Plastic and Cosmetic Surgeries

Ivette Carrico

Ronald Mcclain

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Chapter 1

Plastic surgery

Plastic surgeon	
Occupation	
Names	Doctor, Medical Specialist
Type	Specialty
Activity sectors	Surgery
Description	
Education required	**MD or MBBS or DO-US**
Fields of employment	Hospitals, Clinics

Plastic surgery is a medical specialty concerned with the correction or restoration of form and function. Though cosmetic or aesthetic surgery is the best-known kind of plastic surgery, most plastic surgery is not cosmetic: plastic surgery includes many types of reconstructive surgery, hand surgery, microsurgery, and the treatment of burns.

Etymology

"Plastic" in "plastic surgery" is the adjective meaning 'sculpting' or 'shaping' (Greek *plastikē (tekhnē)* πλαστική (τέχνη) 'the art of modelling'), not the noun plastic, in the sense of synthetic polymers.

History

Walter Yeo, a British soldier, is often cited as the first known person to have benefited from plastic surgery. The photograph shows him before the procedure (left) and after (right) receiving a skin graft performed by Sir Harold Gillies in 1917.

Reconstructive surgery techniques were being carried out in India by 800 BC. Sushruta, the father of Indian surgery, made important contributions to the field of plastic and cataract surgery in 6th century BC. The medical works of both Sushruta and Charak originally in Sanskrit were translated into Arabic language during the Abbasid Caliphate in 750 AD. The Arabic translations made their way into Europe via intermediaries. In Italy the Branca family of Sicily and Gaspare Tagliacozzi (Bologna) became familiar with the techniques of Sushruta.

British physicians traveled to India to see rhinoplasties being performed by native methods. Reports on Indian rhinoplasty performed by a Kumhar vaidya were published in the *Gentleman's Magazine* by 1794. Joseph Constantine Carpue spent 20 years in India studying local plastic surgery methods. Carpue was able to perform the first major surgery in the Western world by 1815. Instruments described in the *Sushruta Samhita* were further modified in the Western world.

Aulus Cornelius Celsus, who lived in the first century AD, described plastic surgery of the face, using skin from other parts of the body.

The ancient Egyptians and Romans also performed plastic cosmetic surgery. The Romans were able to perform simple techniques, such as repairing damaged ears from around the 1st century BC. For religious reasons, they did not dissect either human beings or animals, thus their knowledge was based in its entirety on the texts of their Greek predecessors. Notwithstanding, Aulus Cornelius Celsus left some surprisingly accurate anatomical descriptions, some of which — for instance, his studies on the genitalia and the skeleton — are of special interest to plastic surgery.

In 1465, Sabuncuoglu's book, description, and classification of hypospadias was more informative and up to date. Localization of urethral meatus was described in detail. Sabuncuoglu also detailed the description and classification of ambiguous genitalia. In mid-15th century Europe, Heinrich von Pfolspeundt described a process "to make a new nose for one who lacks it entirely, and the dogs have devoured it" by removing skin from the back of the arm and suturing it in place. However, because of the dangers associated with surgery in any form, especially that involving the head or face, it was not until the 19th and 20th centuries that such surgery became common.

Up until the techniques of anesthesia became established, surgeries involving healthy tissues involved great pain. Infection from surgery was reduced by the introduction of sterile techniques and disinfectants. The invention and use of antibiotics, beginning with sulfa drugs and penicillin, was another step in making elective surgery possible.

In 1792, Chopart performed operative procedure on a lip using a flap from the neck. In 1814, Joseph Carpue successfully performed operative procedure on a British military officer who had lost his nose to the toxic effects of mercury treatments. In 1818, German surgeon Carl Ferdinand von Graefe published his major work entitled *Rhinoplastik*. Von Graefe modified the Italian method using a free skin graft from the arm instead of the original delayed pedicle flap.

The first American plastic surgeon was John Peter Mettauer, who, in 1827, performed the first cleft palate operation with instruments that he designed himself. In 1845, Johann Friedrich Dieffenbach wrote a comprehensive text on rhinoplasty, entitled *Operative Chirurgie*, and introduced the concept of reoperation to improve the cosmetic appearance of the reconstructed nose.

In 1891, American otorhinolaryngologist John Roe presented an example of his work, a young woman on whom he reduced a dorsal nasal hump for cosmetic indications. In 1892, Robert Weir experimented unsuccessfully with xenografts (duck sternum) in the reconstruction of sunken noses. In 1896, James Israel, a urological surgeon from Germany, and in 1889 George Monks of the United States each described the successful use of heterogeneous free-bone grafting to reconstruct saddle nose defects. In 1898, Jacques Joseph, the German orthopaedic-trained surgeon, published his first account of reduction rhinoplasty. In 1928, Jacques Joseph published *Nasenplastik und Sonstige Gesichtsplastik*.

20th century

In World War I, a New Zealand otolaryngologist working in London, Harold Gillies, developed many of the techniques of modern plastic surgery in caring for soldiers suffering from disfiguring facial injuries. His work was expanded upon during World War II by his cousin and former student Archibald McIndoe, who pioneered treatments for RAF aircrew suffering from severe burns. McIndoe's radical, experimental treatments, led to the formation of the Guinea Pig Club. In 1946, Gillies carried out the first female-to-male sex reassignment surgery.

Plastic surgery, as a specialty, evolved remarkably during the 20th century in the United States. One of the founders of the specialty, Vilray Blair, was the first chief of the Division of Plastic and Reconstructive Surgery at Washington University in St. Louis, Missouri. In one of his many areas of clinical expertise, Blair treated World War I soldiers with complex maxillofacial injuries, and his paper on "Reconstructive Surgery of the Face" set the standard for craniofacial reconstruction.

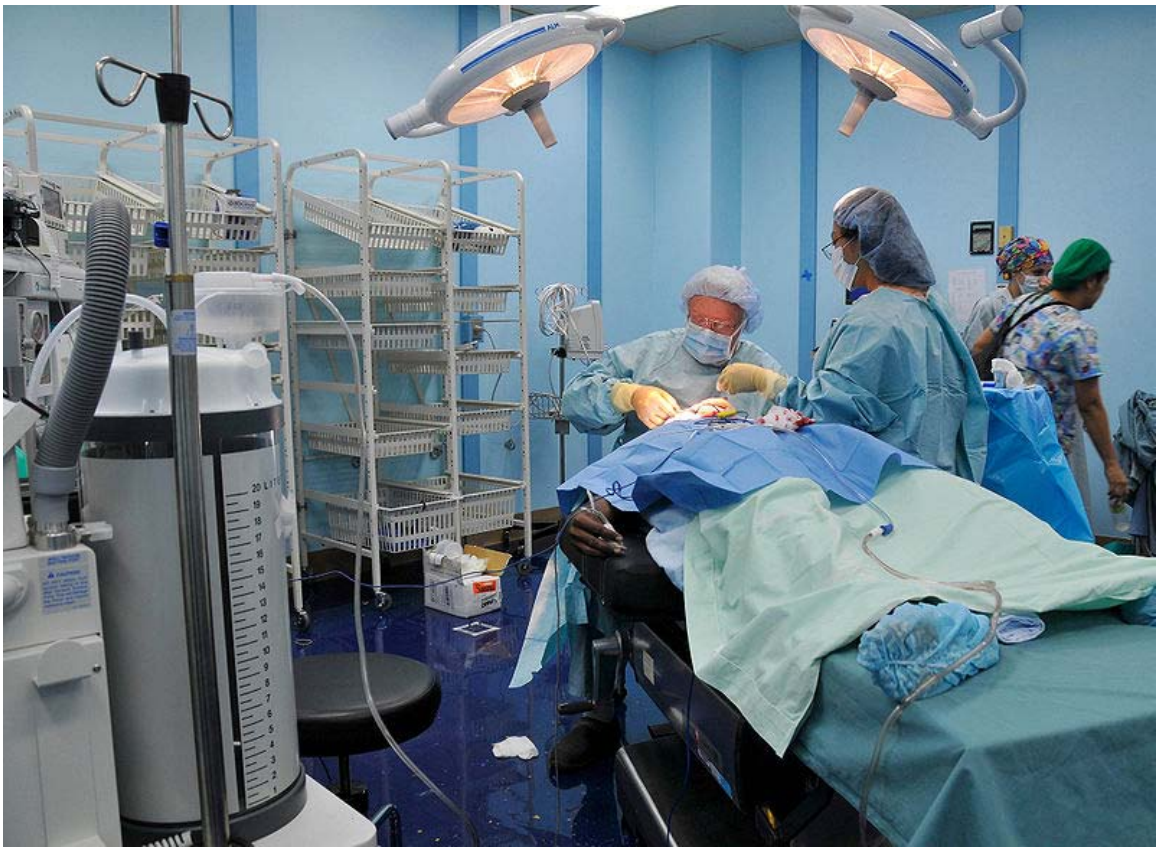
Techniques and procedures

In plastic surgery, the transfer of skin tissue (skin grafting) is a very common procedure. Skin grafts can be taken from the recipient or donors:

- Autografts are taken from the recipient. If absent or deficient of natural tissue, alternatives can be cultured sheets of epithelial cells *in vitro* or synthetic compounds, such as integra, which consists of silicone and bovine tendon collagen with glycosaminoglycans.
- Allografts are taken from a donor of the same species.
- Xenografts are taken from a donor of a different species.

Usually, good results are expected from plastic surgery that emphasizes careful planning of incisions so that they fall in the line of natural skin folds or lines, appropriate choice of wound closure, use of best available suture materials, and early removal of exposed sutures so that the wound is held closed by buried sutures.

Reconstructive surgery



Navy doctors perform reconstructive surgery on a 21-year-old patient

Reconstructive plastic surgery is performed to correct functional impairments caused by burns; traumatic injuries, such as facial bone fractures and breaks; congenital abnormalities, such as cleft palates or cleft lips; developmental abnormalities; infection and disease; and cancer or tumors. Reconstructive plastic surgery is usually performed to improve function, but it may be done to approximate a normal appearance.

The most common reconstructive procedures are tumor removal, laceration repair, scar repair, hand surgery, and breast reduction. According to the American Society of Plastic Surgeons, the number of reconstructive breast reductions for women increased in 2007 by 2 percent from the year before. Breast reduction in men also increased in 2007 by 7 percent. Some other common reconstructive surgical procedures include breast reconstruction after a mastectomy, cleft lip and palate surgery, contracture surgery for burn survivors, and creating a new outer ear when one is congenitally absent.

Plastic surgeons use microsurgery to transfer tissue for coverage of a defect when no local tissue is available. Free flaps of skin, muscle, bone, fat, or a combination may be removed from the body, moved to another site on the body, and reconnected to a blood supply by suturing arteries and veins as small as 1 to 2 millimeters in diameter.

Cosmetic surgery

Rhinoplasty or Nose Surgery

Blepharoplasty or Cosmetic Eyelid Surgery

Aesthetic plastic surgery involves techniques intended for the "enhancement" of appearance through surgical and medical techniques, and is specifically concerned with maintaining normal appearance, restoring it, or enhancing it beyond the average level toward some aesthetic ideal.

In 2006, nearly 11 million cosmetic procedures were performed in the United States alone. The number of cosmetic procedures performed in the United States has increased over 50 percent since the start of the century. Nearly 12 million cosmetic procedures were performed in 2007, with the five most common surgeries being breast augmentation, liposuction, nasal surgery, eyelid surgery and abdominoplasty. The increased use of cosmetic procedures crosses racial and ethnic lines in the U.S., with

increases seen among African-Americans and Hispanic Americans as well as Caucasian Americans. In Europe, the second largest market for cosmetic procedures, cosmetic surgery is a $2.2 billion business. Cosmetic surgery is now very common in countries such as the United Kingdom, France, and Germany. In Asia, cosmetic surgery has become an accepted practice; currently most widely prevalent and normal in China where it is currently Asia's biggest comestic surgery market. Children undergoing cosmetic eye surgery can be seen in Japan and South Korea.

The most prevalent aesthetic/cosmetic procedures include:

- Abdominoplasty ("tummy tuck"): reshaping and firming of the abdomen
- Blepharoplasty ("eyelid surgery"): reshaping of the eyelids or the application of permanent eyeliner, including Asian blepharoplasty
- Phalloplasty
- Mammoplasty:
    - Breast augmentations ("breast implant" or "boob job"): augmentation of the breasts by means of fat grafting, saline, or silicone gel prosthetics, which was initially performed to women with micromastia
    - Reduction mammoplasty ("breast reduction"): removal of skin and glandular tissue, which is done to reduce back and shoulder pain in women with gigantomastia and/or for psychological benefit men with gynecomastia
    - Mastopexy ("breast lift"): Lifting or reshaping of breasts to make them less saggy, often after weight loss (after a pregnancy, for example). It involves removal of breast skin as opposed to glandular tissue
- Buttock augmentation ("butt implant"): enhancement of the buttocks using silicone implants or fat grafting ("Brazilian butt lift") and transfer from other areas of the body
    - Buttock lift: lifting, and tightening of the buttocks by excision of redundant skin
- Chemical peel: minimizing the appearance of acne, chicken pox, and other scars as well as wrinkles (depending on concentration and type of agent used, except for deep furrows), solar lentigines (age spots, freckles), and photodamage in general. Chemical peels commonly involve carbolic acid (Phenol), trichloroacetic acid (TCA), glycolic acid (AHA), or salicylic acid (BHA) as the active agent.
- Labiaplasty: surgical reduction and reshaping of the labia
- Lip enhancement: surgical improvement of lips' fullness through enlargement
- Rhinoplasty ("nose job"): reshaping of the nose
- Otoplasty ("ear surgery"/"ear pinning"): reshaping of the ear, most often done by pinning the protruding ear closer to the head.
- Rhytidectomy ("face lift"): removal of wrinkles and signs of aging from the face
    - Browplasty ("brow lift" or "forehead lift"): elevates eyebrows, smooths forehead skin
    - Midface lift ("cheek lift"): tightening of the cheeks
- Suction-assisted lipectomy ("liposuction"): removal of fat from the body

- Chin augmentation ("chin implant"): augmentation of the chin with an implant, usually silicone, by sliding genioplasty of the jawbone or by suture of the soft tissue
- Cheek augmentation ("cheek implant"): implants to the cheek
- Orthognathic Surgery: manipulation of the facial bones through controlled fracturing
- Fillers injections: collagen, fat, and other tissue filler injections, such as hyaluronic acid
- Laser skin resurfacing

Sub-specialties

Plastic surgery is a broad field, and may be subdivided further. Plastic surgery training and approval by the American Board of Plastic Surgery includes mastery of the following as well:

Burn

Burn surgery generally takes place in two phases. Acute burn surgery is the treatment immediately after a burn. Reconstructive burn surgery takes place after the burn wounds have healed. Reconstructive surgery generally involves plastic surgery.

Cosmetic

Aesthetic surgery is an essential component of plastic surgery. Plastic surgeons use cosmetic surgical principles in all reconstructive surgical procedures as well as isolated operations to improve overall appearance.

Craniofacial

Craniofacial surgery is divided into pediatric and adult craniofacial surgery. Pediatric craniofacial surgery mostly revolves around the treatment of congenital anomalies of the craniofacial skeleton and soft tissues, such as cleft lip and palate, craniosynostosis, and pediatric fractures. Adult craniofacial surgery deals mostly with fractures and secondary surgeries (such as orbital reconstruction) along with orthognathic surgery. Craniofacial surgery is an important part of all plastic surgery training programs, further training and subspecialisation is obtained via a craniofacial fellowship.

Hand

Hand surgery is concerned with acute injuries and chronic diseases of the hand and wrist, correction of congenital malformations of the upper extremities, and peripheral nerve problems (such as brachial plexus injuries or carpal tunnel syndrome). Hand surgery is an important part of training in plastic surgery, as well as microsurgery, which is necessary to replant an amputated extremity. The Hand surgery field is also practiced by orthopedic

surgeons and general surgeons. Scar tissue formation after surgery can be problematic on the delicate hand, causing loss of dexterity and digit function if severe enough.

Micro

Microsurgery is generally concerned with the reconstruction of missing tissues by transferring a piece of tissue to the reconstruction site and reconnecting blood vessels. Popular subspecialty areas are breast reconstruction, head and neck reconstruction, hand surgery/replantation, and brachial plexus surgery.

Pediatric

Children often face medical issues very different from the experiences of an adult patient. Many birth defects or syndromes present at birth are best treated in childhood, and pediatric plastic surgeons specialize in treating these conditions in children. Conditions commonly treated by pediatric plastic surgeons include craniofacial anomalies, cleft lip and palate and congenital hand deformities.

Plastic surgery obsession

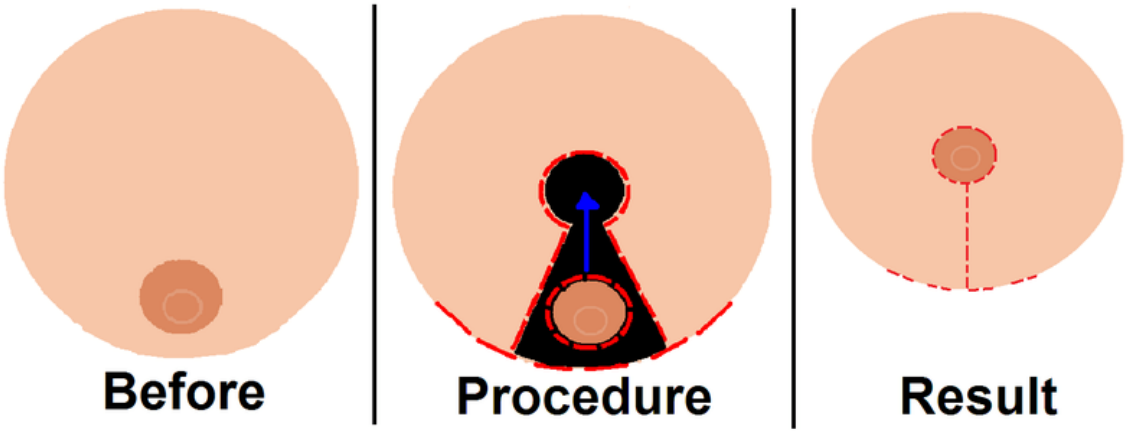
With increased media attention on beauty and perfection, celebrities and those alike are turning to plastic surgery more and more. Some take out loans for this purpose; one woman spent over $83,000 for 14 surgeries.

Though media and advertising do play a large role in influencing many people's lives, researchers believe that plastic surgery obsession is linked to psychological disorders. Body dysmorphic disorder is seen as playing a large role in the lives of those who are obsessed with going under the knife in order to achieve physical perfection. People with this disorder are so preoccupied with their appearance that it can dominate their lives.

In some cases, people whose doctors refuse to perform any further surgeries, have turned to "do it yourself" plastic surgery, injecting themselves and running extreme safety risks.

Chapter 2

Breast Reduction



The common inferior pedicle breast reduction procedure with final result (red indicates incision lines).

Breast reduction or **reduction mammoplasty** is a common surgical procedure which involves the reduction in the size of breasts by excising fat, skin, breast implants and glandular tissue; it may also involve a procedure to counteract drooping of the breasts. As with breast augmentation, this procedure is typically performed on women, but may also be performed on men afflicted by gynecomastia. In 2005, over 113,000 women had breast reductions, an increase of 11 percent from 2004.

Candidates

Breast reduction surgery is oriented toward women with large, pendulous breasts, especially gigantomastia, since the weight of their breasts may cause chronic pain of the head, neck, back, and shoulders, plus circulation and breathing problems. The weight may also cause discomfort as a result of brassiere straps abrading or irritating the skin. For these reasons, the surgery is usually covered by insurance or by welfare provisions. Even if physical discomfort is not a problem, some women feel awkward with the enormity of their breasts in proportion to the rest of their smaller bodies. Except in unusual cases, this procedure is performed on individuals with fully-developed breasts, and it is not typically recommended for women who desire to breastfeed.

Males with common condition of gynecomastia may feel embarrassed and upset with their condition, usually developed during adolescence. They may get the surgery for restored confidence. The surgical methods employed may vary depending on whether the breasts in the male patient are caused by adipose (fatty) or glandular tissue, and the degree to which any glandular tissue extends laterally along the sides of the torso.

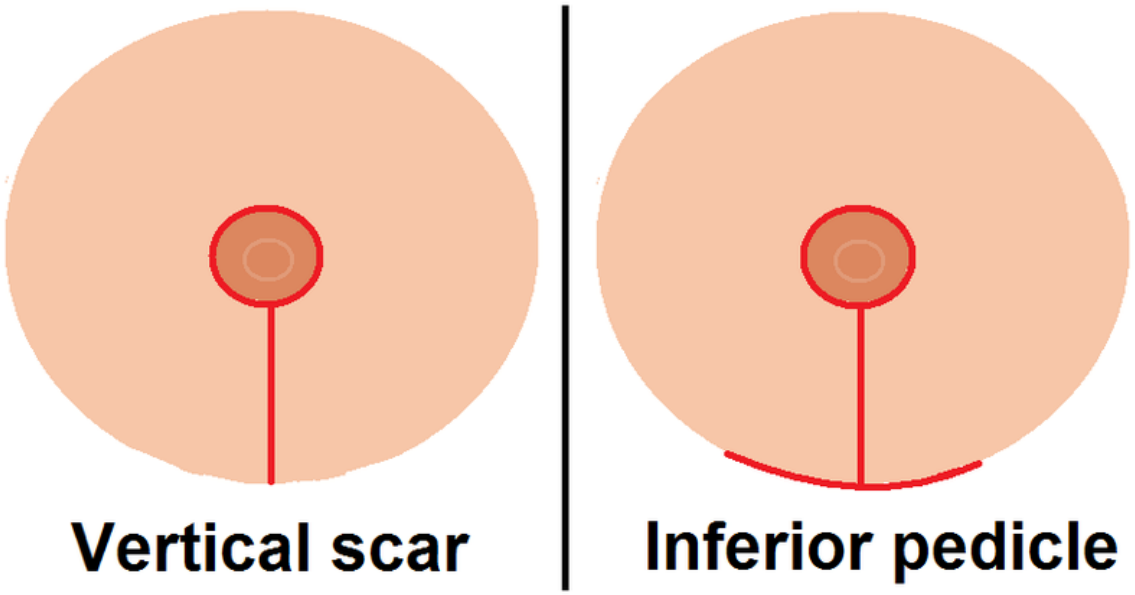
Procedure

Doctors almost always perform breast reductions while the patient is under general anesthesia. During pre-operative visits, the doctor and patient may decide on new, usually higher, positions for the areolas and nipples.

For males, excess tissue may simply be removed through a tiny incision in each breast. This leaves minimal scarring.

Patients may take a few weeks for initial recovery, however it may take from six months to a year for the body to completely adjust to the new breast size. Some women may experience discomfort during their initial menstruation following the surgery due to the breasts swelling.

Techniques



A comparison of post-surgery incision lines from the two most popular techniques

The traditional popular technique in North America bases the blood supply to the nipple and areola complex (NAC) from a central and inferiorly based attachment to the chest wall (an "inferior pedicle" or "central mound" technique), with variations of orientations of such pedicles described. Better understanding of anatomy in terms of innervation to the NAC has made it more likely to leave both nipple sensitivity and capability to lactate

for the patient as compared to other techniques of the past. It is now being studied and debated as to which of the techniques results in a better quality of life for the patient in the long run. Liposuction has been used as an adjunct to other breast reduction procedures for quite some time, but liposuction only techniques are not widely performed. All of the breast reduction techniques produce some degree of breast lift, but have a tendency to settle and stretch out the inferior skin envelope over time.

Inferior pedicle technique

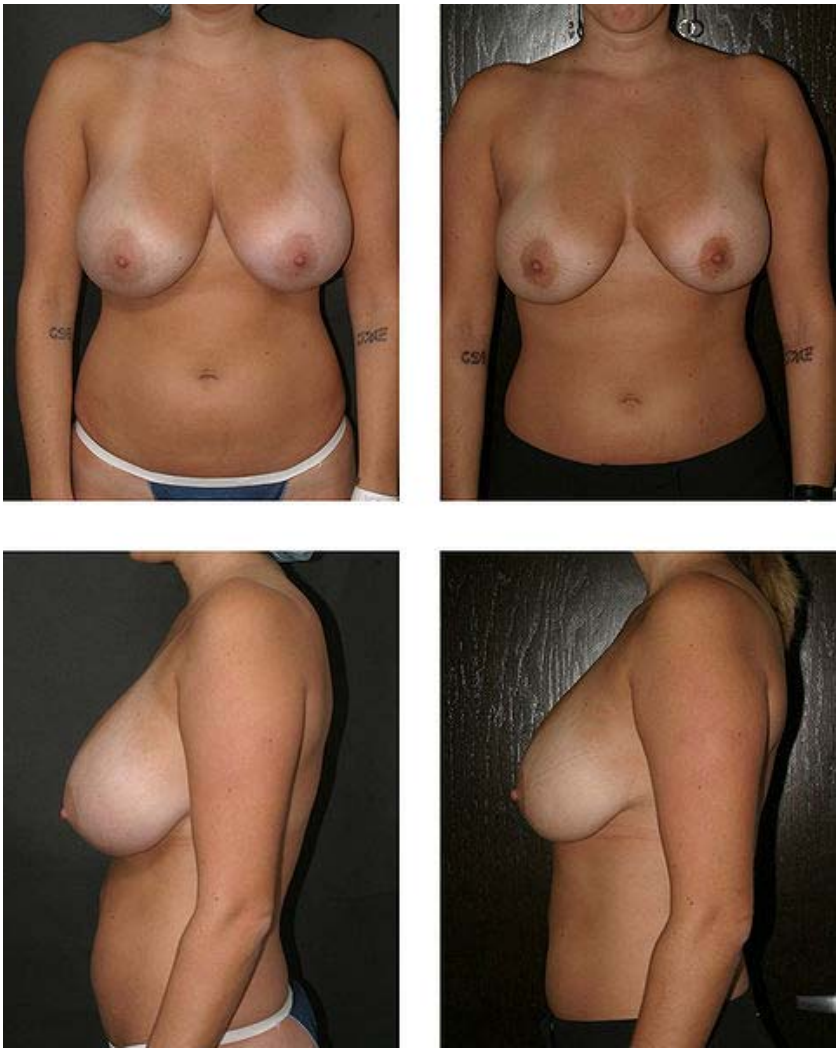
The inferior pedicle technique, sometimes also known as a keyhole, inverted-T, or "Wise pattern" reduction, involves an anchor-shaped incision which circles the areola. The incision extends downward, following the natural curve of the breast. Excess glandular tissue, fat, and skin is removed. Next, the nipple and areola are moved into their new higher position. A drawback of this technique is sometimes "square" looking breasts, but this is a common option for women with the largest, droopiest breasts. This is the most commonly performed technique in North America and produces predictable outcomes with larger reductions. Inferior pedicle techniques can also be performed through shorter scar incisions in some patients.

Vertical scar technique

The vertical scar techniques are gaining popularity in the United States due to their shorter scarring and projecting shape post-surgery. These types of procedures can involve the use of superior, inferior, medial or laterally based pedicles to the NAC. As compared to traditional incisions, they may have a limited or absent horizontal component. These procedures are best suited to smaller reductions with less excess skin to limit the scar length. Advantages include increased projection by the gathering of tissue medially, shorter scar length, and quicker surgery times. This technique keeps its results the best in the long term. The breast is reduced through removal of the lateral and inferior tissues, leaving the upper pole mostly untouched.

Horizontal scar technique

Horizontal scar techniques involve the use of a scar along the inframammary fold and a round cutout for the NAC. These procedures typically require a inferior or inferior-lateral pedical like traditional "Wise pattern" surgeries but eschew the vertical wedge excision. They permit a shorter scar option in women who are too large for vertical scar techniques. Advantages include the absence of a scar on the visible meridian of the breast and better scarring of the NAC inset. Disadvantages are the potential for "boxy" shaped breasts and poorer scarring that can be produced along the IMF.



The liposuction-only technique does not have as noticeable of a result, but will leave minimal scarring.
Liposuction-only technique

The liposuction-only technique is used for women with breasts that are not quite as large as with the other procedures or in patients who are anesthesia risks for longer procedures. For the best outcomes, women who choose this procedure have fatty, non-dense breast tissue with good skin and little ptosis (droop). As few women with larger breasts possess those characteristics, the widespread use of this technique may be limited. The result is not as drastic as the other techniques, but it involves a quicker healing time and little scarring. This is a technique typically used in conjunction with some direct excision of dense tissue for male gynecomastia surgery.

Free nipple graft technique

The free nipple graft technique is used primarily for high risk patients of ischemia to the NAC to reduce the chance of sloughing it postoperatively. Typical candidates would

include diabetics, smokers, longer breasts approaching 20 cm from the IMF to the nipple, and breasts with significantly larger than normal resection requirements. In this procedure, the areola and nipple are completely removed for relocation and replaced as a skin graft higher on the breast. In these cases, sensation from the areola area will be lost and it eliminates the ability for lactation. This technique is sometimes used during surgery or postoperatively if the NAC viability is questionable. By eliminating the requirement for a pedical, this procedure allows significantly greater amounts of tissue to be removed safely.

Results

Reduction mammoplasty affords the recipient smaller, lighter, and firmer breasts. The surgeon may also reduce the size of and change the shape of the areola or nipples. Both men and women typically have restored confidence, as well. It has been mentioned that patients who have received breast reductions are the happiest and most satisfied of all plastic surgery recipients.

Risks

Possible issues include difficulty breast feeding, scarring, asymmetry, delayed wound healing, altered nipple sensation, fluid retention in the breast, altered erogenous function, and late changes in shape and recurrent ptosis (drooping).

It may impair the likelihood of breastfeeding success due to the surgical disruption to the lactiferous duct system. However, a number of studies have demonstrated a similar ability to breast feed when breast reduction patients are compared to control groups.

Scarring from this procedure may be extensive and permanent. Initially, the scars are lumpy and red, but they gradually subside into their final smaller sizes as thin lines, slightly discolored. Though permanent, the surgeon can make the scars inconspicuous to the point that even low-cut tops may be worn without visible scars.

Cancer-prevention

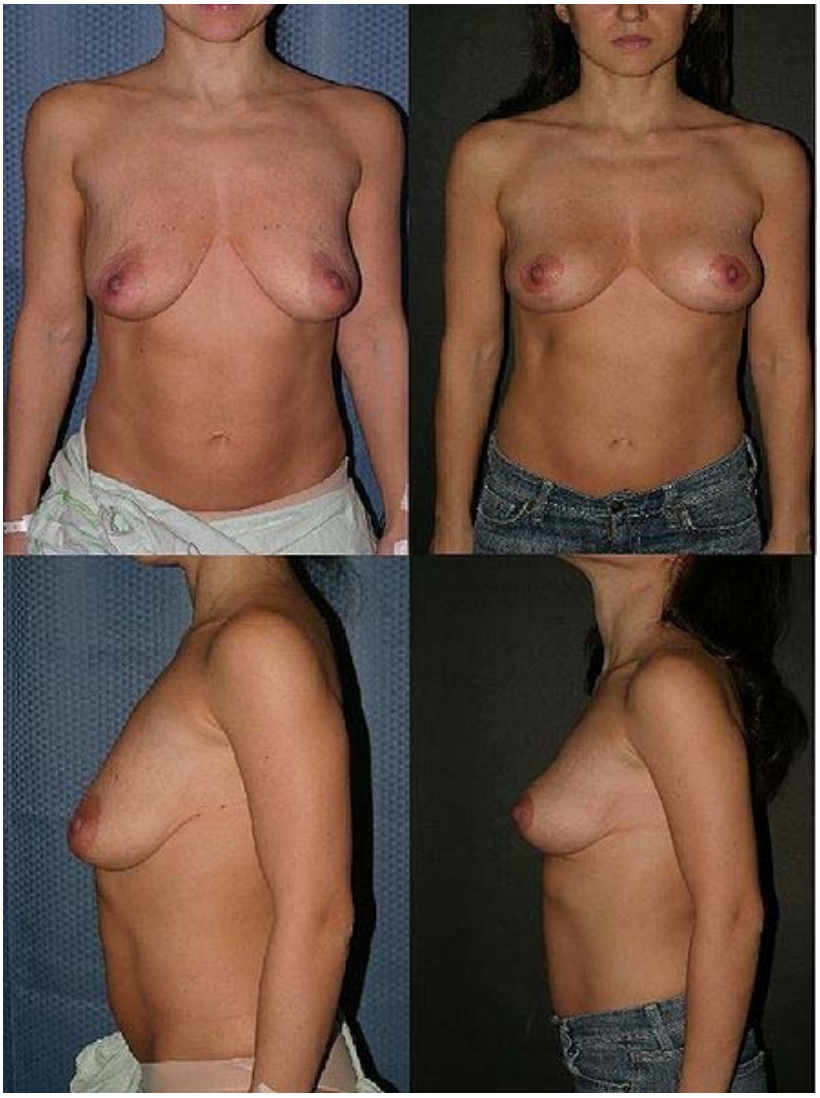
Although not advocated as a cancer risk reducing procedure, a woman's risk of subsequently developing breast cancer will be reduced proportionately to the amount of breast tissue left.

The surgery can also make mammograms easier, since it may be difficult to get a decent mammogram reading with a great deal of excess breast tissue. Therefore, with less tissue, it can be easier for doctors to get and interpret the results of a mammogram. However, it is still typically recommended that patients receive new baseline mammograms 6 to 8 months after breast reduction to accommodate expected radiographic changes and give a new basis to which future imaging studies can be compared.

Chapter 3

Mastopexy and Chemical Peel

Mastopexy



Mastopexy: the vertical technique bilateral breast lift.

Mastopexy (**breast lift**) surgery denotes a group of elective surgical procedures designed either to lift or to change the shape of a woman's breasts. Besides lifting the breast tissue and removing skin, a mastopexy might also include repositioning the areola and the nipple. In practice, a mastopexy can be effected as a discrete surgery, or as a subordinate surgery comprehended within a breast augmentation done for the emplacement of breast implants. The physical changes afforded by a mastopexy — the position and shape of the breast, by the (re) distribution of the existing breast tissues — are temporary, because the effects of gravity and of aging will continue acting upon the patient's body, causing ptosis to recur in the course of time.

Mastopexy surgery procedures

Full breast lift

The full breast lift involves an incision along the crease underneath the breast, incisions around the areola, and a vertical incision between the areola and the base of the breast, called "anchor incision" and "inverted-T incision". This technique removes excess skin, elevates the breast, and often reduces the size of the areola, and thus allows effecting maximal changes to the breast. As such, it is the most widely used, traditional surgical technique because it consistently produces the desired breast shape and breast position upon the chest wall.

Breast augmentation: A plastic surgeon performing a mastopexy (breast lift) in conjunction with a silicone breast implant procedure. To meet the patient's desired outcome, the two procedures are commonly combined as one surgery.

The three, distinct scars, consequent to this mastopexy technique, are in three locations; each has a characteristic pattern of healing. In the peri-areolar area, the scarring is partially concealed by the lighter-to-darker change in skin color at the transition from the breast skin to the pigmented skin of the areola. The vertical, anchor incision from the areola to the breast crease can be hidden in shadow. The inframammary portion of the scar, that courses along the inframammary fold of the breast, often is the thickest of the three surgical scars, but it can be hidden in that fold. Moreover, although the coloration of these scars fades, they do remain visible, in most cases.

Modified breast lift

The modified breast lift effects the same transformation as a full breast lift, but with fewer consequent scars; yet, it is potentially limited, because the plastic surgeon can effect fewer changes to the shape of the breast. In surgical praxis, the modified mastopexy surgical technique often is performed as part of a breast augmentation. There are several, variant modified breast lift techniques: (i) the "Benelli breast lift" ("doughnut lift"), which is a concentric mastopexy that involves removing a ring of skin from around the areola in order to limit scarring of the areolar area; (ii) the "crescent lift" that also removes a ring of tissue from around the areola, but which takes more tissue from the area above the areola, thereby raising the nipple and areola on the chest wall; (iii) the "lollipop lift", which involves an incision around the nipple and areola, with a vertical scar extending to the inframammary fold, the crease underneath the breast; and (iv) a "doughnut lift" variant that includes removing excess skin from underneath the breast.

Chemical peel

A **chemical peel** is a body treatment technique used to improve and smooth the texture of the facial skin using a chemical solution that causes the dead skin to slough off and eventually peel off. The regenerated skin is usually smoother and less wrinkled than the old skin. Thus the term chemical peel is derived. Some types of chemical peels can be purchased and administered without a medical license, however people are advised to seek professional help from a dermatologist, esthetician, plastic surgeon, or otolaryngologist on a specific type of chemical peel before a procedure is performed.

Types

There are several types of chemical peels.

Alpha hydroxy acid peels

Alpha hydroxy acids (AHAs) are naturally occurring carboxylic acids such as glycolic acid, a natural constituent of sugar cane juice and lactic acid, found in sour milk and tomato juice. This is the mildest of the peel formulas and produces light peels for treatment of fine wrinkles, areas of dryness, uneven pigmentation and acne. Alpha hydroxy acids can also be mixed with a facial wash or cream in lesser concentrations as part of a daily skin-care regimen to improve the skin's texture.

There are five usual fruit acids: citric acids (citrus-derived), glycolic acid (derived from sugar cane), lactic acid (although derived from milk, this is still considered a "fruit acid"), malic acid (derived from apples) and tartaric acid (derived from grapes). Many other alpha hydroxy acids exist and are used.

- Citric acid: Usually derived from lemons, oranges, limes and pineapples. These peels are simple and effective, although not incredibly invasive or capable of significant improvement with one treatment.
- Glycolic acid: Formulated from sugar cane, this acid creates a mild exfoliating action. Glycolic acid peels work by loosening up and exfoliating the superficial top layer. This peel also stimulates collagen growth. High strength peels are good in terms of efficacy but they irritate more. Some glycolic peels claim the use of strontium nitrate in order to try to reduce skin irritation. Nevertheless, strontium nitrate is a product which is strictly prohibited in cosmetic products since it has an high toxic potential
- Lactic acid: This acid is derived from either sour milk or bilberries. This peel will remove dead skin cells, and promote healthier skin.
- Malic acid: This peel is the same type of mildly invasive peel derived from the extracts of apples. It can open up the pores, allow the pores to expel their sebum and reduce acne.
- Tartaric acid: This is derived from grape extract and is capable of delivering the same benefits as the above peels.

AHA peels are not indicted for treating wrinkles.

AHA peels may cause stinging, cause skin redness, cause mild skin irritation, cause dryness, and take multiple treatments for desired results.

Beta hydroxy acid peels

It is becoming common for beta hydroxy acid (BHA) peels to be used instead of the stronger alpha hydroxy acid (AHA) peels due to BHA's ability to get deeper into the pore than AHA. Studies show that BHA peels control oil, acne as well as remove dead skin cells to a certain extent better than AHAs due to AHAs only working on the surface of the skin.

Jessner's peel

Jessner's peel solution, formerly known as the Coombe's formula,was pioneered by Dr Max Jessner, a German-American dermatologist. Dr Jessner combined 14% salicylic acid, lactic acid, and resorcinol in an ethanol base. It is thought to break intracellular bridges between keratinocytes. It is very difficult to "overpeel" the skin due to the mild percentages associated with the acid combination.

Retinoic acid peel

Retinoic acid is derived from retinoids. This type of facial peel is also performed in the office of a plastic surgeon or a dermatologist in a medical spa setting. This is a deeper peel than the beta hydroxy acid peel and is used to remove scars as well as wrinkles and pigmentation problems. It is usually performed in conjunction with a Jessner; which is performed right before, in order to open up the skin, so the retinoic acid can penetrate on

a deeper level. The client leaves with the chemical peel solution on their face. The peeling process takes place on the third day. More dramatic changes to the skin require multiple peels over time.

Trichloroacetic acid peels

Trichloroacetic acid (TCA) is used as an intermediate to deep peeling agent in concentrations ranging from 20-50%. Depth of penetration is increased as concentration increases, with 50% TCA penetrating into the reticular dermis. Concentrations higher than 35% are not recommended because of the high risk of scarring.

Trichloroacetic acid peels:

- are preferred for darker-skinned patients over Phenol
- smooth out fine surface wrinkles
- remove superficial blemishes
- correct skin pigment problems

Trichloroacetic acid peels may:

- require pre-treatment with Retin-A or AHA creams
- require repeat treatment to maintain results
- require the use of sunblock for several months (this is a must)
- take several days to heal depending on the peel depth

Phenol peels

Phenol is the strongest of the chemical solutions and produces a deep skin peel. Some publications claim that phenol peel affect could be due to the action of croton oil and that phenol would not be effective without this oil. This should be longer studied and double blind comparative studies should be done to prove this claim. In reality, many phenol peel solutions exist(ed) that do (did) not contain croton oil. This last is only a penetration enhancer, acting at the epidermal very superficial layers. Croton oil is not the only penetration enhancer that can be used. After 15 seconds as a maximum, phenol penetrates inside of the dermis and the most important question seems to be actually : How to do in order to slow down phenol penetration and give it a major possibility of interaction with skin proteins (coagulation effect)? Effects of a phenol chemical peel are long lasting, and in some cases are still readily apparent up to 20 years following the procedure. Improvements in the patient's skin can be quite dramatic. A single treatment usually achieves the desired result.

Phenol peels are used to:

- correct blotches caused by sun exposure or aging
- smooth out coarse deep wrinkles
- remove precancerous growths

Phenol peels may:

- pose a risk of arrythmias if applied without following strict rules
- permanently remove facial freckles
- many formulas cause permanent skin lightening by reducing the ability to produce pigment
- require increased protection from the sun for life

Anesthesia

Light chemical peels like AHA and glycolic acid peels are usually done in medical offices. There is minimal discomfort so usually no anesthetic is given because the patient feels only a slight stinging when the solution is applied. No pain killer is needed.

Medium peels like TCA are also performed in the doctor's office or in an ambulatory surgery center as an outpatient procedure and are a bit more painful. Frequently, the combination of a tranquilizer like Valium and a pain pill usually suffice. TCA peels often do not require anesthesia even if the solution itself has - at the contrary of phenol - no numbing effect on the skin. The patient usually feels a warm or burning sensation.

Phenol is the classic deep chemical peel. Old phenol peel solutions are very painful and most practitioners will perform it under either general anesthesia, administered by an MD-anesthesiologist or nurse anesthetist. More recent formulas easily allow a simple heavy sedation, usually intravenous. Recent phenol peel formulas can be applied locally (chemical blepharoplasty or cheiloplasty)without any kind of anaesthesia.

Chapter 4

Labiaplasty

Labiaplasty (also **labioplasty**, **labia minor reduction**, and **labial reduction**) is plastic surgery of either the labia majora or the labia minora or both — the external folds of skin surrounding the structures of the vulva — in order to reduce the size of elongated labia. Moreover, a labiaplasty that creates labia where there were none, usually is a subordinate procedure within a vaginoplasty, plastic surgery of the vagina. The medical and sociologic reasons for labial reduction include the correction of labial damage occurred during childbirth, the elimination of pain and discomfort consequent to larger and enlarged labia, and for personal, æsthetic reasons, as cosmetic surgery.

Surgeries

Labiaplasty reduces the size of one or both sets of labia (labia majora, labia minora) in repairing the labia following the patient's recovery from disease or injury. Moreover, as part of a labiaplasty, a hoodectomy (excision of the clitoral prepuce) might also then be affected in order to expose the clitoris, in an attempt to increase sexual stimulation; a hoodectomy occasionally is affected in treating anorgasmia, a type of sexual dysfunction.

Historically, as recently as 1999, plastic surgeons usually performed labium reduction via straight amputation of the protuberant sections, then sutured the edges together; however, labia minora reduction occasionally creates a fragile, stiff suture line and eliminates the natural contour and pigmentation of the labia minora. Moreover, other procedural and clinical problems exist with labial reduction by amputation, thus, a favorable outcome is not guaranteed.

Technologically, the inclusion of medical lasers to the armamentarium of the plastic surgeon allowed the development of refined surgical procedures, such as the "inferior wedge resection" and the "superior pedicle flap reconstruction". The surgical outcome study *Aesthetic Labia Minora Reduction with Inferior Wedge Resection and Superior Pedicle Flap Reconstruction* (2006) reported that of 20 patients studied after undergoing labiaplasty via the procedure, 95.2 per cent, at the 46-month mark, reported being very satisfied; and that only five medical complications occurred, of which four were immediately resolved post-operatively, without requiring an extended hospitalization or interfering with the healing of the labiaplasty.

In practice, labiaplasty is usually an outpatient surgical procedure performed under anesthesia; the physician determines the use of either local anesthetic or short, general anesthetic in ensuring the patient's comfort. After surgery, the patient might experience some mild discomfort and variable inflammation of the tissues, which usually subside and disappear within one to two weeks.

Risks

Despite improved liposuction outcome rates, many initial surgeries for breast augmentation and rhinoplasty yield results unsatisfactory to the patient, and the patient returns to the operating table for revision and correction. In comparison with other bodily rejuvenation surgeries, 5–7 per cent of labiaplasty patients require additional treatment. In 2006, per the U.S. statistics compiled by American, British, and other developed nation surgeons, the American Society of Plastic Surgeons (ASPS) reported some 1,000 "vaginal rejuvenations" performed, indicating that the application of labiaplasty appears exponential. Reconstructive surgery medical associations, such as the American Society of Plastic Surgeons (ASPS), the American Society for Aesthetic Plastic Surgery (ASAPS), the British Association of Aesthetic Plastic Surgeons (BAAPS), and the International Society of Aesthetic Plastic Surgeons (ISAPS), do not record labiaplasties to their annual statistics of plastic and cosmetic procedures. Moreover, *Hypertropohy of Labia Minora: Experience with 163 reductions*, a nine-year study of 163 labiaplasty patients reported that 83 percent of patients were satisfied with the results one month after the surgery.

Sexual reassignment

In sexual reassignment surgery, in the case of the trans woman patient, labiaplasty usually is the second of a two-stage vaginoplasty, wherein are created the labia and a clitoral hood. The procedure usually is effected within months of the first-stage of the sexual reassignment. In some cases, after a one-stage vaginoplasty, the labiaplasty is an elective procedure for improving the æsthetics of the woman's genital physical appearance.

Patient reports and responses

Labial reduction usually is requested by the patient, because of either functional (pain or discomfort) or æsthetic reasons (e.g. physical embarrassment with her lover), or both; yet there is no comprehensive study of the matter. In 2007, the British Medical Journal reported that "the few reports that exist on patients' satisfaction with labial reductions are generally positive, but assessments are short-term and lack methodological rigour". The extant studies, by plastic surgeons, include one by Dr. John R. Miklos and Dr. Robert D. Moore, which they conducted in their practice. In "Labiaplasty of the Labia Minora: Patients' Indications for Pursuing Surgery", they reported that 32 per cent of the patients had a labiaplasty performed because of functional impairment; 31 per cent underwent the procedure for functional and æsthetic reasons; and 37 per cent underwent the surgery for æsthetic reasons.

Also in 2007, in the British Medical Journal, the psychologist Lih Mei Liao and the gynecologist Sara M. Creighton, said that women's demand for cosmetic genitoplasty had increased, and that the National Health Service (NHS) had performed double the number of labiaplasties performed in the previous five years inclusive. They interviewed healthy women who had undergone the surgery, to learn their motives for undergoing a labiaplasty; many of the women said that their genital physical appearance was an important motive. In "Requests for Cosmetic Genitoplasty: How Should Healthcare Providers Respond?", drs. Lih and Creighton report that:

Patients consistently wanted their vulvas to be flat, with no protrusion beyond the labia majora . . . some women brought along images to illustrate the desired appearance, usually from adverts or pornography that may have been digitally altered.

In the event, they criticized the "designer vagina craze", arguing that its social popularity is rooted in commercialism. Elsewhere, like concerns were published in Australia. Earlier, in 2004, in a sociologic feature article, The New York Times newspaper reported that the commonplace use of pornography had increased the demand for labiaplasties.

Opposition and controversy

Labiaplasty is a controversial subject among laymen and physicians who say that women's desire for the procedure, to achieve an æsthetically "ideal female genitalia", is engendered commercially, by means of a mentally unhealthy, sexual self-image derived from pornography. Conflating the medical, the sociologic, and the religious connotations of such plastic surgery, some opponents liken labiaplasty to genital modification and mutilation. In 2007, the American College of Obstetricians and Gynecologists (ACOG) officially stated its professional opposition to commercial misrepresentations of surgeries that are "deceptive, to give the impression" that labiaplasty and associated surgical procedures are "accepted and routine surgical practices" among physicians. The ACOG published a committee opinion about labiaplasty and other female genital surgeries — "vaginal rejuvenation", "designer vaginoplasty", "revirgination", and "Gräfenberg Spot amplification" — wherein they doubt the safety of the surgical procedures, noting that there is little documentation of them. The ACOG opinion recommends that women seeking such surgeries must be fully informed of the dearth of statistical data substantiating the safety of the surgical procedures and potential risks of infection, altered sensation, dyspareunia (difficult or painful coitus), adhesions, and scarring.

In the U.S., "The New View Campaign", based in New York City, is a feminist organization of social scientists and clinicians that opposes labiaplasty as part of a larger socio-psychologic societal problem, manifested as the medicalizing of female sexuality. They oppose the extension of legally unregulated genital cosmetic surgery as a business that medicalizes female sexuality and thereby engenders new health risks, social norms, and psychologic insecurities in women. In 2008, the World Health Organization (WHO) published a report that said: "Health professionals must never perform female genital mutilation", citing the physician's fundamental medical ethics against harming a patient, and the social danger that the medicalization of female sexuality legitimates these

surgical practices. In the opinion of The New View Campaign, the social and mental health alternatives are the legitimation of the diversity of women's body and genital types; acknowledging that sexual self-hatred is societally induced; and the teaching of sexual and genital self-acceptance.

Because some opponents and critics said that women were requesting labiaplasties out of vanity, solely to have "more socially acceptable genitalia" created, six academics, including the heads of two women's centers and the chiefs of four university departments of obstetrics and gynecology, discussed the matter in a symposium sponsored by The International Society for the Study of Women's Sexual Medicine. They discussed elective vulvar plastic surgery and female genital cutting in Third World nations, and assigned six experts to gather vulvar health evidence. The report indicated that variations in vulvar appearance are statistically normal, but that labiaplasty — like any medical treatment — is a woman's right, concluding that vulvar plastic surgery might be medically warranted only after counseling and if it remains her choice; the surgery must be safely effected, and the physician performs it as medical requirement, not solely for the business purpose of performing surgery.

Chapter 5

Rhinoplasty

Rhinoplasty (Greek: *Rhinos*, "Nose" + *Plassein*, "to shape"), commonly referred to as **nose reshaping** or a **nose job**, is a surgical procedure which is usually performed by either an otolaryngologist (head and neck surgeon), maxillofacial surgeon, or plastic surgeon in order to improve the function (reconstructive surgery) or the appearance (cosmetic surgery) of a human nose. Rhinoplasty can be performed to meet aesthetic goals or for reconstructive purposes to correct trauma, birth defects or breathing problems. Rhinoplasty can be combined with other surgical procedures such as chin augmentation to enhance the aesthetic results.

History

Reconstructive nose surgery was first developed by Sushruta, an important Ayurvedic physician in ancient India, who is often regarded as the "father of plastic surgery."Sushruta first described nasal reconstruction in his text *Sushruta Samhita* circa 500 BC. He and his later students and disciples used rhinoplasty to reconstruct noses that were amputated as a punishment for crimes. The techniques of forehead flap rhinoplasty he developed are practiced almost unchanged to this day. This knowledge of plastic surgery existed in India up to the late 18th century as can be seen from the reports published in *Gentleman's Magazine* (October, 1794).

A book written in Latin titled De Curtorum Chirurgia Per Insitionem - meaning The Surgery of Defects by Implantations - was published in 1597, and was written by Gaspare Tagliacozzi, professor or surgery and anatomy at the University of Bologna describes operations carried out to repair faces that had been wounded in battle. It is illustrated with diagrams, including the rhinoplasty, in which the patient's nose was attached to a flap of skin from his upper arm (bicep) and tells how he stayed like that for about three weeks until the skin from his arm had attached itself properly. After a further two weeks the flap of skin was shaped so it resembled a nose and the process was complete.

Patient, three days post-op. Procedures included dorsal bone reduction and re-setting and refinement of nasal tip cartilage. The typical orbital discoloration is also present due to trauma and disruption of blood vessels around the eyes. Also present is a splint.

The precursors to the modern rhinoplasty surgeons include Johann Dieffenbach (1792–1847) and Jacques Joseph (1865–1934), who used external incisions for nose reduction surgery. John Orlando Roe (1848–1915) is credited with performing the first intranasal rhinoplasty in the U.S. in 1887.

Prior to the 1970s, all rhinoplasty surgeries were performed via the intranasal approach, which is often called closed rhinoplasty. However, in 1973, Dr. Wilfred S. Goodman published an article entitled "External Approach to Rhinoplasty" which helped initiate a shift in rhinoplasty techniques to what has become known as the open rhinoplasty. The open rhinoplasty technique was further refined and popularized by Dr. Jack Anderson in his article "Open rhinoplasty: an assessment". The open approach to rhinoplasty gained in popularity during that time, but it was used mainly for first-time rhinoplasty surgery and not for revision rhinoplasty.

In 1987 Dr. Jack P. Gunter, who trained under Dr. Anderson, published an article describing the merits of the open rhinoplasty approach for secondary rhinoplasty. This was a major shift in the approach to treating nasal deformities that arose from a previous rhinoplasty.

Surgical procedures and types

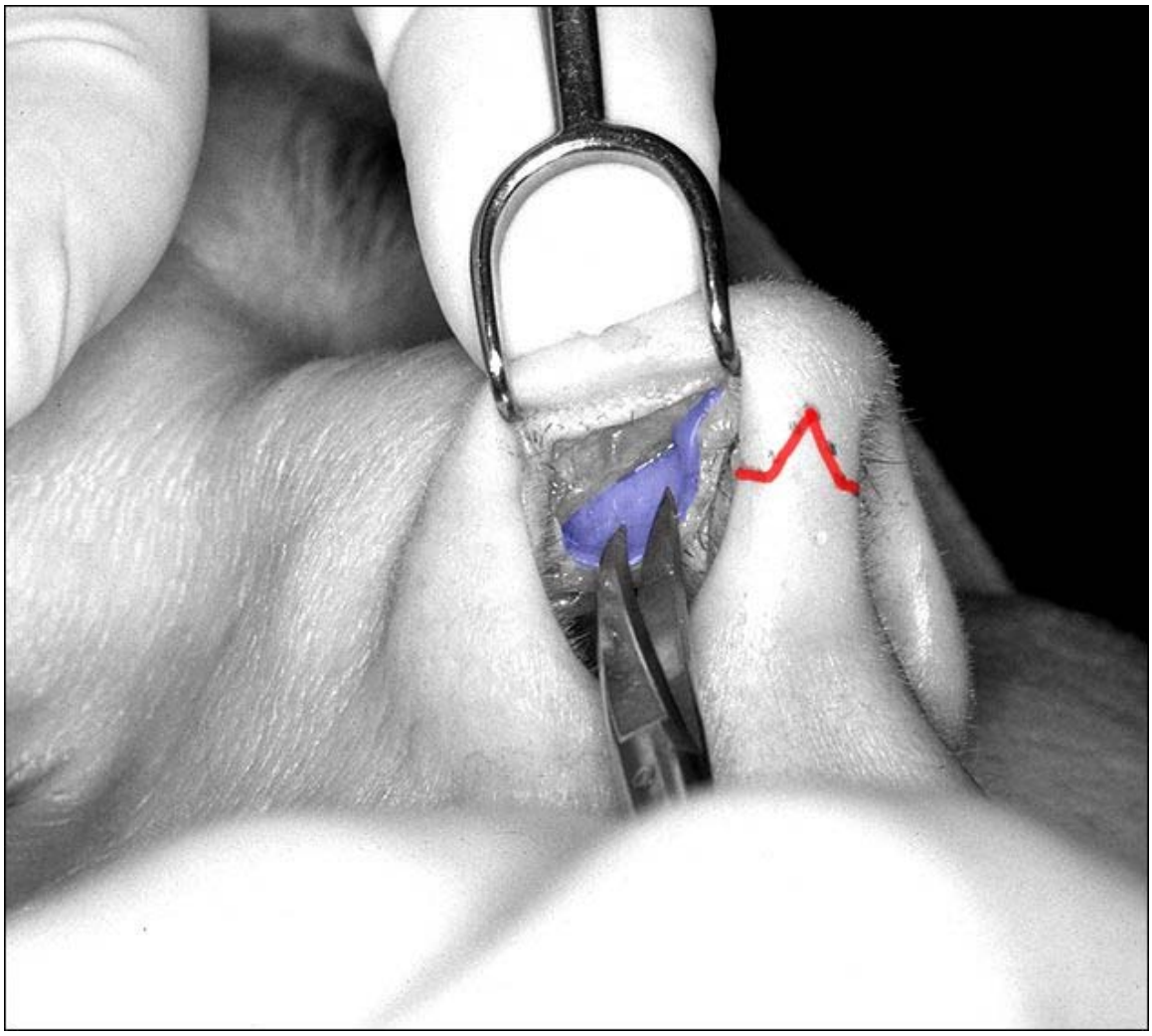
Surgical approach: Open vs. closed

Rhinoplasty can be performed under a general anesthetic, sedation, or with local anesthetic. Initially, local anesthesia, which is a mixture of lidocaine and epinephrine, is injected to numb the area and temporarily reduce vascularity. There are two possible approaches to the nose: closed approach and open approach. In closed rhinoplasty, incisions are made inside the nostrils. In open rhinoplasty, also known as a Coronal Forehead Lift, an additional inconspicuous incision is made across the columella (the bit of skin that separates the nostrils). The surgeon first separates the skin and soft tissues of the nose from the underlying structures. The cartilage and bone are reshaped, and the incisions are sutured closed. Some surgeons use a stent or packing inside the nose, followed by tape or stent on the outside.

In some cases, the surgeon may shape a small piece of the patient's own cartilage or bone, as a graft, to strengthen or change the shape of the nose. Usually the cartilage is harvested from the septum. If there isn't enough septum cartilage, which can occur in revision rhinoplasty, cartilage can be harvested from the concha of the ear or the ribs. In the rare case where bone is required, it is harvested from the cranium, the hip, or the ribs. Sometimes a synthetic implant may be used to augment the bridge of the nose.

Skin incision for an open rhinoplasty. The incision may be “v-shaped” or a “stair-step” shaped incision. This aids the surgeon in attaining a precise closure and for camouflaging the resulting scar.

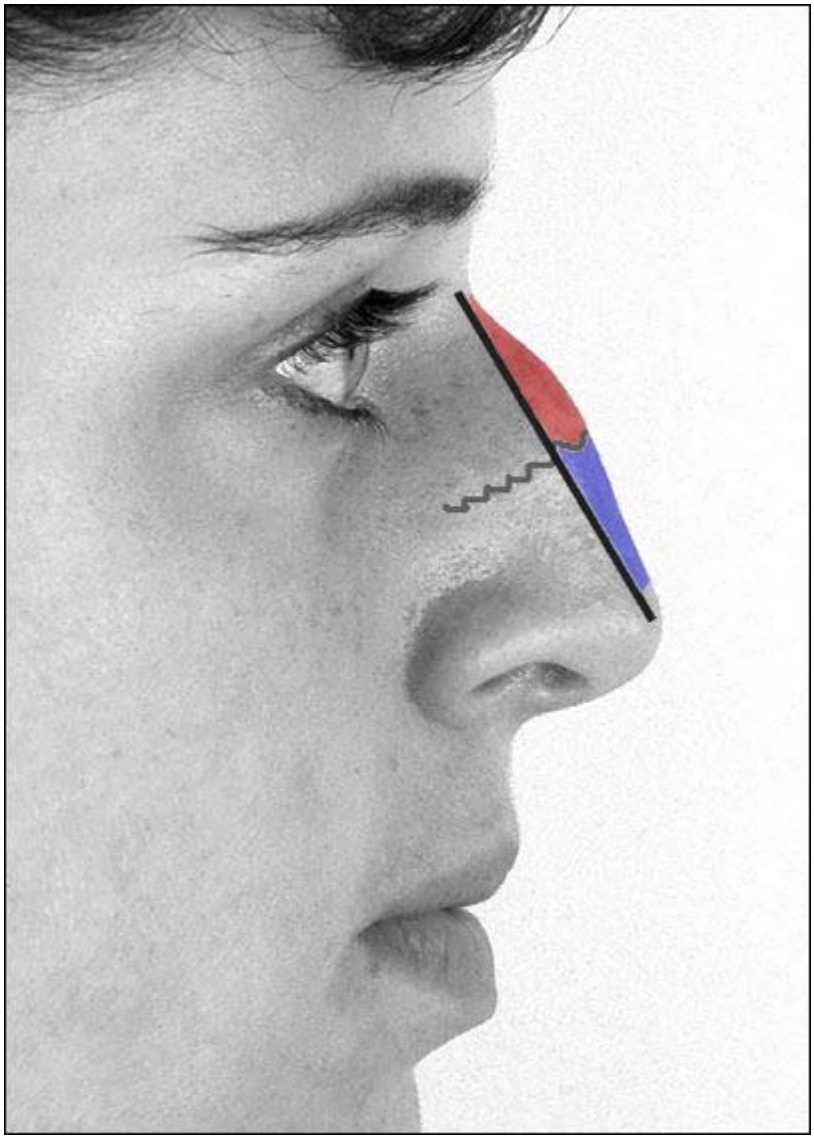
The incisions for a rhinoplasty are hidden inside the nose, with the exception of a small incision across the base of the nose, depicted by the dotted line.



Exposing the cartilages inside the nose

The incisions allow the surgeon to see the size and shape of the cartilages and bones on the inside of the nose, so that they can be altered.

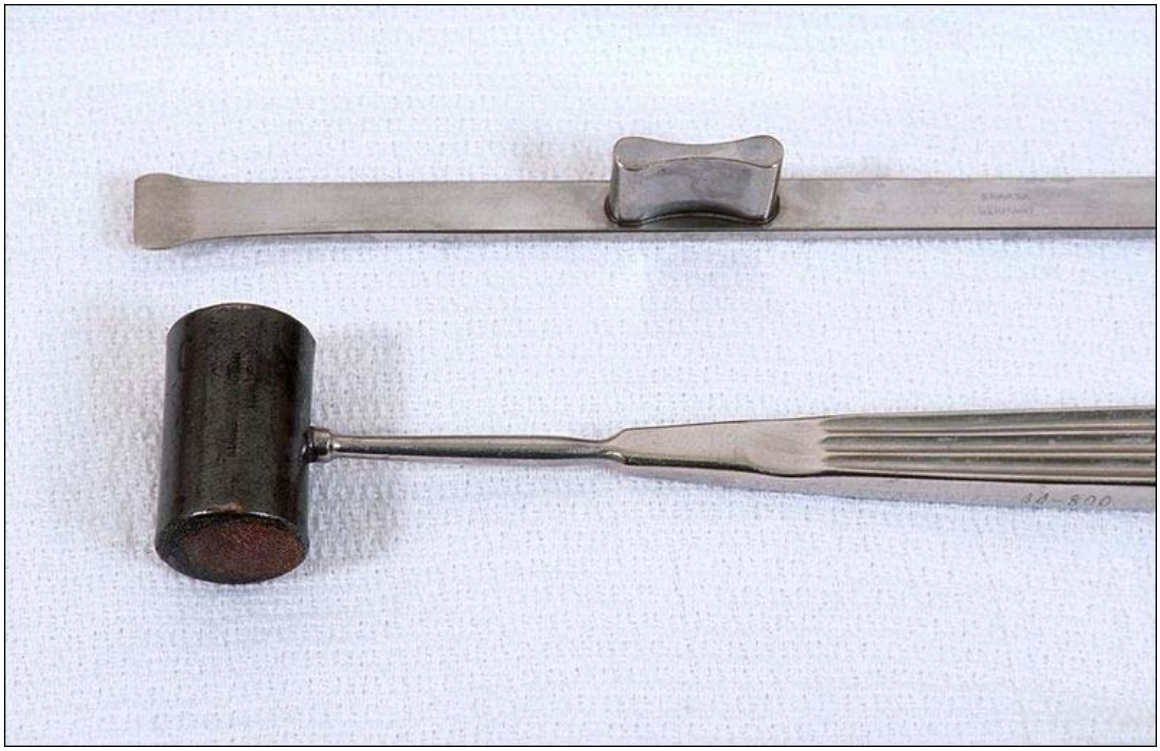
Here, the scissors are pointing out the lower lateral cartilage (in blue), which is one of the cartilages that gives the tip of the nose its shape. The red line shows the location of the planned incision across the bottom of the nose.



Planning excision of a nasal hump

Once the skin has been lifted from the bone and cartilage framework of the nose, often the first task is to remove a hump, if one is present. Part of the hump is made of bone, and part of the hump is cartilage.

In the photograph, the black line shows the desired profile. The nose is made of bone above the scalloped grey line and cartilage below that line. The part of the hump made of bone is shaded red, and the part of the hump made of cartilage is shaded blue.



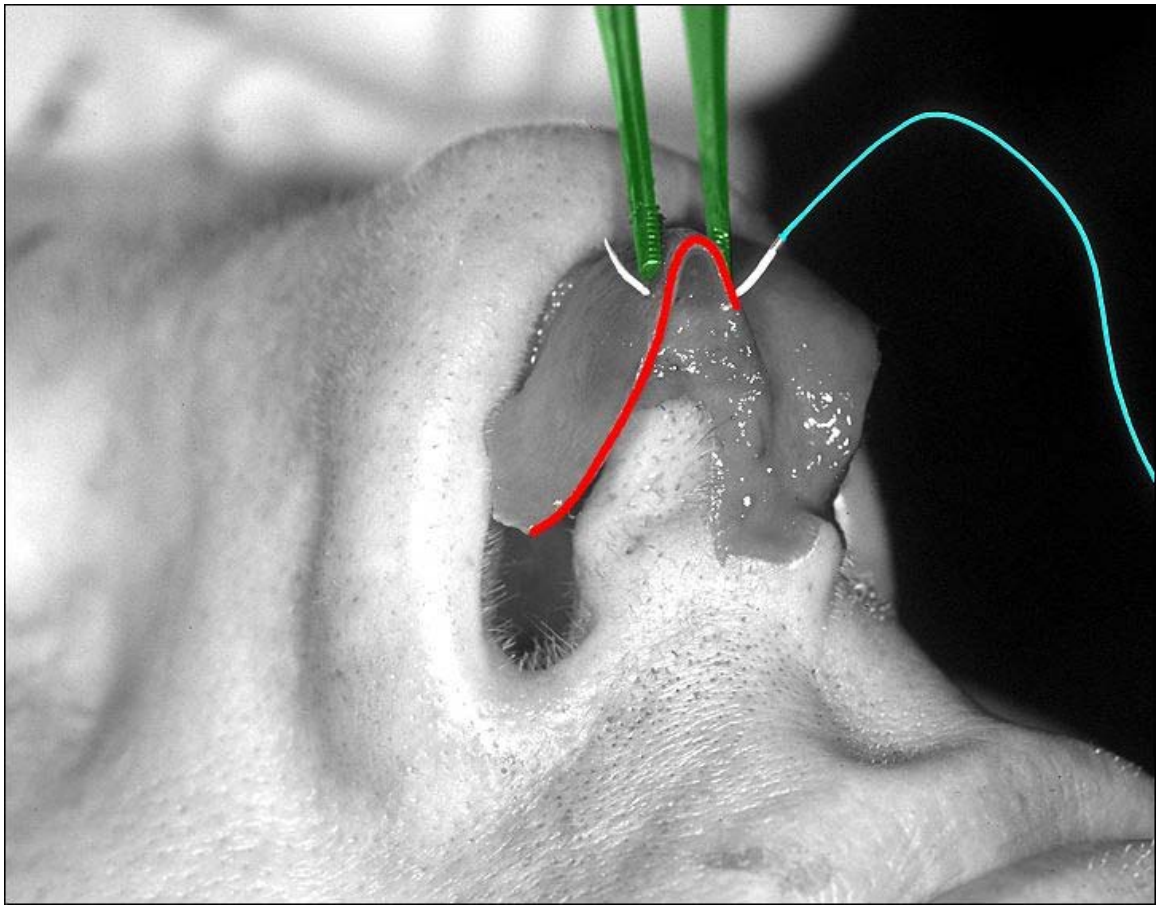
Rhinoplasty osteotome and hammer

The soft cartilage of the hump is removed with a scalpel, and the bony hump is often removed with a chisel, shown at the top of this photograph. "Osteotome" is the medical term for a chisel. This photograph also shows the copper hammer that is used with the osteotome.

Rhinoplasty rasps

After the main part of the hump is removed with an osteotome, files are used to smooth out the remaining bone. The files are also called rasps, and they come in different shapes, orientations, and grades.

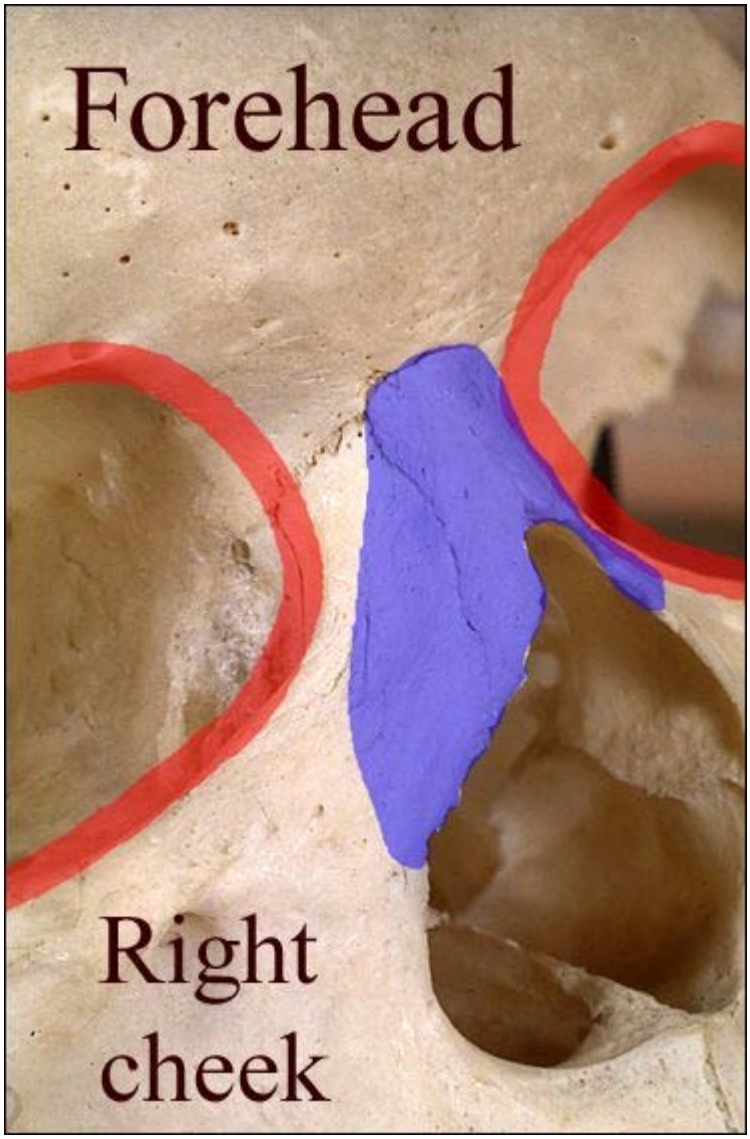
Some surgeons use rasps to remove the entire hump, foregoing use of the osteotome.



One technique to narrow the nasal tip

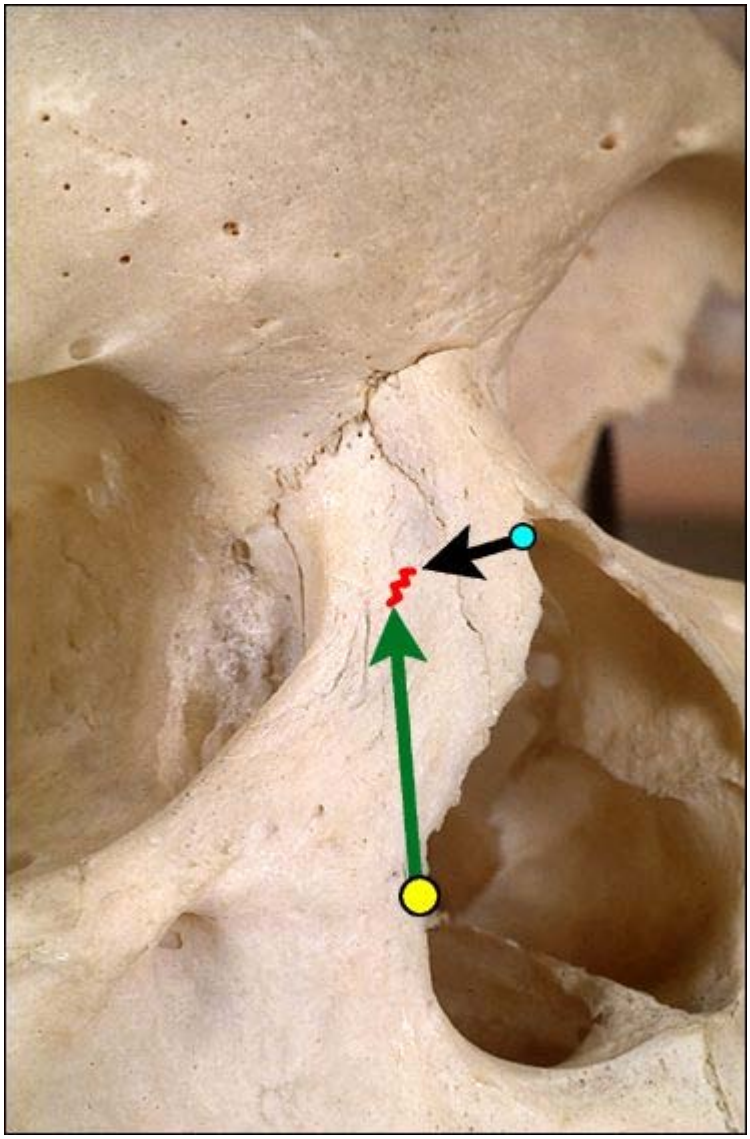
A common complaint is that the tip of the nose is too wide. Many surgical techniques are available to narrow the tip of the nose, depending on what is causing the excess width.

In this photo, a suture is being placed to narrow the tip of the nose. The red line outlines the edge of the tip cartilage, which is narrowed when the suture tightens the fold of the cartilage at its apex. The suture is in light blue, ending in the needle, which appears white in the photograph. The cartilage is being held in place with tweezers, which are shaded green.



The nasal bones

If the position of the nasal bones gives excess width to the upper part of the nose, the bones are moved inward, to a more narrow position. This skull shows in blue the position of the bones in the nose. For orientation, the eye sockets are outlined in red.



Designing the cuts in the nasal bones

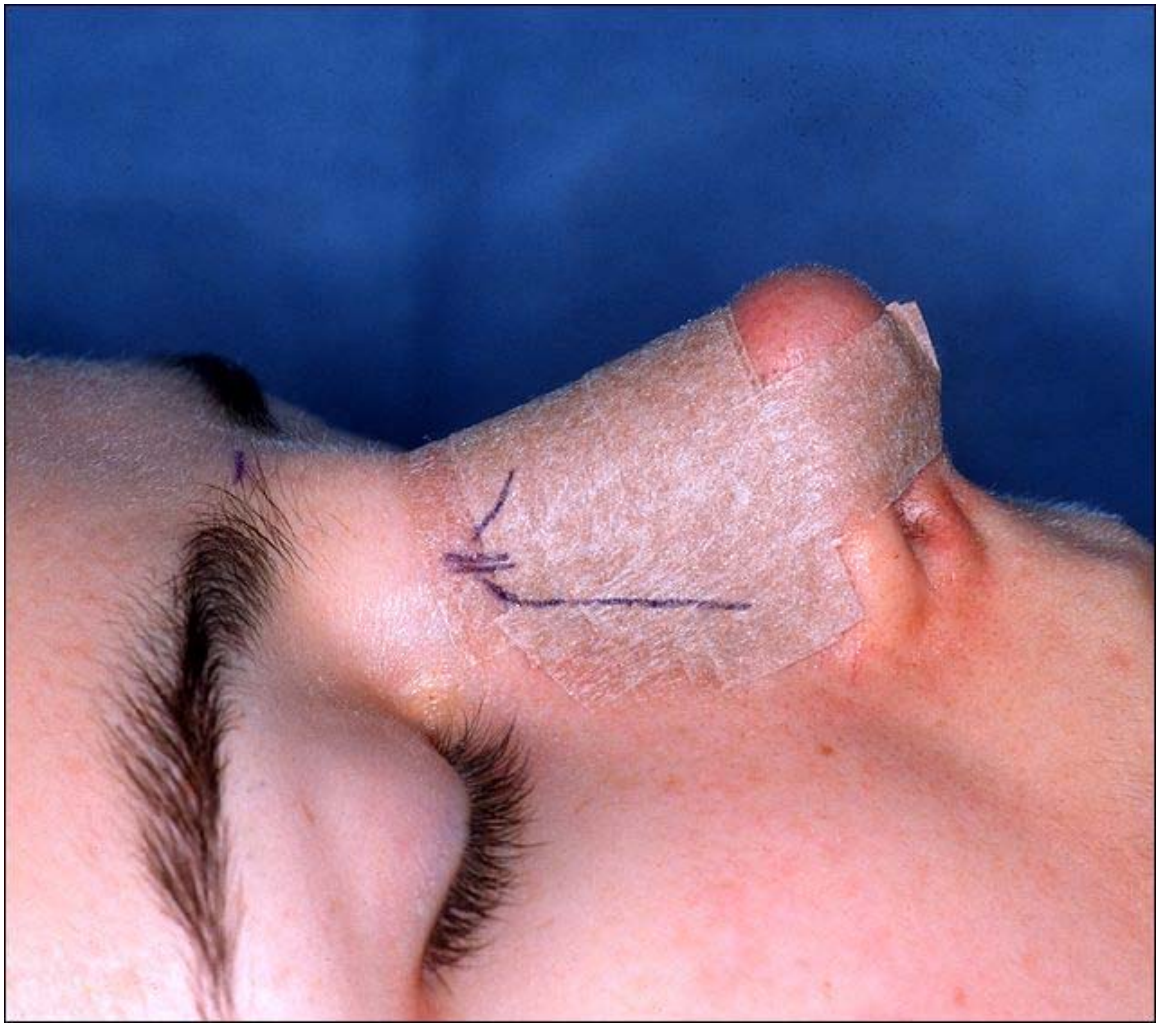
To narrow a nasal bone, two cuts are made in the bone with a tiny chisel: one cut starting at the yellow dot and extending up along the green arrow, and another cut starting at the blue dot and extending out along the black arrow. The piece of bone thus loosened from the skull is pushed inward, narrowing the nose.

These chisel cuts are made from underneath the skin, so there is no scar in the area after healing.

At the end of the rhinoplasty

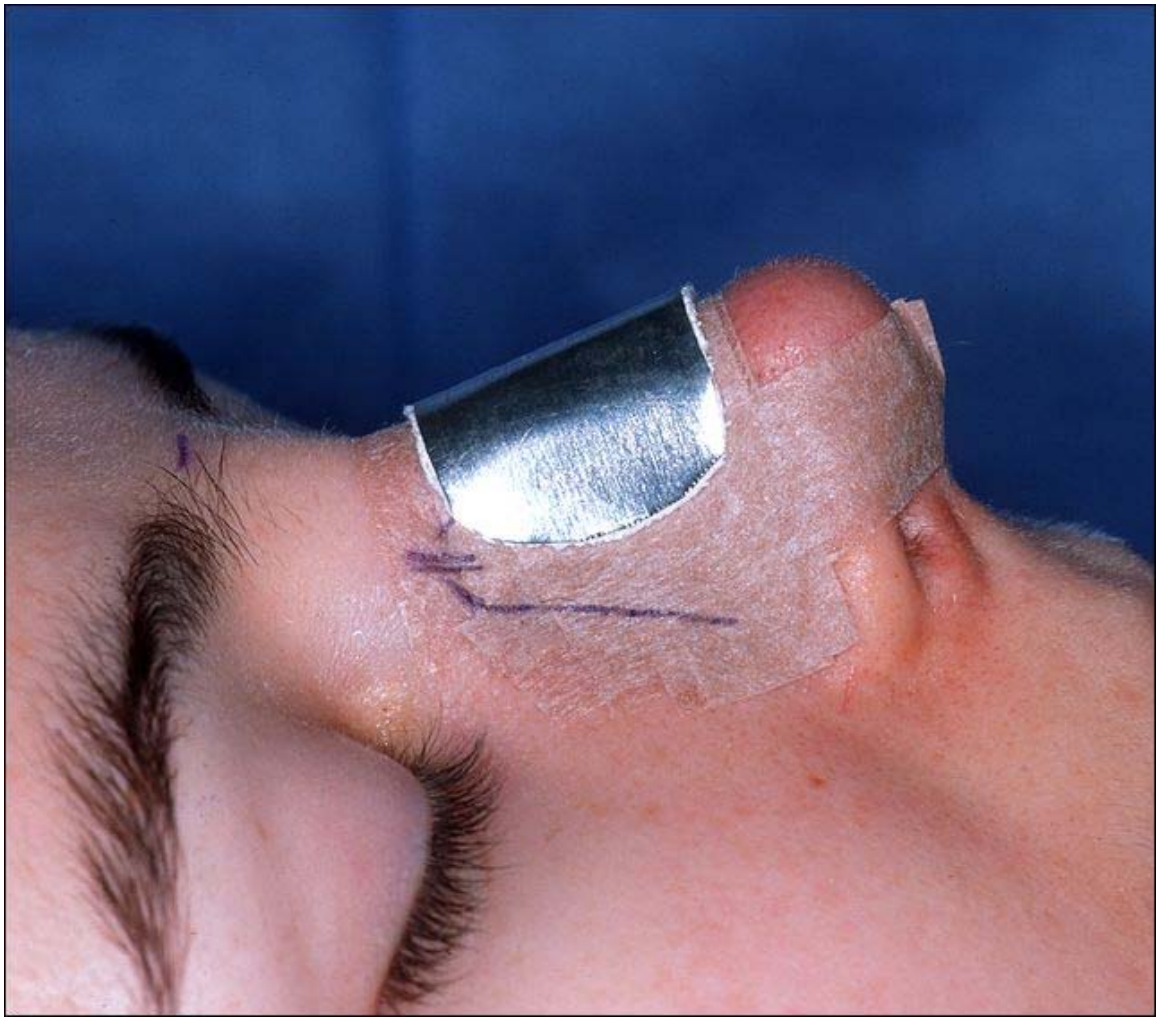
At the end of the procedure, after the incisions are closed, the nose is dressed, to hold it securely in place as it heals.

This photo shows the nose just before the dressing and splint are placed. The purple marks on the nose guided the surgeon in making accurate cuts in the bone during surgery.



Taping the nose, in preparation for the metal splint

Preparing for the metal splint: the nose is first covered with paper tape in a manner to help maintain the nose's new shape.



Metal nasal splint in place

After taping, the metal splint is designed and cut and shaped, and it is placed on the nose.

Metal nasal splint has been taped on the nose

The metal splint is then covered with the tape, to hold it in place. The operation is now completed. The dressing will be removed in one week.

Primary and secondary

Primary rhinoplasty refers to first-time rhinoplasty whether it is performed for aesthetic, functional, or reconstructive purposes.

Revision rhinoplasty, also known as secondary rhinoplasty, is a nose operation performed to correct or revise an unsatisfactory outcome from a previous rhinoplasty. An unsatisfactory outcome occurs from 5% to 20% of rhinoplasties. There are two main reasons for performing secondary rhinoplasty. Patients often seek secondary rhinoplasty to correct a cosmetic deformity of the nose. A patient may be unsatisfied with all or part of a previous "nose reshaping.". A nasal fracture may not have been reduced enough, or

too much. A prominent or bulbous nasal tip may have not been addressed appropriately, or over-aggressively. The nose may looked pinched, it may look like a parrot's beak, or like a boxer's nose. There are many ways in which previous nose surgery may have left a nose aesthetically unappealing to a patient. The second reason is functional. The original nasal surgery may have been carried out to help with difficulties in breathing, and the outcome may have been unsatisfactory. Alternatively, the original surgery may have been performed for cosmetic reasons, but may have disrupted a normal physiologic mechanism involving the inspiration or expiration of air, making it difficult to breathe. Secondary rhinoplasty is a procedure often said to be extremely complicated. Because the nasal framework has often been destroyed or deformed from previous surgery, revision rhinoplasty experts frequently must reconstruct the support structures of the nose using cartilage grafts from either the ear (auricular cartilage graft) or from rib cartilage (costal cartilage graft). Most revision rhinoplasty specialists perform secondary rhinoplasty via the open approach. This allows the surgeon to directly visualize the deformity. Advances in rhinoplasty techniques, such as stabilization of rib cartilage grafts and utilization of the open approach, now allow satisfactory results in secondary rhinoplasty that were not possible in the past.

Functional and reconstructive

Reconstructive rhinoplasty refers to restoring the normal shape and function of the nose following damage from a traumatic accident, autoimmune disorder, intra-nasal drug abuse, previous injudicious cosmetic surgery, cancer involvement, or congenital abnormality. Rhinoplasty can restore skin coverage, recreate normal contours, and re-establish nasal airflow. To improve nasal breathing function, a septoplasty may also be performed. If there is turbinate hypertrophy, an inferior turbinectomy can be performed.

Rhinoplasty may be sought in the aftermath of traumatic deformity. Traumatic accidents are the most common cause of nasal deformity. Typically the nasal bones are broken and displaced. Occasionally, the nasal cartilages are disrupted or displaced, and in the worst cases the nasal dorsum is collapsed. Rhinoplasty allows shaving of the displaced bony humps, and re-alignment of the nasal bones after they are cut. When cartilage is disrupted, stitching of the cartilage for re-suspension, or use of cartilage grafts to camouflage depressions allows re-establishment of normal nasal contour. When the dorsum is collapsed, grafts of rib cartilage, ear cartilage, or cranial bone can be used to restore continuity to the dorsum. Although synthetic implants are also available for augmenting the nasal dorsum, cartilage or bone graft from the patient's own body poses fewer risks of infection or rejection.

The lower lateral cartilage (greater alar cartilage) exposed through the left nostril for modification during a rhinoplasty.

Rhinoplasty is sometimes sought for a collapsed nose due to septum perforation. Autoimmune problems such as Wegener's Granulomatosis, Sarcoidosis, Churg-Strauss Syndrome, and Relapsing Polychondritis can lead to creation of a hole in the nasal septum, and loss of support in the dorsum leading to a saddle nose deformity. Intra nasal use of drugs such as cocaine, or extreme abuse of nasal decongestant sprays can similarly cause septum perforation and nasal dorsum collapse. Dorsum reconstruction is accomplished through the use of rib cartilage or bone grafts.

Rhinoplasty to correct nasal obstruction following injudicious cosmetic surgery is common. Reconstructive rhinoplasty after injudicious cosmetic surgery allows the restoration of normal breathing. When nasal cartilages are over-aggressively trimmed during rhinoplasty, the nose can appear pinched and nasal potency compromised. Patients complain of nasal blockage that is worsened by attempts at deep inspiration. Internal cartilage grafts to support the nasal tip (batton grafts) or widen the middle vault of the nose (spreader grafts) can be quite effective in restoring normal breathing. These grafting techniques will increase the size of the nasal tip and widen the dorsum.

Rhinoplasty for skin cancer excision also exists. Excision of skin cancers from the nose can lead to loss of internal support as well as external skin coverage. Skin cancer excision in the nose is commonly accomplished via the Mohs' technique. Once the cancer is removed, reconstructive rhinoplasty aims to provide skin coverage utilizing techniques such as skin graft, local skin flaps, or pedicle flaps. If cancer resection leads to loss of tissue in the area of the nasal tip, cartilage grafts are utilized to maintain support and prevent long-term distortion, by the force of scar contracture.

Rhinophyma is the late stage manifestation of a skin condition known as Rosacea, where the skin is infected with acne roseacea. The skin in the area of the nasal tip becomes red, thickened, and enlarged as exemplified by W C Fields. Although known acne treatments such as antibiotics and Acutane can halt the progression of this disease, thickening of the skin and obscuring of the nasal tip landmarks can only be remedied by surgical correction. Currently, laser excision of thickened abnormal skin represents the best option in rhinoplasty for Rhinophyma. The CO2 laser and the Erbium YAG laser are the most effective types of laser for this disorder.

Vascular malformations and cleft lip anomalies are relatively common causes of congenital nasal deformities. In vascular malformations, the disease process can cause distortions of the skin and underlying structure of the nose. In cleft palate abnormalities, the size, position, and orientation of the nasal tip cartilages may be distorted. Rhinoplasty for reconstruction of vascular malformations can involve laser treatment of the skin and possible surgical excision. When the underlying cartilage structure is disturbed, cartilage grafts and stitching of the native nasal cartilages can help improve nasal appearance. In cleft lip patients, reconstructive rhinoplasty allows re-orientation of the nasal tip cartilages. Additional refinements with cartilage grafts to the tip are also frequently employed.

Ethnic

Although techniques and methods employed during rhinoplasty surgeries are the same regardless of ethnicity, there are some trends that apply to patients of certain ethnic backgrounds, due to their similar anatomic features. East Asian patients often want their noses to appear narrower and their bridges higher. If very little elevation of the bridge is desired, the nasal bones can be cut and moved towards the midline. This technique will narrow the bridge and also cause a slight elevation in the dorsum. East Asian patients who seek greater augmentation of the bridge of their nose require implants. A variety of alloplastic implants including Gore-Tex, Med-Por, or silicone can be used. Tissues from the patient's own body (autologous) can be used for augmentation, in order to reduce the risk of complications such as infection or extrusion. Septum cartilage, rib cartilage (costal cartilage), ear cartilage (auricular cartilage), and fascia are being often used. In non surgical rhinoplasty, filler materials such as hyaluronic acid or calcium based microspheres can be injected under the skin, in the bridge of the nose. These injections however, are non permanent lasting between six months to a year.

Patients of African descent commonly seek narrowing of wide nostrils in a procedure known as alar base reduction. This procedure may include removing sections of the base of the nostrils or sections of the nose where it meets the face. Risk of keloid scar formation is very low, if the patient has not had keloids in the past. The tip of the nose can be restructured by removing tiny sections of cartilage to give the nose more definition, or adding cartilage grafts to provide additional structure to the nasal tip.

Non-surgical

Non-surgical rhinoplasty refers to reshaping the nose with injectable substances rather than surgical means of altering the shape and structure of the nose. It is also called a "non-surgical nose job", and can be performed in the outpatient setting without anesthesia. Another non-surgical option used by some people are flexible "nose inserts" that are placed in the nostril area between the nose tip and back of the nose. The nose inserts reshape one's nose only while worn. A non-surgical nose job is not permanent and only lasts about a month.

Recovery

The patient returns home after the surgery. Most surgeons recommend antibiotics, pain medications, and steroid medication after surgery. Most people choose to remain home for a week, although it is safe to be outdoors. If there are external sutures, they are usually removed 4 to 5 days after surgery. The external cast is removed at one week. If there are internal stents, they are usually removed at four days to two weeks. The periorbital bruising usually lasts two weeks. Due to wound healing, there is moderate shifting and settling of the nose over the first year.

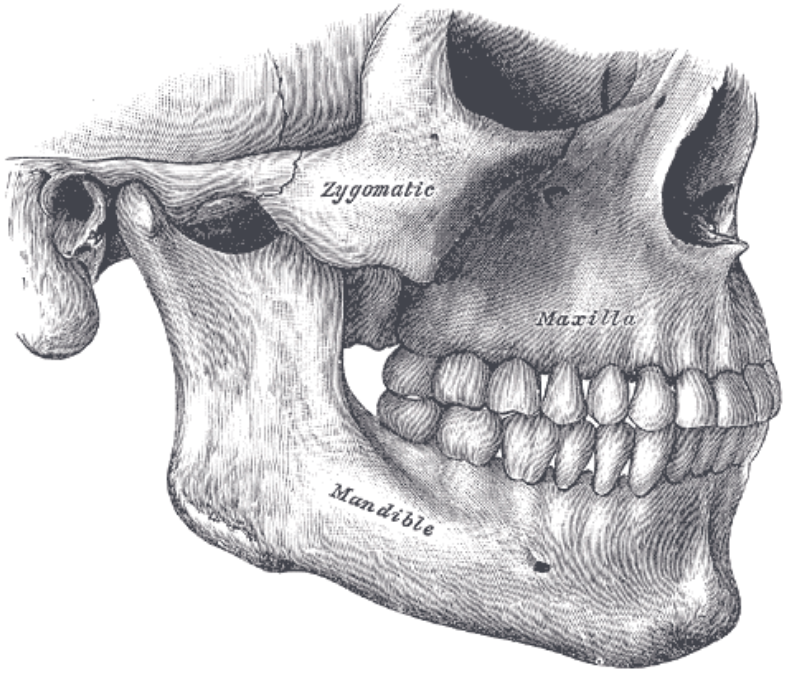
Health risks

Although rhinoplasty is usually considered to be safe and successful, several complications can arise. Post operative bleeding is uncommon and often resolves without needing treatment. Infection is rare and can occasionally progress to an abscess that requires surgical drainage under general anesthetic. Adhesions, which are scars that form to bridge across the nasal cavity from the septum to the turbinates, are also rare but cause nasal obstruction to breathing and usually need to be cut away. A hole can be inadvertently made at the time of surgery in the septum, called a septal perforation. This can cause chronic nose bleeding, crusting, difficult breathing and whistling with breathing.

If too much of the underlying structure of the nose (cartilage and/or bone) is removed, this can cause the overlying nasal skin to have little shape resulting in a "polly beak" deformity. Likewise if the septum is not supported, the bridge of the nose can sink resulting in a "saddle nose" deformity. The tip of the nose can be over-rotated causing the nostrils to be too visible and creating a pig-like look. If the cartilages of the tip of the nose are over-resected, this can cause a pinched look to the tip. If an incision is made across the collumella (open approach rhinoplasty) there can be variable degree of numbness to the nose that may take months to resolve.

Chapter 6

Orthognathic Surgery



Relationship between mandible and maxilla

Orthognathic surgery is surgery to correct conditions of the jaw and face related to structure, growth, sleep apnea, TMJ disorders, correct malocclusion problems owing to skeletal disharmonies or other orthodontic problems that cannot be easily treated with braces. Originally coined by Dr. Harold Hargis, D.M.D., it is also used in treatment of congenital conditions like cleft palate. Bones can be cut and re-aligned, held in place with either screws or plates and screws.

Indications

- Gross jaws discrepancies (Anteroposterior , Vertical and /or Transverse discrepancies).
- Facial skeletal discrepancies associated with documented sleep apnea, airway defects, and soft tissue discrepancies.

- Facial skeletal discrepancies associated with documented temporomandibular joint pathology.

Surgeon

Orthognathic surgery is performed by either an oral and maxillofacial surgeon or a craniofacial surgeon in collaboration with an orthodontist, often including braces before and after surgery, and retainers after the final removal of braces. Orthognathic surgery is often needed after reconstruction of cleft palate or other major craniofacial anomalies. Careful coordination between the surgeon and orthodontist is essential to ensure that the teeth will fit correctly after the surgery. This coordination often necessitates that the surgeon be trained in dentistry, where complex concepts of occlusion between upper and lower teeth are taught. Unlike Oral and Maxillofacial Surgeons who are trained in dentistry, Plastic Surgeons receive no or minimal training. Thus, it is rare that an Orthodontist would find it appropriate for the surgery to be referred to a non-Oral and Maxillofacial Surgeon.

Planning

Planning for the surgery usually involves input from a multidisciplinary team. Involved professionals are Oral and Maxillofacial surgeons, Orthodontists, and sometimes a Speech and language therapist. As the surgery usually results in a noticeable change in the patient's face a psychological assessment is occasionally required to assess patient's need for surgery and its predicted effect on the patient.

Radiographs and photographs are taken to help in the planning and there is software to predict the shape of the patient's face after surgery, which is useful both for planning and for explaining the surgery to the patient and the patient's family. Advanced software can allow the patient to see the predicted results of the surgery.

The main goals of orthognathic surgery are to achieve a correct bite, an aesthetic face and an enlarged airway. While correcting the bite is important, if the face is not considered the resulting bony changes might lead to an unaesthetic result. Orthognathic surgery is also available as a very successful treatment (90-100%) for obstructive sleep apnea. Great care needs to be taken during the planning phase to maximize airway patency.

Procedure

The surgery might involve one jaw or the two jaws during the same procedure. The modification is done by making cuts in the bones of the mandible and / or maxilla and repositioning the cut pieces in the desired alignment. Usually surgery is performed under general anaesthetic and using nasal tube for intubation rather than the more commonly used oral tube; this is to allow wiring the teeth together during surgery. The surgery often does not involve cutting the skin, and instead, the surgeon is often able to go through the inside of the mouth.

Cutting the bone is called osteotomy and in case of performing the surgery on the two jaws at the same time it is called a bi-maxillary osteotomy (two jaws bone cutting) or a maxillomandibular advancement. The bone cutting is traditionally done using special electrical saws and burs, and manual chisels. Recently a machine that can make the bone cuts using ultra-sound waves has been introduced; this is yet to be used on a wide scale. The maxilla can be adjusted using a "Lefort I" level osteotomy (most common). Sometimes the midface can be mobilised as well by using a Lefort II, or Lefort III osteotomy. These techniques are utilized extensively for children suffering from certain craniofacial abnormalities such as Crouzon syndrome.

The jaws will be wired together (inter-maxillary fixation) using stainless steel wires during the surgery to insure the correct re-positioning of the bones. This in most cases is released before the patient wakes up. Some surgeons prefer to wire the jaws shut.

Complications

Like any other surgery, there can be some complications like bleeding, swelling, infection, nausea and vomiting. There could also be some numbness in the face due to nerve damage. The numbness may be either temporary, or, more rarely, permanent. In general, complications of this surgery occur, but not frequently.

If the surgery involved the upper jaw, then the surgery could have an effect on the shape of the patient's nose. This can be minimised by careful planning and accurate execution of the surgical plan. Sometimes, this is considered part of the benefit.

Post operation

After orthognathic surgery, patients are often required to adhere to an all-liquid diet. After time, soft food can be introduced, and then hard food. Diet is very important after the surgery, to accelerate the healing process. Weight loss due to lack of appetite and the liquid diet is common, but should be avoided if possible. Normal recovery time can range from a few weeks for minor surgery, to up to a year for more complicated surgery.

For some surgeries, pain may be minimal due to minor nerve damage and lack of feeling. Doctors will prescribe pain medication and prophylactic antibiotics to the patient. Most of the swelling will disappear in the first few weeks, but some may remain for a few months.

The surgeon will see the patient for check-ups frequently, to check on the healing, check for infection, and to make sure nothing has moved. The frequency of visits will decrease over time. If the surgeon is unsatisfied with the way the bone is mending, he may recommend additional surgery to rectify whatever may have shifted. It is very important to avoid any chewing until the surgeon is satisfied with the healing.

Chapter 7

Breast Reconstruction

Breast reconstruction is the rebuilding of a breast, usually in women. It involves using autologous tissue or prosthetic material to construct a natural-looking breast. Often this includes the reformation of a natural-looking areola and nipple. This procedure involves the use of implants or relocated flaps of the patient's own tissue.

Overview

The primary part of the procedure can often be carried out immediately following the mastectomy. As with many other surgeries, patients with significant medical comorbidities (high blood pressure, obesity, diabetes) and smokers are higher-risk candidates. Surgeons may choose to perform delayed reconstruction to decrease this risk. Patients expected to receive external beam radiation as part of their adjuvant treatment are also commonly considered for delayed autologous reconstruction due to significantly higher complication rates with tissue expander-implant techniques in those patients.

Breast reconstruction is a large undertaking that usually takes multiple operations. Sometimes these follow-up surgeries are spread out over weeks or months. If an implant is used, the individual runs the same risks and complications as those who use them for breast augmentation but has higher rates of capsular contracture (tightening or hardening of the scar tissue around the implant) and revisional surgeries.

Outcomes based research on quality of life improvements and psychosocial benefits associated with breast reconstruction served as the stimulus in the United States for the 1998 Women's Health and Cancer Rights Act, which mandated health care payer coverage for breast and nipple reconstruction, contralateral procedures to achieve symmetry, and treatment for the sequelae of mastectomy. This was followed in 2001 by additional legislation imposing penalties on noncompliant insurers. Similar provisions for coverage exist in most countries worldwide through national health care programs.

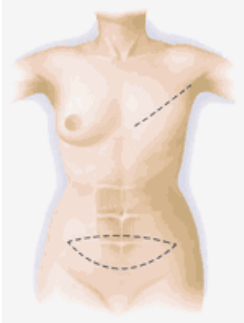
Techniques

There are many methods for breast reconstruction. The two most common are:

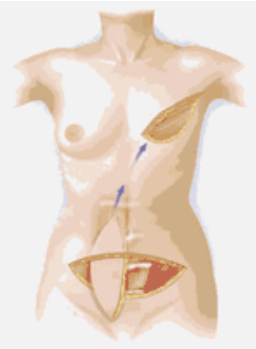
- **Tissue Expander - Breast implants** This is the most common technique used in worldwide. The surgeon inserts a tissue expander, a temporary silastic implant, beneath a pocket under the pectoralis major muscle of the chest wall. The pectoral muscles may be released along its inferior edge to allow a larger, more supple pocket for the expander at the expense of thinner lower pole soft tissue coverage. The use of acellular human or animal dermal grafts have been described as an onlay patch to increase coverage of the implant when the pectoral muscle is released, which purports to improve both functional and aesthtic outcomes of implant-expander breast reconstruction.
    - In a process that can take weeks or months, saline solution is percutaneously injected to progressively expand the overlaying tissue. Once the expander has reached an acceptable size, it may be removed and replaced with a more permanent implant. Reconstruction of the areola and nipple are usually performed in a separate operation after the skin has stretched to its final size.
- **Flap reconstruction** The second most common procedure uses tissue from other parts of the patient's body, such as the back, buttocks, thigh or abdomen. This procedure may be performed by leaving the donor tissue connected to the original site to retain its blood supply (the vessels are tunnelled beneath the skin surface to the new site) or it may be cut off and new blood supply may be connected.
    - **The latissimus dorsi muscle flap** is the donor tissue available on the back. It is a large flat muscle which can be employed without significant loss of function. It can be moved into the breast defect still attached to its blood supply under the arm pit (axilla). A latissimus flap is usually used to recruit soft-tissue coverage over an underlying implant. Enough volume can be recruited occasionally to reconstruct small breasts without an implant.
    - **Abdominal flaps** The abdominal flap for breast reconstruction is the TRAM flap or its technically distinct variants of microvascular "perforator flaps" like the DIEP/SIEP flaps. Both use the abdominal tissue between the umbilicus and the pubis. The DIEP flap and free-TRAM flap require advanced microsurgical technique and are less common as a result. Both can provide enough tissue to reconstruct large breasts. The contour of the lower abdomen is reliably improved by these procedures which remove the same tissue as an abdominoplasty (tummy tuck.) TRAM flap procedures may weaken the abdominal wall and torso strength, but are tolerated well in most patients. To prevent muscle weakness and incisional hernias, the portion of abdominal wall exposed by reflection of the rectus abdominis muscle may be strengthened by a piece of surgical mesh placed over the defect and sutured in place. Perforator techniques such as the DIEP (deep inferior epigastric perforator) flap and SIEA (superficial inferior epigastric artery) flap require precise dissection of small perforating vessels through the rectus muscle, and purport the advantage of less weakening of the abdominal wall, though rectus abdominus muscle function may still be compromised. Other total autologous tissue breast reconstruction donor sites include the buttocks (superior or inferior gluteal

artery perforator flaps (SGAP or IGAP)). The purpose of perforator flaps (DIEP, SIEA, SGAP, IGAP) is to provide sufficient skin and fat for an aesthetic reconstruction while minimizing morbidity from harvesting the underlying muscles.

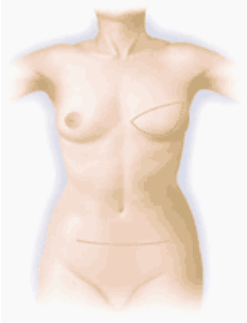
The TRAM Flap Procedure



Identification of the target and donor sites



Raising the flap and transposing it to the target site



The result of the reconstruction

Other considerations

Nipple reconstruction is usually delayed until after the breast mound reconstruction is completed so that the positioning can be planned precisely. There are several methods of reconstructing the nipple-areolar complex, including:

- *Nipple-Areolar Composite Graft (Sharing)* - if the contralateral breast has not been reconstructed and the nipple and areolar are sufficiently large, tissue may be harvested and used to recreate the nipple-areolar complex on the reconstructed side.
- *Local Tissue Flaps* - a nipple may be created by raising a small flap in the target area and producing a raised mound of skin. To create an areola, a circular incision may be made around the new nipple and sutured back again. The nipple and areolar region may then be tattooed to produce a realistic colour match with the contralateral breast.
- *Local Tissue Flaps With Use of AlloDerm* - as above, a nipple may be created by raising a small flap in the target area and producing a raised mound of skin. AlloDerm (cadaveric dermis) can then be inserted into the core of the new nipple acting like a "strut" which may help maintain the projection of the nipple for a longer period of time. The nipple and areolar region may then be tattooed later.

One of the challenges in breast reconstruction is to match the reconstructed breast to the mature breast on the other side (often fairly 'ptotic' - droopy.) This often requires a lift (mastopexy), reduction, or augmentation of the other breast.

Follow-up and Recovery

Recovery from implant-based reconstruction is generally faster than with flap-based reconstructions, but both take at least three to six weeks to recover and both require follow-up surgeries in order to construct a new areola and nipple. All recipients of these operations should refrain from strenuous sports, overhead lifting and sexual activity during the recovery period (three to six weeks). TRAM flap patients can show abdominal muscle weakness on EMG studies, but clinically most patients who have undergone unilateral breast reconstruction (reconstruction of one breast only) return to normal activities after recovery.

Patients who have undergone bilateral breast reconstruction with TRAM flaps (i.e. reconstruction of both breasts) require sacrifice of both rectus muscles and tend to have permanent abdominal strength loss. For this reason, many plastic surgeons now frown upon bilateral breast reconstruction with TRAM flaps. This also explains the significant patient interest in perforator flap techniques such as the DIEP flap which preserves abdominal muscle function long term. These patients tend to return to full activity after several weeks without permanent limitations.

There is little information about upper body exercise post-mastectomy. Issues such as simple mastectomy, mastectomy with reconstruction, mastectomy with lymph node excision and reconstruction all factor into limitations to amount and extent of upper body exercise. Generally, cardiac exercise (treadmill, walking, etc.) are approved for rehabilitation post-surgery and for weight control.

Women who have undergone breast reconstruction must still be followed for local or regional recurrence of their cancer with manual exams of the breast/chest wall and axilla.

The most effective relief from breast reconstruction is Hilotherapy, a therapy that provides relief from heamatoma, pain and swelling post-surgery without the dangers of Frostbite and Skin Necrosis.

Chapter 8

Fat Transfer

Fat injection reportedly started in 1893 when German physician Franz Neuber used a small piece of upper arm fat to build up the face of a patient whose cheek had large pit caused by a tubercular inflammation of the bone.

In 1895, another German doctor, Dr. Karl Czerny, did the very first documented breast augmentation when he transplanted a fatty tumor from the patient's lumbar region, or lower back, to a breast defect.

Overview of current techniques

In the 1980s, when the liposuction procedure became more widely available, fat also became much more easily withdrawn from the body. In 1984, Mel Bircoll M.D. introduced micro injection of fat graphs, using liposuction techniques. That development allowed more plastic, dermatological and cosmetic surgeons to offer their patients fat transfer for cosmetic reasons. Some contend that an advantage of fat transfer is that it is the patient's own tissue and, hence, not subject to rejection by the body. Another advantage pointed to is that most other dermal fillers are absorbed by the body within three to nine months, making regular injections a continuing expense.

Essentially, the fat transfer procedure harvests fat from one part of the body where an excess exists and then places it in another part of the body where the additional bulk is used for cosmetic and aesthetic purposes. Fat transfer—which is also known as fat grafting, fat autographs, autologous fat transplantation, fat injecting or microlipoinjections to physicians—is being used in cosmetic plastic surgery to:

- Smooth and repair aged hands
- Fill wrinkled, creased faces
- Create more shapely, curvaceous buttocks
- Enlarge breasts

Procedures

Facial Plastic Surgeon Babak Azizzadeh, MD and fellow extracting fat from male patient's stomach to use for facial fat transfer procedure.

Fat is withdrawn from the patient in one of three ways: with a syringe that has a large-bore needle or with a liposuction cannula. The fat is prepared according to the practitioner's preferred method and then injected into the patient's recipient site. The preparation process clears the donor fat of blood, pain killers and other unwanted ingredients that could cause infections or other undesirable side effects. Moreover, some physicians have found that human fat outside the body is incredibly delicate. One researcher (Mendieta) found that, to obtain viable fat, the needle withdrawing the fat can't be too narrow, the liposuction cannula can't have too strong a vacuum pressure and the centrifuge used to clear debris from the donated tissue can't spin too rapidly. Another

researcher found that vacuum pressure on the liposuction machine could not be higher than 700 mmHg.

A few doctors excise, or cut, small strips of fat from the body and then place, rather than inject, the tissue in the recipient site, using additional small incisions.

Other uses and applications continue to develop as surgeons work with, and learn more about, fat transfer. Some of the most current and developing applications include:

- Cheek and chin Implants
- Repair of inverted nipples
- Increasing the girth of the penis

Depending on the surgeon, the patient and several other factors, the body is reported to reabsorb anywhere from 20 to 95 percent of transferred fat.

Due to the varying rates of absorption and the different lengths of time fat is reported remaining in the body, many physicians and other researchers worldwide since the 1980s have tracked success, safety and failure rates of fat transfer.

In most applications, fat injections are laid down through several different layers of skin and muscle to provide a better chance for the fat cells to find a nearby blood supply. Because some fat is always absorbed, most physicians inject somewhere around 30 percent too much. Physicians have learned the best donor areas are found in:

- The lower stomach
- The inner thighs
- The inner knees

Current clinical applications

Fat transfer to the hand

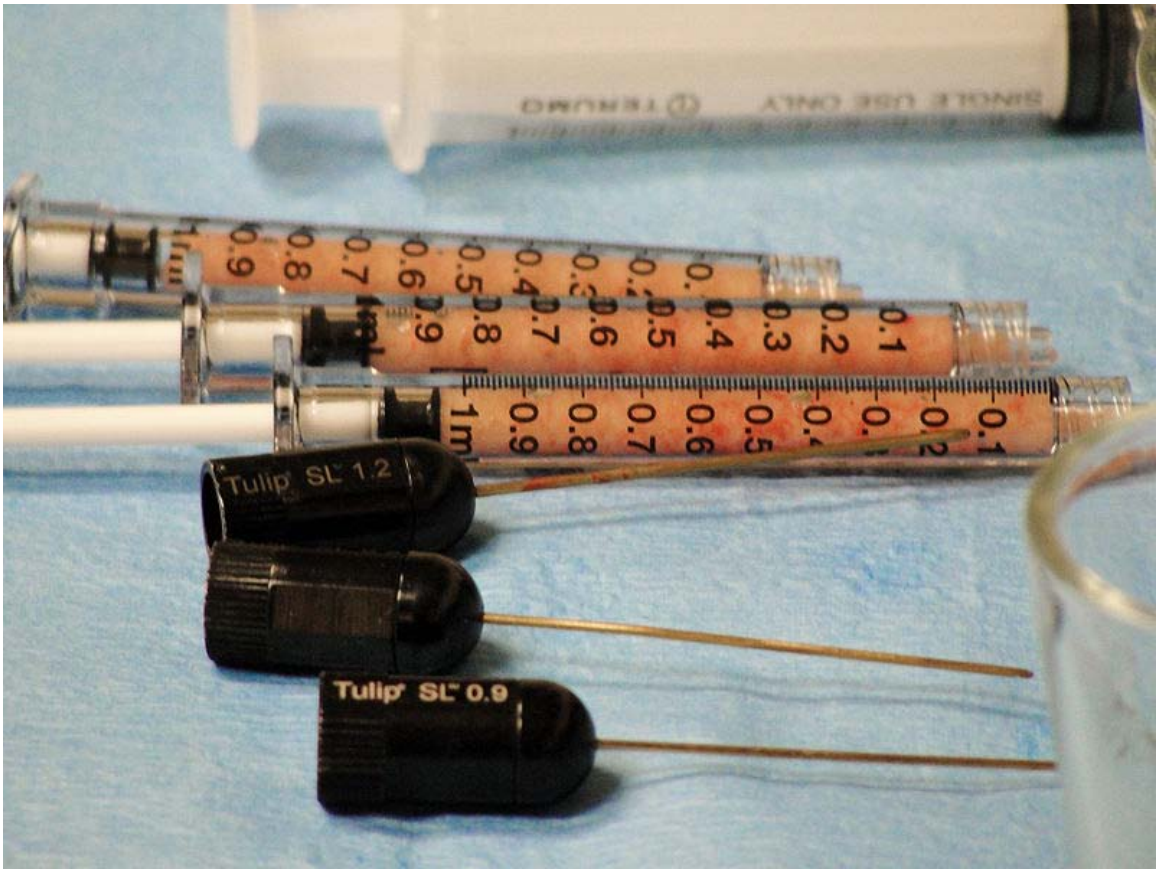
A wrinkled, bony hand with large veins, sun spots and deep grooves can reveal an advanced age even though the patient's face, breasts or body have been surgically rejuvenated. Consequently, plastic, dermatological and cosmetic surgeons have developed techniques to make hands also look younger. A few practitioners use dermal fillers like Restylane and Juvederm but the longer lasting method seems to be fat transfer via injection which is reported to last for years.

Facial fat transfer

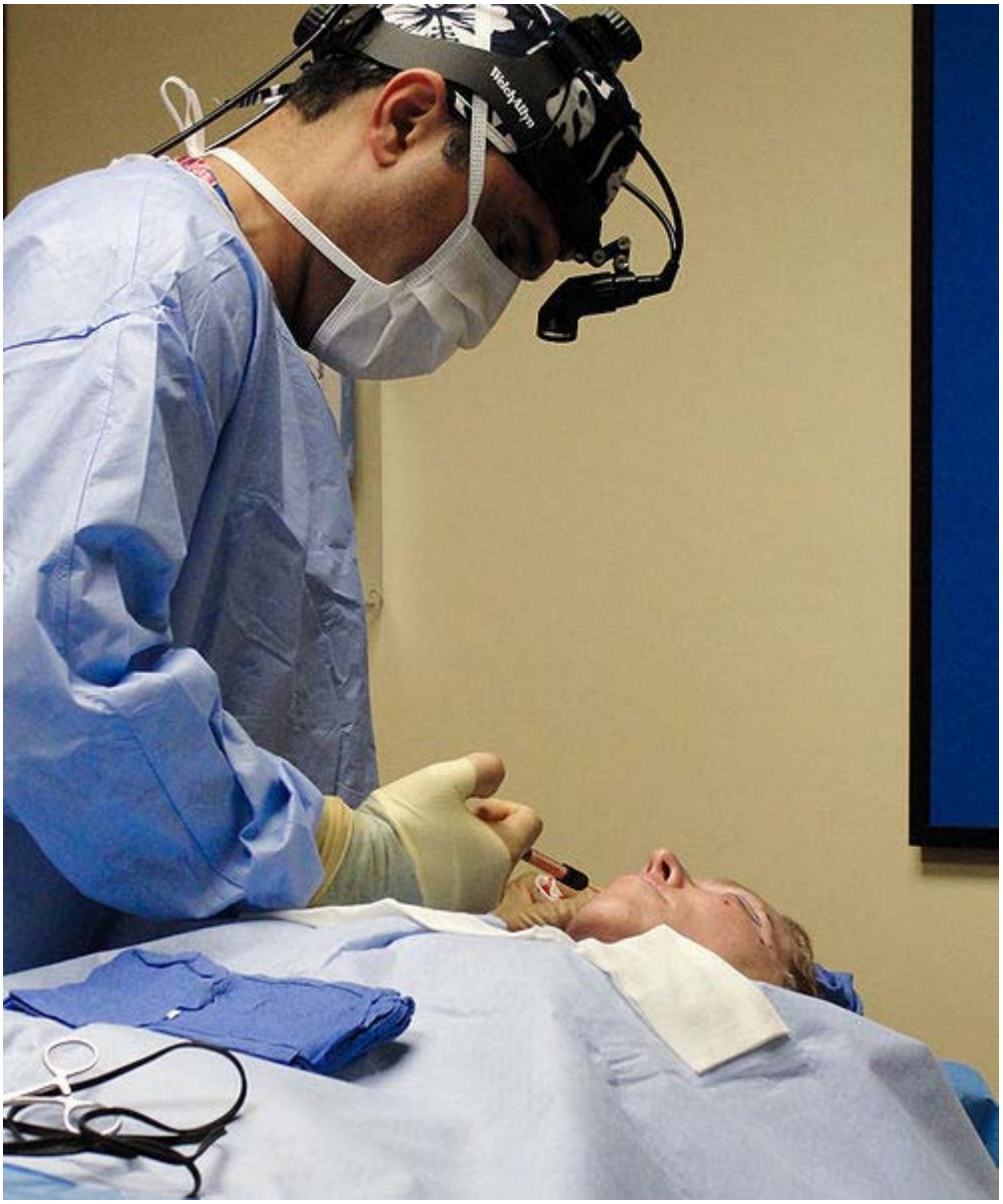
A liposuction technique is used to harvest the fat and prepare it for transfer. The fat is then injected into the desired portion of the face. When using a micro injection technique, extremely small parcels of fat are placed into multiple layers of the face. The procedure is most commonly performed under local anesthesia with a light oral sedation.

Harvesting fat from patient's abdomen which will be transferred to patient's face

Transferring harvested fat into injection syringes



Syringes with harvested fat ready to be transferred



Harvested fat being injected into patient's cheeks by Facial Plastic Surgeon Amir Karam, MD.

The most common facial locations for fat transfer include:

- Filling in sunken areas beneath the eyes
- Fleshing out the folds of skin that physicians know as nasolabial folds, the deep wrinkles next to the mouth often referred to as “laugh lines.”
- Filling in forehead creases
- Cheek Augmentation

Generally, 40-60% of the transferred fat persists permanently. Although, the long-term efficacy of transferred fat has been documented in numerous studies results are extremely technique dependent.

Lip augmentation

Tiny, punch-like incisions are made at one corner of the patient's mouth. The surgeon then takes one- to two-millimeter-thick strips of fat from the donor site and gently works them into the upper and lower lips for a plumping effect that is reported to be safer, softer and more natural than lip augmentation with popular injectable facial fillers like Restylane or filler materials like medical Gore-Tex or, e-PTFE (polytetrafluorethylene) as the material is known to doctors.

Buttocks augmentation via fat injections

Lipoinjection to buttock with upper And lower abdomen, upper back, bilateral hips, mons pubis, and bilateral inner thighs.

Many women, including transwomen, and a growing number of men want a curvier, rounder and shapelier rear end. While thin patients must opt for insertion of special buttocks implants to fill out their derrière, patients who can spare the fat can undergo fat injection in a surgical procedure known as gluteoplasty or Brazilian butt lift. Working through small incisions in each gluteal cheek, the surgeon places fat cells at dozens of levels through the patient's rear. It's an exacting procedure; one practitioner (Roberts) reports that a placement of fat cells the size of teaspoon will perish because that many fat cells can't find a blood supply. Most surgeons who perform the task say the perfect deposit of fat cells is about the size of a single pearl or a pea; the drops are placed in long rows. After the procedure, the patient must wear a compression garment for about six weeks and sleep on the stomach for about a week. In most cases, non-athletic activities and driving can be resumed in about five days.

Breast augmentation via fat grafting

Fat grafting to enlarge female breasts is done, not only for cosmetic reasons, but to reconstruct deformities like a mastectomy, a lumpectomy, a breast implant collapse, a tuberous breast, a condition in which the adult breasts fail to develop in puberty and result in extremely small, narrow and sagging breasts or for the correction of Polands Syndrome, rare birth defect characterized by underdevelopment or absence of the chest muscle (pectoralis) on one side of the body.

Coleman and Saboeiro compiled statistics on a series of fat injection breast augmentation patients and reported that improvements in the size and shape of the breasts are possible with a fat grafting technique.

In that procedure, the doctors harvest donor fat, centrifuge it for refinement and to screen out impurities. Then, in a four- to five-hour procedure, they inject the fat into the layers of the breast through six to eight, two-millimeter incisions in each breast. (One millimeter is the width of a single line drawn by a ballpoint pen.) Blunt syringes and cannulas are used to place the fat so that no damage is done to blood vessels or nerves. The fat is layered from the pectoralis major muscle up through the top of the breast; the surgeons rely on the fat injections to shape the breasts for an aesthetic, natural-looking result.

Despite the reports of some small clinical studies (clinicaltrials.gov), no current, standard method exists among physicians for preparing donated fat before injection back into the patient. For this and other reasons, the American Society of Plastic Surgeons (ASPS) and the American Society of Aesthetic Plastic Surgeons (ASAPS) are advising their surgeon members and the public against the fat transfer procedure, at least, fat grafting to augment breasts, unless the patient is part of an ongoing clinical research study. However, an earlier report in 2001 by ASAPS found fat grafting "safe and effective" for augmenting buttocks.

The ASPS issued a new policy paper on Fat Transfer/Fat Graft and Fat Injection (March 11, 2009). In it, the Executive Committee approved the policy paper, "Fat Transfer/Fat Graft and Fat Injection ASPS Guiding Principles". The paper offers background

information on the applications, risks and complications, and techniques of fat transfer procedures. The paper also summarizes scientific evidence. Additionally, four guiding principles are stated, based on the conclusion that fat grafting is a safe procedure in select cases; and that results are dependent on a surgeon's technique and expertise. Indications for fat grafting included: Micromastia; Post breast augmentation deformity, with or without removal of implant; Tuberous breasts; Poland's Syndrome, Post lumpectomy deformity; Post mastectomy deformity; Deficits caused by conservative treatment or reconstruction with implants and/or flaps (latissimus dorsi or TRAM); Damaged tissue resulting from radiotherapy and nipple reconstruction. There is at least one registered clinical trial, ID:NCT00466765, currently with open enrollment.

In addition to these referenced reconstructive procedures, fat transfer was introduced for use in the high risk breast cancer patient. The patient undergoes standard bilateral nipple sparing mastectomy and liposuction. The lipo-aspirate is stored using known biological tissue storing techniques in liquid nitrogen. After a suitable healing period, the lipo-aspirate is injected in serial treatments to build to a natural contour. Given a relatively small breasted woman with sufficient donor fat, the breasts may be enhanced in size over the preoperative state.

Results

Because the surgeon usually must inject too much fat to allow for reabsorption, the overcorrection can make the patient’s face look too plump or swollen for about a week. However, many patients are able to return to their normal activities immediately. Most notice some bruising, swelling, and redness in the donor and injection sites. Results from patients, physicians, and other researchers place the durability of fat injections anywhere from half a year up to eight years.

Potential risks and side effects

Fat transfer remains controversial although many plastic, dermatology and cosmetic surgeons offer various fat transfer procedures to their patients because the procedure is so well received by patients.

Potential risks of any fat transfer include bleeding or hematoma, (a pool of blood forming under the skin), infection, nerve damage or wound dehiscence, when a surgical wound opens. Sometimes, fluid collection, or seroma, around a surgical wound happens. While all are normally easily controlled and healed, more serious complications can arise. In the case of the former Miss Argentina, Solange Magnano, the gluteoplasty led to pulmonary embolism, which she succumbed to on November 29, 2009 after three days in critical condition. A close friend, Roberto Piazza, was quoted as saying the liquid from the injections "went to her lungs and brain."

Overall, the survival of injected fat seems to depend on how the physician harvests the donor fat, the technique used to treat the fat and how the prepared fat cells are put back into the patient and the site to which the fat was moved. Doctors Summer and Sattler

found that fat survives equally well when removed with suction via liposuction or when withdrawn by a syringe. The issue of survivability seems most affected by where in the body the fat is transferred, how much that site moves, how muscular it is and if disease is present.

When a large area like the buttocks is treated, the patient may have to stop normal activities for a while and can expect some swelling, bruising or redness.

Chapter 9

Scalpel (Instrument used in Plastic Surgery)

Scalpel

Various scalpels

Classification	Cutting tool
Used with	Stencil
Related	Lancet, utility knife, laser scalpel

A **scalpel**, or **lancet**, is a small and extremely sharp bladed instrument used for surgery, anatomical dissection, and various arts and crafts (called a **hobby knife**). Scalpels may be single-use disposable or re-usable, re-usable scalpels can have attached, resharpenable blades or, more commonly, non-attached, replaceable blades. Disposable scalpels usually have a plastic handle with an extensible blade (like a utility knife) and are used once, then the entire instrument discarded. Double-edged scalpels are referred to as "lancets".

Scalpel blades are usually made of hardened and tempered steel, stainless steel, or high carbon steel; in addition, titanium, ceramic, diamond and even obsidian knives are not uncommon. For example, when performing surgery under MRI guidance, steel blades are unusable (the blades would be drawn to the magnets) or may cause image artifacts. Alternatives to scalpels in surgical applications include electrocautery and lasers.

Surgical scalpels

Surgical scalpels consist of two parts, a blade and a handle. The handles are reusable, with the blades being replaceable. In medical applications, each blade is only used once (even if just for a single, small cut). Medical scalpel handles come in two basic types. The first is a flat handle used in the #3 and #4 handles. The #7 handle is more like a long writing pen, rounded at the front and flat at the back. A #4 handle is larger than a #3. Blades are manufactured with a corresponding fitment size so that they fit on only one size handle. The following table of blades is incomplete and some blades listed may work with handles not specified here. The handle is also known as b.p handle .

Types of surgical scalpel blades

Blade No.	Compatible Handles	Blade Description	Uses
#10	1, 3, 7	Curved cutting edge with flat back	For cutting skin and muscle in surgery, and for general carving and stencil making; also can be used for removal of 'edge beads' from photolithography resists.
#10a	3, 3L, 3 Graduated, 5B, 7, 9, B3, B3L	This blade is a small and straight	
#11	1, 3, 7	Triangular blade with sharp point, flat cutting edge parallel to the handle and flat back	For precision cutting, stripping, sharp angle cuts and also stencil cutting due to its similarity to the X-Acto artknife blade
#12a	3, 7	A small, pointed, crescent-shaped blade sharpened on the inside edge of the curve	
#12b	3, 7	A small, pointed, crescent-shaped blade sharpened on both sides of the curve	
#15	3, 7	A smaller version of the #10	For the same general uses as the #10 blade
#15c	3, 7	The #15 with a	

		downward angle, flatter and thinner than the #15	
#16	1, 3	A narrow chisel-like blade with flat, angled cutting edge, positioned higher than the axis of the handle	For cutting stencils, scoring and etching
#17	1, 3	A flat face 1.6 mm chisel blade	For narrow cuts
#18	2, 5, 6	A 12.7 mm chisel blade	For deep cuts and scraping
#19	4	A similar blade to the #15	
#22	2, 4, 5, 6	A larger version of the #10	For general use, shaping, whittling and trimming
#23	4, 4L, 4-Grad, 6B	Similar to #22, leaf-shaped	For long incisions.
#24	2, 4, 5, 6	A wide, flat, angled cutting edge	For corner cuts, trimming, stripping, and cutting mats and gaskets
#25	4	A triangular blade similar to the #11, with the flat back edge taking a downwards angle	
#34	4	A triangular blade similar to the #11	
#36	4	A larger blade	Used in general surgery but also within a Laboratory setting for Histology and Histopathology
#60	4	A long blade resembling the #10 with a long cutting edge, rounded tip and flat back.	

Gripping a medical scalpel

Palmar grip

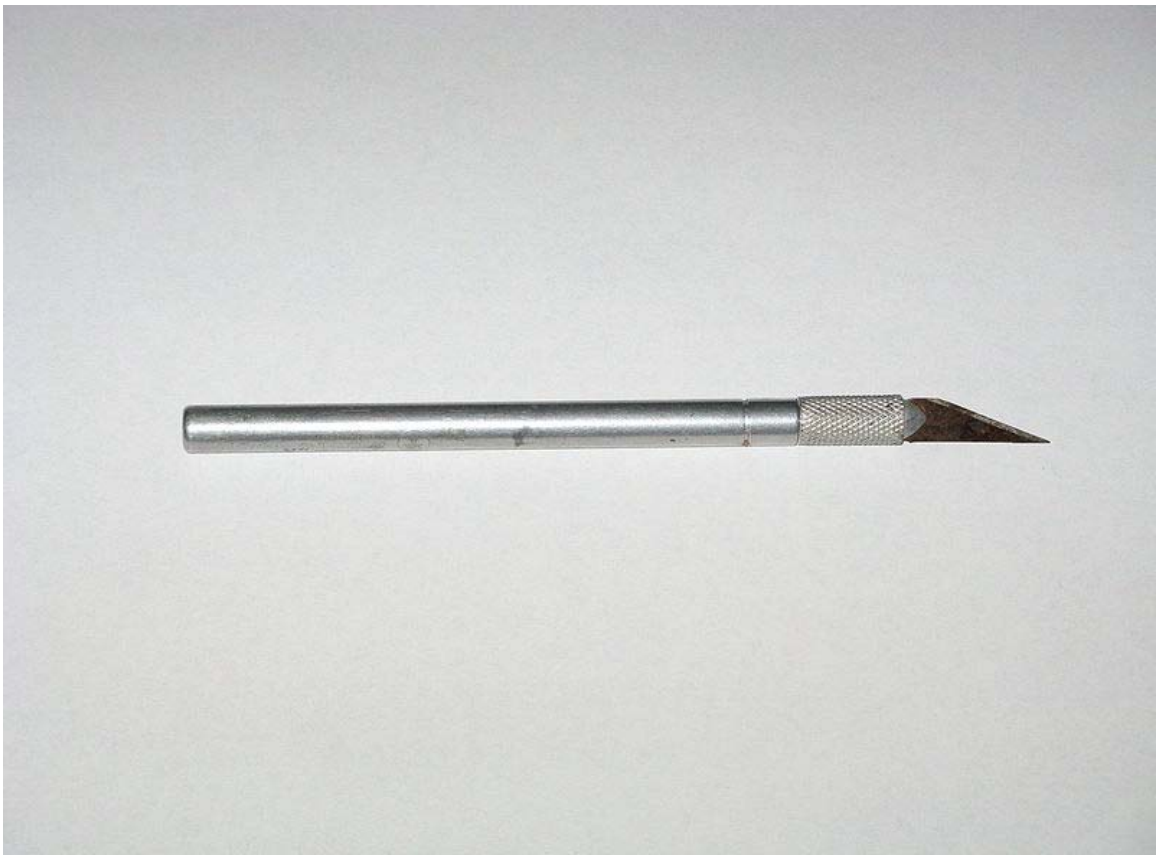
Also called the "dinner knife" grip. The handle is held with the second through fourth fingers and secured along the base of the thumb, with the index finger extended along the

top rear of the blade and the thumb along the side of the handle. This grip is best for initial incisions and larger cuts.

Pencil grip

Best used for more precise cuts with smaller blades (e.g. #15) and the #7 handle. The scalpel is held with the tips of the first and second fingers and the tip of the thumb with the handle resting on the fleshy base of the index finger and thumb. Care should be taken not to allow the handle to rest too far along the index finger as this promotes an unstable grip and cramped fingers.

Graphic design and arts and crafts blades



X-Acto knife

Graphical and model-making scalpels tend to have round handles, with textured grips (either knurled metal or soft plastic). These are often called by the name of the most well-known manufacturer of graphic arts blades, X-Acto knives. The blade is usually flat and straight, allowing it to be run easily against a straightedge to produce straight cuts.

There are many kinds of graphic arts blades, the most common around the graphic design studio is the #11 blade which is very similar to a #11 surgical blade (q.v.). Other blade shapes are used for wood carving, cutting leather and heavy fabric, etc.

Ancient scalpels

- Ancient Egyptians made incisions for embalming with scalpels of sharpened obsidian, a material that is still sometimes used in modern times.
- Ancient Romans used more than 150 different surgical instruments, including scalpels.
- Indian Ayurvedic medicine mentions the use of sharp bamboo splinters.

Scalpel injuries

In the last decade, a rising awareness of the dangers of sharps in a medical environment has led to the development of various methods of protecting healthcare workers from accidental cuts and puncture wounds. According to the Centers for Disease Control and Prevention, as many as 1,000 people each day are subject to accidental needle sticks and lacerations while providing medical care. Scalpel blade injuries are among the most frequent sharps injuries, second only to needlesticks. Scalpel injuries make up 7 percent to 8 percent of all sharps injuries.

"Scalpel Safety" is a term coined to inform users that there are choices available to them to ensure their protection from this common sharps injury.

Safety scalpels

Safety scalpels are becoming increasingly popular as their prices come down and also on account of legislation such as the Needle Stick Prevention Act. There are essentially two kinds of disposable safety scalpels offered by various manufacturers. They can be either classified as retractable blade or retractable sheath type. The retractable blade version made by companies such as OX Med Tech, DeRoyal, Jai Surgicals, Swann Morton are more intuitive to use due to their similarities to a standard box-cutter. Retractable sheath versions are made by companies such as Aditya Dispomed, Becton Dickinson and Personna. Few companies have also started to offer a safety scalpel with a reusable metal handle. In such models, the blade is usually protected in a cartridge. Such systems usually require a custom handle and the price of blades and cartridges is considerably more than for conventional surgical blades.

However, CDC studies shows that up to 87% of active medical devices are not activated. Safety scalpels are active devices and therefore the risk of not activating is still significant. There is a study that indicated there were actually four times more injuries with safety scalpels than reusable scalpels.

Blade removers

There are various scalpel blade removers on the market that allows users to safely remove blades from the handle, instead of dangerously using fingers or forceps. In the medical field, when taking into account activation rates, the combination of a single-handed scalpel blade remover with a passing tray or a neutral zone was as safe and up to five

times safer than a safety scalpel. Companies like Qlicksmart offers a single-handed scalpel blade remover that complies with regulatory requirements such as US OSHA Standards.

Safety

The usage of both safety scalpels and a single-handed blade remover combined with a hands-free passing technique are potentially effective in reducing scalpel blade injuries. It is up to employers and scalpel users to consider and use safer and more effective scalpel safety measures when feasible.

Chapter 10

Buttock Augmentation and Craniofacial Surgery

Buttock augmentation

before

simulated after (using hip and buttock padding)

There are two types of **buttock augmentation**:

- The lifting of the buttocks.
- The surgical enlargement of the buttocks through the insertion of a moulded synthetic implant or through the use of substances such as elastomer.

Buttock and thigh Dermolipectomy

Lipoinjection to buttocks with suction assisted lipectomy of upper & lower abdomen, upper back, bilateral hips, mons pubis, and bilateral inner thighs.

Brazilian butt lift

The most common type of shape-modifying injections to the bottom is the "Brazilian butt lift", although the procedure is also called *fat injections*, *fat transfer*, and *fat grafting*. It usually consists of a combination of liposuction around the buttocks and many injections of fat into the buttocks. The fat is harvested by liposuction from the patient's buttocks, abdomen, or elsewhere, and processed and purified before it is reinjected.

Implants

Buttock implants are "stronger than breast implants" and made of an elastomer that cannot leak. Implants are placed using a small incision atop of the muscles above the sitting area and below the surrounding fascia to secure them. A previous technique of intermuscular augmentation only augmented the upper third of the buttocks whereas implants can address the entire area. The incision scar will normally heal such that it is barely visible by approximately one year after surgery.

In some countries, it is permissible for buttock augmentation to be done using beads of acrylic glass that are injected in much the same way as fat obtained by liposuction.

Transgender

Surgical buttock augmentation is sometimes performed on transsexual and transgender women who wish to have more feminine buttocks. Cis-gendered women's bodies typically have a more pronounced curve of the hips than transgender women, so the goal is to create a more feminine body shape. This type of surgery is sometimes also referred to as "hip augmentation" or *hip enlargement*. This surgery may take the place of the usage of hip and buttock padding.

Risks

Like all surgery, gluteoplasty has some risk. In 2009, Solange Magnano, winner of the 1994 Miss Argentina contest, died from complications relating to a gluteoplasty she had received in Buenos Aires. It was thought that a liquid that had been injected into her buttocks had traveled to her lungs and brain. In February 2011, Claudia Aderotimi, a 20-year-old aspiring actress and model from London who flew to Philadelphia with a friend for the procedure, died in a local hospital shortly after allegedly having the procedure performed in a hotel room at the Philadelphia International Airport.

Craniofacial surgery

Craniofacial surgery is a surgical subspecialty of maxillofacial surgery, plastic surgery, and ENT that deals with congenital and acquired deformities of the skull, face, and jaws. Although craniofacial treatment often involves manipulation of bone, craniofacial surgery is not tissue-specific, i.e., craniofacial surgeons deal with bone, skin, muscle, teeth, etc. Craniofacial surgery does not, however, include surgery of the brain or eye.

Defects typically treated by craniofacial surgeons include craniosynostosis (isolated and syndromic), rare craniofacial clefts, acute and chronic sequellae of facial fractures, cleft

lip and palate, micrognathia, Treacher Collins Syndrome, Apert's Syndrome, Crouzon's Syndrome, hemifacial microsomia and many others.

Training in craniofacial surgery usually consists of a 1-year surgical fellowship completed after a residency in either plastic surgery, oral and maxillofacial surgery, or otolaryngology.

Craniosynostosis

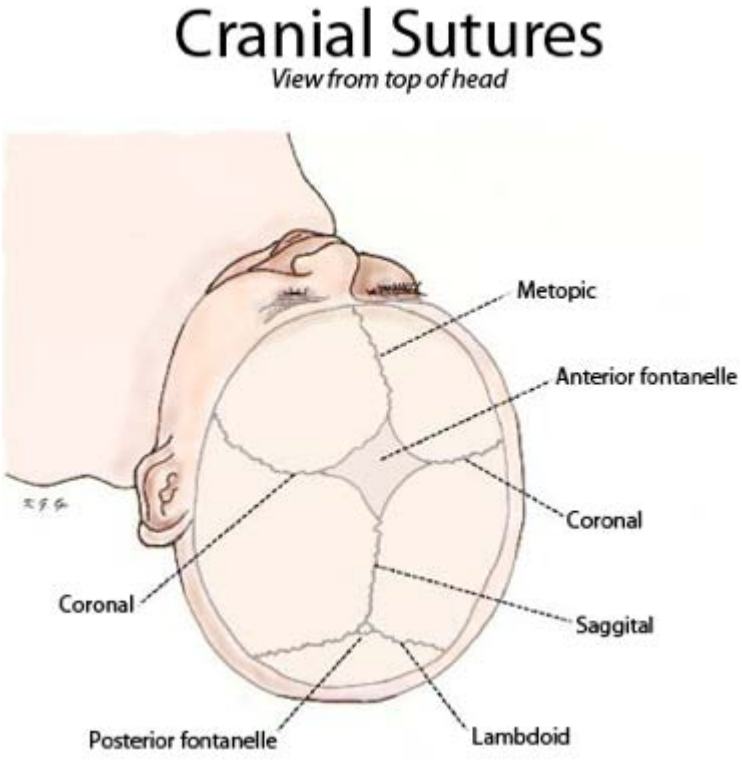


Fig. 1 Cranial sutures viewed from top of head

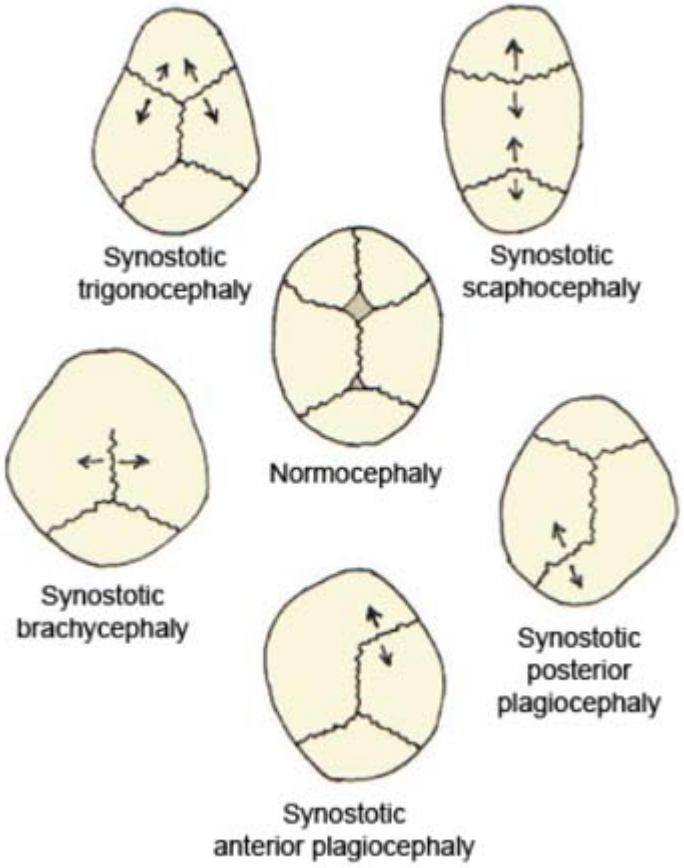


Fig. 2 Skull deformities associated with single suture synostosis

The bones of the human skull are joined together by cranial sutures (see figure 1). The anterior fontanelle is where the metopic, saggital and coronal sutures meet. Normally the sutures gradually fuse within the first few years after birth. In infants where one or more of the sutures fuses too early the growth of the skull is restricted, resulting in compensation mechanisms which cause irregular growth patterns. Growth in the skull is perpendicular to the sutures. When a suture fuses too early, the growth perpendicular to that suture will be restricted, and the bone growth near the other sutures will be stimulated, causing an abnormal head shape. The expanding brain is the main stimulus for the rapid growth of the skull in the first years of life. Inhibited growth potential of the skull can restrict the volume, needed by the brain. In cases in which the compensation does not effectively provide enough space for the growing brain, craniosynostosis results in increased intracranial pressure.

Craniosynostosis is called simple when one suture is involved, and complex when two or more sutres are involved. It can occur as part of a syndrome or as an isolated defect (nonsyndromic).

There are several classifications of deformities of the human skull, we will discuss them in order of prevalence.

Scaphocephaly

In scaphocephaly the saggital suture is prematurely fused. The saggital suture runs from the front to the back of the head. The shape of this deformity is a long narrow head, formed like a boat (greek skaphe, “light boat or skiff”). The incidence of scaphocephaly is 2.8 per 10 000 births in the Netherlands and is therefore the most common form of craniosynostosis.

Trigonocephaly

In trigonocephaly the metopic suture is prematurely fused. The metopic suture is situated in the medial line of the forehead. Premature fusion of this suture caused the forehead to become pointed, giving the head a triangular shape when viewd from above (greek trigono, “triangle”). The incidence of trigonocephaly is 1 - 1.9 per 10 000 births in the Netherlands.

Plagiocephaly

In plagiocephaly one of the coronal sutures is prematurely fused. The coronal sutures run over the top of the head, just in front of the ears. The shape of this deformity is an asymmetrical distortion (flattening of one side of the head) as you can see in figure 2. The incidence is 1 in 10 000 births.

Brachycephaly

In brachycephaly both of the coronal sutures are prematurely fused. The shape of this deformity is a wide and high head. The incidence at birth is 1/20 000.

Surgical procedures

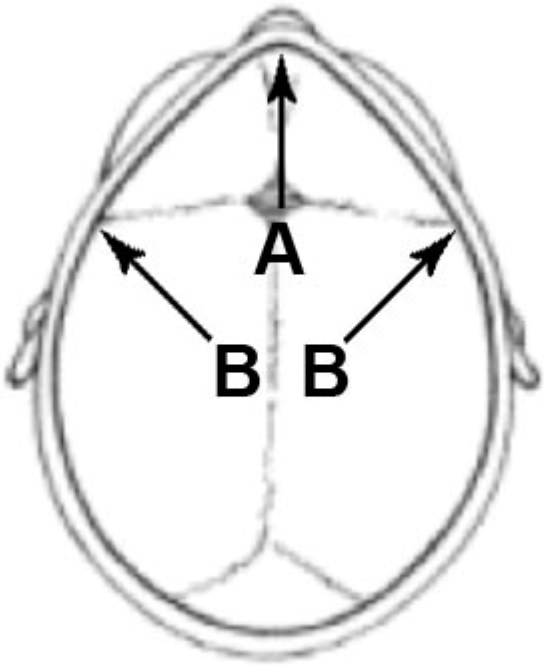


Fig. 3 Locations of the incisions used in fronto-supraorbital advancement

In cases where the forehead is involved (trigonocephaly and plagiocephaly), a technique called fronto-supraorbital advancement is used to correct the shape of the head. The procedure is performed at a young age in order to provide the brain with enough space to grow and prevent further abnormal growth of the skull. Fronto-orbital advancement literally means moving the front of the skull including the eye sockets forward. A section of the skull, ranging from the coronal sutures to the eye sockets is cut loose in order to correct the shape of the skull. The incision is cut in a zigzag shape from ear to ear so that the hair will cover the scar and make it less visible. The incision is made to the bone only, leaving the underlying meninges intact. The top half of the eye sockets is cut loose. Once the eye socket section has been cut loose, a vertical incision is made in the midline, and the whole section of the eye socket is bent outwards in order to correct the pointed shape of the forehead. Because the section is now too wide, a wedge needs to be cut on either side to allow the section to fit into the skull. Figure 4 shows the sections that are loosened and adjusted, and figure 3 shows the location of the vertical incision (arrow A) and the two wedges (arrow B).

In scaphocephaly the saggital suture is prematurely fused, preventing the skull from growing perpendicular to the suture. Thus the head becomes very narrow and long. If a scaphocephaly is diagnosed within 4 to 5 months after birth, it can be corrected with a relatively simple procedure whereby the saggital suture is surgically reopened. Once the suture has been opened the bone segments will be able to grow again and the head can

regain its normal shape. This operation is only performed on patients younger than five months old with a scaphocephaly. This is due to the fact that the bone segments only have the ability to adapt so severely when the operation is performed at this young age. A scaphocephaly that is diagnosed and treated later in life requires a more extensive secondary operation than one which is treated before five months.

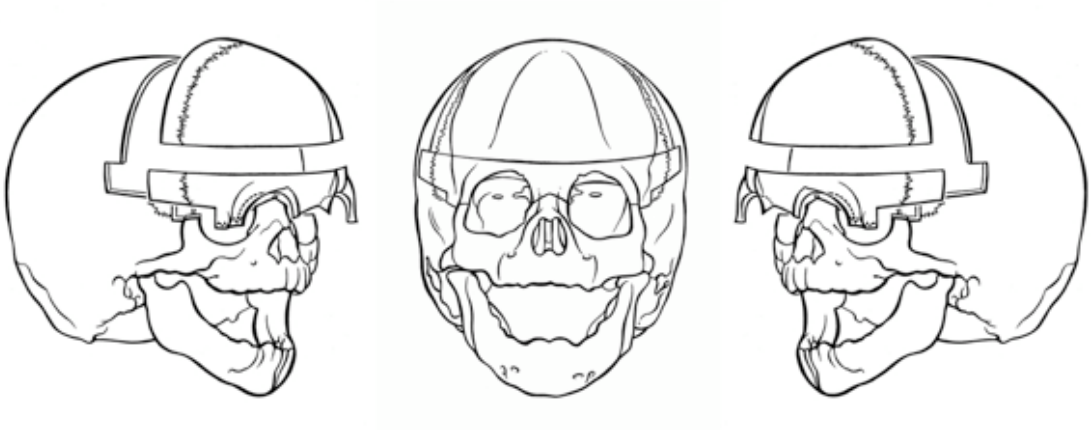


Fig. 4 Bone segments that are removed in fronto-supraorbital advancement

Ethical considerations

The Hastings Center, a prominent bioethics research institute, conducted a project called "Surgically Shaping Children". The project produced an edited volume (Parens, 2006) which considers reconstructive surgery on children with craniofacial anomalies, ambiguous genitalia, and achondroplasia.

New Developments

In Miami research has been done on a new technique called minimally invasive laparoscopic surgery. In this procedure, two 4cm long incisions are made (one in the front of the head and one in the back), and the saggital suture is removed laparoscopically. The ‘traditional’ open surgery makes one long scar from ear to ear reaching about 16cm , so the minimally invasive technique reduces the scar length by about 50%. These procedures are not yet sufficient to be adopted as standard procedure, but show promise for the future.

Chapter 11

Jaw Reduction and Pediatric Plastic Surgery

Jaw reduction

Jaw reduction is a type of aesthetic plastic surgery in which the objective of treatment is to narrow the lower one-third of the face—particularly the contribution from the mandible and its muscular attachments. There are several techniques for treatment—including surgical and non surgical methods.

Facial aesthetics

A square lower jaw is generally considered a very masculine trait. Widening of the lower third of the face can cause either a square appearance to the face as a whole or can distort the natural appearance of the angle between the chin and the neck.

Whereas square lower jaws are often considered a positive trait in Caucasian and many Asian men, a wide mandible can cause significant facial discordance and/or masculinization of the female face—particularly in those of East Asian descent. Even in certain men, the size of the lower jaw can cause facial disharmony—particularly when there is asymmetry.

A wide lower face can primarily be caused by enlargement of the mandible or masseter muscle.

Causes

The primary cause of an enlarged mandible is developmental or congenital. There are some rare disorders that can further widen the jaw such as acromegaly.

Conversely, while a masseter muscle can be large due to congenital reasons, it can commonly be an acquired deformity. Like any muscle it increases in size with exercise. Behaviors such as repeated gum chewing, teeth clenching, or bruxism can contribute to enlargement of the muscle.

Techniques

There are several jaw reduction techniques available—both surgical and non-surgical. Ideally prior to selection of a treatment, the patient is examined to determine whether the cause is due to the bone, the masseter or both. Additionally, if a treatable cause is present it should be identified.

Botox injection

Non-surgical techniques are essentially limited to cases in which the masseter is enlarged. A convenient method to treat an enlarged muscle is through the use of botox) injections. Botox is injected into the enlarged muscle, weakening it so it slowly becomes smaller through atrophy over several months. There is no down-time and improvement is gradual—individuals who interact with the patient may never know that a plastic surgical procedure was performed

The use of Botox for jaw reduction has been studied scientifically. Improvement is generally not seen for at least 2 - 3 weeks. Peak improvement occurs at months 3 to 9 with good results still observable at one year in many patients.

The procedure can result in temporary paralysis of the muscles that move the lips, a rare but acknowledged complication.

Surgical reduction

Surgical techniques are used to directly reduce the size of an enlarged mandible. Incision can be to the inside or outside of the mouth, though the internal incision is the most common because it leaves no visible scar. A burr is used to remove the outer layer of the enlarged mandible, narrowing the jaw.

Potential complications include injury to the inferior alveolar nerve which provides sensation to the lower lips and teeth.

Pediatric plastic surgery

Pediatric plastic surgery is plastic surgery performed on children. Its procedures are most often conducted for reconstructive or cosmetic purposes. In children, this line is often blurred, as many congenital deformities impair physical function as well as aesthetics.

Surgery is defined as treating injuries or conditions with operative instrumental treatment. Plastic is a derivative of the Greek word plastikos, which means 'to build up' or 'to take

form.' It is a logical prefix, as parts of the body are remade or reformed during most reconstructive and cosmetic surgical procedures. Children make up roughly 3% of all Plastic Surgery procedures, and the majority of these procedures correct a congenital deformity.

Cosmetic plastic surgery is defined as a surgical procedure undertaken to improve the physical appearance and self-esteem of a patient. As these procedures are usually elective, they are generally not covered by insurance.

Reconstructive surgery on the other hand (the procedures most children have done), is performed on abnormal structures of the body that are the result of "congenital defects, developmental abnormalities, trauma, infection, tumors, or disease." While reconstructive surgery is most often undertaken to regain normal motor function or prevent current or future health problems, aesthetics are also considered by the surgical team.

Reconstructive Plastic Surgery

Several of the most common congenital birth defects can be treated by a plastic surgeon operating as an individual, or as a part of a multi-disciplinary team. The most common pediatric birth defects requiring plastic surgeon involvement include:

- Cleft lip and/or palate - Worldwide, clefts are estimated to affect 1 in every 700-1000 live births. Roughly 25% of cleft lip and palate cases are inherited from parents, with the other 75% believed to be the cause of a combination of lifestyle and chance factors.
- Syndactyly / Polydactyly – The most common of congenital malformations affecting limbs, it is believed that Syndactyly, the failure of fingers or toes to differentiate into unique digits, affects 1 in every 2,000 – 3,000 live births. Polydactyly is the presence of extra fingers or toes at birth, and is believed to affect somewhere around 2 out of every 1,000 live births. However, it is believed that many cases are so minor that they are taken care of shortly after birth and not reported, so actual statistics may be higher.
- Positional Plagiocephaly – IN 1992, to decrease the incidence of SIDS, the American Academy of Pediatrics initiated the "Back to Sleep" campaign, which recommended that babies be put to sleep on their backs. While this almost halved the number of SIDS deaths, the campaign appeared to also help raise plagiocephaly incidence fivefold, to roughly one in sixty live births. Plagiocephaly is simply the flattening of one area of the skull, generally one babies tend to favor as they lie. While treatment is often as simply as repositioning the baby during sleep, in more pronounced cases helmet therapy may be put to use. In most cases, plagiocephaly is quite minor and easily resolved, with many more pediatric plastic surgeons becoming familiar with helmet therapy for more advanced cases.
- Craniosynostosis – Much less common, but potentially much more serious than plagiocephaly is craniosynostosis. Craniosynostosis occurs when one or more of the sutures in skull fuse prematurely. This fusion often requires surgical

intervention to reconstruct the skull to give it a more natural shape. It is believed that craniosynostosis occurs in 1 out of 1,800 to 2,200 live births, and is often a side effect of an associated syndrome.

Cosmetic Plastic Surgery

While the majority of pediatric plastic surgery procedures done are reconstructive; there are those performed for cosmetic purposes. The most common procedures done for cosmetic benefit in children include:

- Breast Augmentation
- Male Breast Reduction
- Ear Surgery as a result of microtia
- Rhinoplasty

Out of all procedures, nose reshaping generally has the most cases on an annual basis (4,313 procedures in 1996). However, children make up only 9% of the total caseload for all nose reshaping. On the opposite end of the spectrum, children requiring ear surgery accounted for 2,470 procedures in 1996, a total of 34% of all total ear surgeries. While many of these procedures are done for purely cosmetic benefit, many plastic surgeons work on these features (giving them a more normal appearance), while performing a surgery to improve function as the result of a congenital deformity.

Multi-Disciplinary Emphasis

With the unique challenges created in the field of plastic surgery, an increasingly popular trend has been to utilize the multi-disciplinary team approach in treatment.

Common conditions involving team treatment include:

- **Breast problems** - Includes gynecomastia (male breast development), macromastia (excessively large breasts), tuberous defects, and breast asymmetry. Often, not only do children with breast conditions suffer from physical problems, but psychological side effects as well. With this knowledge, current multi-disciplinary clinics have arisen including specialists from plastic surgery, nutrition, adolescent medicine, psychology, gynecology, and social work.

- **Head, Neck, and Skullbase Tumors** – Includes angiofibroma, desmoid tumors, fibrosarcomas, hemangiomas, lymphomas and lymphatic malformations, and neuroblastoma. While the bulk of procedures may be left up to neurosurgeons, otolaryngology, and maxillofacial surgery, a multidisaplinary approach is also crucial to minimize scars and maintain a somewhat normal shape and function.

- **Cleft lip and palate** – In cleft lip and palate cases, not are there only hampering physical side effects manifested in the under developed lip and palate, there are also a host of other potential complications. For this reason, CLP children are

cared for by a team that may include plastic surgeons or oral and maxillofacial surgeons, speech pathologists, audiologists, densits, orthodontists, and genetics professionals if there is an associated syndrome.

- **Craniofacial anomalies** - Includes craniosynostosis, plagiocephaly, and syndromes associated with these defects. In cases of craniosynostosis where surgical intervention is necessary, the involvement of a team of multi-disciplinary professionals is of utmost importance. Team members often come from departments of plastic surgery, oral and maxillofacial surgery, neurosurgery, audiology, dentistry, orthodontics, and speech and language pathology. These professionals often assist not only in operational procedures, but in developing coordinated care plans for the child throughout their life.
- **Vascular anomalies** – vascular malformations, hemangiomas, and rare vascular tumors. Not only do vascular anomalies have often prominent interior bodily effects; they manifest themselves physically as well. For this reason, the involvement of multiple specialties in coordinating care is of utmost importance. Specialists involve in vascular anomalies and hemangioma care often hail from the disciplines of general surgery, vascular anomalies research, plastic surgery, dermatology, cardiology, hematology/oncology, neurology/neurosurgery, maxillofacial surgery, and otolaryngology. The child needs treatment not only to minimize the physical side effects of a hemangioma or vascular anomalies, but also help in finding out why the tumor is present (if it is in fact a tumor), and developing a course of treatment if necessary.

Children's Hospitals with Dedicated Plastic Surgery Departments

With the advent of pediatric plastic surgery as a legitimate subspecialty, many children's hospitals have begun to add comprehensive Plastic Surgery Departments to their hospitals programs. Such programs include:

Children's Hospital Los Angeles - Division Head: Mark Urata, DDS, MD

Children's Hospital Boston – Chief of Surgery : John G. Meara, MD, DMD, MBA, FACS, FRACS

Children's Hospital of Philadelphia – Director: Scott P. Bartlett, MD

Texas Children's Hospital, Houston – Chief of Service: Samuel Stal, MD

The Children's Hospital, Aurora, Colorado

St. Louis Children's Hospital, St. Louis, MO

In addition to those offering comprehensive departments, many other pediatric hospitals also treat plastic surgery cases within the department of surgery.

Chapter 12

Phalloplasty

Phalloplasty refers to the construction (or reconstruction) of a penis or, sometimes, artificial modification of the penis by surgery, often for cosmetic purposes. It is also occasionally used to refer to penis enlargement.

The first phalloplasty done for the purposes of sexual reassignment was performed on trans man Michael Dillon in 1946 by Dr. Harold Gillies, which is documented in Pagan Kennedy's book *The First Man-Made Man*.

Indications

A complete construction or reconstruction of a penis is done on:

- Patients with congenital anomalies such as micropenis, epispadias, and hypospadias
- FtM transsexual patients
- Cisgendered men who have lost their penis through minor to serious iatrogenic, accidental or intentional penile trauma injuries (or total emasculation).

Techniques and related procedures

There are four different techniques for phalloplasty. All of the techniques involve taking a graft of tissue from a donor site and extending the urethra. A penis of up to 7 inches (14–18cm) long with a circumference up to 5.9 inches (11–15cm) can be created with each of the methods.

Surgery on cisgender men is more simple than on trans men, because the urethra requires less lengthening. The urethra of a trans man ends near the vaginal opening and has to be lengthened considerably. The lengthening of the urethra is when most complications occur.

With all types of phalloplasty in trans men, scrotoplasty can be performed using the labia majora (vulva) to form a scrotum where prosthetic testicles can be inserted. If vaginectomy, hysterectomy and/or oophorectomy have not been performed, they can be done at the same time.

Unlike metoidioplasty, phalloplasty requires an implanted erectile prosthesis to achieve an erection (and enable sexual penetration). This is usually done in a separate surgery to allow time for healing. There are several types of erectile prostheses, including malleable rod-like medical devices that allow the neo-penis to either stand up or hang down. Penile implants require a neophallus of appropriate length and volume in order to be a safe option. The long term success rates of implants in constructed penises are less than the success rates of reconstruction in cisgender men. Good sensation in the reconstructed penis can help reduce the risk of the implant eventually eroding through the skin.

Earlier techniques used a bone graft as part of reconstruction. Long-term follow-up studies from Germany and Turkey of more than 10 years proved that these reconstructions maintain their stiffness without late complications. Unfortunately, it results in a penis that has no ability to become flaccid again without breaking the internal bone graft.

As of November 2009, there is research in progress to synthesize *corpus cavernosa* (erectile tissue) in the lab on rabbits for eventual use in patients requiring penile construction surgery. Of the rabbits used in the preliminary studies, 8 had biological responses to sexual stimuli that was similar to the tissue of a male rabbit that was not part of the study.

Phalloplasty techniques explained

Graft from the arm

An operation using the forearm as a donor site is the easiest to perform, but results in a cosmetically undesirable scar on the exposed area of the arm. Arm function may be hampered if the donor site does not heal properly. Electrolysis and/or laser hair reduction is required for a relatively hairless neophallus.

Sometimes a full-scale metoidioplasty is done a few months before the actual phalloplasty to reduce the possibility of complications after phalloplasty. Sensation is retained through the clitoral tissue at the base of the neophallus, and surgeons will often attempt to graft nerves together from the clitoris or nearby. Nerves from the graft and the tissue it has been attached to may eventually connect. This **does not** necessarily guarantee the ability to achieve genital orgasm after healing, as the most important task of nerve reconnection is to insure the penis is able to sense injury.

The following explanation of this technique has many similarities to other approaches, but the construction of the glans differs.

- The surgery starts (after the patient is prepped) with the forearm marked for graft size. After the graft is taken, another graft may be used to reconstruct the arm (resulting in a secondary scar).
- The graft skin is dissected to expose the veins and *antebrachial cutaneous* nerves. (the latter done carefully for later reattachment)

- If the urethra is being constructed at the same time as the phallus, it is joined at this step. If not, the glans is shaped. Sometimes *glansplasty* is done in a separate surgical stage after urethral extension.
- A segment of vein going to the patient's groin is "borrowed" to allow easier joining of the graft with the preexisting tissues.
- The vein is carefully attached to the *femoral artery*.
- The blood supplies from the flap and the vein leading to the femoral artery are joined.
- The clitoral hood and ligament is cut away, and the nerve bundle is isolated for the time being. **Important:** while this assumes the clitoral tissue is assimilated (buried) into the penis base, some surgeons give the option of leaving it as-is in a post metoidioplasty like state.
- The flap is partially attached physically while the surgeon attempts to join the nerve bundles.
- If the urethra was extended, it is now joined with a catheter that will remain in place for healing purposes for two to four weeks. Otherwise, the skin is sutured up and/or the scrotum is fabricated.

If the patient chooses to have the urethra extended to the glans of the neophallus, it is formed by the following steps:

- The labia minora is injected with a mixture of saline and epinephrine.
- It is then split open and layers separated using sharp and blunt dissection.
- The layers are wrapped around a catheter and stitched.
- A mucosal flap from the vagina may be used to bridge the urethra with the extension. This is often done in a separate procedure. Alternative graft locations include the mouth/cheeks or experimentally, the intestines. If the labia minora is not used during construction of the urethral extension, (or in the chance there is enough material remaining) it can be used during glansplasty to provide for better results compared with a full thickness skin graft.

Patient satisfaction and concerns

The overall aesthetic satisfaction rate for forearm phalloplasty is 90% in spite of its shortcomings. 83% of patients who replied to a study reported good superficial (skin) sensation. Only 9% had erogenous sensitivity in their neopenis, and only 51% were able to perform satisfactorily during intercourse (defined as being able to penetrate their partner successfully without difficulty or pain).

Post-op depression which required temporary use of anti-depressants were noted by 27% of those who replied, with one suicide attempt not related to the surgery outcome. After surgery, 40% were able to apply for employment positions that they were unable to fill when they were legally female. 93% of patients stated that after phalloplasty, they were happy with their genitals.

Graft from the side of the chest

A relatively new technique involving a graft from the side of the chest under the armpit (known as a *musculocutaneous latissimus dorsi* free transfer flap) is a step forward in phalloplasty. The advantages of this technique over the older forearm flap technique include:

- Hairlessness (little to no electrolysis needed)
- Aesthetic appearance of normally colored skin (the glans may be tattooed to proper color)
- Capable of tactile sensation (as with any form of phalloplasty, this does not necessarily mean the ability to have a genital orgasm after healing, as the erogenous zone is limited to the base of the penis)
- Leaves an inconspicuous scar
- Has a lower occurrence of complications from both the initial surgery and the erectile prosthesis insertion

This is a three part surgery that takes place over a period of six to nine months. The steps consist of:

Neophallus creation using MLD free flap

- The surgery starts (after the patient is prepped) with the side of the chest marked for graft size.
- The graft skin is dissected to expose the veins and the *thoracodorsal* nerves.
- The graft, while still attached to the blood supply, is formed to a rough phallus shape by rolling the edges together.
- A segment of vein going to the patient's groin is "borrowed" to allow easier joining of the graft with the preexisting tissues.
- The vein is carefully attached to the *femoral artery*.
- The blood supplies from the flap and the vein leading to the femeral artery are joined.
- The clitoral hood and ligament are cut away and the nerve bundle is isolated.
- The flap is partially attached physically while the surgeon attempts to join the nerve bundles.

During initial recovery, the neophallus is protected from contact with other tissues with a specially constructed dressing as to avoid blood supply complications.

After three months, urethroplasty (urethral extension) is performed.

- The neophallus is dissected and a buccal (oral) mucosa graft inlaid into the created cavity and extended to the native urethra and joined to permanently allow urination while standing
- A catheter is placed for several weeks to allow for proper healing

After another three to six months, a device that allows an erection can be inserted.

Graft from the leg

The lower leg operation is similar to forearm graft with the exception that the donor scar is easily covered with a sock and/or pants and hidden from view. Other details are same as forearm graft, especially the need for permanent hair removal before the operation. A graft from the leg or another area where the scar is less noticeable may be combined with free forearm graft to sculpt the glans penis.

Pubic area flap

The graft location is around the pelvic bone, usually running across the abdomen under the belly button. As such, there is a large horizontal scar that may not be aesthetically acceptable. The grafts have a less natural appearance and may not maintain an erectile implant long term. Electrolysis is required before surgery with the alternative being clearing of hair via shaving, or chemical depilatory.

Gillies technique

This technique was pioneered by Sir Harold Delf Gillies as one of the first competent phalloplasty techniques. It was simply a flap of abdominal skin rolled into a tube to simulate a penis, with urethral extension being another section of skin to create a "tube within a tube." Early erectile implants consisted of a flexible rod. A later improvement involved the inclusion of a blood supply pedicle which was left in place to prevent tissue death before it was transplanted to the groin. Most latter techniques involve tissues with attached pedicle.

Abdominal muscle

Skin grafted muscle flaps have fallen from popularity. This procedure is a minimum of 3 steps and involves implantation of an expansion balloon to facilitate the amount of skin needed for grafting. The grafts have a less natural appearance and are less likely to maintain an implant erectile long term.

Future

In the future, bioengineering may be used to create fully functional penises.

Common complications

As phalloplasty has improved over the decades, the risks and complications from surgery have been reduced. However, there is still a possibility of a need for revision surgery to repair incorrect healing.

A study of post-op men showed that on average, 25% had one or more serious complications of the neopenis. The ones reported consisted of:

- Loss of the phallus from either disease or blood supply issues
- Cephalic vein thrombosis (blood clot)
- Arterial ischaemia (shortage of blood supply)
- Infection
- Distal limited necrosis (death of parts of the penis)
- Haematoma (bruise)

In the same study, chances of complications of the extended urethra were higher, averaging 55%. The most common complications reported were:

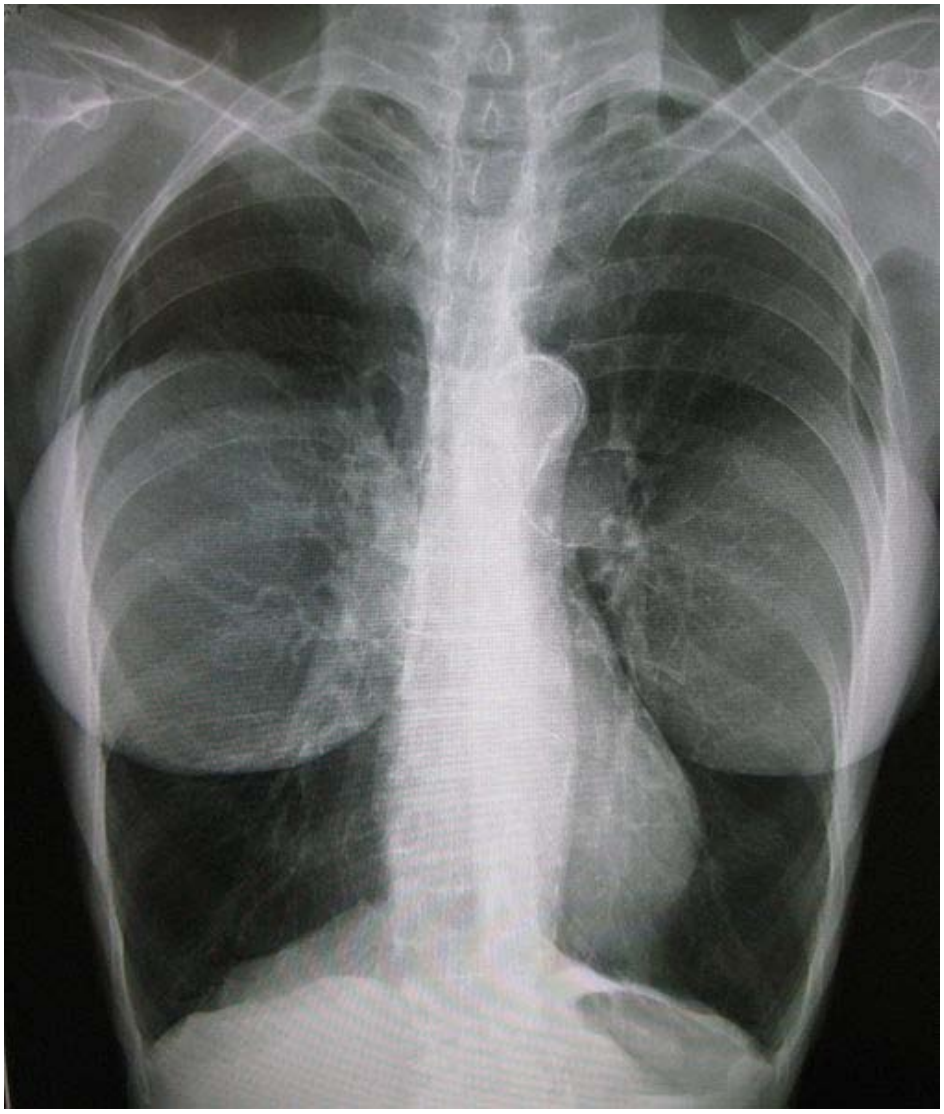
- Urinary fistula (hole) requiring perineal urethrostomy
- Urinary fistula (hole) with conservative treatment
- Urinary retention (from stenosis or narrowing of the new urethra)
- (Erectile) prosthesis change (from complications)
- (Erectile) prosthesis explantation (removal of the prosthesis without replacement)

Chapter 13

Breast Implant

Breast augmentation, before and after

Bilateral breast augmentation with submuscular placement of 350 cc saline impants through an inframmary fold



Chest X-ray showing bilateral breast implants

A **breast implant** is a prosthesis used to alter the size and shape of a woman's breasts (known as **breast augmentation**, **breast enlargement**, **mammoplasty enlargement**, **augmentation mammoplasty** or the common slang term **boob job**) for cosmetic reasons, to reconstruct the breast (e.g. after a mastectomy or to correct congenital chest wall deformities), or as an aspect of male-to-female gender transition. A breast tissue expander is a temporary breast implant used during staged breast reconstruction procedures. According to the American Society of Plastic Surgeons, breast augmentation is the most commonly performed cosmetic surgical procedure in the United States. According to data collected by the American Society of Plastic Surgery, in 2007, 307,230 breast augmentation procedures were performed in the U.S., a 12% decrease compared to the previous year. This decrease has been associated with the financial challenges posed by a struggling economy.

There are two primary types of breast implants: saline-filled and silicone-gel-filled implants. *Saline implants* have a silicone elastomer shell filled with sterile saline liquid. *Silicone gel implants* have a silicone shell filled with a viscous silicone gel. Several alternative types of breast implants had been developed, such as polypropylene string or soy oil, but these are no longer manufactured.

Pectoral implants are a related device used in cosmetic and reconstructive procedures of the male chest wall.

History

Implants have been used since at least 1895 to augment the size or shape of women's breasts. The earliest known implant was attempted by Vincenz Czerny, using a woman's own adipose tissue (from a lipoma, a benign growth, on her back). An Austrian physician, Robert Gersuny tried paraffin injections in 1889, with disastrous results. In the early to mid-1900s, a number of other substances were tried, including ivory, glass balls, ground rubber, ox cartilage, Terylene wool, gutta-percha, Dicora, polyethylene chips, polyvinyl alcohol-formaldehyde polymer sponge (Ivalon), Ivalon in a polyethylene sac, polyether foam sponge (Etheron), polyethylene tape (Polystan) or strips wound into a ball, polyester (polyurethane foam sponge) Silastic rubber, and teflon-silicone prostheses. In recent history, various creams and medications have been used in attempts to increase bust size. Furthermore, Dr. Berson in 1945 and Jacques Maliniac in 1950 performed a flap-based augmentation by rotating the patient's chest wall tissue into the breast to add volume. Various synthetics were used throughout the 1950s and 1960s, including silicone injections, which an estimated 50,000 women received. Development of silicone granulomas and hardening of the breasts were in some cases so severe that women needed to have mastectomies for treatment. Women sometimes seek medical treatment for complications up to 30 years after receiving this type of injection.

Indications

Breast implants are used primarily for:

- primary reconstruction (to replace breast tissue that has been removed due to cancer or trauma or that has failed to develop properly due to a severe breast abnormality such as the tuberous breast deformity)
- revision-reconstruction (revision surgery to correct or improve the result of an original breast reconstruction surgery)
- primary augmentation (to increase breast size for cosmetic reasons)
- revision-augmentation (revision surgery to correct or improve the result of an original breast augmentation surgery)

Patient characteristics

Patients seeking breast augmentation have been reported as commonly younger females. Many of these patients have reported greater distress about their appearance in a variety of situations, and have endured teasing about their appearance.

Studies have identified a pattern (shared by many cosmetic surgery procedures) that suggest women who undergo breast implantation are slightly more likely to have undergone psychotherapy, have low levels of self-esteem, and have higher prevalences of depression, suicide attempts, and mental illness (including body dysmorphia) as compared with the general population.

Post-operative surveys on mental health and quality of life issues have reported improvement on a number of dimensions including: physical health, physical appearance, social life, self confidence, self esteem, and sexual function. Longer term follow-up studies suggest these improvements may be transitory, with the exception of body esteem related to sexual attractiveness. Overall, most patients report being satisfied long-term with their implants even when they have required re-operation for complications or aesthetic reasons.

The Netherlands is the country with most breast augmentation surgeries. More than half of the women in the United States who undergo cosmetic surgery earn less than $25,000 annually. National health care plans subsidize breast augmentation in Sweden, the Netherlands, and elsewhere in Europe.

Mental health

A 2007 Swedish and US longitudinal study found that women who get cosmetic breast implants are nearly three times as likely to commit suicide as other women. No notable increase was seen in the first 10 years after surgery, but 10 to 19 years after, risk was 4.5 times higher, and six times higher after 20 years, compared with the expected suicide rate.

The same study found that women with breast implants also had a tripled risk of death from alcohol and drug use. At least seven studies have been made connecting breast implants to a higher rate of suicide.

Researchers believe that breast implants themselves do not directly cause the higher suicide rate amongst the women who undergo the procedure. The hypothesis is that women with an inclination towards psychopathology (psychological problems) are more likely to get breast implants in the first place. For example, a Danish study found that eight percent of women who underwent cosmetic breast augmentation also had a history of psychiatric hospitalization before surgery.

Most ethical surgeons screen patients prior to surgery and breast implants can have a positive impact on mental health as it correlates to self-esteem and sexual satisfaction.

According to a study by Figueroa-Hass, improvements in women's self-esteem and sexual satisfaction were directly attributed to their breast augmentation. Patients aged 21 to 57 years old showed an average increase in self-esteem from 20.7 to 24.9 on the 30-point Rosenberg scale. Further to the increase in self-esteem, a 78.6 percent increase was noted in sexual desire.

Procedure

The surgical procedure for breast augmentation takes approximately one to two hours. Variations in the procedure include the incision type, implant material, and implant pocket placement.

Incision types

Breast implants for augmentation may be placed via various types of incisions:

- **Inframammary** – an incision is placed below the breast in the infra-mammary fold (IMF). This incision is the most common approach and affords maximum access for precise dissection and placement of an implant. It is often the preferred technique for silicone gel implants due to the longer incisions required. This method can leave slightly more visible or thicker scars.
- **Periareolar** – an incision is placed along the areolar border. This incision provides an optimal approach when adjustments to the IMF position or mastopexy (breast lift) procedures are planned. The incision is generally placed around the inferior half, or the medial half of the areola's circumference. Silicone gel implants can be difficult to place via this incision due to the length of incision required (~ 5 cm) for access. As the scars from this method occur on the edge of the areola, they are often less visible than scars from inframammary incisions in women with lighter areolar pigment. There is a higher incidence of capsular contracture with this technique, and this incision causes the most problems with breast feeding, due to cutting milk ducts and nerves that lead to the nipple.
- **Transaxillary** – an incision is placed in the armpit and the dissection tunnels medially. This approach allows implants to be placed with no visible scars on the breast, but is more likely to produce asymmetry of the inferior implant position. Subsequent revisions of transaxillary-placed implants usually require inframammary or periareolar incisions. Transaxillary procedures can be performed with or without an endoscope.
- **Transumbilical (TUBA)** - a less common technique where an incision is placed in the navel and dissection tunnels superiorly. This approach enables implants to be placed with no visible scars on the breast, but makes appropriate dissection and implant placement more difficult. Transumbilical procedures are performed bluntly, with or without an endoscope (tiny lighted video camera) to assist dissection. This technique is not appropriate for placing silicone gel implants due to potential damage of the implant shell if attempting insertion through the small 2 cm incision in the navel, and as those implants are pre-filled they cannot be passed through that incision.

- **Transabdominoplasty (TABA)** – procedure similar to TUBA, where the implants are tunneled up from the abdomen into bluntly dissected pockets while a patient is simultaneously undergoing an abdominoplasty procedure.

Types of implants

Saline implants

saline filled breast implants

Saline-filled breast implants were first manufactured in France in 1964, introduced by Arion with the goal of being surgically placed via smaller incisions. Current saline devices are manufactured with thicker, room temperature vulcanized (RTV) shells than earlier generations of devices. These shells are made of a silicone elastomer and the implants are filled with salt water (saline) after the implant is placed in the body. Since the implants are empty when they are surgically inserted, the scar is smaller than is necessary for silicone gel breast implants (which are filled with silicone before the surgery is performed). A single manufacturer (Poly Implant Prosthesis, France) produced a model of pre-filled saline implants which has been reported to have higher failure rates in vivo.

Saline-filled implants were most common implant used in the United States during the 1990s due to restrictions that existed on silicone implants, but were rarely used in other countries. Good to excellent results may be obtained, but as compared to silicone gel implants, saline implants are more likely to cause cosmetic problems such as rippling, wrinkling, and to be noticeable to the eye or the touch. Particularly for women with very little breast tissue, or for post-mastectomy breast reconstruction, silicone gel implants are

considered as superior. In patients with more breast tissue in whom submuscular implant placement is used, saline implants can look very similar to silicone gel.

Silicone gel implants

Silicone gel-filled breast implants

Thomas Cronin and Frank Gerow, two Houston, Texas, plastic surgeons, developed the first silicone breast prosthesis with the Dow Corning Corporation in 1961. The first woman was implanted in 1962. Silicone implants are generally described in terms of five generations which segregate common characteristics of manufacturing techniques.

First generation

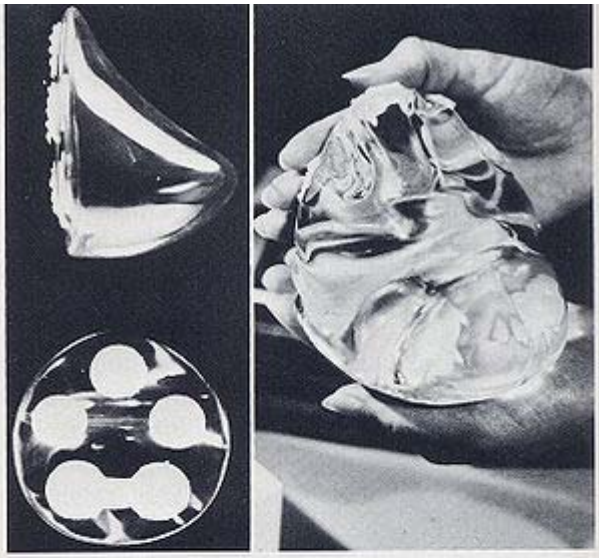


Fig. 24-1. New seamless design of the Silastic gel mammary prosthesis. (Courtesy Dow Corning Corporation, Midland, Mich.)

Fig. 24-2. X-ray picture showing position of prosthesis after implantation. (Courtesy Dow Corning Corporation, Midland, Mich.)

Original Cronin-Gerow Implant from 1963. Note Dacron patch and anatomic "tear drop" shape.

The Cronin-Gerow implants were made of a tear drop shaped silicone rubber envelope (or sac), filled with a thick, viscous silicone gel with a Dacron patch (to reduce rotation of the implant) on the posterior shell.

Second generation

In response to cosmetic surgeons' requests for softer and more lifelike implants, breast implants were redesigned in the 1970s with thinner, less cohesive gels and thinner shells.

These implants had a greater tendency to rupture or "gel bleed" silicone through an intact implant shell, and complications such as capsular contracture were quite common. It was predominantly implants of this generation that were involved in the American class action-lawsuits against Dow-Corning and other manufacturers in the early 1990s.

Another development in the 1970s was a ***polyurethane foam coating*** on the implant shell which was very effective in diminishing capsular contracture by causing an inflammatory reaction that discouraged formation of fibrous tissue around the capsule. These implants were later briefly discontinued due to concern of potential carcinogenic breakdown products from the polyurethane. A review of the risk for cancer from TDA by the FDA later concluded that the risk was so small so as not to justify recommending explantation of the devices from individual patients. Polyurethane implants are still used in Europe and South America, but no manufacturer has sought FDA approval for sale in the United States. Second-generation implants also saw the introduction of various **"double lumen" designs**. These implants were essentially a silicone implant inside a saline implant. The double lumen was an attempt to provide the cosmetic benefits of gel in the inside lumen, while the outside lumen contained saline and its volume could be adjusted after placement. The failure rate of these implants is higher than for single lumen implants due to their more complex design. The contemporary versions of these devices ("Becker Implants") are used primarily for breast reconstruction.

Third and fourth generation

Third and fourth generation implants, from the mid 1980s, represented sequential advances in manufacturing principles with elastomer-coated shells to decrease gel bleed, and are filled with thicker, more cohesive gel. The increased cohesion of the gel filler reduced potential leakage of the gel compared to earlier devices and the more substantial shell improved durability as compared to 2nd generation implants. A variety of both round and tapered anatomic shapes are available from different implants in this group. The anatomic or shaped implants are uniformly impregnated with a textured surface to reduce rotation, while round devices are available in both smooth or textured surfaces.

Fifth generation

Evaluation of "gummy bear" or solid, high-cohesive, form-stable implants is in preliminary stages in the United States but these implants have been widely used since the mid 1990s in other countries. The semi-solid gel in these type of implants largely eliminates the possibility of silicone migration. Studies of these devices have shown significant potential improvements in safety and efficacy over the older implants with low rates of capsular contracture and rupture.

US FDA approval

Silicone gel-filled breast implants were first introduced in the United States 1962 by Cronin and Gerow. As a response to reports of implant failure and allegations of resultant complications and illness, in 1988 the U.S. Food and Drug Administration (FDA)

announced that all breast implants would be subsequently relabeled as class III medical devices, and called for data from manufacturers showing the safety and effectiveness of these devices. In 1992, the FDA placed a moratorium on silicone gel breast implants for cosmetic purposes. The FDA concluded there was "inadequate information to demonstrate that breast implants were safe and effective." Access to silicone gel-filled breast implants continued to be allowed under controlled clinical studies for reconstruction after mastectomy, correction of congenital deformities, or replacement of ruptured silicone gel-filled implants due to medical or surgical reasons. Implant manufacturers were required to collect clinical trial data and were allowed distribution of the implants to a limited number of augmentation patients for these studies. In mid-1992, the FDA approved an adjunct study protocol for silicone gel-filled breast implants for reconstruction and revision patients. That same year, silicone and breast implant manufacturer, Dow Corning, announced that it would no longer make five implant grades of silicone, but that it would continue to manufacture 45 other medical grades of silicone materials. Just three years later, in 1995, Dow Corning Corp., once the major manufacturer of silicone breast and other implants, faced 19,000 lawsuits, pushing it into bankruptcy.

In 1997, the Department of Health and Human Services (HHS) began one of the most extensive research studies in medical history by appointing the Institute of Medicine of the National Academy of Science (IOM) to examine potential complications during or after silicone-based breast implant surgeries. After reviewing years of evidence and research concerning silicone gel-filled breast implants, the IOM found that "Evidence suggests diseases or conditions such as connective tissue diseases, cancer, neurological diseases or other systemic complaints or conditions are no more common in women with breast implants than in women without implants." Most individual studies and all systemic review studies have also subsequently failed to find a link between silicone breast implants and disease.

In 1998, the FDA approved adjunct study protocols for silicone gel-filled breast implants for reconstruction and revision patients only and also approved, later that same year, the corporation's IDE study for silicone gel-filled breast implants for a limited number of augmentation, reconstruction, and revision patients.

In 1999, the IOM released a comprehensive report on both saline-filled and silicone gel-filled breast implants entitled Safety of Silicone Breast Implants. The determination was that there was no evidence to suggest silicone or saline breast implants cause systemic health effects and that there was no new or novel health or safety issue associated with the use of either types of implants. The IOM concluded that local complications are "the primary safety issue with silicone breast implants", making a clear distinction between routine local complications and systemic health concerns.

In 2000, the FDA granted approval of saline-filled breast implant PMAs, showing data on the types and rates of local complications experienced by patients. “Despite complications experienced by some women, the majority of those women still in the Inamed Corporation and Mentor Corporation studies after three years reported being

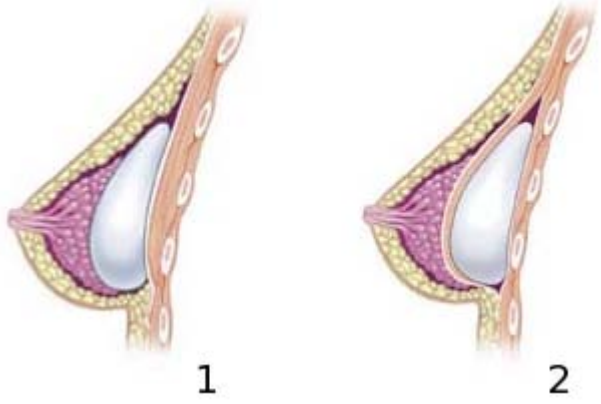
satisfied with their implants." Both PMAs were approved for breast augmentation to females of at least 18 years of age and for breast reconstruction.

The manufacturers continued to improve their gel-filled products, developing more cohesive gel implant, and continued with their studies. On November 17, 2006, the FDA lifted its restrictions on the use of silicone gel-filled breast implants produced by the two manufacturers for breast reconstruction and for cosmetic breast augmentation. The approval was given with a number of conditions including a requirement to complete 10-year studies on women who have already received the implants and a 10 year study on the safety of the devices in 40,000 women. The post-approval studies will be closely monitored by the FDA. The FDA warned that the implants are not without risk and that women receiving implants should be suggested to have periodic MRI exams to watch for any signs of rupture or leakage. It was also mandated that patients be given brochures explaining the risks.

The FDA has set age limits with respect to who can get breast implants. For reconstruction purposes, silicone gel-filled and saline-filled breast implants are approved for women of all ages. For augmentation, however, saline-filled breast implants are approved for women 18 years of age and older and silicone gel-filled implants are approved for women 22 years of age and older . The age minimum is different for saline-filled and silicone gel-filled implants because the two products entail different risks. Namely, with silicone gel-filled implants there is a risk of silent rupture, so frequent MRI monitoring is suggested . Health ministries in other countries by contrast, do not endorse MRI screening of asymptomatic patients and suggest physical exam with or without ultrasound to be sufficient in most instances.

Currently the FDA has approved silicone gel-filled breast implants and over a million women around the world have already received these implants. Breast implants and breast augmentation surgery is now commonplace all over the world.

Implant pocket placement



Diagrams of cross sections of breast implants, subglandular (left) and submuscular (right)

The placement of implants is described in relation to the pectoralis major muscle.

- **Subglandular**- implant between the breast tissue and the pectoralis muscle, in the retromammary space. This position closely resembles the plane of normal breast tissue and is felt by many to achieve the most aesthetic results. The subglandular position in patients with thin soft-tissue coverage is more likely to show ripples or wrinkles of the underlying implant. Capsular contracture rates may also be slightly higher with this approach.
- **Subfascial** - the implant is placed in the subglandular position, but underneath the fascia of the pectoralis muscle. The benefits of this technique are debated, but proponents believe the fascial layer of tissue may help with coverage and sustaining positioning of the implant.
- **Subpectoral** ("dual plane") - the implant is placed underneath the pectoralis major muscle after releasing the inferior muscular attachments. As a result, the implant is partially beneath the pectoralis in the upper pole, while the lower half of the implant is in the subglandular plane. This is the most common technique in North America and achieves maximal upper implant coverage while allowing expansion of the lower pole. Animation or movement of the implants in the sub pectoral plane can be excessive to some patients.
- **Submuscular** - the implant is placed below the pectoralis without release of the inferior origin of the muscle. Total muscular coverage may be achieved by releasing the lateral chest wall muscles (serratus and/or pectoralis minor) and sewn to the pectoralis major. This technique is most commonly used for maximal coverage of implants used in breast reconstruction.

Recovery

Depending on the level of activity required, patients are generally able to resume normal activity in approximately one week's time. Women who have their implants placed underneath the muscle (submuscular placement) will generally have a longer recovery time and experience slightly more pain due to the muscle being cut during surgery. Exercise and strenuous physical activity will often need to be avoided for up to six weeks.

During initial recovery arm movement is encouraged to help lessen the discomfort. Pain catheters have been shown to be safe and effective. Scars from a breast augmentation surgery will last six weeks or longer and usually begin to fade several months after surgery.

Claims of systemic illness and disease

Since the early 1990s, a number of independent systemic comprehensive reviews have examined studies concerning links between silicone gel breast implants and systemic diseases. The consensus of these reviews is that there is no evidence of a causal link between the implantation of silicone breast implants and systemic disease.

Thousands of women claim that they have become ill from their implants; complaints include neurological and rheumatological problems. Some studies have suggested that subjective and objective symptoms of women with implants may improve when their implants are removed.

As studies have followed women with implants for a longer period of time, more data have become available on systemic diseases as well as autoimmune symptoms. Several large studies from the national health registry in Denmark found implant recipients no more likely to be diagnosed with an increased incidence of classic auto-immune symptoms as compared to women of the same age in the general population, and that musculoskeletal symptoms were generally lower among women with implants compared with women with other cosmetic surgery and women in the general population. Recent longitudinal follow-up of these patients has confirmed previously reported findings.

Several studies have established that women who elect to undergo breast augmentation or other plastic surgery tend to be healthier and more affluent than the general population, prior to surgery and afterwards. For example, two large studies of plastic surgery patients found a decreased standardized mortality ratio in both breast implant and other plastic surgery patients, but an increased risk of respiratory cancer deaths in breast implant recipients compared to other forms of plastic surgery. Smoking was statistically controlled in one study and not in the other, but the authors speculated that there could potentially be differences in smoking that might contribute to the higher lung cancer deaths among women with implants. Another large study with long-term follow-up of nearly 25,000 Canadian women with implants reported: "Findings suggest that breast implants do not directly increase mortality in women."

In 2001 a study claimed an increase in fibromyalgia among women with extracapsular silicone gel leakage, compared to women whose implants were not broken or leaking outside the capsule. This study was criticized as methodologically flawed, and such an association has not been repeated in a number of related studies, and the US-FDA concluded "the weight of the epidemiological evidence published in the literature does not support an association between fibromyalgia and breast implants."

While there is international consensus that silicone implants have not been shown to cause or worsen any systemic illness, excluding the possibility that a small group of patients may become ill through (as of yet) unknown mechanisms may prove difficult. Long term prospective follow up studies are being undertaken in the United States to further study this issue.

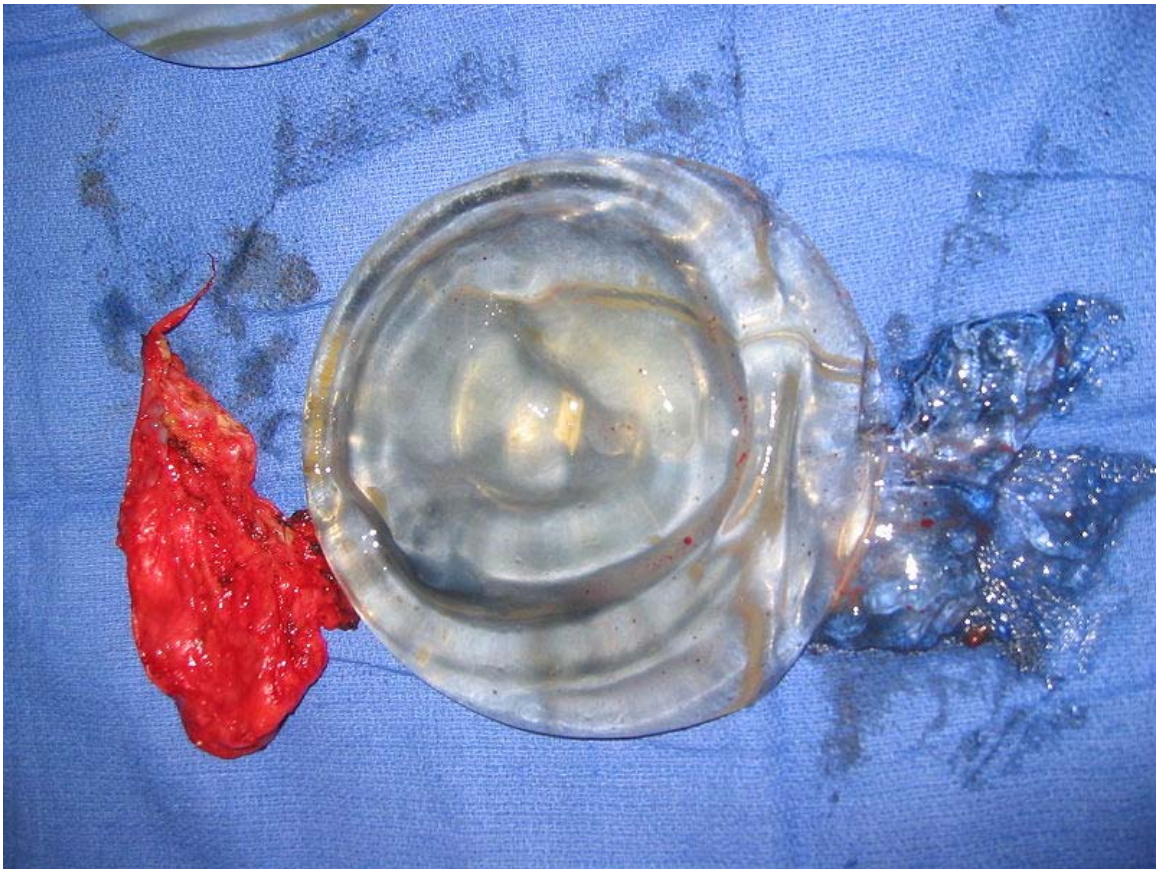
Complications

Surgeries involving breast implants, whether for cosmetic or reconstructive surgery, carry risk common to many types of surgery. These include adverse reactions to anesthesia, post-operative bleeding (hematoma) or fluid collection (seroma), surgical site infection or breakdown, breast pain or alterations in sensation, unfavorable scarring (6-7%), interference with breast feeding, visible wrinkling, asymmetry, thinning of the breast

tissue, and symmastia (disruption of the natural plane between breasts which is sometimes referred to as 'bread loafing'). Complications and reoperations related to surgeries with breast implants or tissue expanders can add significant long term costs to patients and health care systems.

Specific complications to indwelling breast implants that have received notable attention involve surveillance and treatment for implant rupture and the phenomena of capsular contracture.

Rupture



Ruptured silicone implant with removed capsule

Breast implants can potentially remain intact for decades in the body, but all such devices will fail at some point. When saline breast implants break, they often deflate quickly and can be easily removed. Prospective studies of saline-filled breast implants showed rupture/deflation rates of 3–5% at three years and 7–10% at 10 years for augmentation patients. Among the suspected mechanisms for rupture are damage during implantation or other procedures, degradation of the implant shell, blunt or penetrating chest trauma, and in rare instances from the pressure of traditional mammograms.

The age and design of the implant are the most important factors in rupture, but estimating ruptures rates of more contemporary devices has been difficult, as most

previous reports mixed heterogeneous groups of devices in non-randomized populations. The only available literature with longer term available MRI data on single lumen 3rd/4th generation silicone implants comes from Europe and has reported silent rupture rates of an implant at between 8% to 15% at or around a decade (or 15–30% of patients). In 2009, patients followed in one arm of the core FDA clinical trials for primary breast augmentation reported rupture rates of 1.1% after six years followup

The first series of MRI evaluation of the highly-cohesive (5th generation) gel implants suggests improved durability, with a rupture rate reported at 1% or less at a median age of six years.

It has been suggested that clinical exams alone are inadequate to evaluate suspected rupture after a study reported that only 30% of ruptures in asymptomatic patients are accurately detected by experienced plastic surgeons, compared to 86% detected by MRIs The US-FDA has recommended that MRIs be considered to screen for silent rupture starting at three years after implantation and then every two years thereafter. Other countries have not endorsed routine MRI screening, and have taken the position that MRI should be reserved only for cases involving suspected clinical rupture or to confirm mammographic or ultrasound studies suggesting rupture.

When silicone implants break they rarely deflate, and the silicone from the implant can leak out into the space around the implant. An intracapsular rupture can progress to outside of the capsule (extracapsular rupture), and both conditions are generally agreed to indicate the need for removal of the implant. Extracapsular silicone has the potential to migrate, but most clinical complications have appeared to be limited to the breast and axillae in the form of granulomas (inflammatory nodules) and axillary lymphadenopathy (enlarged lymph glands in the armpit area). The specific risk and treatment of extracapsular silicone gel is still controversial.

Capsular contracture

High grade (Baker IV) capsular contracture in the right breast around a subglandular gel implant.

Capsules of tightly-woven collagen fibers form as an immune response around a foreign body (e.g. breast implants, pacemakers, orthopedic joint prosthetics), tending to wall it off. Capsular contracture occurs when the capsule tightens and squeezes the implant. This contracture is a complication that can be very painful and distort the appearance of the

implanted breast. The exact cause of contracture is not known. However, some factors include bacterial contamination, silicone rupture or leakage, and hematoma.

Methods which have reduced capsular contracture include submuscular implant placement, using textured or polyurethane-coated implants, limiting handling of the implants and skin contact prior to insertion and irrigation with triple-antibiotic solutions.

Correction of capsular contracture may require surgical removal or release of the capsule, or removal and possible replacement of the implant itself. Closed capsulotomy (disrupting the capsule via external manipulation), a once common maneuver for treating hard capsules, has been discouraged as it can cause implant rupture. Nonsurgical methods of treating capsules include massage, external ultrasound, treatment with leukotriene pathway inhibitors (Accolate, Singulair), and pulsed electromagnetic field therapy.

Platinum

Platinum is a catalyst used in the making of silicone implant polymer shells and other silicone devices used in medicine. The literature indicates that small amounts of platinum leaches (leaks) from these implants and is present in the surrounding tissue. The FDA reviewed the available studies from the medical literature on platinum and breast implants in 2002 and concluded there was little evidence suggesting toxicity from platinum in implant patients.

In 2006, researchers published a controversial study that claimed to identify the previously undocumented presence of toxic platinum oxidative states *in vivo*. A letter from the editors of the publishing journal, *Analytical Chemistry*, subsequently expressed concern over the research's experimental design and urged the journal's readers to "use caution in evaluating the conclusions drawn in the paper." The FDA reviewed this study and the existing literature, concluding that the body of existing research did not support their findings, and that the platinum in new implants is likely not ionized and therefore would not represent a significant risk to women.

Implants and mammography

The presence of radio-opaque breast implants may interfere with the sensitivity of screening mammography. Specialized radiographic techniques where the implant is manually displaced (Eklund views) may improve this somewhat, but approximately 1/3 of the breast is still not adequately visualized with a resultant increase in false-negative mammograms. A number of studies looking at breast cancers in women with implants have found no significant difference in stage of disease at time of diagnosis, and prognosis appears to be similar in both groups with augmented patients not a higher risk for subsequent cancer recurrence or death. Conversely, the use of implants for reconstruction *after* mastectomy for breast cancer also appears not to have a negative effect on cancer-related mortality.

An observation that patients with implants are more often diagnosed with palpable tumors (but not larger ones) suggest that tumors of equal size may be more easily palpated in augmented patients, and this may compensate somewhat for the potential impairment of mammography. This palpability is due to thinning of the breast by compression, innately smaller breasts a priori, and that the implant serves as a base against which the mass may be differentiated.

The presence of a breast implant does not influence the ability for breast conservation (lumpectomy) surgery for women who subsequently develop breast cancer, and does not interfere with delivery of external beam radiation (XRT) treatments that may be required. Fibrosis of breast tissue after XRT is common and an increase in capsular contracture rates would be expected.

Implants and breastfeeding

Women with implants are able and encouraged to breastfeed. Implants may cause difficulties in nursing, and some procedures, particular periareolar incisions and subglandular placement are associated with greater difficulties; thus a woman of childbearing years is advised to discuss breastfeeding with a surgeon prior to surgery.

A particular safety concern is whether the implant may leak into breast milk, and whether this causes health problems for the nursing infant. Saline is salt water, and silicone is used in colic drops, and considered indigestible – both substances are chosen to be neutral and are widely present in the environment, and on this basis some doctors argue that there "should be no absolute contraindication to breastfeeding by women with silicone breast implants". Regarding studies, some small-scale non-random studies (meaning "patients came with complaints, which may have many sources", not "doctors performed random tests") in the early 1990s – at the early stages of the controversy over silicone implants – indicated possible complications from breastfeeding with silicone implants; these were not corroborated by large-scale randomized studies.

Difficulties in breastfeeding arise if functional tissue is affected, particularly if milk ducts or major nerves are cut, or if milk glands are otherwise damaged or pressured. Duct and nerve damage is most caused by periareolar incisions, which cut tissue near the nipple, while other incisions (inframammary, transaxillary, TUBA) avoid nipple tissue; if aware of concerns, periareolar incisions can be done so as to reduce damage to ducts and nerves. Milk glands are most affected by subglandular (over-the-muscle) implants and large implants, which cause pressure on the glands; submuscular and smaller implants cause fewer problems. However, many women have been able to successfully breastfeed with periareolar incisions and subglandular placement.

All women planning to breastfeed are advised to consult with breastfeeding professionals (lactation consultants), which are of particular assistance to woman with or considering implants, who can advise on what to expect. Women considering implants and breastfeeding are encouraged to discuss this with their surgeon to allow them to make choices so as to minimize damage to functional breast tissue and facilitate breastfeeding.

Other breast surgeries, such as breast lifts or nipple surgery, may also cause difficulties, while breast reduction surgery is more likely to cause nursing difficulties, due to removal of breast tissue.

Repair or revision surgery

Regardless of the type of implant, it is likely that women with implants will need to have one or more additional surgeries (re-operations) over the course of their lives. Breast implants do not last forever. According to studies conducted by implant companies for the U.S. FDA, they sometimes only last a few years. Most common indications for re-operations have included major or minor complications, capsular contracture treatment, and replacement of ruptured/deflated implants. Re-operation rates are predictably more frequent in breast reconstruction cases due to the dramatic changes in the soft-tissue envelope and anatomical breast borders after mastectomy, particularly when patients have received adjuvant XRT. Breast cancer patients also frequently undergo staged procedures for reconstruction of the nipple-areola complex (NAC) and symmetry procedures on the opposite breast.

It appears that re-operation rates in cosmetic cases can be improved by more carefully matching individual patients' soft-tissue characteristics to the type and size of implants used. Using appropriate device selection and proper technique, re-operation rates at up to seven years followup have been reported as low as 3%, as compared with the 20 percent re-operation rate at 3 years in the most recent Food and Drug Administration study.

Controversy

Since the early 1990s, nearly a dozen comprehensive systemic reviews have been commissioned by various governments' health ministries to examine the alleged links between silicone gel breast implants and systemic diseases. A clear consensus has emerged from these independent scientific reviews that there is no clear evidence of a causal link between the implantation of silicones and connective tissue disease. The conclusions of these reviews are summarized:

Year	Country	Systemic Review Group	Conclusions
1991–1993	United Kingdom	Independent Expert Advisory Group (IEAG)	The IEAG concluded that there was no evidence of an increased risk of connective tissue disease in patients who had undergone silicone gel breast implantation and that ther case for changing practice or policy in the UK in respect of breast implantation
1996	USA	US Institute of Medicine (**IOM**)	Not "sufficient evidence for an association of silicone gel- or saline-filled breast implants with defined connective tissue disease".
1996	France	Agence Nationale	"Nous n’avons pas observé de connectivite ni

		pour le Developpement de l'Evaluation Medicale (**ANDEM**)	d'autre pathologie auto-immune susceptible d'être directement ou indirectement induite par la présence d'un implant mammaire en particulier en gel de silicone..." (We did not observe connective tissue diseases to be directly or indirectly associated with (in particular) silicone gel breast implants)
1997	Australia	Australia's Therapeutic Devices Evaluation Committee review	"current high quality literature suggest that there is no association between breast implants and connective tissue disease-like syndromes (atypical connective tissue diseases)"
1998	Germany	Germany's Federal Institute for Medicine and Medical Products	concluded that "silicone breast implants neither cause auto-immune diseases nor rheumatic diseases and have no disadvantageous effects on pregnancy, breast feeding capability or the health of children who are breast fed. There is no scientific evidence for the existence of silicone allergy, silicone poisoning, atypical silicone diseases or a new silicone disease"
2000	USA	Review request of the United States Federal Judiciary	"no evidence of an association between...silicone-gel-filled breast implants specifically, and any of the individual CTDs, all definite CTDs combined, or other autoimmune or rheumatic conditions."
2000	European Union	European Committee on Quality Assurance & Medical Devices in Plastic Surgery (**EQUAM**)	"Additional medical studies have not demonstrated any association between silicone-gel filled breast implants and traditional auto-immune or connective tissue diseases, cancer, nor any other malignant disease....EQUAM continues to believe that there is no scientific evidence that silicone allergy, silicone intoxication, atypical disease or a 'new silicone disease' exists."
2001	United Kingdom	UK Independent Review Group (**UK-IRG**)	"there is no evidence of an association with an abnormal immune response or typical or atypical connective tissue diseases or syndromes"
2001	USA	Review for court appointed National Science Panel	The panel evaluated both established and undifferentiated connective tissue diseases and concluded that there was no evidence of an association between breast implants and these CTDs.
2003	Spain	**STOA** Report to the European Parliament Petitions Committee	Regarding new scientific evidence, the currently available information shows that there is not solid evidence linking SBI to severe

diseases (such as breast cancer or connective tissue diseases).

Thousands of women have still claimed that they have become ill from their implants. Complaints include systemic fungus, neurological and rheumatological problems.

As studies have followed women with implants for a longer period of time, more information has been made available to assess these issues. A 2004 Danish study, reported that women who had breast implants for an average of 19 years were no more likely to report an excess number of rheumatic symptoms than control groups. A large study of plastic surgery patients found a decreased standardized mortality ratio in both breast implant and other plastic surgery patients, but a relatively increased risk of lung cancer deaths in breast implant recipients compared to other forms of plastic surgery. The authors attributed this to differences in smoking rates. Another large study of nearly 25,000 Canadian women with implants recently reported a 43 percent lower rate of breast cancer compared with the general population and a lower-than-average risk of developing cancer of any kind.

Chapter 14

Forehead Lift

A **forehead lift**, also known as a browlift or browplasty, is a cosmetic surgery procedure used to elevate a drooping eyebrow that may obstruct vision and/or to remove the deep "worry" lines that run across the forehead and may portray to others anger, sternness, hostility, fatigue or other unintended emotions.

Overview of the procedure

Patients commonly request rejuvenation surgery on the forehead because the area is large enough to comprise the major focal and expression point of the upper face, the eyes notwithstanding. Given time and gravity, the muscles that hold the forehead smooth become loose and weak, allowing deep wrinkles to appear. Correction of a wrinkled forehead usually leads to a more youthful look. Patients requesting the procedure commonly range in age from 40 to 60.

A forehead lift is often used in combination with eyelid surgery to reduce sagging skin found on the upper eyelids.

Multiple surgical approaches can be utilized. A direct brow lift is performed by removing an ellipse of skin and muscle just above the eyebrows. The incision is hidden within the brow hair. This technique does not address wrinkles or lines within the forehead and surgical scars may be prominent. It is typically reserved for older patients or for men with thick eyebrow hair and male pattern baldness.

A mid-forehead lift is intended for patients older than 65 who have heavy sagging eyebrows and the deepest forehead wrinkles. To bring about a more youthful look, the surgeon makes incisions within the deep forehead wrinkles and removes the excess skin, fat and muscle. Incisions are made within the deep wrinkles so that the resulting scars are hidden and not very noticeable after healing.

A coronal forehead lift is performed by making an ear to ear incision across the forehead and elevating the entire forehead and brow.

The most current technique, called an endoscopic forehead lift, involves the use of a surgical telescope to elevate the brows and smooth forehead wrinkles through small incisions made behind the hairline.

History

The first documented medical discussion about a forehead lift was written in 1910 by the famous German surgeon Erich Lexer.

The main surgical method of lifting the forehead from Lexer's time up until the 1950s was then known as a coronal, or open, forehead lift.

While the procedure is currently used far less frequently, the surgeon began the procedure by making one, long incision running from ear to ear over the top of the head through the hairline. The surgeon lifted the skin and muscles upwards and free from the bone, pulled the tissues up toward the top of the head, trimmed the excess and closed the incision with sutures. The incision was initially made well into the hairline so the scar could not later be seen.

In some cases, especially those in which the eyebrows and forehead skin are not too heavy, the upper eyelids are also elevated. In most cases, the procedure provides the smoother appearance which many patients want to help look younger and more refreshed and rested In the late 1950s, and 60s some surgeons achieved the younger appearance on the forehead by scoring or removing some of the small forehead muscles -- most notably the frontalis muscle which causes frowning and grimacing.

Current surgical techniques

Since the advent of the hugely popular wrinkle remover, Botox (Dysport in the United Kingdom and Europe) many consumers have eschewed the invasive surgery altogether, opting for Botox injections every four to six months to get the same results. Botox is also used after some forehead lift procedures to increase the effects of the surgeries.

Endoscopic surgery is often employed in forehead lifts. An endoscope is a surgical system with thin, pencil-sized arms that are inserted through three to five incisions about 3/8 of an inch long. One of the instrument's arms is a lighted camera that displays what it sees under the patient's skin on a television monitor.Other arms on the Endoscope carry actual surgical tools that perform cutting, or grasping functions. The surgeon watches the television monitor to guide his movements.

Yet another advancement to endoscopic forehead lift surgery is with a fixation device known as an Endotine The bioabsorbable Endotine implant is:

- Essentially a hanger with five small tines
- Affixed by inserting a flanged post into a drill hole in the skull

First, the surgeon frees the tissues of the forehead from the skull, then lifts them upwards and engages them onto the implant tines which hold them in place. The upside is the surgeon can readjust the height of the lift by simply moving the tissues up on the Endotine. If left undisturbed for 30 to 60 days, the forehead tissues heal to the bone at the

higher position. The body absorbs the Endotine in about four to seven months. However, patients report they can feel the Endotines under the skin for some months after their procedures.

Risks

When surgeons have problems with an endoscopic forehead lift, -- in about one percent of cases -- they finish the procedure by switching to the open forehead lift method.

Complications are said to be rare and minor when a forehead lift is performed by a surgeon trained in the technique. However, it is possible for the surgical process to damage the nerves that control eyebrow and forehead movements. Hair loss can also occur along the scar edges in the scalp when an incision is made through the hairline. Moreover, infection and bleeding are possible with any surgical procedure.

Patients who have Endotine implants in their foreheads risk moving their newly adjusted tissues with relatively small movements just after the operation and before complete healing takes place. While the implant absorbs into the body, the Endotine generally does not support the very thick forehead flesh and heavy brows often seen in some overweight males.

Chapter 15

Skin Grafting

Walter Yeo, a British soldier, is assumed to be the first person to be benefited from plastic surgery employing tubed pedicle flaps, performed by Sir Harold Gillies in 1917. Before (left) and after (right) the operation.

Skin grafting is a type of medical grafting involving the transplantation of skin. The transplanted tissue is called a **skin graft**.

Skin grafting is often used to treat:

- Extensive wounding or trauma
- Burns
- Areas of extensive skin loss due to infection such as necrotizing fasciitis or purpura fulminans
- Specific surgeries that may require skin grafts for healing to occur

Skin grafts are often employed after serious injuries when some of the body's skin is damaged. Surgical removal (excision or debridement) of the damaged skin is followed by skin grafting. The grafting serves two purposes: it can reduce the course of treatment

needed (and time in the hospital), and it can improve the function and appearance of the area of the body which receives the skin graft. There are two types of skin grafts, the more common type is where a thin layer is removed from a healthy part of the body (the donor section) like peeling a potato, or a full thickness skin graft, which involves pitching and cutting skin away from the donor section. A full thickness skin graft is more risky, in terms of the body accepting the skin, yet it leaves only a scar line on the donor section, similar to a Cesarean section scar. For full thickness skin grafts, the donor section will often heal much more quickly than the injury and is less painful than a partial thickness skin graft.

Graft taxonomy

- **Autologous**: The donor skin is taken from a different site on the same individual's body (also known as an *autograft*).
- **Isogeneic**: The donor and recipient individuals are genetically identical (e.g., monozygotic twins, animals of a single inbred strain; *isograft* or *syngraft*).
- **Allogeneic**: The donor and recipient are of the same species (human→human, dog→dog; *allograft*).
- **Xenogeneic**: The donor and recipient are of different species (e.g., bovine cartilage; *xenograft* or *heterograft*).
- **Prosthetic**: Lost tissue is replaced with synthetic materials such as metal, plastic, or ceramic (*prosthetic implants*).

Graft classification

Skin grafts can be

- **Split-thickness** - epidermis and variable amounts of dermis. Commonly taken from the thigh or buttocks. The donor site heals by re-epitheliasation from the dermis and surrounding skin and requires dressings.
- **Full - thickness**- epidermis and all the dermis. The donor site is either sutured directly or split-thickness skin grafted.
- **Composite graft** - small grafts containing skin and underlying cartilage or other tissue. Donor sites include, for example, ear skin and cartilage to reconstruct nasal alar rim defects.

Donor selection

Skin Graft Donor site 8 days after the skin was taken

When grafts are taken from other animals, they are known as heterografts or xenografts. By definition, they are temporary biologic dressings which the body will reject within days to a few weeks. They are useful in reducing the bacterial concentration of an open wound, as well as reducing fluid loss.

For more extensive tissue loss, a full-thickness skin graft, which includes the entire thickness of the skin, may be necessary. This is often performed for defects of the face and hand where contraction of the graft should be minimized. The general rule is that the thicker the graft, the less the contraction and deformity.

Cell cultured epithelial autograft (CEA) procedures take skin cells from the patient to grow new skin cells in sheets in a laboratory. The new sheets are used as grafts, and because the original skin cells came from the patient, the body does not reject them. Because these grafts are very thin (only a few cell layers thick) they do not stand up to trauma, and the "take" is often less than 100%. Newer grafting procedures combine CEA with a dermal matrix for more support. Research is investigating the possibilities of combining CEA and a dermal matrix in one product.

Surgical procedure

In order to remove the thin and well preserved skin slices and stripes from the donor, surgeons use a special surgical instrument called a dermatome. This usually produces a split-thickness skin graft, which contains the epidermis with only a portion of the dermis. The dermis left behind at the donor site contains hair follicles and sebaceous glands, both of which contain epidermal cells which gradually proliferate out to form a new layer of epidermis. The donor site may be extremely painful and vulnerable to infection.

The graft is carefully spread on the bare area to be covered. It is held in place by a few small stitches or surgical staples. The graft is initially nourished by a process called **plasmatic imbibition** in which the graft "drinks plasma". New blood vessels begin growing from the recipient area into the transplanted skin within 36 hours in a process called **capillary inosculation**. To prevent the accumulation of fluid under the graft which can prevent its attachment and revascularization, the graft is frequently meshed by making lengthwise rows of short, interrupted cuts, each a few millimeters long, with each row offset by half a cut length like bricks in a wall. In addition to allowing for drainage, this allows the graft to both stretch and cover a larger area as well as to more closely approximate the contours of the recipient area. However, it results in a rather pebbled appearance upon healing that may ultimately look less aesthetically pleasing.

An increasingly common aid to both pre-operative wound maintenance and post-operative graft healing is the use of negative pressure wound therapy (NPWT). This system works by placing a section of foam cut to size over the wound, then laying a perforated tube onto the foam. The arrangement is then secured with bandages. A vacuum unit then creates negative pressure, sealing the edges of the wound to the foam, and drawing out excess blood and fluids. This process typically helps to maintain cleanliness in the graft site, promotes the development of new blood vessels, and increases the chances of the graft successfully taking. NPWT can also be used between debridement and graft operations to assist an infected wound in remaining clean for a period of time before new skin is applied. Skin grafting can also be seen as a skin transplant

Skin graft on lower leg trauma injury, some 5 days after surgery. Take and healing aided by use of Vacuum Assisted Closure.

Risks

Risks for the skin graft surgery are:

- Bleeding
- Infection
- Loss of grafted skin
- Nerve damage
- Graft-versus-host disease

Rejection may occur in xenografts. To prevent this, the patient usually must be treated with long-term immunosuppressant drugs.

Prognosis

Most skin grafts are successful, but in some cases they do not heal well and require repeat grafting. The graft should also be monitored for good circulation. The recovery from surgery is usually rapid after split thickness skin grafting. The skin graft must be protected from trauma or significant stretching for 2-3 weeks. Depending on the location of the graft, a dressing may be necessary for 1-2 weeks. Exercise that might stretch or injure the graft should be avoided for 3-4 weeks.

Chapter 16

Smile Surgery

Before and after dynamic smile reconstruction in facial paralysis

Smile surgery or smile reconstruction is a surgical procedure that restores the smile for people with facial nerve paralysis. Facial nerve paralysis is a relatively common condition with a yearly incidence of 0.25% leading to function loss of the mimic muscles. The facial nerve gives off several branches in the face. If one or more facial nerve branches are paralysed, the corresponding mimetic muscles lose their ability to contract. This may lead to several symptoms such as incomplete eye closure with or without exposure keratitis, oral incompetence, poor articulation, dental caries, drooling, and a low self-esteem. This is because the different branches innervate the frontalis muscle,

orbicularis oculi and oris muscles, lip elevators and depressors, and the platysma. The elevators of the upper lip and corner of the mouth are innervated by the zygomatic and buccal branches. When these branches are paralysed, there is an inability to create a symmetric smile.

Smile surgery is performed as a static or dynamic reconstruction. An example of static reconstruction is upper and lower lip shortening or thickening with commissure preservation. Dynamic smile reconstruction procedures restore the facial nerve activity.

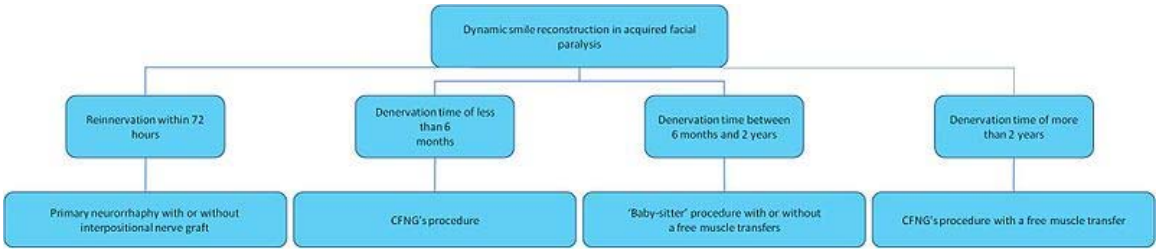
Historical background

The first known surgical repair of an injured facial nerve was performed by Drobnick in 1879, who connected the proximal spinal accessory nerve (innervates trapezius and sternocleidomastoid muscles) to the paralysed facial nerve. More symmetrical features were the result. In 1971 a new technique for facial nerve reconstruction was introduced, as Scaramella and Smith reported on the technique of cross facial nerve grafting (CFNG) for reconstruction of a coordinated smile in unilateral facial paralysis cases. Harii et al. for the first time used a free muscle transfer in combination with a nerve transfer in 1976. Eight years later, Terzis introduced the "babysitter" procedure, which consists of a combination of CFNGs and a simultaneous partial hypoglossal to facial nerve transfer. In 1989, Zuker et al. suggested the use of the masseteric nerve as possible donor nerve for innervation of the transplanted muscle in patients with Moebius syndrome.

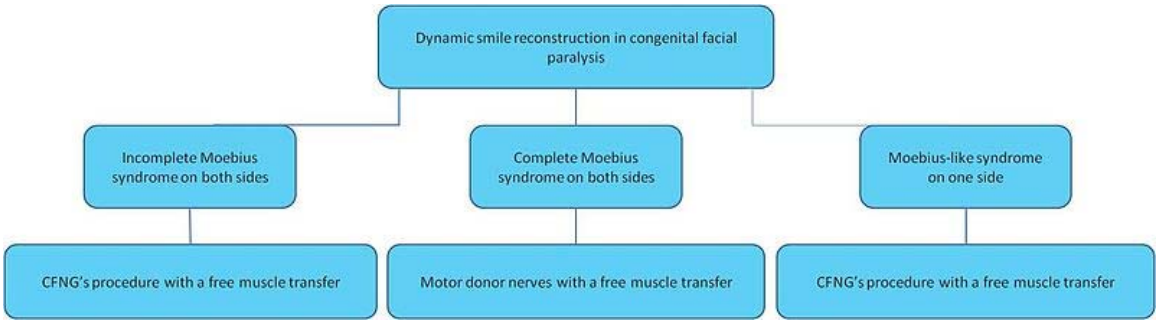
Indications

The main indications for dynamic smile reconstruction are unilateral or bilateral facial paralysis due to acquired and congenital causes. Trauma, Bell's palsy and tumour extirpation are examples of secondary or acquired facial paralysis. Bell's palsy or idiopathic facial paralysis is a condition which leads to facial paralysis, however, without a known cause. It has an acute onset and is mostly self-limiting. But if spontaneous recurrence of (near) normal function does not take place, surgical reanimation may be indicated. Some head and neck tumours invade or compress the facial nerve leading to facial paresis or paralysis. Examples of such tumours are facial neuromas, cholesteatomas, haemangiomas, acoustic neuromas, parotid gland neoplasms or metastases. Sometimes, the facial nerve cannot be preserved during resection of these tumours. Congenital facial paralysis occurs usually unilaterally and may be complete or incomplete. The most common congenital cause is the Moebius syndrome. Moebius syndrome is a congenital neurological disorder with bilateral paralysis of both the facial and abducens nerves. Therefore, lateral eye movement and facial animation are absent. In Moebius-like syndrome, only one side of the face is affected, but with additional nerve palsies of the affected facial and abducens nerve.

Surgical techniques



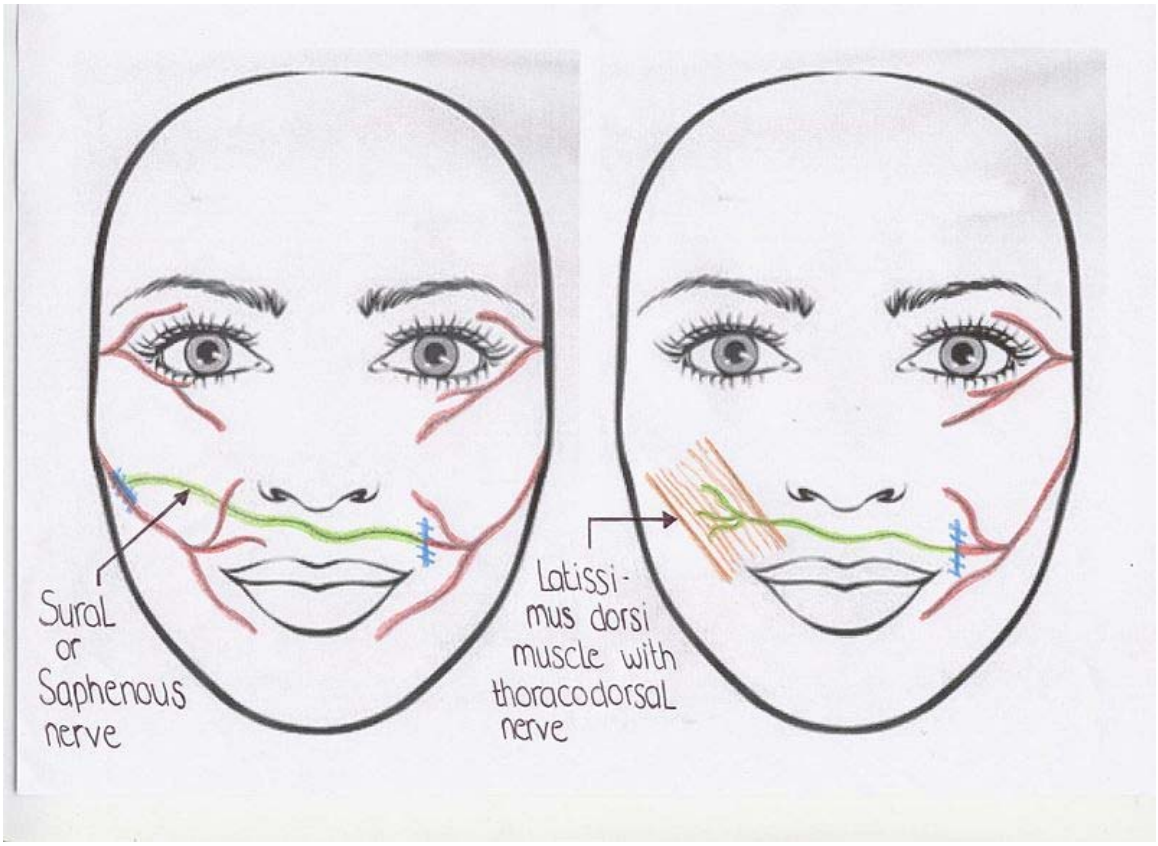
1. Algorithm for dynamic smile reconstruction in acquired facial paralysis



2. Algorithm for dynamic smile reconstruction in congenital facial paralysis

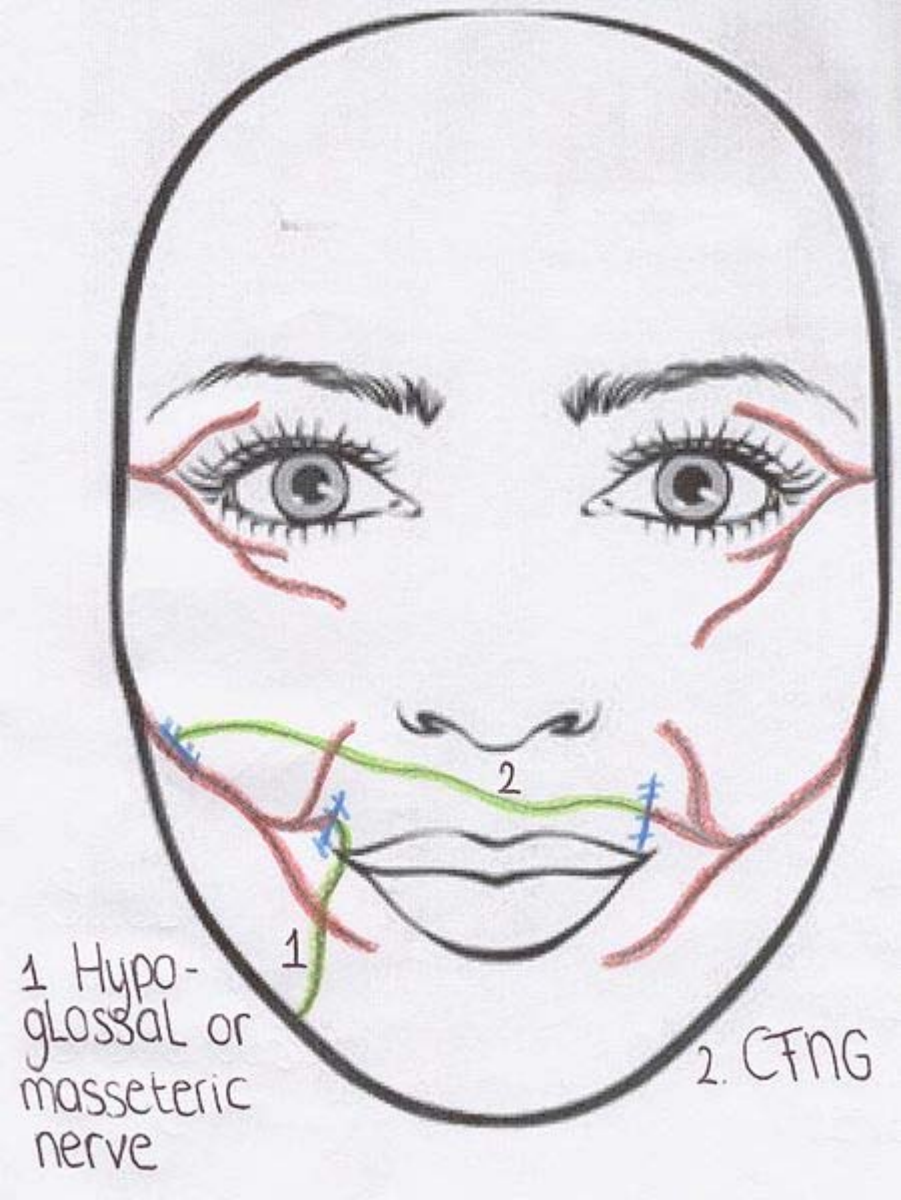
Selection of the type of nerve transfer is based on the individualised needs and condition of the patient. Individual factors can be patient age, type of paralysis (partial or complete, uni- or bilateral), denervation time of the mimetic muscles, availability of nerve grafts and medical condition of the patient.

If facial paralysis is caused by trauma or tumour surgery, direct reinnervation of the facial muscles (ideally within 72 hours after facial nerve damage) can be achieved by neurorrhaphy, with or without an interposition nerve graft. (Algorithm 1) Neurorrhaphy is a primary end-to-end reconnection of the facial nerve stumps. However, tension-free reconnection is needed, otherwise scar formation can occur and axons will regenerate outside the facial nerve. If a tension-free reconnection is not possible, interposition nerve grafts are an option. Mostly the great auricular nerve or sural nerve is used as a graft between the two facial nerve stumps.



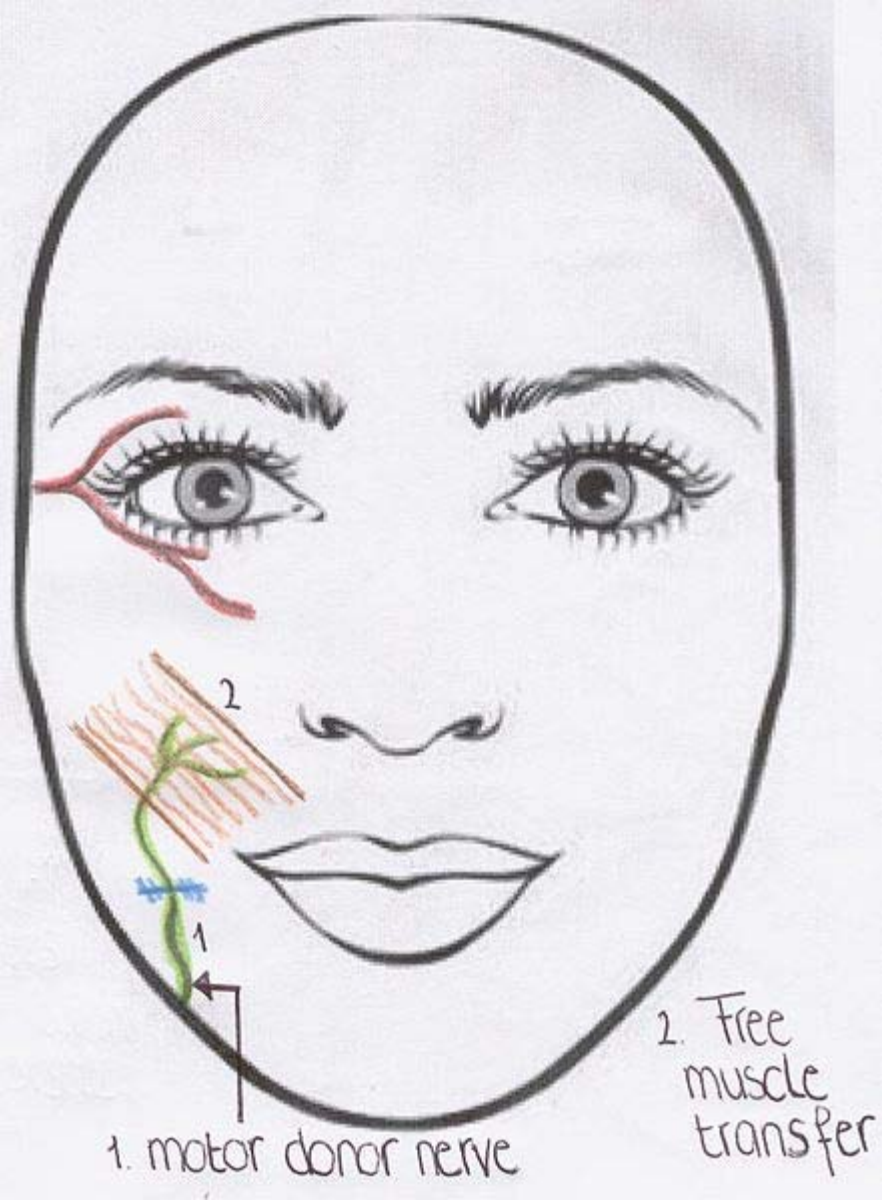
Cross facial nerve graft

In more long standing acquired facial paralysis either a CFNG procedure or ”baby-sitter” procedure are the indicated techniques, with or without a free muscle transfer.(Algorithm 1) Secondary facial paralysis with a denervation time of less than 6 months can be treated with one or more cross facial nerve grafts (CFNGs) . During a cross facial nerve graft procedure one or more branches of the non-paralysed facial nerve are divided and connected to one or more sural nerve grafts which are tunnelled to the affected side of the face. Whether these nerve grafts are immediately attached to the paralysed facial nerve branches or after 9 to 12 months depends on the chosen procedure.



Babysitter procedure

If facial paralysis lasts between 6 months and 2 years, the ”babysitter” procedure may be used.(Algorithm 1) During this operation both CFNGs and part of an undamaged donor nerve on the affected side are used. For example the hypoglossal nerve or masseteric nerve on the affected side can be used as donor nerves. This donor nerve is then attached to the distal end of the paralysed facial nerve. A free muscle transplant is sometimes indicated after the ”babysitter” procedure has been performed, depending on the continuity of the injured facial nerve. In other words, if there is contraction of the mimetic muscle during a electromyogram. After a denervation time of approximately more than 2 years, atrophy of the mimetic muscles is permanent. In these cases a free muscle transfer is always performed in combination with a CFNG.



Motor donor nerve

The procedure of choice for congenital facial paralysis is either CFNG or motor donors, both with a free muscle transfer. (Algorithm 2) Incomplete bilateral Moebius syndrome has the same clinical features as the Moebius syndrome, however some motor function is still apparent on one side of the face. This incomplete syndrome is reanimated with the use of the CFNG and free muscle transfer. The cross facial nerve graft comes from the side with some motor function of the facial nerve. However it first has to be investigated if the motor function of the nerve is strong enough to be separated. A free muscle transfer is always used on the paralysed side, as the muscle is a congenital atrophic muscle. Complete bilateral Moebius syndrome is treated with motor donor nerves on both

sides. Optional motor donor nerves are: the masseteric nerve, accessory nerve or hypoglossal nerve. In rare cases when these nerves are also affected, cervical nerve branches can be used. The use of a free muscle transfer is again indicated. The nerve that initially innervated the free muscle transfer is then connected to the provided branches of the motor donor nerve. In Moebius-like syndrome the CFNG is performed, as the facial nerve on the affected side does not have a strong enough motor function. A free muscle transfer is also used, due to the atrophic muscle.

Surgical Procedures

Based on the preference of the surgeon, the gracilis muscle, latissimus dorsi muscle, or pectoralis minor muscle are used as free neurovascular grafts. The gracilis muscle is mostly used free neurovascular muscle, because it has a reliable anatomy and is relatively simple to harvest. In addition, it can be trimmed for the correct size and volume with preservation of superior contraction qualities compared to bipennate muscles, because the gracilis is a parallel-fibered or strap muscle. Another advantage is the possibility for simultaneous dissection by a second team while the first team is preparing the face for the free muscle transplant. Another option for a free muscle transfer is the lattisimus dorsi muscle. A disadvantage is that it can only be harvested with the patient in lateral decubitus or prone position. Therefore the patient has to be turned during the operation. Advantages of the latissimus dorsi muscle are its reliable anatomy and relatively simple dissection. Analogue to the gracilis muscle, this muscle can be trimmed to the correct size and volume. The lattisimus dorsi muscle is also a parallel-fibered muscle. Its long neurovascular bundle makes a one-stage facial reanimation without a CFNG possible. By using the long thoracodorsal nerve of the lattisimus dorsi muscle, direct coaptation to the facial nerve on the other side can be performed . The third option is the pectoralis minor muscle, which is mainly used in children. Advantages of this muscle are its relatively small size and flat and fan-like shape, obviating the need for trimming without bulkiness as a result. In addition, the pectoralis minor muscle has a muscle fibre orientation that is much alike with the facial muscles. . However, as dissection of this muscle is rather difficult and the neurovascular anatomy is variable, nowadays surgeons tend to use it less frequently. Furthermore, the pectoralis minor muscle is not a parallel-fibered muscle, and it is oversized in adults.

During a one-stage or two-stage CFNG procedure, one or more non-affected facial nerve branches are used for reinnervation of the paralysed side. In the one stage procedure a free muscle transplant with a lattisimus dorsi graft or a nerve graft (using the sural nerve or saphenous nerve) can be used. The lattisimus dorsi graft is used because of its long thoracodorsal nerve. Therefore it can be coapted directly to the normal functioning facial nerve. The one stage CFNG, implies an end-to-side coaptation of the sural or saphenous nerve to the distal end of the affected facial nerve. In the two-stage procedure, an incision in front of the ear is made on the non-paralysed side. Upon electrical stimulation, the nerve which produces the best contraction of the zygomatic muscles (and so the appearance of a smile) is selected. This branch is then sectioned. The sural or saphenous nerve as cross facial nerve graft is coapted to this unaffected branch of the facial nerve and tunnelled across the face to the paralysed side through a subcutaneous tunnel. The

end of the graft is positioned in front of the tragus (cartilage in front of the ear) on the paralysed side. Nine to twelve months is needed for axonal regeneration in the cross facial nerve graft, because the result of damaged nerve tissue is loss of structure and axonal function. Degeneration appears distally in the paralysed facial nerve but this takes time, this process is called Wallerian degeneration. During the second stage end-to-side or end-to-end nerve coaptation to the proximal end of the paralysed facial nerve is performed with a microscope. And a free muscle transplant is placed, if indicated.

Likewise the babysitter procedure uses the CFNG, in combination with the masseteric or hypoglossal nerve. In the 'babysitter' procedure, the hypoglossal nerve or masseteric nerve on the affected side is identified. This donor nerve is then attached to the distal end of the paralysed facial nerve. Techniques for donor nerve transfers are transposition of the entire donor nerve, partial transposition by splitting the donor nerve longitudinally or indirect hypoglossal- or masseteric-facial anatomosis using a 'jump' interposition graft. This usually is the great auricular nerve or sural nerve. These hypoglossal- or masseteric-facial nerve anastomosis using a 'jump' interposition graft can be used to directly reinnervate the paralysed facial muscles or as a babysitter procedure. The goal of the latter is only to achieve fast reinnervation of the mimetic muscle to prevent irreversible atrophy. Simultaneously one or more CFNGs are performed to eventually reinnervate the mimetic muscles, again as a one- or two-stage procedure, depending on the choice for the free muscle transfer graft. If a two-stage procedure is performed, the CFNGs are connected to the distal branches of the paralysed facial nerve during the second stage 9 to 12 months later. The donor nerve can be left intact. If a free muscle transfer is indicated, this is also performed in the second stage of the procedure to augment the partially reinnervated mimic muscles by the hypoglossal nerve.

In case of longstanding facial paralysis with irreversible muscle atrophy and unavailability of a suitable donor facial nerve, a free muscle graft is indicated for smile restoration, which has to be reinnervated by another donor nerve (usually the masseteric nerve) in an end-to-end fashion. Through an incision in front of the ear, the cheek flap is elevated below the underlying layer of fat. Here the nerve stimulator can be used in identifying the donor motor nerve to the masseter muscle. Once the nerve is identified, it is dissected from its connections and traced into the muscle to free as much length as possible.

Results

All procedures in general show an improvement of symmetry of smile and patient satisfaction, although time of recovery differs between different approaches. Primary neurorrhaphy provides the best possible outcome, as the anatomy and function of the damaged facial nerve is restored. After primary neurorrhaphy of the facial nerve mean recovery time typically is 6 to 12 months. The contraction amplitude after using a CFNG is usually not very powerful, but it results in a relatively spontaneous smile because the contralateral healthy facial nucleus controls the movements. After a CFNG procedure the first signs of reinnervation usually occur between 4 and 12 months. The use of the masseteric nerve provides an amount of movement that is within the normal range,

resulting in a more symmetrical but not completely emotional smile. Nerve transfers using the hypoglossal or massseteric nerves and the 'babysitter' procedure result in first contractions of the mimic muscles after approximately 4 to 6 months. However, after the use of the hypoglossal nerve control of facial movements is hard to obtain by the patient and a spontaneous smile may not occur at all.

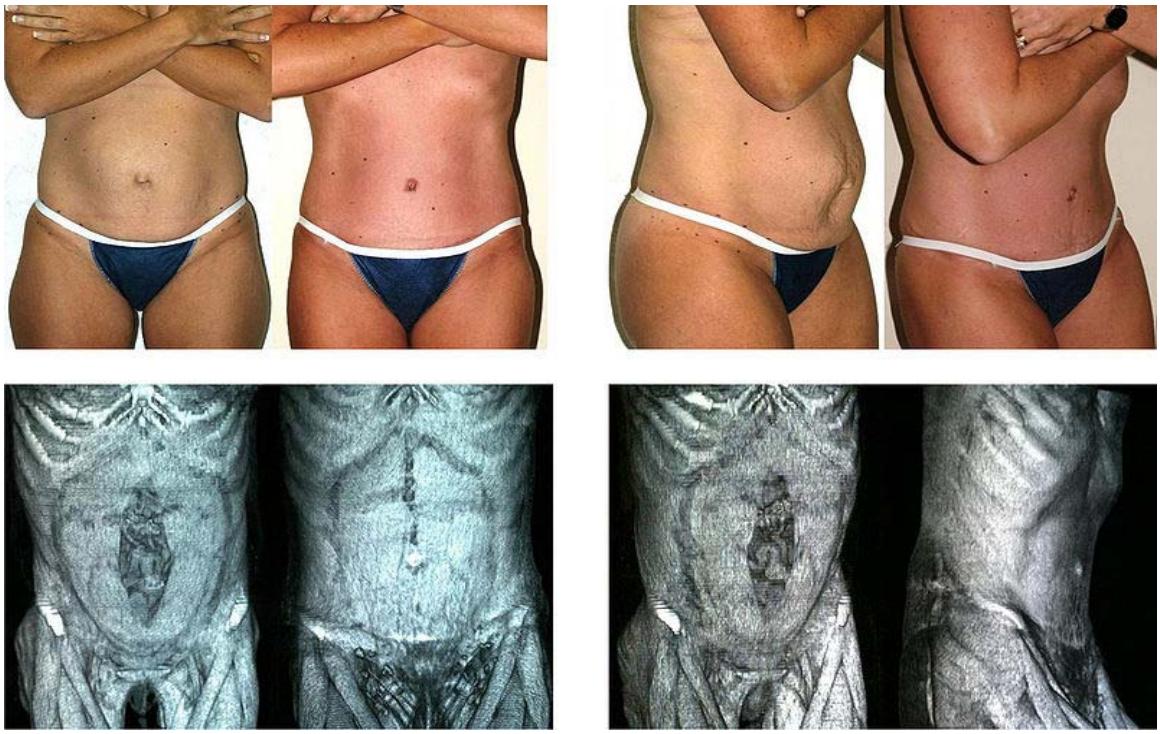
True spontaneity of a smile will not occur at the same rate in all dynamic smile reconstructions. A spontaneous smile is smiling without consciously thinking about it. The primary neurorrhaphy and free muscle transfer are the only options to restore a true spontaneous smile. Although the masseteric nerve transfer provides a strong smile within the range of normal, it never becomes truly spontaneous and emotional. But with practice, the majority of patients can provide a spontaneous smile some of the time due to the plasticity of the cerebral cortex. Effective rehabilitation can also prevent biting whilst smiling, when using the masseteric nerve as nerve transfer.

Complications

There are several complications, however, most patients find them less invalidating than the inability to smile. General postoperative complications are infection of the muscle donor site, facial abscess, hypertrophic scars , hematoma and swelling of the face or muscle donor site. In some cases of incomplete facial paralysis, the procedure had a decline in function as a result. However, this improved after only a few months. Almost all procedures show synkinesis, meaning involuntary movements appear during the voluntary movements. In primary neurorrhapy, with or without a interposition graft, perineural fibrosis is a common complication. With the use of the CFNG there is a risk of sensory deficits in the lower part of the leg, due to the sural or sapheneous nerve graft. A complication seen with the use of the masseteric nerve is the inability to chew without the appearance of a smile. The hypoglossal nerve as a donor nerve can induce tongue atrophy due to denervation.

Chapter 17

Abdominoplasty

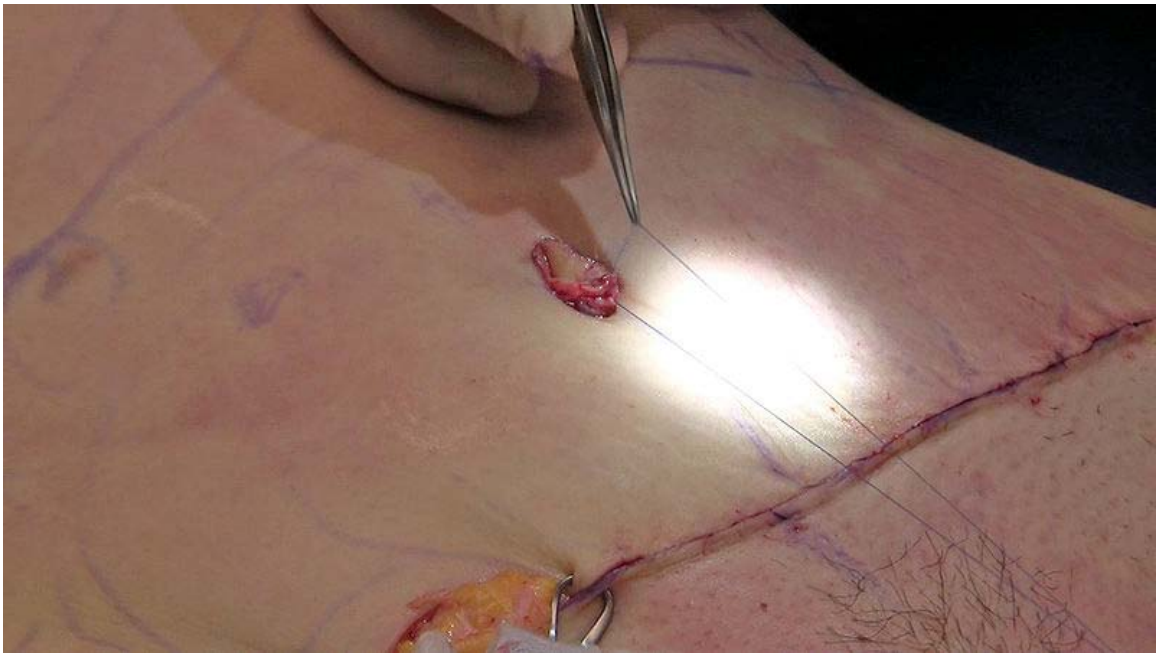


Abdominoplasty before & after

Abdominoplasty or "**tummy tuck**" is a cosmetic surgery procedure used to make the abdomen more firm. The surgery involves the removal of excess skin and fat from the middle and lower abdomen in order to tighten the muscle and fascia of the abdominal wall. This type of surgery is usually sought by patients with loose tissues after pregnancy or individuals with sagging after major weight loss.

Procedures

Abdominoplasty operations vary in scope and are frequently subdivided into categories. Depending on the extent of the surgery, a complete abdominoplasty can take 1 to 5 hours. A partial abdominoplasty (Mini-Tuck Abdominoplasty) can be completed between 1 to 2 hours.



Reconstruction of the umbilicus (belly button) following an abdominoplasty surgery. The original umbilicus is sutured into a new hole created by the surgeon.

Complete abdominoplasty

In general, a complete (or full) abdominoplasty follows these steps:

1. An incision is made from hip to hip just above the pubic area.
2. Another incision is made to free the navel from the surrounding skin.
3. The skin is detached from the abdominal wall to reveal the muscles and fascia to be tightened. The muscle fascia wall is tightened with sutures.
4. The remaining skin and fat are tightened by removing the excess and closing the defect.
5. The old belly button stalk is brought out through a new hole and sutured into place.
6. Liposuction is often used to refine the transition zones of the abdominal sculpture.
7. A dressing and sometimes a compression garment are applied and any excess fluid from the site is drained.

Full abdominoplasty consisting of musculofascial plication abdominal dermal lipectomy, suction-assisted lipectomy of hips.

Partial abdominoplasty

A partial (or mini) abdominoplasty proceeds as follows:

1. A smaller incision is made.
2. The skin and fat of the lower abdomen are detached in a more limited fashion from the muscle fascia. The skin is stretched down and excess skin removed.
3. Sometimes the belly button stalk is divided from the muscle below and the belly button slid down lower on the abdominal wall.
4. Sometimes a portion of the abdominal muscle fascia wall is tightened.
5. Liposuction is often used to contour the transition zone.
6. The flap is stitched back into place.

The completely sutured area where nearly 100 square centimeters of skin was removed during a combination abdominoplasty and liposuction procedure (also known as a "lipo-tuck"). Note the "neo"-umbilicus (belly button) that was reattached to a newly created hole.

Extended abdominoplasty

An extended abdominoplasty is a complete abdominoplasty plus a lateral thigh lift. The resulting scar runs from the posterior axillary line (when placing you open hands on your hips, the thumbs lie along the posterior axillary line.) The operation does all of the abdominal contouring of a complete abdominoplasty plus allows further improvement of the flank (waist), as well as smoothing the contour of the upper lateral thigh.

High lateral tension tummy tuck

This is an advanced technique that takes a little more than four and half hours to perform. Conventional abdominoplasty tightens muscles in a vertical line. In this new method, known as *high lateral tension abdominoplasty*, in addition to vertical-line tightening, muscles are tightened horizontally. The final result with this technique is a dramatically flat abdomen with significantly better-defined waistline.

Circumferential abdominoplasty

An circumferential abdominoplasty is an extended abdominoplasty plus a buttock lift. The resulting scar runs all the way around the body, and the operation is also called a Belt Lipectomy or Body Lift. This operation is most appropriate for patients who have undergone massive weight loss.

Combination procedures

An abdominoplasty is a component of a lower body lift and can be combined with liposuction contouring, breast reduction, breast lift, or occasionally hysterectomy, depending on the reason for the hysterectomy. A popular name for breast enhancement procedures performed in conjunction with an abdominoplasty is a "mommy makeover". Recent literature in MEDLINE also has noted implementation of barbed suture in these procedures.

Recovery

- Depends on the problem to be treated, surgical technique(s), and other factors. Can take one to four weeks and patients are advised to take at least a portion of this recovery time off from work.
- Heavy activity especially is best avoided during this time.
- Initially there may be bruising and discomfort.
- A supportive abdominal binder or compression garment can minimize swelling / bruising, and support the repaired tissues.
- Patients are advised to avoid all forms of nicotine for a month or longer prior to surgery and also during the recovery period.
- Full recovery takes 3 – 6 months, with further fading of scars thereafter.

Risks

Abdominoplasty carries certain risks that may be serious or life-threatening. When taking the decision to undergo such a procedure it is recommended to compare the benefits with the potential risks and complications. Hence, all patients must be informed on all the risks they are exposing themselves to.

Abdominoplasty surgery is a cosmetic operation that is performed by a plastic surgeon to thin the abdominal region.

Although "tummy tucks" are considered safe procedures, as with any other type of surgery, different complications may arise. The majority of the risks can be avoided if the patients follow carefully the instructions they receive from their surgeon. Severe complications occur however in rare cases and these include blood clots, thrombosis, cardiac and pulmonary complications or infection.

Infection and blood clots are a serious potential risk after abdominoplasty, but which occur rarely. Infection is usually treated with antibiotics and drainage. Patients are recommended to move around as soon as possible after surgery to minimize their risks of developing blood clots. Pulmonary embolism, heart attack or stroke are very rare complications that may result after any type of surgery due to immobility after surgery which results in blood clots that may travel to the heart, lung or brain. Thus, pulmonary embolism is a serious risk after "tummy tuck" procedure and if they occur, they commonly happen within 3 weeks of the surgery, but more commonly within the first 72 hours after the procedure has been performed.

If complications occur, they usually delay the healing process. In rare cases, another surgery is needed to fix a potential complication. Skin necrosis is one of the complications that may require another procedure as the dead skin must be replaced by a skin graft. Although necrosis is extremely rare, smokers have an increased risk to develop skin necrosis. Stopping nicotine use and smoking several weeks before and several weeks after surgery cleans the body and improves the chance of an uneventful recovery.

One of the more common problems after an abdominoplasty is collection of fluid under the skin after the drains have been removed. Your surgeon can aspirate the fluid with a needle. The drainage stops within a month and does not affect the final results.

The scars resulting from abdominoplasty are long, brutal in appearance, and permanent. The size of the scar depends on the amount of skin that has been cut-off, the techniques used for the surgery, the surgeon's skills, and the body's ability to recover. Although this scar will never become invisible, it is usually placed under the swimsuit line so it is covered by clothes. It normally takes 9 months to a year before scars flatten out and lighten in color.

Possible risks of abdominoplasty include:

- Bleeding
- Fluid accumulation
- Poor wound healing
- Skin loss
- Numbness or other changes in skin sensation
- Anesthesia complications
- Skin discoloration and/or prolonged swelling
- Fatty tissue found deep in the skin might die (fat necrosis)
- Major wound separation
- Asymmetry

- Recurrent looseness of skin
- Pain, which may persist
- Persistent swelling in the legs
- Nerve damage
- Possibility of revisional surgery
- Hematoma (may occur in 3 to 4% of cases)
- Keloid (heavy scar)
- Seroma
- Suture rupture
- Swelling
- Visible scar
- Death

Cost

The cost of a "tummy tuck" varies from country to country and even within locales of countries. As with most cosmetic surgery operations, the cost depends on a variety of factors like the age of the patient, their weight and the state of their health. Depending on the individuals, there may also be other costs involved after the operation. This does not include the follow-up visits as required by some doctors.

On average in the United States, this procedure can cost from USD$4,000 to as much as $20,000.

The pre-operative and post-operative care, facility fees, anesthesia, and medications must be taken into consideration when reviewing surgery costs. No surgeries are a guaranteed success and therefore a second procedure or a touch-up may be required to achieve the desired appearance. These costs are typically not included in the original cost.

Related procedures

Liposuction, also known as lipoplasty, is a cosmetic surgical procedure that slims and reshapes specific areas of the body by removing excess fat deposits, improving the body's contours and proportion, and ultimately, enhancing the patient's self-image. Liposuction involves the use of a small stainless steel tube, called a cannula. The cannula is connected to a powerful suction pump and inserted into the fat through small incisions in the skin. Fat removal is accomplished as the suction cannula creates tiny tunnels through the fatty layers. Liposuction can be performed on both men and women. Ideal for this type of procedure are non-smokers, healthy individuals who do not have a life-threatening illness or medical conditions that can impair healing, adults within 30% of their ideal weight who have firm and elastic skin.

Body contouring is a general term that refers to various plastic surgeries performed to different parts of the body with the aim of improving the shape and tone of the underlying tissue that supports fat. It is a common procedure performed for people who have undergone major weight loss. It may be performed in both men and women.

Breast reduction, or reduction mammoplasty, is the cosmetic surgery used in resizing the breast, in women with oversized breasts and men who suffer from gynecomastia. It is an overall safe procedure and most of the patients are pleased with the results. This type of surgery is performed to treat a breast condition known as hypertrophy, which refers to oversized breasts. This condition usually occurs in both breasts and commonly develops at puberty or immediately after.

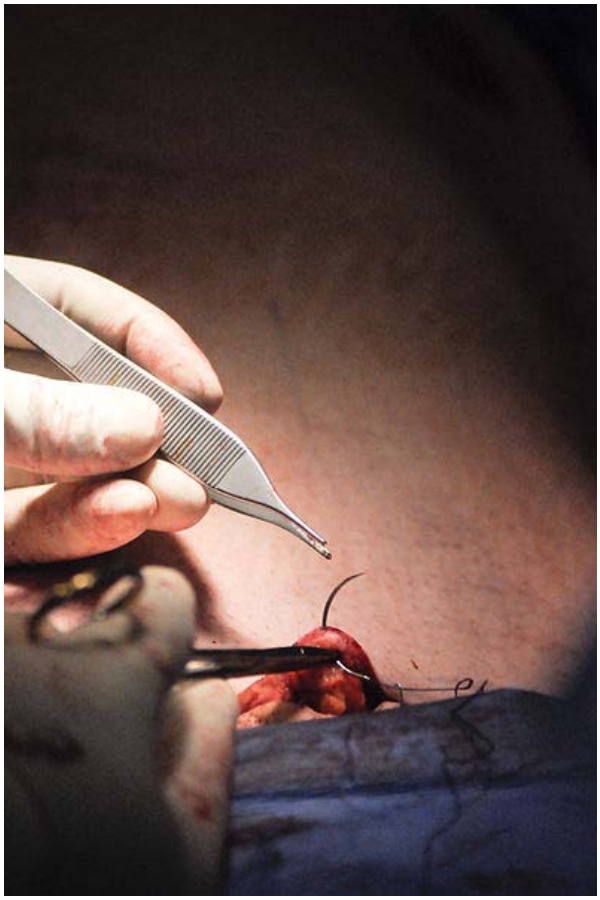
Breast lift, also referred to as mastopexy, is the surgical procedure that removes the excess skin and tightens the surrounding tissue of the breast, resulting in raising and firming the breast. Mastopexies carry a certain degree of risks as any other type of surgery does. They are however safe procedures and the risks are minimized if the patients follow the surgeon's instructions.

'*Hysterectomies* are sometimes performed with abdominoplasty. A hysterectomy consists in removing the uterus and it may be complete (when the body, fundus and cervix are removed) or partial (when only the uterine body is surgically removed). This procedure is normally performed by gynecologists and it is one of the most common gynecological surgeries. This type of surgery is used to treat some benign tumors, cancers of the ovaries, uterus or cervix, endometriosis and are also performed in transmen.

The final sutures securing the umbilicus (also known as "belly button") into its new position after an abdominoplasty.

Making the initial incision across the lower abdomen. The incision is placed in the bikini line and runs from hip to hip.

The removal of nearly 100 square centimeters of skin from the abdomen of a 40-year old woman during an abdominoplasty surgery (also known as a "tummy tuck")



Placing the final sutures following an abdominoplasty procedure

Chapter 18

Blepharoplasty

The incisions made during an upper eyelid blepharoplasty procedure

Blepharoplasty is surgical modification of the eyelid. Excess tissue such as skin and fat are removed or repositioned, and surrounding muscles and tendons may be reinforced. It can be both a functional and cosmetic surgery.

Indications

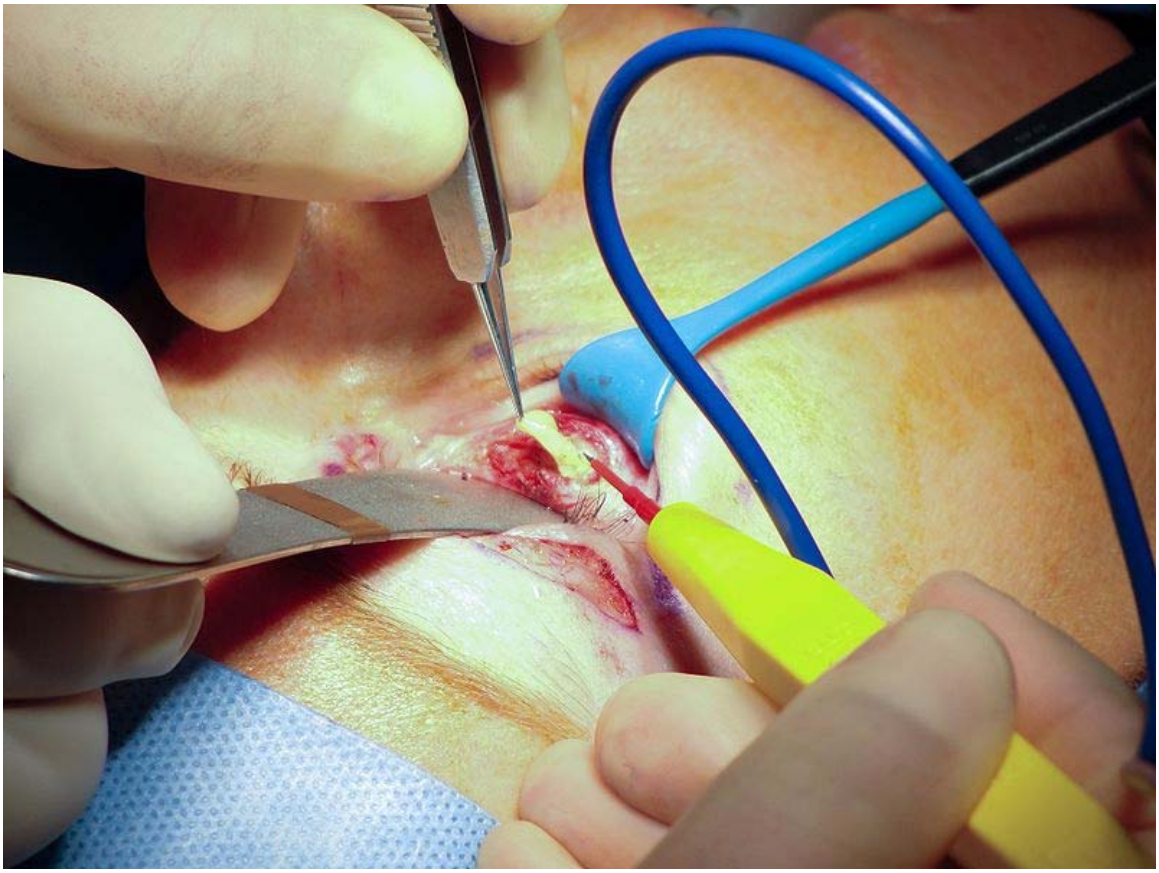


Photo of a transconjunctival blepharoplasty with removal of orbital fat for cosmetic lower eyelid blepharoplasty.

Blepharoplasty is often done as an elective surgery for cosmetic reasons. Lower eyelid blepharoplasty is almost always done for cosmetic reasons, to improve puffy lower eyelid "bags" and reduce the wrinkling of skin. *Asian blepharoplasty* or *double eyelid surgery* is a special type of blepharoplasty that creates a crease in the upper eyelid. This "supratarsal fold" is common in many races but absent in about half of Asians. Surgery can artificially create this crease and make a 'single-lidded' patient appear 'double-lidded'. It is the most popular form of cosmetic surgery among those of east and southeast Asian background.

Blepharoplasty is sometimes needed for functional reasons. When an advanced amount of upper eyelid skin is present, the skin may protrude over the eyelashes and causes a loss of peripheral vision. The outer and upper parts of the visual field are most commonly affected and the condition may cause difficulty with activities such as driving or reading. In this circumstance, upper eyelid blepharoplasty is performed to improve peripheral vision.

Procedure

The fat (yellow tissue) and skin (linear tissue) removed from a quadruple blepharoplasty. Lower-lid fat was removed using the transconjunctival technique.

Blepharoplasty is usually performed through external incisions made along the natural skin lines of the eyelids, such as the creases of the upper lids and below the lashes of the lower lids. Incisions may be made from the inside surface of the lower eyelid (transconjunctival blepharoplasty); this allows removal of lower eyelid fat without an externally-visible scar, but does not allow excess skin to be removed. External skin resurfacing with a chemical peel or carbon dioxide laser may be performed simultaneously. This allows for a faster recovery process.

The operation typically takes one to three hours to complete. Initial swelling and bruising resolve in one to two weeks but at least several months are needed until the final result becomes stable. Blepharoplasty's effects are best appreciated by comparing before and after photos of surgical patients.

The anatomy of the eyelids, skin quality, age, and the adjacent tissue all affect the cosmetic and functional outcomes. Factors which are known to cause complications include:

- dry eyes - which may become exacerbated by disrupting the natural tear film
- laxity (looseness) of the lower lid margin (edge) - which predisposes to lower lid malposition
- prominence of the eye in relation to the malar (cheek) complex - which predisposes to lower lid malposition

Transconjunctival blepharoplasty of the right lower eyelid

An incision is made on the inner eyelid surface. A suture holds the inner eyelid tissue over the eye.

Fat is held with forceps (left) and clamped with a hemostat (right). A small retractor (bottom right) keeps away extra tissue.

The fat is cut away with surgical scissors (right)

Recovery

The recovery process after a blepharoplasty may take up to a few weeks. Patients will receive instruction for during the home care and most of the time they receive painkillers that ease the pain caused by the incisions.

The first two days after the operation has been performed, the patient receives an ointment treatment to keep the incisions lubricated. Doctors recommend keeping iced eye pads on the eyes to reduce bruising and swelling. Eye drops may also be prescribed as they may help in pain management and in preventing infections. Patients are recommended to keep their heads higher than the body while sleeping as this will accelerate the recovery process.

Different medications can help in moderating bruises and swelling resulted after surgery and also to accelerate the patient's recovery. One of them is Wobenzym, an agent that helps in moderating swelling. Wobenzym should be administrated the second or third days after surgery and three times a day. The patient's condition will improve without this medication as well as it is only an additional treatment. Auriderm is another medication that has quite a similar effect as Wobenzym. Auriderm must be applied 10 days before the blepharoplasty and twice a day. There are however many products like these that could accelerate one's recovery and they must be discussed with one's surgeon.

The third day after surgery, the patients are advised to keep lukewarm eye pads for comfort and wearing dark glasses for at least one week is also recommended to prevent irritation that may be caused by the wind and sun exposure.

The stitches are usually removed two days after the operation. The patient's eyelids will be discolored and swollen for about seven to ten days, and feel "tight" or "stiff" for a while. Patients should lubricate their eyes by exercising closing their eyes or looking at the ceiling.

During the first few weeks after a blepharoplasty, patients normally experience excessive tearing, light sensitivity and sometimes double or even blurred vision. The whites of the patient's eyes can turn red or have red splotches. These symptoms usually disappear on themselves within two or three weeks after the operation.

Wearing contact lenses is prohibited until the incisions are completely cured. Patients who need them will be advised by their doctor when it is safe to wear them again.

Patients who undergo a blepharoplasty may watch TV and are able to read after two or three days after surgery. Patients may go to work in a week or ten days after the operation. The scars may however still be visible, but one can use makeup to cover them.

As a part of blepharoplasty recovery, the patient must avoid bending at the waist for about five days and strenuous activity (especially activities that raise one's blood pressure, such as lifting and rigorous sports) for about ten days to two or three weeks.

Surgery will leave scars, but they are usually well hidden and normally fade in time. Blepharoplasty may leave patients with bruises or swelling on their faces, and sometimes patients become depressed because of this. These are some of the side effects of surgery, which are completely normal and which disappear in few weeks, after a complete healing.

Blepharoplasty costs in the United States and around the world

Facial Plastic Surgeon performing Upper Eyelid Blepharoplasty under Local Anesthesia Reducing Cost and Risk to patient.

The cost is determined in part by a patient's geographical location and the actual surgeon who is performing the surgery but also by the related fees.

According to the American Society of Plastic Surgeons, in the United States, the national average cost of blepharoplasty surgeon fees in 2007 was $3,134. Here are some regional averages: New England states: $3,063; Middle Atlantic states: $2,199; North Central states: $2,254; South Central states: $2,143; and Mountain/Pacific states: $2,378. The surgeon's fee does not include the cost of the operating facility (outpatient surgery facility, surgery suite or hospital.) It does not include the cost of anesthesia, the cost of medications, or the cost of any post-surgery supplies.

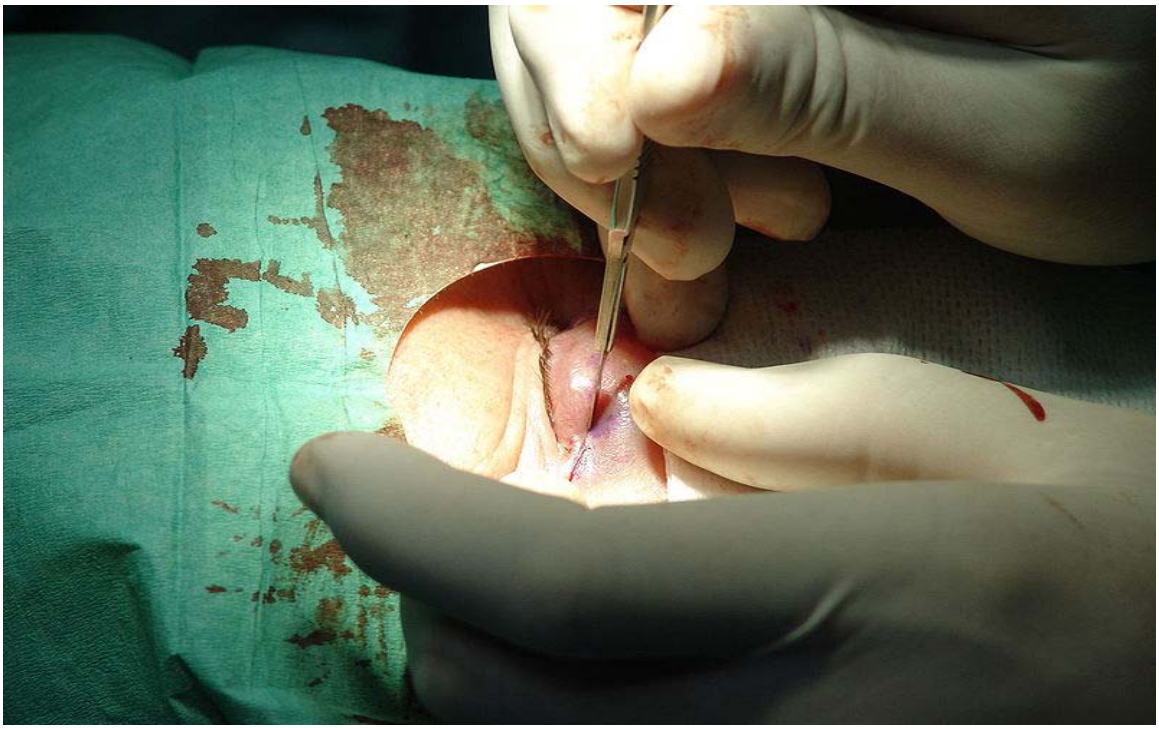
An insurance carrier may agree to cover this surgery only if the patient's eyelids are drooping to a level that impairs his or her vision. Otherwise, the procedure is considered cosmetic and not medically necessary.

In the United Kingdom, a blepharoplasty may be performed for an average price of 1,006 GBP, the equivalent of $1,500.

History

Karl Ferdinand von Gräfe coined the phrase blepharoplasty in 1818 when the technique was used for repairing deformities caused by cancer in the eyelids.

The roots of the present cosmetic advancements began around 3000 years ago with the ancient Egyptians. Documents “written on papyrus text detail how surgeons, even in that primitive age performed reconstructions on lips, noses, and ears using skin grafts cut from folds from the forehead or cheek”. As techniques began developing the ancient Greeks and Romans began writing down and collecting everything they knew involving these procedures. Aulus Cornelius Celsus, a first century Roman, described making an excision in the skin to relax the eyelids in his book *De Medicine*. Knowledge of blood circulation and tissue health were discovered and spread throughout the ancient world allowing techniques to improve. However, during the Middle Ages, plastic surgery was prohibited because it was viewed as something that was spiritual and unethical. This ban was also due to poor hygiene. During the Renaissance, intellectuals rediscovered texts from ancient Greece and Rome illustrating surgical procedures and techniques.



Initial incision along the upper left eyelid

As the 19th century approached developments were being made that would eventually be the foundation to modern cosmetic surgery. The First World War was the first major event that really relied on the dedication of surgeons and advancements in cosmetic surgery. This gave doctors a chance to practice and perfect reconstructive surgical procedures. It also prepared medical personnel for the tragedies of World War II and other subsequent catastrophes. As with any medical advancements, the development of surgical techniques goes through a period of trial and error as reconstructive surgery did during World War I. Each improvement eventually becomes the root of future advancements allowing physicians to combine procedures such as a basic lid fat resection and chemical peels ensuring a speedy recovery.

Non-surgical alternatives

Non-surgical alternatives have shown improvement with patients exhibiting early indications of facial aging. Lasers, chemical peels, botulinum toxin, and dermal fillers are all used in some degree to treat periorbital tissue. Although effective, these treatments are not technically "blepharoplasty" and yet some practitioners refer to any treatment involving the eyes as such; often preceded by "laser", "non-surgical" or "lunch-time". Botulinum toxin, it should be noted, is used to relax the muscles in the forehead and between the eyes, therefore not addressing most of the issues a patient seeking a blepharoplasty would want fixed.

In so called "non-surgical blepharoplasty" topical applications of acids and/or the use of lasers are used to tighten and decrease skin volume in the upper and lower eyelids. Injectable dermal fillers are also used to temporarily increase volume in the trough area between the lower eyelid and the cheek. These techniques are effective yet have not replaced surgical treatments, and should not be confused with blepharoplasty, which treats not only the superficial skin tissue, but also underlying connective and muscle tissues.

Chapter 19

Lip Enhancement

Lip enhancement is a type of cosmetic surgery that aims to improve the appearance of the lips by increasing their fullness through enlargement.

History

Chittagong, Bangladesh – Medical staff from Operation Smile and the Military Treatment Facility (MTF) aboard the Military Sealift Command (MSC) hospital ship USNS Mercy (T-AH-19), perform a cleft lip surgery during the ship's visit to provide humanitarian and civic assistance to the people of Bangladesh

Full lips with an accentuated border have often been associated with beauty and youth. It has been suggested that this is because the lips occupy both sides of the face and, with the smile, constitute a major[focal point of overall facial beauty. Tribal peoples worldwide have introduced various materials into and through the upper and lower lips of both genders to enhance beauty. Unfortunately, one of the effects of human aging is atrophy of facial fat including the lips. In most cultures, this translates as no longer attractive, youthful nor desirable. The procedure to enlarge lips can also reduce the fine lines and wrinkles above the top lip, flaws often referred to as "smoker's lines."

Around 1900, surgeons tried injecting paraffin into the lips without success. Liquid silicone was used for lip enhancement, starting in the early 1960s but was abandoned thirty years later due to general—and later, unfounded—fears about the effects of silicone on general health.

About 1980, injectable bovine collagen was introduced to the cosmetic surgery market and became the standard against which other injectable fillers were measured. However, that collagen does not last very long and requires an allergy test, causing the patient to wait at least three weeks before another appointment, after which more waiting is required to see cosmetic results.

Currently, fillers containing hyaluronic acid like Restylane and Juvederm have captured the attention of consumers and physicians in Europe, North America, South America and Australia.

Materials and techniques

In the late 1990s, with the huge popularity of surgical rejuvenation and concomitant increase of cosmetic surgery procedures worldwide, more substances, along with biocompatible materials commonly used in other medical applications for years, became available to surgeons for use in augmenting thinning or misshapen lips into more plump and attractive features.

Some of the first widely used lip augmentation substances were:

- **Autologen**, an injectable dermal material made from the patient's own skin. No risk of allergy exists but the results are very temporary because the body quickly absorbs the material.
- **Collagen** requires an allergy test because the material is extracted from bovine hides. It lasts anywhere from four weeks to three months because it is also absorbed into the body. However, the allergy test must be observed for four weeks.
- **Dermalogen** is taken from the patient's skin—and through a laboratory process—made into a high concentration collagen that can be injected into the lips. Some studies indicate it lasts somewhat longer than collagen.
- **Alloderm** is donor tissue taken from cadavers and then denatured, purified and treated to remove viable cells that could pass along disease. Under a local anesthesia, Alloderm is placed into the mucosa, or body, of the lips in small rolls to make them larger. Alloderm can also be placed into the vermillion, the pink area of the lip, to provide definition and a sharper border.
- **Radiance**, a synthetic, laboratory produced solution containing calcium hydroxylapatite (bone) suspended in a gel that has been safely used in medicine for years. Some studies indicate Radiance can last between three and five years. One researcher (Tzikas) found in a study of Radiance on 90 patients that 59 percent felt when injected, moderate to severe pain which disappeared two to five minutes later. But the substance produced results for an average of two years with

a few patients reporting the plumping effects being sustained as long as three to five years. Of the 90 patients, four required surgical intervention due to nodules in the lips.
- **Gore-Tex implants**. In medical uses, Gore-Tex is known as EPTFE, or expanded polytetrafluoroethylene and, commercially as Advanta, UltraSoft and SoftForm. The EPTFE is delivered to surgeons in strips that are 1/16 inch (2.4mm) and 3/16 (3.4 mm) diameter tubes.

Current popular procedures

Since 2000, more products and techniques have been developed to make lip augmentation more effective and patient friendly. The relative ease of many injections is due to surgeons using tiny 30 and 31 gauge (about as thick as a dozen human hairs) needles that are used to inject the very sensitive lips. Nonetheless, topical anesthesias are often used for lip enhancement procedures.

Some of these new techniques and substances include.

- **Fat transfer**. Surgeons harvest through liposuction or excision the patient's fat from places on the body where it can be spared and either injected or surgically placed into the lips. Surgical applications usually require general anesthesia.
- **Restylane**, a non-animal, clear gel that is reported to be very close to the hyaluronic acid found naturally in the body. According to the American Society of Plastic Surgeons, there were 778,000 cases of Restylane injection in 2006, the most recent year for which statistics are available. The substance usually lasts six months and, sometimes, longer. While Juvederm is extremely chemically close to Restylane; many surgeons report the former is slightly smoother to inject.
- **Artecoll**. Both Artecoll and ArteFill are not used to inject the body of the lips because the substance is heavy and would show as white through the thin skin of the lips. Additionally, both products contain tiny microspheres known as PMMA (polymethylmethacrylate) which remain in the face permanently. In cases where Artecoll has been used around the edges of the lips to remove fine lines and wrinkles, some patients have reported annoying nodules or small lumps. In a few cases, surgery was required to remove the Artecoll.

Risks and side effects

Most patients are satisfied with their lip augmentation procedure and would undergo the treatment again. Several studies have found fat grafting of the lip to be one of the best methods of maintaining a semi-permanent fuller and softer lip. When the lips are overfilled, the results can be comic, often supplying fodder to tabloid newspapers and offbeat websites. This look is sometimes mockingly called a 'trout pout'. Overaggressive injections can lead to lumpiness while too little can result in ridges.

Common reactions can range from redness, swelling or itching at the injection site(s). Other possible complications include bleeding, uneven lips, movement of the implants or

extrusion, when an implant breaks through the outermost surface of the skin. The usual, expected swelling and bruising can last from several days to a week.

Some patients are allergic to the common local anesthetics like lidocaine and probably should not consider lip injections. A few others react badly to the skin test patients must take before receiving collagen, again, because the substance contains animal byproducts. Other patients who should forego procedures to the lip include those who have active skin conditions like cold sores, blood clotting problems, infections, scarring of the lips or certain diseases like diabetes or lupus that cause slower healing. Patients with facial nerve disorders, severe hypertension or recurrent herpes simplex lesions should also eschew lip augmentation. As in all surgeries, smokers complicate completion of their procedure as well as the speed of healing.

Fat transfer can last longer than other injected materials but can have lumping or scarring effects. The length of time a fat transfer may last in the lips is often determined by how much the area moves and how close it is to a major blood supply. In addition, the donor fat must be harvested from another area of the patient's body which leaves another—albeit tiny—surgical wound. However, donor fat harvesting techniques have become extremely well refined.

Gore-tex, despite its impressive rates of success in lip augmentation and other procedures, is nonetheless a foreign body which bears a slight risk of becoming infected or rejected.

Discussion

Cosmetic surgery providers often advise their patients that many options now exist for improving the appearance of the lips. Most practitioners also admit that successful lip augmentation is highly dependent on the skill of the provider, with that skill stemming from many years of experience injecting the lips of many types of patients. Moreover, the surgeon must master the various injection techniques. With many injectables, the benefit to the patient is an immediate return to normal, usual activities. A few surgeons offer a procedure known as surgical flap augmentations in which small sections of skin near the lips or inside the mouth are excised and added to the lips. But the technique does not add volume and achieves only a slight outward protrusion of the lips.

Chapter 20

Otoplasty and Rhytidectomy

Otoplasty

Otoplasty, is a cosmetic surgery to change the appearance of a person's external ears. Otoplasty can take many forms, such as bringing the ears closer to the head (often called **ear pinning**), reducing the size of very big ears, or reshaping various bends in the cartilage. Other reconstructive procedures deal with the deformed, or absent (microtic) ears. Otoplasty surgery can involve a combination of moving, reshaping, adding, or removing structural ear elements. This procedure is usually performed by either an oral and maxillofacial surgeon, plastic surgeon, or ENT surgeon.

The pinna, or external ear, is made of a thin structural cartilage covered over with thin skin. Each of the various folds and structures of the pinna is named. Ear deformity results from distorted, damaged, or missing ear elements. Many otoplasties are performed not because of actual deformity, but because the individual is displeased with the shape of their ears.

History

Otoplasty was first developed by Sushruta, a physician often regarded as the "father of surgery". He lived in ancient India circa 600 BC, which he first described in his text *Susrutha Samhita*. He and his later students and disciples used otoplasty to reconstruct ears that were amputated as a punishment for crimes. The techniques of otoplasty he developed form the basis of surgical procedures that are practiced to this day. This knowledge of plastic surgery existed in India up to the late 18th century.

How otoplasty is performed

Anesthetic options depend on the problem to be treated and ability of the patient to cooperate and can include local anesthesia alone, local anesthesia with sedation, and under general anesthesia (which is generally the case for children). Most otoplasty surgery is performed as an outpatient surgery, some require a hospital stay. The procedure can take from an hour and a half to five hours depending on the problem.

Incising one side of a flat cartilage piece leaves unopposed elastic forces on the other side and permits the shape to evolve over time. Thus, incising one side of the lop-ear cartilage along the new anti-helical fold may be one element of the surgery. This can be done through a small incision, or without an incision: an **"Incisionless Otoplasty,"** where a needle is placed through the skin to both 1) model the cartilage, and 2) to place the retention sutures to hold the antihelix and conchal bowl areas.

For many ear operations, one or more incisions give access to the structures to be sculpted. The main, and often only incision, is behind the ear. Other possible incisions depend on what needs to be done. Through the incision behind the ear, the concha bowl can be moved closer to the head, a small tunnel created along the front of a poorly folded antihelix to weaken this cartilage, sutures placed to reshape the anti-helix fold, and to balance the ear lobe with the rest of the ear.

Ear reduction otoplasty may involve reducing one or more components of the ear. Incisions are typically hidden near folds in the front when a part of this surgery.

Addressing Microtia (small ear deformity) or Anotia (missing ear deformity) involve augmentation or adding elements to replace deformed or missing structures. Cartilage from the ear or rib are the most common for these more extensive reconstructions. Other ear shapes may be changed through moving, adding, and weakening ear structures.

Internal sutures often are permanent. The wound(s) are then closed with either dissolvable sutures or ones that are removed by a doctor after the wounds have healed. A bulky ear dressing protects the ear after surgery.

Example photos - before and after

Posterior aspect - left lateral asymetry

Multiple aspects - left lateral asymmetry

Frontal - before

after

Rhytidectomy

Temporal incision behind the hairline in endoscopic midface lift (rhytidectomy). Note the shiny surface of the deep temporal fascia. This plane is dissected down to the orbital rim and connected to the midface subperiosteal plane created through the sublabial incision under the upper lip, and often through a lower eyelid incision.

A **facelift**, technically known as a **rhytidectomy** (literally, *surgical removal of wrinkles*), is a type of cosmetic surgery procedure used to give a more youthful appearance. It usually involves the removal of excess facial skin, with or without the tightening of underlying tissues, and the redraping of the skin on the patient's face and neck. The first facelift was performed in Berlin in 1901 by Eugen Holländer. According to the most recent 2008 statistics from the American Society for Aesthetic Plastic Surgery, facelifts were the sixth most popular aesthetic surgery performed after liposuction, breast augmentation, blepharoplasty (eyelid surgery), abdominoplasty (tummy tuck), breast reduction, and rhinoplasty.

In the traditional facelift, an incision is made in front of the ear extending up into the hairline. The incision curves around the bottom of the ear and then behind it, usually ending near the hairline on the back of the neck. After the skin incision is made, the skin is separated from the deeper tissues with a scalpel or scissors (also called undermining) over the cheeks and neck. At this point, the deeper tissues (SMAS, the fascial suspension system of the face) can be tightened with sutures, with or without removing some of the excess deeper tissues. The skin is then redraped, and the amount of excess skin to be

removed is determined by the surgeon's judgement and experience. The excess skin is then removed, and the skin incisions are closed with sutures and staples.

Sublabial incision through which periosteum of maxilla is elevated in an endoscopic midface lift (rhytidectomy).

Facelifts are helpful for eliminating loose skin folds in the neck and laxity of tissues in the cheeks. The areas not well corrected by a facelift include the nasolabial folds and perioral mounds marionette lines which are more suitably treated with Botox or liposculpture, respectively. A facelift requires skin incisions; however, the incisions in front of and behind the ear are usually inconspicuous. Hair loss in the portions of the incision within the hair-bearing scalp can rarely occur. In men, the sideburns can be pulled backwards and upwards, resulting in an unnatural appearance if appropriate techniques are not employed to address this issue. Achieving a natural appearance following surgery in men can be more challenging due to their hair-bearing preauricular skin. In both men and women, one of the signs of having had a facelift can be an earlobe which is pulled forwards and/or distorted. If too much skin is removed, or a more vertical vector not employed, the face can assume a pulled-back, "windswept" appearance. This appearance can also be due to changes in bone structure that generally happen with age.

Facelifts are effectively combined with eyelid surgery (blepharoplasty) and other facial procedures and are typically performed under general anesthesia or deep twilight sleep.

The most common complication can be bleeding which usually requires a return to the operating room. Less common, but potentially serious, complications may include damage to the facial nerves and necrosis of the skin flaps, or infection.

Contraindications to facelift surgery include severe concomitant medical problems. While not absolute contraindications, the risk of postoperative complications is increased in cigarette smokers and patients with hypertension and diabetes. Patients are typically asked to abstain from taking aspirin or other blood thinners for at least one week prior to surgery.

New surgical options are always being developed. One such option is the use of Barbed suture

Costs

Cost varies by country where surgery is performed (2008):

- Canada - US$7,000-15,000
- Pakistan - US$5,500
- Malaysia - US$6,400
- Panama - US$2,500
- Russia - US$10,000
- Singapore - US$7,500
- South Korea - US$6,650
- India - US$4,800
- Taiwan - US$8,500
- Thailand - US$5,000
- United States - US$7,000-$15,000

Costs in Europe (2009):

- Belgium - GBP £1,650 and up
- Italy - GBP £5,000
- United Kingdom - £4,000 - £9,000

Chapter 21

Liposuction

Liposuction, also known as **lipoplasty** ("fat modeling"), **liposculpture suction lipectomy** or simply **lipo** ("suction-assisted fat removal") is a cosmetic surgery operation that removes fat from many different sites on the human body. Areas affected can range from the abdomen, thighs and buttocks, to the neck, backs of the arms and elsewhere.

Suction-assisted lipectomy of bilateral outer thighs

Several factors limit the amount of fat that can be safely removed in one session. Ultimately, the operating physician and the patient make the decision. There are negative aspects to removing too much fat. Unusual "lumpiness" and/or "dents" in the skin can be seen in those patients "over-suctioned". The more fat removed, the higher the surgical risk.

While reports of people removing 50 pounds (22.7 kg or around 3.6 stone) of fat has been claimed, the contouring possible with liposuction may cause the appearance of weight loss to be greater than the actual amount of fat removed. The procedure may be performed under general or local ("tumescent") anesthesia. The safety of the technique relates not only to the amount of tissue removed, but to the choice of anesthetic and the patient's overall health. It is ideal for the patient to be as fit as possible before the procedure and not to have smoked for several months.

History

Doctors Giorgio and Arpad Fischer, two Italian-American surgeons working in Rome, Italy, invented the liposuction procedure in 1974. The roots of liposuction, however, date back to the 1920s. Relatively modern techniques for body contouring and removal of fat were first performed by a French surgeon, Charles Dujarier. A tragic case that resulted in gangrene in the leg of a French model in a procedure performed by Dr. Dujarier in 1926 set back interest in body contouring for decades to follow.

Liposuction evolved from work in the late 1960s from surgeons in Europe and was pioneered in the United States by the European surgeon Leon Forrester Tcheupdjian using primitive curettage techniques which were largely ignored, as they achieved irregular results with significant morbidity and bleeding. Modern liposuction first burst on the scene in a presentation by the French surgeon, Dr Yves-Gerard Illouz, in 1982. The "Illouz Method" featured a technique of suction-assisted lipolysis after infusing fluid into tissues using blunt cannulas and high-vacuum suction and demonstrated both reproducible good results and low morbidity. During the 1980s, many United States surgeons experimented with liposuction, developing some variations, and achieving mixed results.

In 1985, Klein and Lillis described the "tumescent technique", which added high volumes of fluid containing a local anesthetic allowing the procedure to be done in an office setting under intravenous sedation rather than general anesthesia. Concerns over the high volume of fluid and potential toxicity of lidocaine with tumescent techniques eventually led to the concept of lower volume "super wet" tumescence.

In the late 1990s, ultrasound was introduced to facilitate the fat removal by first liquefying it using ultrasonic energy. After a flurry of initial interest, an increase in reported complications tempered the enthusiasm of many practitioners.

Technologies involving the use of laser tipped probes (which induce a thermal lipoysis) have been introduced in recent years and are being evaluated to examine any potential benefit over traditional techniques.

Overall, the advantages of 30 years of improvements have been that more fat cells can more easily be removed, with less blood loss, less discomfort, and less risk. Recent developments suggest that the recovery period can be shortened as well. In addition, fat can also be used as a natural filler. This is sometimes referred to as "autologous fat transfer" and in general, for these procedures, fat is removed from one area of the patient's body (for example, the stomach), cleaned, and then re-injected into an area of the body where contouring is desired, for example, to reduce or eliminate wrinkles.

Popularity

Removal of very large volumes of fat is a complex and potentially life-threatening procedure. The American Society of Plastic Surgeons defines "large" in this context as being more than 5 liters (around 8½ pints). Most often, liposuction is performed on the abdomen and thighs in women, and the abdomen and flanks in men. According to the American Society for Aesthetic Plastic Surgery, liposuction was the most common plastic surgery procedure performed in 2006 with 403,684 patients.

Candidacy

Not everyone is a good candidate for liposuction. It is not a good alternative to dieting or exercising. To be a good candidate, one must usually be over 18 and in good general health, have tried a diet and exercise regime, and have found that the last 10 or 15 pounds persist in certain pockets on the body. Diabetes, any infection, heart or circulation problems, generally nullify one's eligibility for the procedure. In older people, the skin is usually less elastic, limiting the ability of the skin to readily tighten around the new shape. Liposuction of the abdominal fat should not be combined with simultaneous tummy tuck procedures due to higher risk of complications and mortality. Laws in Florida prevent practitioners combining liposuction of the upper abdomen and simultaneous abdominoplasty because of higher risks.

Approaches

The basic surgical challenge of any liposuction procedure is:

- To remove the right amount of fat
- To cause the least disturbance of neighboring tissue, such as blood vessels and connective tissue
- To leave the person’s fluid balance undisturbed
- To cause the least discomfort to both patient and surgeon

As techniques have been refined, many ideas have emerged that have brought liposuction closer to being safe, easy, painless, and effective.

Areas of the body where liposuction is performed

- Abdomen
- Hips
- Outer thighs (saddlebags)
- Flanks (love handles)
- Back
- Inner thighs
- Inner knees
- Upper arms
- Submental (chin)
- Gynecomastia (male breast tissue)

Techniques

Power-assisted liposuction Cannula

In general, fat is removed via a cannula (a hollow tube) and aspirator (a suction device). Liposuction techniques can be categorized by the amount of fluid injection and by the mechanism in which the cannula works.

Amount of fluid injection

Dry liposuction

The dry method does not use any fluid injection at all. This method is seldom used today.

Wet liposuction

A small amount of fluid, less in volume than the amount of fat to be removed, is injected into the area. It contains lidocaine as a local anesthetic, adrenaline to contract the blood vessels and thus minimize bleeding, and a salt solution to make the solution isotonic. This fluid helps to loosen the fat cells and reduce bruising. The fat cells are then suctioned out as in the basic procedure.

Super-wet liposuction

Liposuction procedure using the Super-wet technique being performed on female patient

In this method, the infusate volume is in about the same amount as the volume of fat expected to be removed. This is the preferred technique for high-volume liposuction by many plastic surgeons as it better balances homeostasis and potential fluid overload (as with the tumescent technique). It takes one to three hours, depending on the size of the treated area/ areas. It may require either IV sedation as well as the local lidocaine, or complete anesthesia.

Tumescent liposuction

Tumescent The surgeon injects high volumes of a solution containing a local anesthetic and vasoconstrictor (often lidocaine and epinephrine respectively) directly into the subcutaneous fat to be removed. Due to a potentially large total volume of local anesthetic injected into the tissue, systemic toxicity from lidocaine is a potentially fatal complication which must be considered with larger volume cases.

Laser assisted liposuction (LAL)

Laser assisted liposuction uses thermal and photomechanical energy to affect the lipolysis. The addition of a laser to traditional liposuction possibly increases skin tightening effects through tissue coagulation. The procedure involves either the use of the Erchonia or Nd:YAG powered devices. The first FDA-approvals came for laser assisted lipolysis units in 2006, but FDA-approved studies using Nd:YAG date back as early as 1994. The efficacy of this technique as opposed to traditional SAL is still being debated.

Mechanism of liposuction

Suction-assisted liposuction (SAL)

Suction-assisted liposuction is the standard method of liposuction. In this approach, a small cannula (like a straw) is inserted through a small incision. It is attached to a vacuum device. The surgeon pushes and pulls it in a forwards and backwards motion, carefully through the fat layer, breaking up the fat cells and drawing them out of the body by suction.

Ultrasound-assisted liposuction (UAL)

In ultrasound-assisted or ultrasonic liposuction, a specialized cannula is used which transmits ultrasound vibrations within the body. This vibration bursts the walls of the fat cells, emulsifying the fat (i.e. liquefying it) and making it easier to suction out. UAL is a good choice for working on more fibrous areas, like the upper back or male breast area. It takes longer than traditional liposuction, but not longer than tumescent liposuction. There is slightly less blood loss. There appears to be slightly more risk of seromas forming (pockets of fluid) which may have to be drained with a needle.

After ultrasonic liposuction, it is necessary to perform suction-assisted liposuction to remove the liquified fat. Ultrasound-assisted liposuction techniques used in the 1980s and

1990s were associated with cases of tissue damage, usually from excessive exposure to ultrasound energy. Third-generation UAL devices address this problem by using pulsed energy delivery and a specialized probe that allows physicians to safely remove excess fat.

A 40-year old woman undergoing a combination liposuction and abdominoplasty. Power-assisted liposuction: the cannula is inserted to about 80% of its full length.

Power-assisted liposuction (PAL)

PAL uses a specialized cannula with mechanized movement, so that the surgeon does not need to make as many manual movements. Otherwise it is similar to traditional SAL.

Twin-cannula (assisted) liposuction (TCAL or TCL)

Twin cannula (assisted) liposuction uses a tube-within-a-tube specialized cannula pair, so that the cannula which aspirates fat, the mechanically reciprocated inner cannula, does not impact the patient's tissue or the surgeon's joints with each and every forward stroke. The aspirating inner cannula reciprocates within the slotted outer cannula to simulate a surgeon's stroke of up to 5 cm (2 in) rather than merely vibrating 1–2 mm (1/4 in) as other power assisted devices, removing most of the labor from the procedure. Superficial or subdermal liposuction is facilitated by the spacing effect of the outer cannula and the fact that the cannulas do not get hot, eliminating the potential for friction burns.

External ultrasound-assisted liposuction (XUAL or EUAL)

XUAL is a type of UAL where the ultrasonic energy is applied from outside the body, through the skin, making the specialized cannula of the UAL procedure unnecessary. It was developed because surgeons found that in some cases, the UAL method caused skin necrosis (death) and seromas, which are pockets of a pale yellowish fluid from the body, analogous to hematomas (pockets of red blood cells).

XUAL is a possible way to avoid such complications by having the ultrasound applied externally. It can also potentially cause less discomfort for the patient, both during the procedure and afterwards; decrease blood loss; allow better access through scar tissue; and treat larger areas. At this time however, it is not widely used and studies are not conclusive as to its effectiveness.

Water-assisted liposuction (WAL)

WAL uses a thin fan-shaped water beam, which loosens the structure of the fat tissue, so that it can be removed by a special cannula. During the liposuction the water is continually added and almost immediately aspirated via the same cannula. WAL requires less infiltration solution and produces less edema from the tumescent fluid. The utility of this technology is under study and is currently not widely used.

Sutures

Since the incisions are small, and the amount of fluid that must drain out is large, some surgeons opt to leave the incisions open, the better to clear the patient's body of excess fluid. They find that the unimpeded departure of that fluid allows the incisions to heal more quickly. Others suture them only partially, leaving space for the fluid to drain out. Others delay suturing until most of the fluid has drained out, about 1 or 2 days. In any case, while the fluid is draining, dressings need to be changed often. After one to three days, small self-adhesive bandages are sufficient.

Preparation

Before receiving any of the procedures, no anticoagulants should be taken for two weeks before the surgery. If general anesthesia or sedation will be used, and the surgery will be in the morning, fasting from midnight the night before is required. If only local anesthesia will be used, fasting is not required. Smoking must be avoided for about two months prior to surgery, as nicotine interferes with circulation and can result in loss of tissue.

The procedure

In all liposuction methods, there are certain things that should be done when having the procedure:

- The candidate and the surgeon will agree ahead of time on exactly which area(s) will be treated and both will discuss what outcome to expect
- A consent form is signed on the day of surgery
- An antibiotic will be given about an hour beforehand, or afterwards
- The targeted areas are marked on the body while the candidate is in a standing position
- Sometimes photos will be taken of the area to be treated, so the patient will have before and after photos
- In the operating room, a sterilizing solution such as Betadine, is applied to the relevant areas
- Local anesthetic is injected and the patient may be given a sedative, either orally, or through an IV injection
- Incisions are small, about a quarter to a third of an inch
- The patient will probably have an IV fluid line, since they will be losing fluid with the fat, and the fluid balance must be kept intact
- There will be some monitoring devices attached to the body to keep track of the blood pressure, heart rate, and blood oxygen level
- The patient will feel only a scraping or rasping sensation from the cannula movement
- Usually the patient can get up, walk around, and go home the same day if they did not receive general anesthesia, although they would need someone else to drive them.

Recovery

Depending on the extent of the liposuction, patients are generally able to return to work between two days and two weeks. A compression garment which can easily be removed by the patient is worn for two to four weeks, this garment must have elasticity and allow for use of bandages. If non-absorbable sutures are placed, they will be removed after five to ten days.

Any pain is controlled by a prescription or over-the-counter medication, and may last as long as two weeks, depending on the particular procedure. Bruising will fade after a few days or maybe as long as two weeks later. Swelling will subside in anywhere from two weeks to two months, while numbness may last for several weeks. Normal activity can be resumed anywhere from several days to several weeks afterwards, depending on the procedure. The final result will be evident anywhere from one to six months after surgery, although the patient will see noticeable difference within days or weeks, as swelling subsides.

The suctioned fat cells are permanently gone. However, if the patient does not maintain a proper diet and exercise regimen, the remaining fat cell neighbors could still enlarge, creating irregularities.

Side effects

A side effect, as opposed to a complication, is medically minor, although it can be uncomfortable, annoying, and even painful.

- Bruising: can be painful in the short term, and should fade after a few weeks.
- Swelling: should subside gradually over a month or two.
- Scars: will vary in size depending on the particular procedure, and should fade over the weeks. Scarring is an individual thing, partly dependent on heredity. For some, scar healing may take as long as a year.
- Pain: should be temporary and controlled by either over-the-counter medication, or by a prescription.
- Numbness: sometimes persists for a few weeks.
- Limited mobility: will depend on the exact procedure.

There could be various factors limiting movement for a short while, such as:

- Wearing a compression garment
- Keeping the head elevated
- Temporary swelling or pain

The surgeon should advise on how soon the patient can resume normal activity.

Possible complications

As with any surgery, there are certain risks, beyond the temporary and minor side effects. The surgeon should mention them during a consultation. Careful patient selection minimizes their occurrence. Their likelihood is somewhat increased when treated areas are very large or numerous and a large amount of fat is removed.

During the 1990s there were some deaths as a result of liposuction, as well as alarmingly high rates of complication. By studying more and educating themselves further, surgeons have reduced complication rates. A study published in *Dermatologic Surgery* (July 2004, pp. 967–978), found that "The overall clinical complication rate [for liposuction] ... was 0.7% (5 out of 702)", the minor complication rate was 0.57%, and the major complication rate was 0.14% with one patient requiring hospitalization.

The more serious possible complications include:

- Allergic reaction to medications or material used during surgery.
- Infection: any time the body is incised or punctured, bacteria can get in and cause an infection. During liposuction, multiple small puncture wounds are made for inserting the cannula, that can vary in size depending on the technique.
- Damage to the skin: most surgeons work on the deeper levels of fat, so as to avoid wounding the skin any more than they must for the insertion of the cannula.

- Sometimes the cannula can damage tissue beneath the skin, which may show up as a spotted appearance on the skin surface.
- Skin necrosis (dead skin) is a rare complication, in which the skin falls off in the necrotic area. The problem can vary in degree. The resulting wound then needs to heal typically requiring extended wound care.
- Puncture of an internal organ: since the surgeon can't see the cannula, sometimes it damages an internal organ, such as the intestines during abdominal liposuction. Such damage can be corrected surgically, although in rare cases it can be fatal. An experienced cosmetic surgeon is unlikely to puncture any internal organ.
- Contour irregularities: sometimes the skin may look bumpy and/or withered, because of uneven fat removal, or poor skin elasticity. Not all patients heal in the same way, and with older patients the healing may be slower and a bit imperfect. Sometimes a small touch-up procedure can help.
- Thromboembolism and fat embolisation: although liposuction is a low-risk procedure for thromboembolism including pulmonary embolism, the risk can't be ignored.
- Burns: sometimes the cannula movement can cause friction burns to skin or nerves. Also, in UAL, the heat from the ultrasound device can cause injury to the skin or deeper tissue.
- Lidocaine toxicity: when the super-wet or tumescent methods are used, too much saline fluid may be injected, or the fluid may contain too high a concentration of lidocaine. Then the lidocaine may become too much for that particular person's system. Lidocaine poisoning at first causes tingling and numbness and eventually seizures, followed by unconsciousness and respiratory or cardiac arrest.
- Fluid imbalance: since fat contains a lot of fluid and is removed in liposuction, and since the surgeon injects fluid for the procedure, even a very large amount of it for tumescent liposuction, there is a danger of the body's fluid balance being disturbed. This could happen afterwards, after the patient is at home. If too much fluid remains in the body, the heart, lungs and kidneys could be badly affected.

The cosmetic surgeon should give the participant a written list of symptoms to watch for, along with instructions for post-op self-care.

Combined with other procedures

Liposuction and tightening / lifting skin

The removal of quantities of fat from under the skin allows the elastic skin to potentially retract after SAL . Good examples of this effect are seen after liposuction to the arms, stomach areas and breasts. The level of skin retraction following liposuction is affected by the age of the patient, quality of skin, presence of underlying disease or smoking and the presence of previous skin damage such as caused by childbirth and surgery. Liposuction techniques such as subdermal undermining using fine cannulas can stimulate further skin retraction but are more frequently associated with contour irregularity. While subdermal undermining may help the skin contract, patients with severe elasticity loss

and heavy stretch marks prior to liposculpture may require removal of redundant skin by surgical means after liposculpture. Usually this can be performed after 6 months.

Surgical lifts such as a rhytidectomy (facelift), mastopexy (breast lift), abdominoplasty (tummy tuck), or lower body lift, thigh lift, or buttock lift can be utilized when sagging skin alone is the issue or after massive weight loss when the combination of large amounts of skin and shrunken fat cause significant skin droop.

Large volume Liposuction (SAL) in combination with other surgery is common, but may have higher complication rates. When done simultaneously, SAL is done minimally in the areas of the undermined tissues to minimize further insult to the blood supply, however a new techniques in tummytuck surgery involves vigorous liposuction first before excising the redundant skin.

Non-surgical alternatives

Cryolipolysis

Cryolipolysis refers to the external application of controlled cooling to reduce limited fat bulges.

Shapewear

One non-surgical alternative that has gained in popularity is the use of shapewear garments. Although shapewear cannot provide patients with the same level of results as liposuction, body scans have shown that they can remove bulges and slim the waist, hips, and thighs. Most shapewear products are similar to the post-surgical compression garments but unlike the post-surgical garments, shapewear is designed for long-term daily use.

Diet and exercise

Healthy eating habits combined with regular exercise has also been proven to cause weight loss. However, the process can take much longer compared to liposuction. However, losing weight via exercise and eating a healthy diet carries much less risk than liposuction.

Liposuction does not significantly improve the metabolic abnormalities associated with obesity, and does not achieve the general health benefits (such as increased cardiovascular health) associated with weight loss.

Chapter 22

Cheek Augmentation and Injection Lipolysis

Cheek augmentation

Cheek augmentation is a cosmetic surgical procedure that is intended to emphasize the cheeks on a person's face. To augment the cheeks, a plastic surgeon may place a solid implant over the cheekbone. Injections with the patients' own fat or a soft tissue filler, like Restylane, are also popular. Rarely, various cuts to the zygomatic bone (cheekbone) may be performed. Cheek augmentation is commonly combined with other procedures, such as a face lift or chin augmentation.

Implants

Materials

Cheek implants can be made of a variety of materials. The most common material is solid silicone. In addition, two popular options are high-density porous polyethylene, marketed as *Medpor*, and ePTFE (expanded polytetrafluoroethylene), better known as *Gore-Tex*. Both Medpor and ePTFE are inert substances, providing better integration with the underlying tissue and bone than solid silicone. However, in the case of Medpor, the implants' integration and ingrowth with the underlying tissue causes difficulty removing the implant if revisions are needed.

Shapes

There are three general shapes to cheek implants: *malar*, *submalar*, or *combined*. Malar implants, the most common shape, are placed directly on the cheekbones. The result is more projection to the cheekbones, providing a "higher" contour to the side of the face. In contrast, submalar implants are not placed on the cheekbones. They are intended to augment the midface, especially if the person has a gaunt or "sunken" appearance to this area. Combined implants or *malar/submalar combination*, are an extended implant intended to augment both the midface and the cheekbones.

Incisions

A surgeon will usually make an incision in the upper mouth near the top of the gum line and slide the implants into place. Another method is to make an external incision near the eye, but most patients do not choose this method since it can create a visible scar. However, the intraoral (inside the mouth) approach carries a higher risk of infection since the mouth contains more bacteria. Cheek implant surgery is usually performed under sedation or general anesthesia and take about one to two hours. Recovery from this surgery usually takes about ten days.

Risks

As with any surgery there is a risk of infection, postoperative bleeding, formation of a blood clot, and severe swelling. Asymmetry is a risk with all forms of cheek augmentation. This can occur due to uneven resorption, implant displacement, or shifting. This shift can happen due to swelling, trauma or scarring. Although a temporary loss of sensation is common, an extended loss of sensation can occur with any surgery, especially cosmetic plastic surgery.

Fillers or injections

Injections to the cheekbones to provide a less invasive and less expensive approach to cheek augmentation. A hyaluronic acid, such as Restylane or Juvederm, can be injected to the cheek area. Autologous fat is considered a "more permanent" option, but all are eventually completely resorbed.

Zygomatic osteotomy

A zygomatic "sandwich" osteotomy is far less common. The procedure is often indicated during reconstructive surgery for birth defects or traumatic injury. During this procedure, the zygoma, or cheekbone, is separated by bone cuts near the orbital rim and maxilla. The bone is then moved outward and a solid material, such as hydroxylapatite, is wedged in place to hold the new position of the zygoma.

Injection lipolysis

Injection lipolysis is a controversial cosmetic procedure in which drug mixtures are injected into patients with the goal of breaking down fat. This practice, using drugs generally based on phosphatidylcholine and deoxycholate (PCDC), evolved from the initial intravenous use of those drug formulations to treat blood disorders.

In 1966, investigators noted that the intravenous infusion of PC-containing solutions could remove fat emboli. Later, a drug formulation called Lipostabil containing 5% PC and 4.75% deoxycholate (DC) was approved in Germany and used in the treatment of fat embolism, dyslipidemia, and alcohol-induced liver cirrhosis. The first report of Lipostabil injection for fat removal demonstrated that infra-orbital ("under the eyelid") fat could be removed by Lipostabil injection. While no placebo-controlled studies have demonstrated the safety or efficacy of this therapy, numerous retrospective studies of Lipostabil injections have reported the efficacy of this practice. The mixture is injected directly into the subcutaneous fat through multiple microinjections administered over multiple treatment sessions. The desired end result is the removal of localized fat deposits.

Restrictive action taken by FDA against Lipodissolve

On April 7, 2010, the US Food and Drug Administration issued Warning Letters to six U.S. based medical spas and a company in Brazil for making false or misleading statements on their Web sites about drugs they claim will eliminate fat in a procedure called “lipodissolve,” or for otherwise misbranding lipodissolve products. “We are concerned that these companies are misleading consumers,” said Janet Woodcock, M.D., director of the FDA’s Center for Drug Evaluation and Research. “It is important for anyone who is considering this voluntary procedure to understand that the products used to perform lipodissolve procedures are not approved by the FDA for fat removal.”

The FDA has received reports of adverse effects in persons who have had the procedure using these drugs, including permanent scarring, skin deformation, and deep painful knots under the skin in areas where the lipodissolve products have been injected. The warning letters were issued to the following U.S. companies: Monarch Medspa, King of Prussia, Pa; Spa 35, Boise, Idaho; Medical Cosmetic Enhancements, Chevy Chase, Md.; Innovative Directions in Health, Edina, Minn PURE Med Spa, Boca Raton, Fl.; and All About You Med Spa, Madison, Ind.

The FDA is requesting a written response from the U.S. companies within 15 business days of receipt of the warning letters stating how they will correct these violations and prevent similar violations in the future. Each U.S. company has been informed in its warning letter that failure to promptly correct the violations may result i legal action. Each of the companies involved has been cited for a variety of regulatory violations, including making unsupported claims that the products have an outstanding safety record and are superior to other fat loss procedures, including liposuction. Additionally some of the letters indicate that the companies have made claim that lipodissolve products can be used to treat certain medical conditions, such as male breast enlargement, benign fatty growths known as lipomas, excess fat deposits and surgical deformities. The FDA is not aware of clinical evidence to support any of these claims.

Health warnings

Three medical associations have issued health warnings cautioning against the use of injection lypolysis, including the American Society of Plastic Surgeons (ASPS), the

American Society for Aesthetic Plastic Surgery (ASAPS), and the American Society of Dermatologic Surgery (ASDS).

International regulation

The Medicines and Healthcare Products Regulatory Agency, the governmental body regulating the manufacture and commercialization of drugs in the United Kingdom, issued a similar warning to physicians considering the use of these substances for cosmetic purposes, stating these drugs "are being unlawfully advertised in the UK as a cosmetic product for the reduction of fat." The MHRA also pointed out that considerable safety concerns remain because these agents have not been tested in controlled clinical trials. While British physicians can still inject Lipodissolve for fat removal, the drug cannot be promoted as a drug for that purpose. As of July, 2005, The Medical Protection Society, the organization that provides British doctors with legal advice and coverage against litigation costs and damages, ceased offering malpractice insurance for use of Lipodissolve because of safety concerns.

Chapter 23

Lip lift

Lip Lift

A **lip lift** is a cosmetic surgical procedure that attempts to improve the appearance of lips by reshaping to advance the vermilion border or give the lips have what is perceived to be a more pleasing shape. Lip lift is to be distinguished from lip enhancement, another name for lip augmentation, which is often performed as a non-surgical procedure.

History

According to the American Society of Plastic Surgery, despite a declining economy, there was 3% increase in the total number of cosmetic procedures performed in patients aged 55 years and older in 2008 (3.2 million). With the rising popularity of facial rejuvenation techniques, surgeons have noted that if the majority of the face is rejuvenated but the lips are not, it creates a very discordant impression that undermines the effect as a whole. The ideal of youthful lips is often described as a lozenge shape with a pronounced Cupid's bow and significant fullness in the upper and lower lips. However, with aging, the lips tended to shrink and lose definition. They may also begin to sag and reduce the amount of teeth revealed with a relaxed smile.

With collagen as the only available filler material, and that proving a very unsatisfactory option, many surgeons in the 1980s sought to develop a surgical alternative that would increase the size of lips and give them a more youthful contour. Several techniques were developed, and, as yet, there remains no standard technique for the lip lift.

Variations on the Technique

One way to achieve advancement of the vermilion is the gull wing lift. The gull wing lift removes skin (and sometimes other tissue) directly from or above the white roll—the white line of skin that borders on and sets off the vermilion. In this technique, often complicated incisions are used to remove one or more cuts of tissue that significantly alter the shape of the lips by moving up the vermillion from both peaks of the Cupid's bow out toward the side of the lips (the commissure). Incisions are also made below the lower lips to move more vermilion out on the bottom lips. This is described as a short procedure (20 minutes), with swelling that lasts 1–2 weeks and lip tightness that requires 2–4 months to resolve. Asymmetry, undercorrection, and hypertrophic scarring are listed as complications.

Another variation, called the subnasal or sometimes bull horn lift, involves the removal of an oval or wavy oval of tissue from directly beneath the nose. Skin is pulled up and securely stitched to advance the vermilion.[6 8] This can sometimes lead to an exacerbation of drooping commissures, and therefore is commonly accompanied by what is known as a corner lift.

In the corner lift (or external angle oral commisuroplasty), triangles of tissue are removed from above the commissures to elevate the corners of the mouth.[2] A descending wedge of tissue can also be removed to add contour to the Cupid's bow or to reduce "bulky" lips.

In another variation of the procedure, an incision is made inside the mouth to loosen the mucosa and vermilion, which are then advanced and secured, leaving an exposed portion inside the mouth, which may take 2–4 months to completely heal.

Another variation uses a "W" incision inside the mouth to create several "V" flaps, which are then used in a V-to-Y plasty technique to advance the vermilion of either or both lips. This procedure leaves no exposed area inside the mouth, but can be painful and have a lengthy recovery period.

Another variation is the thread lift, in which a square stitch is placed from one nostril to the other and down to the peaks of the Cupid's bow. This variation has fallen out of favor because the results are short-lived.

Results and Complications

Although many surgeons report satisfaction with their procedure to be "high," the variation in procedures and the controversy over them suggests that no one variation has sufficiently high satisfaction to become the accepted procedure. Most of the procedures

result in a visible increase in the amount of vermilion visible, but so far qualitative data only exists for the V-Y lip augmentation, which did result in statistically significant increases in upper vermilion height and surface area.

Complications listed for the lip lift procedure varied, but included:

- Numbness
- Stiffness
- Pain
- Parasthesia
- Lip distortion
- Lip lengthening
- Smile deformation
- Speech impediment
- Visible scarring

In particular, the technique of removing skin at or directly above the white roll has been singled out as resulting in unfavorable scarring and stiffness in the lips.

Advancements and improvements in nonsurgical fillers available for lip enhancement has reduced demand for the lip lift procedure.

Corner Lip Lift