



Plastic Surgeries

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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 Pfolspendt 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 cosmetic 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

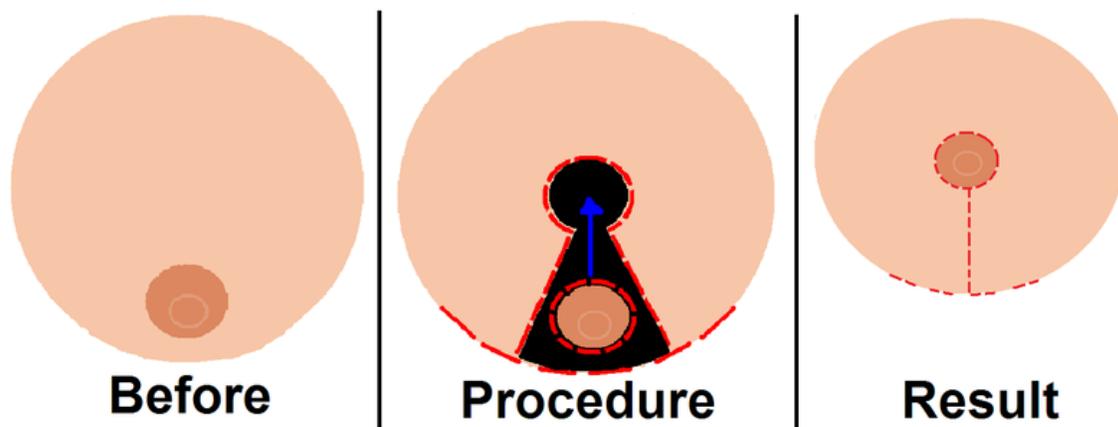
With increased media attention on beauty and perfection, celebrities and those alike are turning to plastic surgery more and more. Some take out loans for this purpose; one woman spent over \$83,000 for 14 surgeries.

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.

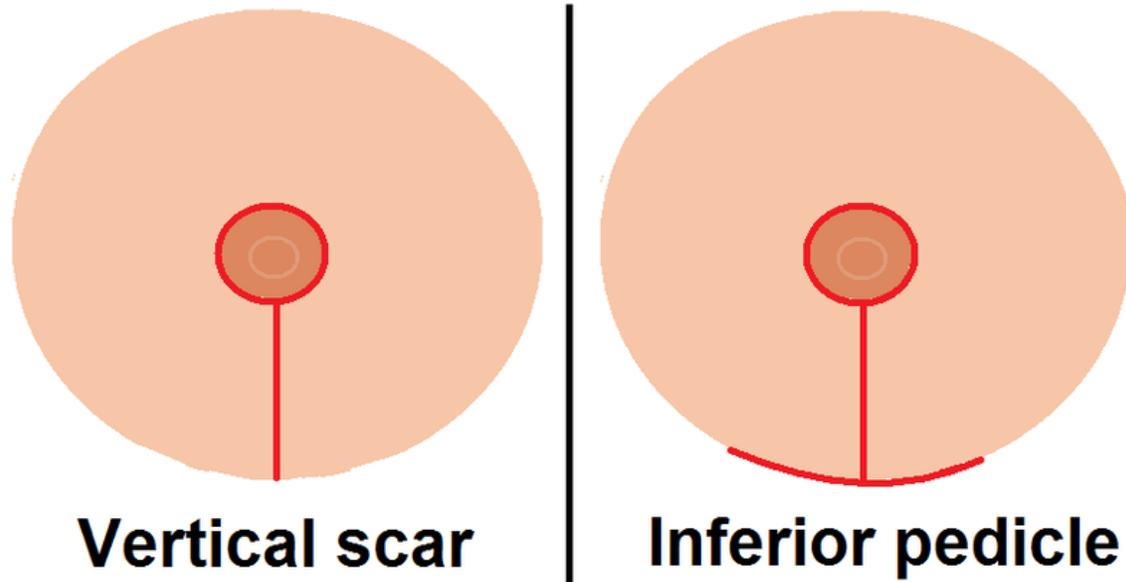
Procedure

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 pedicle, 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 arrhythmias 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, aesthetic 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, *Hypertrophy 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 aesthetics 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 aesthetic 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 aesthetic reasons; and 37 per cent underwent the surgery for aesthetic 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 aesthetically “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 of 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

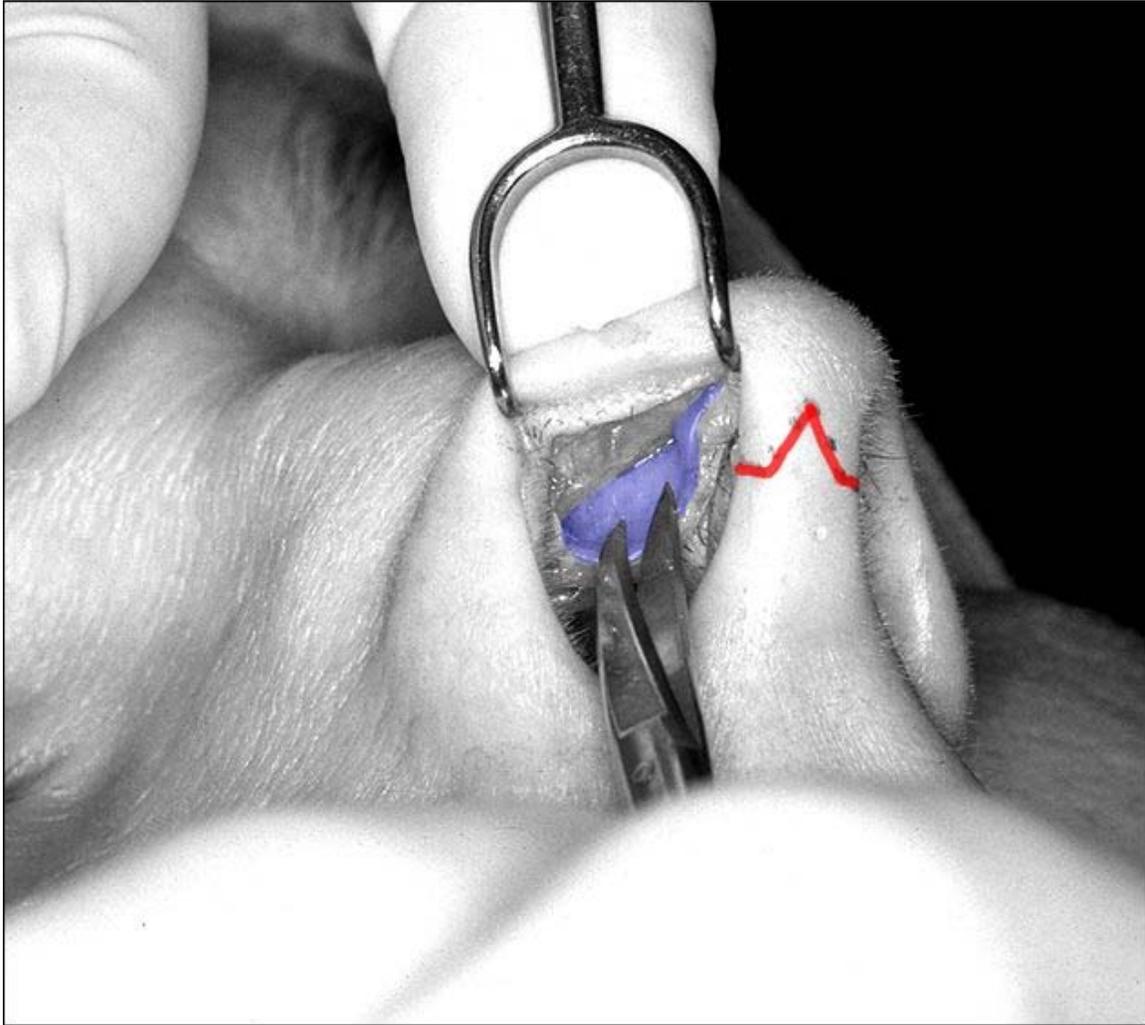
Rhinoplasty can be performed under a general anesthetic, sedation, or with local anesthetic. Initially, local anesthesia, which is a mixture of lidocaine and epinephrine, is injected to numb the area and temporarily reduce vascularity. There are two possible approaches to the nose: closed approach and 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.

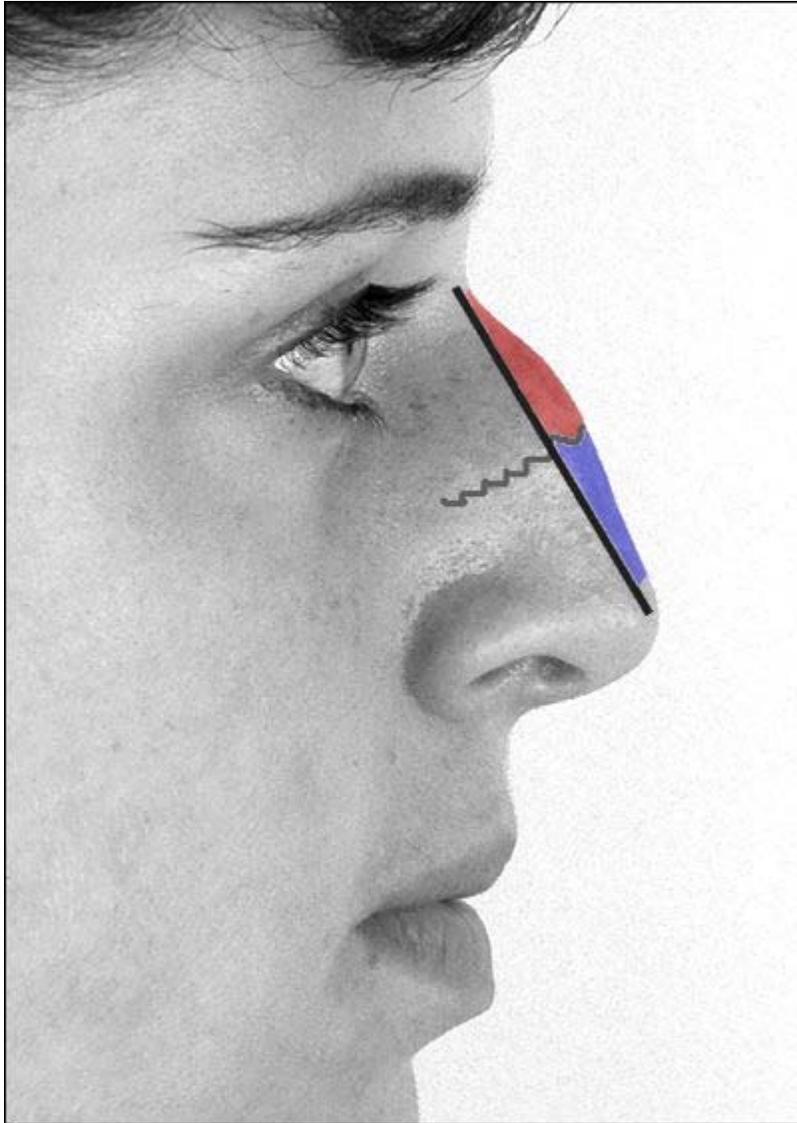
The incisions for a rhinoplasty are hidden inside the nose, with the exception of a small incision across the base of the nose, depicted by the dotted line.



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

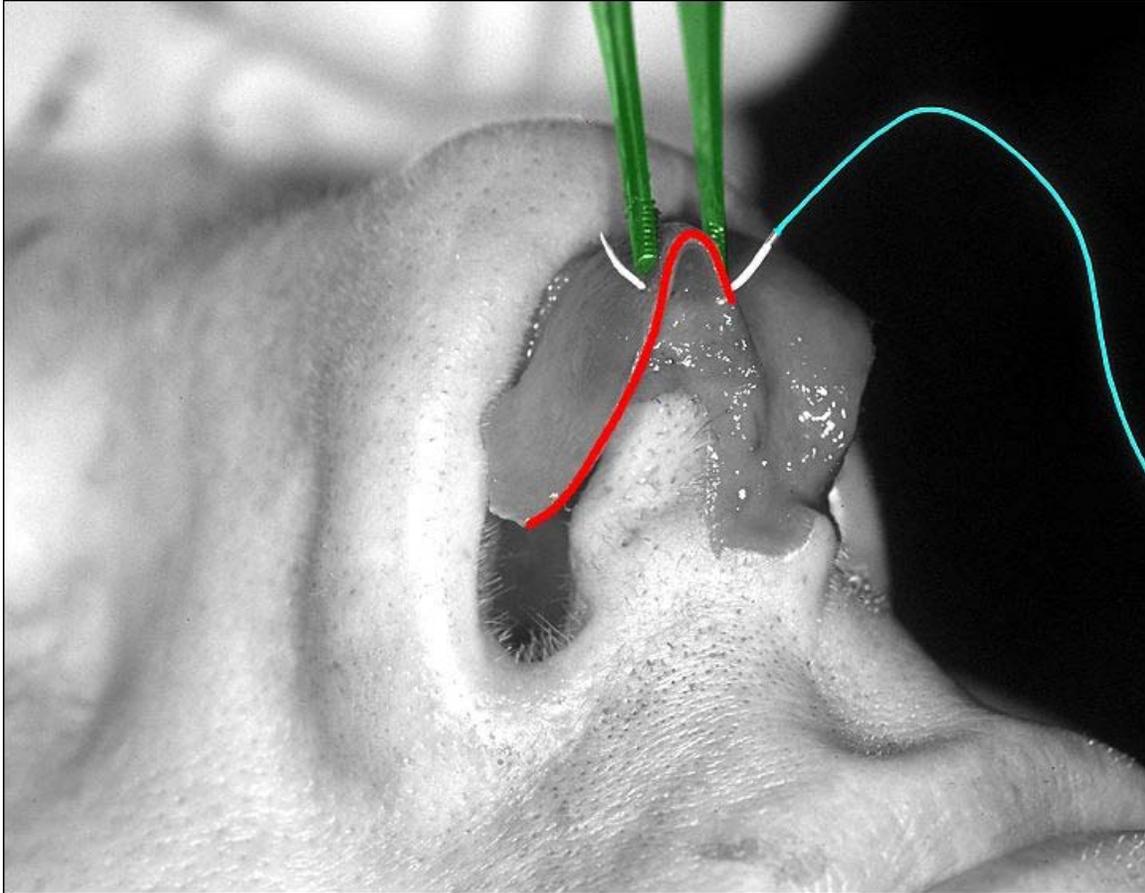
The soft cartilage of the hump is removed with a scalpel, and the bony hump is often removed with a chisel, shown at the top of this photograph. "Osteotome" is the medical term for a chisel. This photograph also shows the copper hammer that is used with the osteotome.



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.

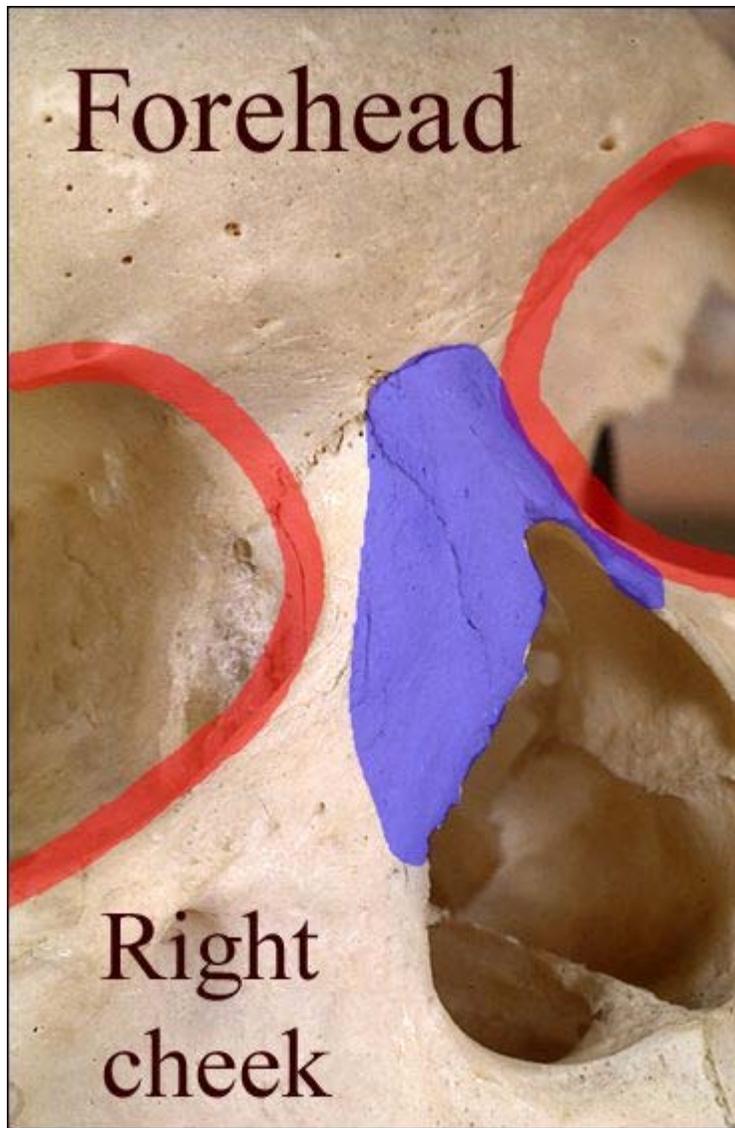
Some surgeons use rasps to remove the entire hump, foregoing use of the osteotome.



One technique to narrow the nasal tip

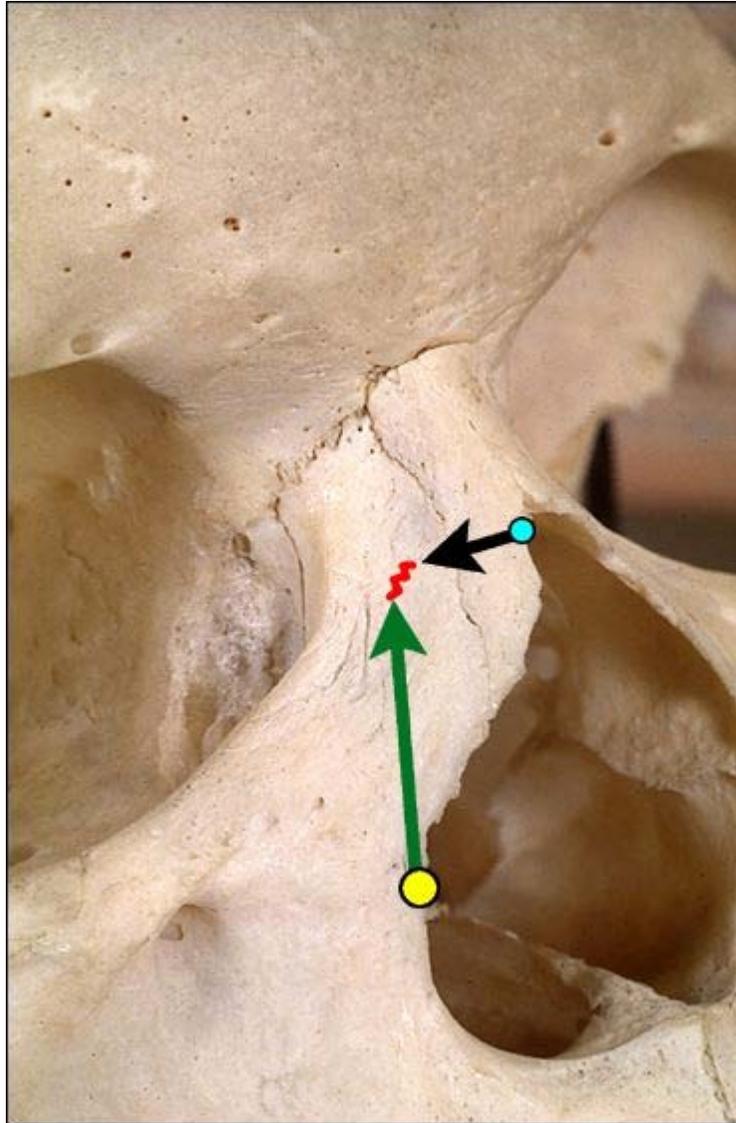
A common complaint is that the tip of the nose is too wide. Many surgical techniques are available to narrow the tip of the nose, depending on what is causing the excess width.

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

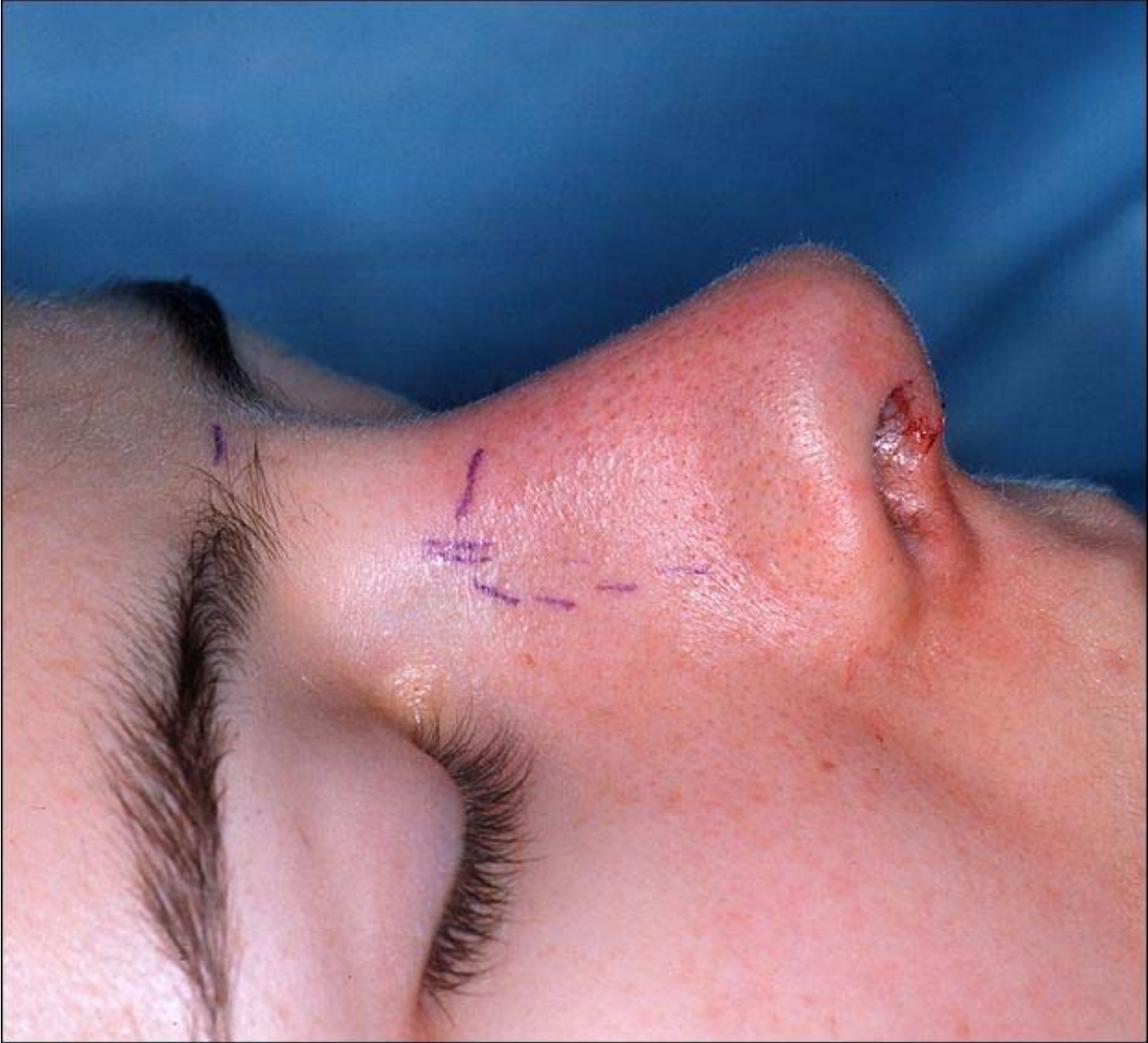
If the position of the nasal bones gives excess width to the upper part of the nose, the bones are moved inward, to a more narrow position. This skull shows in blue the position of the bones in the nose. For orientation, the eye sockets are outlined in red.



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.

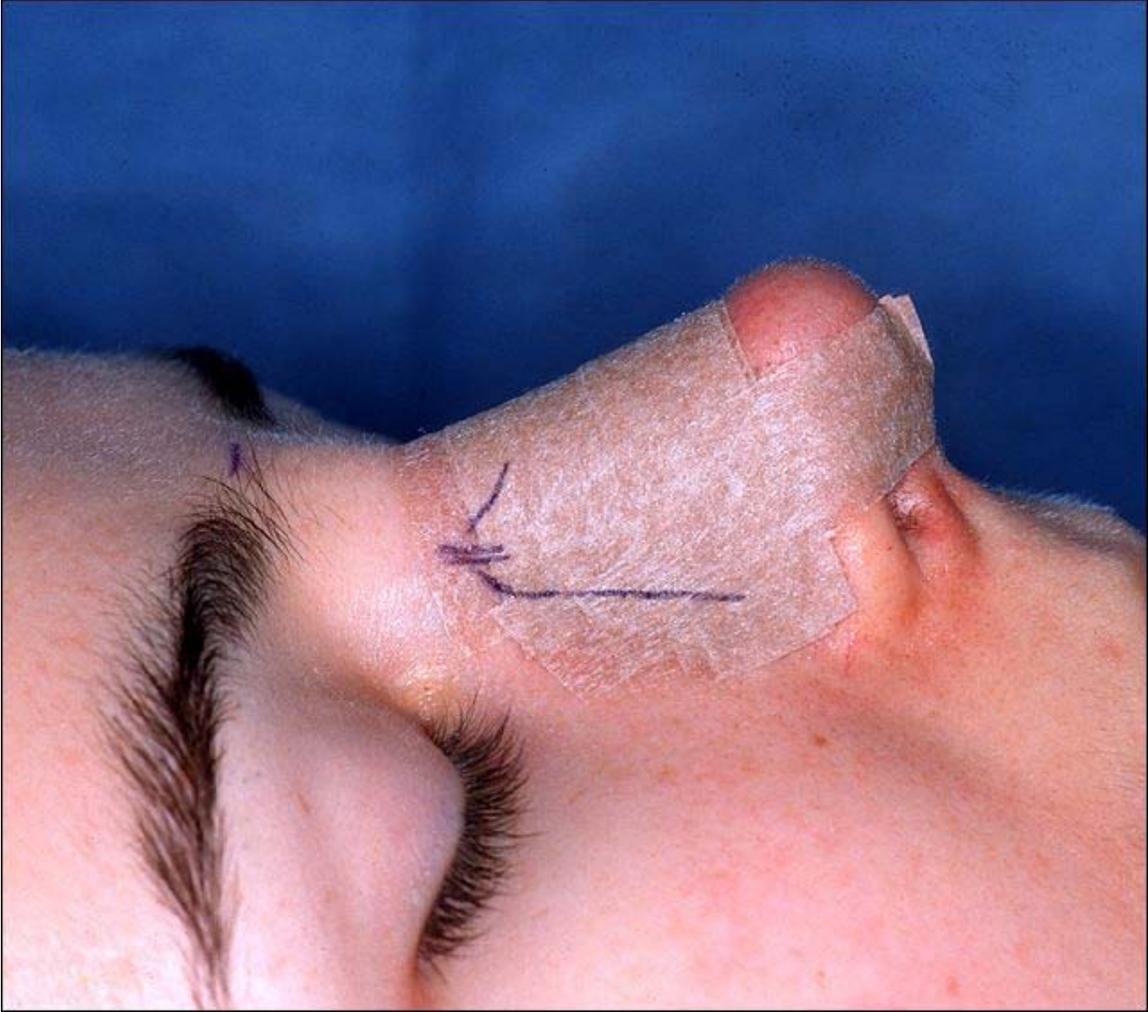
These chisel cuts are made from underneath the skin, so there is no scar in the area after healing.



At the end of the rhinoplasty

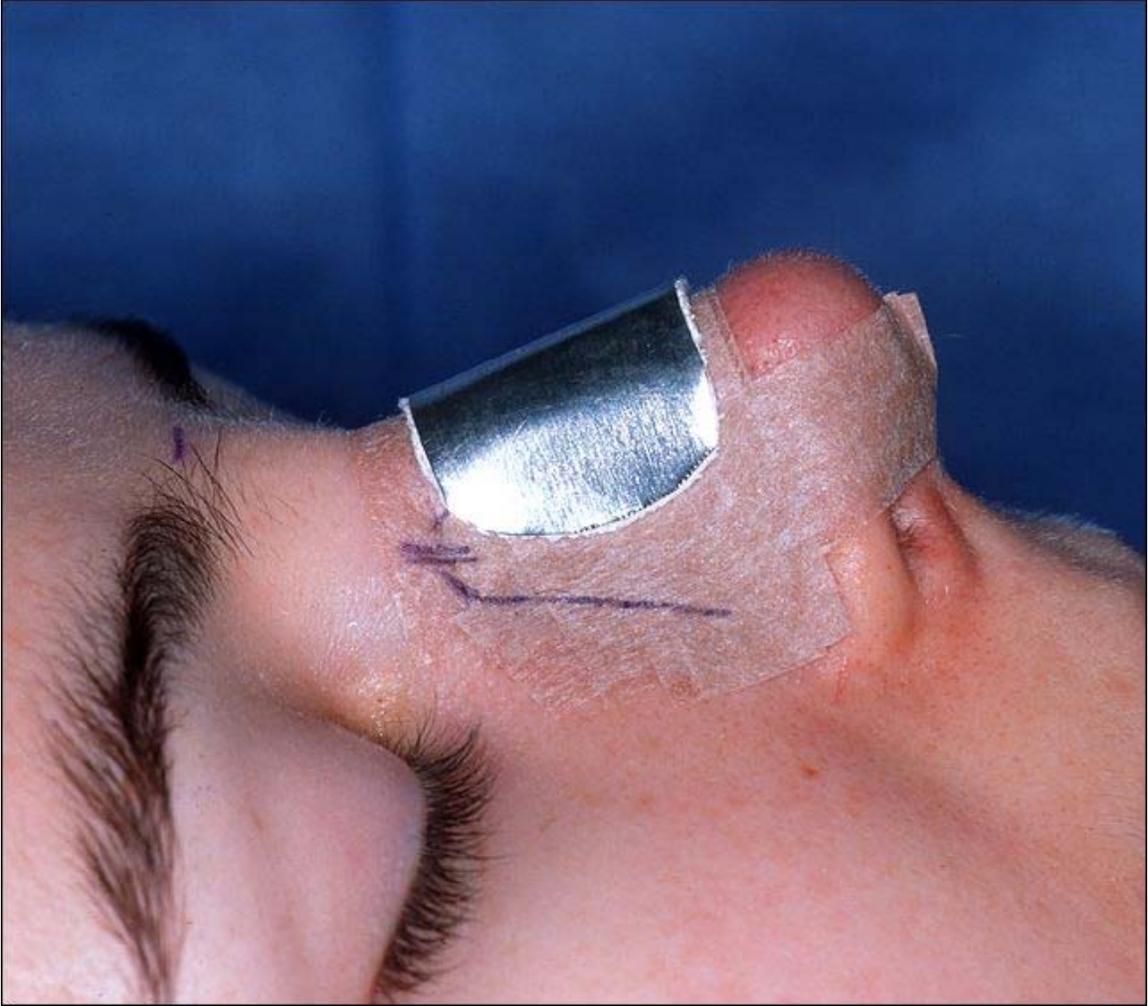
At the end of the procedure, after the incisions are closed, the nose is dressed, to hold it securely in place as it heals.

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 look 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.

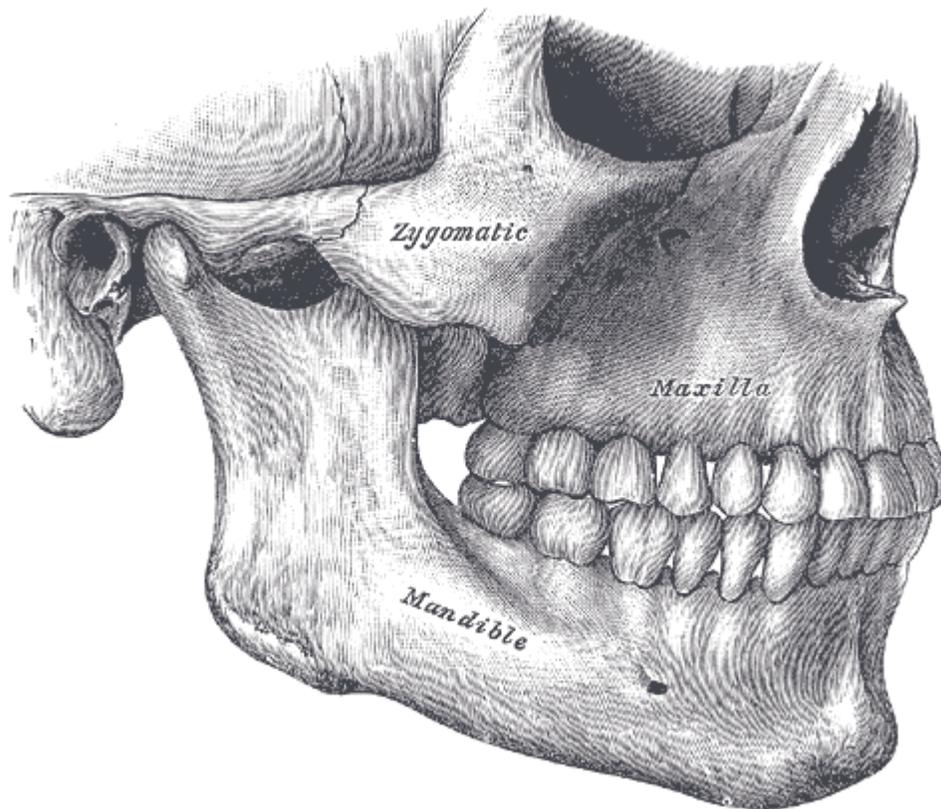
Health risks

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.

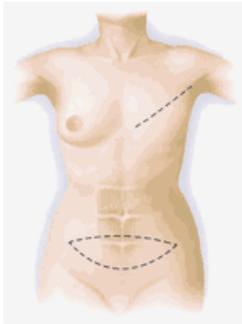
Techniques

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

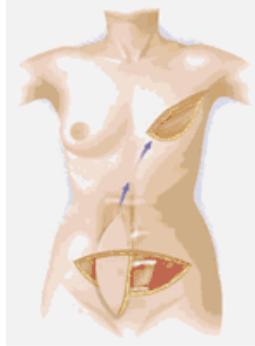
- **Tissue Expander - Breast implants** This is the most common technique used in worldwide. The surgeon inserts a tissue expander, a temporary silastic implant, beneath a pocket under the pectoralis major muscle of the chest wall. The pectoral muscles may be released along its inferior edge to allow 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 aesthetic 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.

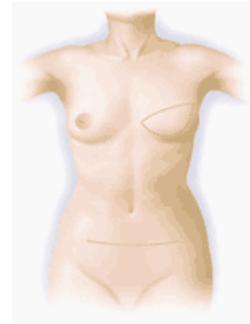
The TRAM Flap Procedure



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 areola 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 hematoma, 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 grafts, 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

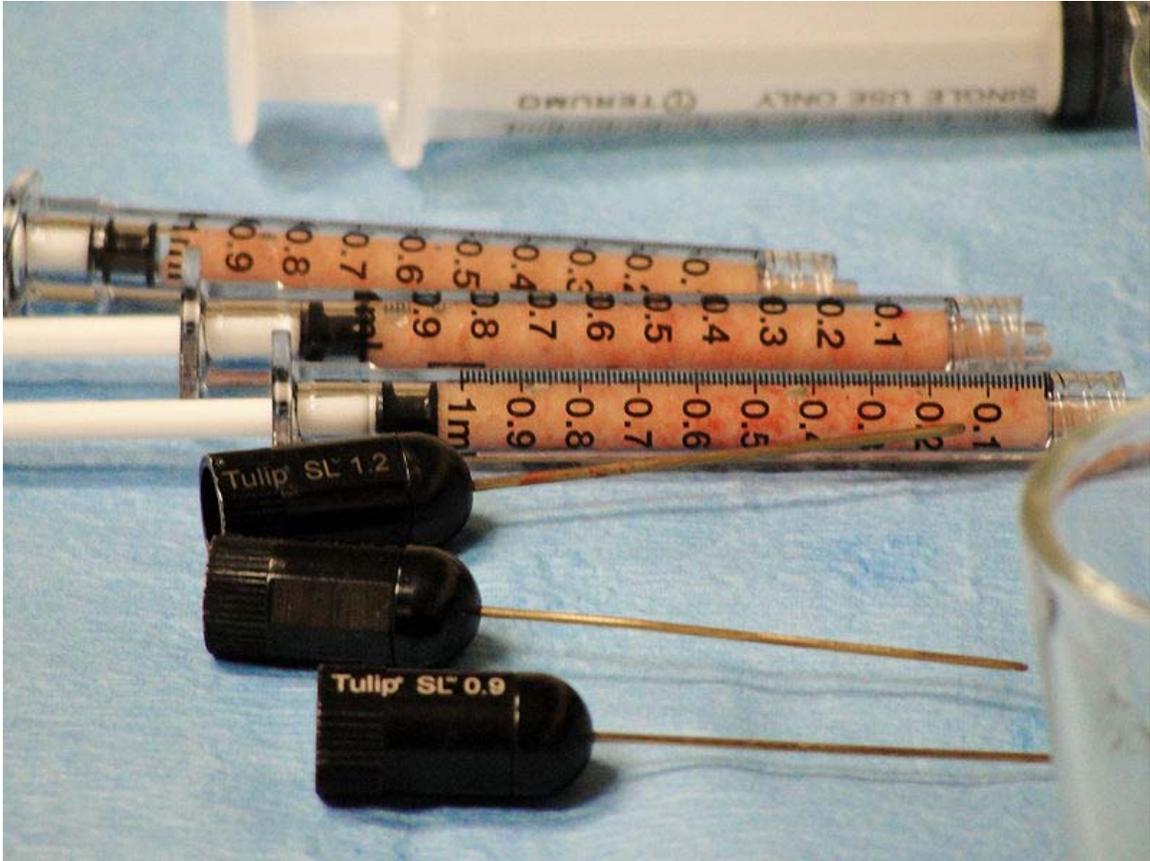
A liposuction technique is used to harvest the fat and prepare it for transfer. The fat is then injected into the desired portion of the face. When using a micro injection technique, extremely small parcels of fat are placed into multiple layers of the face. The procedure is most commonly performed under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



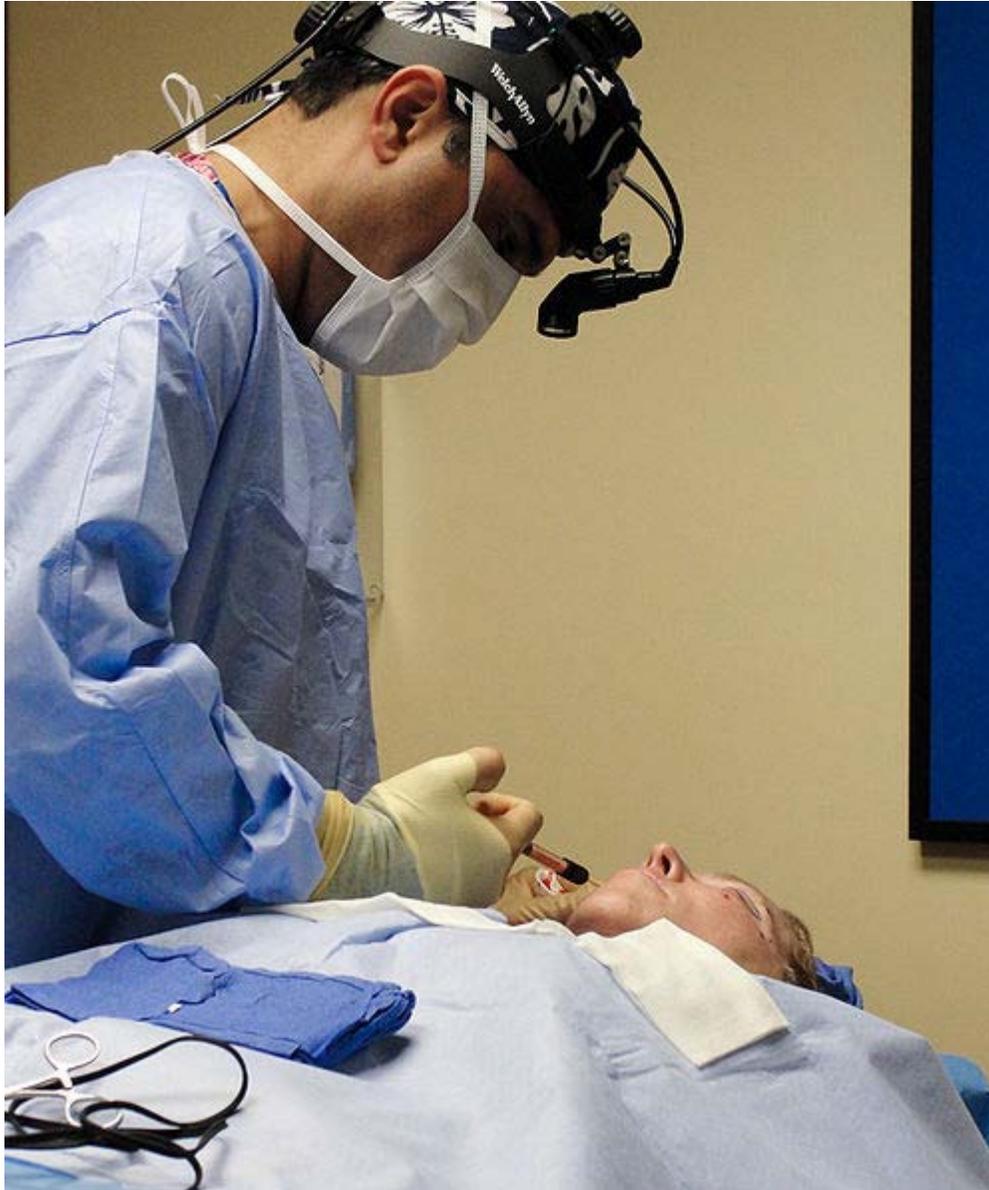
Harvesting fat from patient's abdomen which will be transferred to patient's face.



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; Tuberos 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

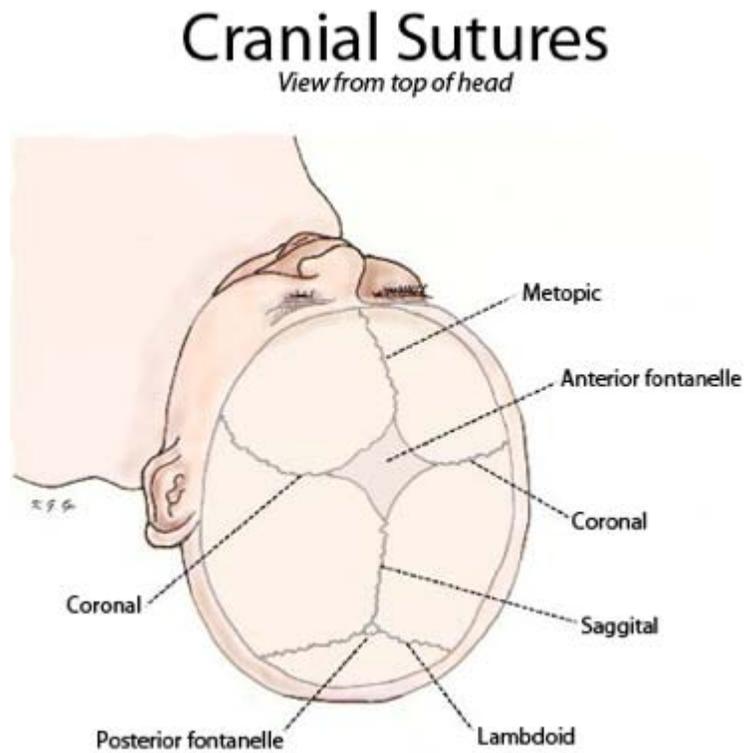


Fig. 1 Cranial sutures viewed from top of head

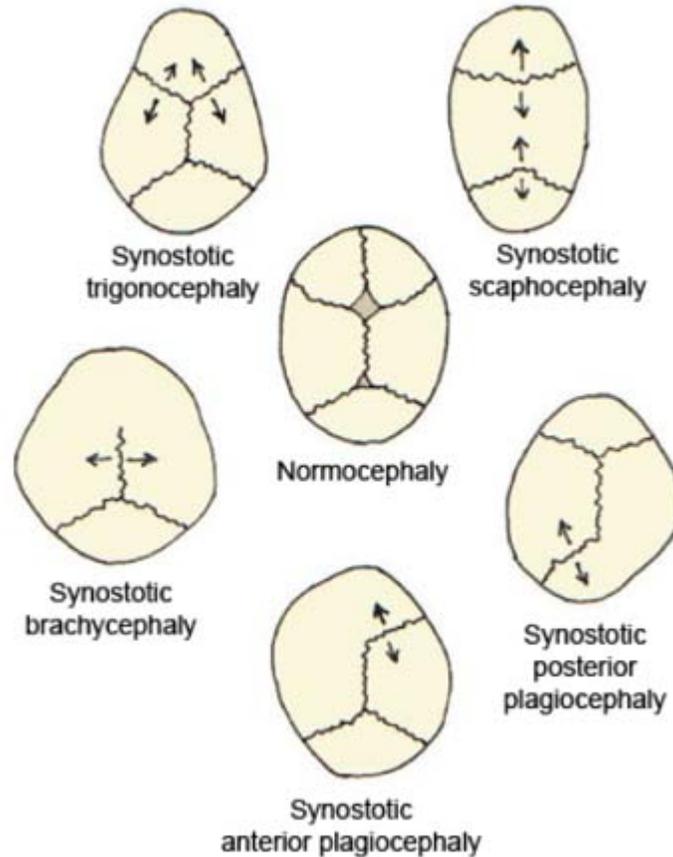


Fig. 2 Skull deformities associated with single suture synostosis

The bones of the human skull are joined together by cranial sutures (see figure 1). The anterior fontanelle is where the metopic, sagittal 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 sutures 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 viewed 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

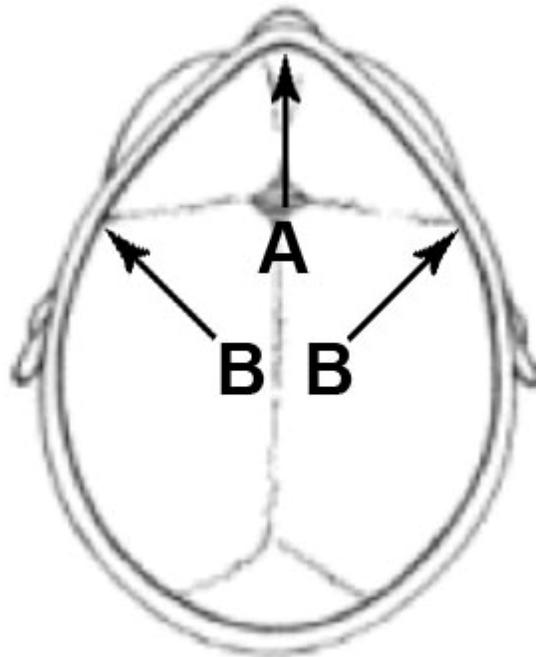


Fig. 3 Locations of the incisions used in fronto-supraorbital advancement.

In cases where the forehead is involved (trigonocephaly and ^[10]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.

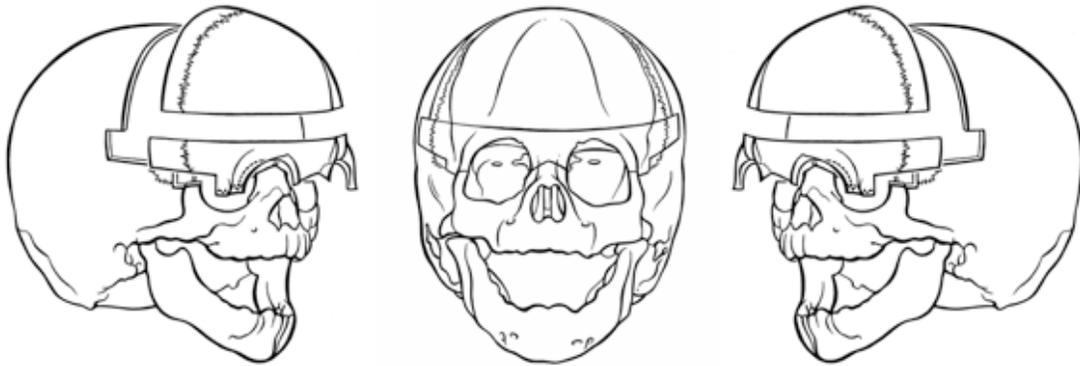


Fig. 4 Bone segments that are removed in fronto-supraorbital advancement

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 sagittal 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 simple 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 multidisciplinary 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, dentists, 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 involved 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 femoral 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

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*).
- **Isogenic:** 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 14

Tissue Expansion and Umblicoplasty

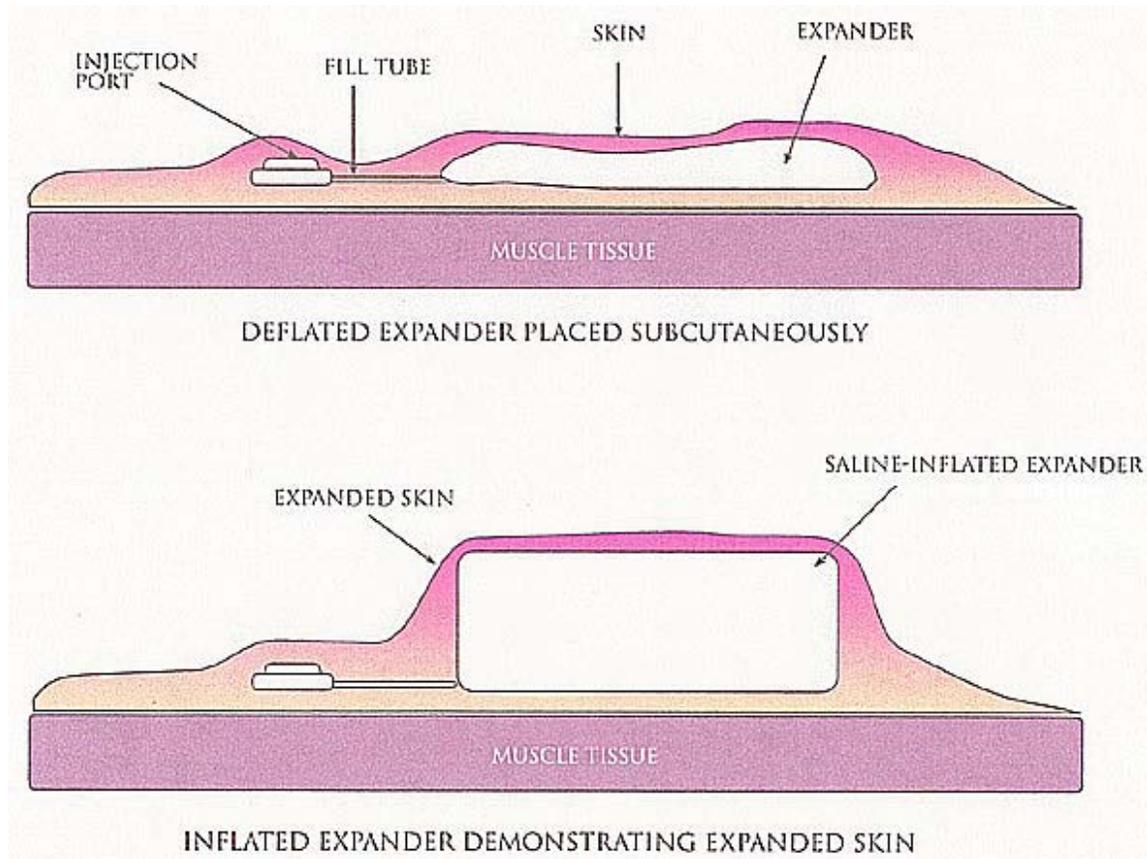
Tissue expansion



Skin and tissue expander with inflatable balloon device

Tissue expansion is a technique used by plastic and restorative surgeons to cause the body to grow additional skin, bone or other tissues.

Skin expansion



Skin expansion using a subcutaneous inflatable balloon

Keeping living tissues under tension causes new cells to form and the amount of tissue to increase. In some cases, this may be accomplished by the implantation of inflatable balloons under the skin. By far the most common method, the surgeon inserts the inflatable expander beneath the skin and periodically, over weeks or months, injects a saline solution to slowly stretch the overlying skin. The growth of tissue is permanent, but will retract to some degree when the expander is removed. Breast reconstruction surgery, for example, can use this technique when the mammary gland was removed by surgery (mastectomy). Later, a more permanent breast implant filled with saline or silicone gel is inserted under the expanded skin pocket.

In other applications, excess skin is grown purposely by expansion on the back or the buttocks, so that it can be harvested later for transplantation to another site where skin was lost due to trauma, extensive wounds, surgery, burns, etc. which is usually non-surgical and applies tension externally using specialized devices to replace circumcised tissues with new cells.

Scalp Reconstruction: The Role of Tissue Expansion

Tissue expansion has been used on the scalp for treating scalp scarring, in lieu of hair transplantation when there is insufficient donor hair to transplant on the scar or the scar tissue is not vascularized to support hair growth. For instance, in a patient who had melanomas removed from the scalp resulting in alopecia defects (hair loss), tissue expansion can be used to allow for the removal of scars and complete hair coverage. The two main indications for choosing tissue expansion over hair grafting are the size and shape of the defect relative to potential supply of donor hair, and the quality and thickness of the scar tissue. Areas of significant scarring and/or tissue atrophy, which is likely to make hair grafting unsuccessful, are best excised and replaced by normal expanded scalp skin. Theoretically, there is no limit to the amount of tissue that can be created with tissue expansion, provided the process is conducted gradually.

Bone expansion

Bone is another tissue that can be expanded relatively easily, by using external devices which are slowly separated using mechanical contraptions, so that bone grows in response to elongation (bone distractor). Other techniques and external devices have been studied and have shown some success, such as in the fibone surgery. This technique was pioneered in 1951 by the Russian physician Ilizarov, and is called the Ilizarov apparatus. It is capable of lengthening limbs in cases of pathological loss of bone, asymmetry of limbs, dwarfism, short stature, etc. In reconstructive and cosmetic surgery, bone expanders have been used to elongate the mandibula in cases of congenital disorders, trauma, tumors, etc. Other newer devices such as the orthofix and intramedullary skeletal kinetic distractor (ISKD) are also used for limb lengthening. It can add over 6 inches per bone, but is expensive, painful, and time-consuming (each procedure lasts around 8–12 months).

Umbilicoplasty

Umbilicoplasty, sometimes referred to as "**belly button surgery**", is a plastic surgery procedure to modify the appearance of one's navel (or "belly button"). It may be performed as part of a tummy tuck or lower body lift operation, or it may be performed alone.

An umbilicoplasty procedure may last from 30 minutes to 3 hours. It is typically performed under local anesthesia, but the patient may be given a sedative that is administered through an intravenous drip. When done as part of a tummy tuck or lower body lift, general anesthesia is more commonly used. Usually there are no scars, since the incision is usually made inside the cavern of the navel.

Candidates typically choose the surgery because they dislike how their navel looks. Their navel may be as it was from birth, or it may have changed due to unrelated surgery, such as a Caesarean section. Some may have experienced weight gain, weight loss, or pregnancy, causing changes to the shape of the navel. Others may have a protruding navel, which they may wish to change.

Chapter 15

Vaginoplasty

Vaginoplasty is a reconstructive surgery procedure used to either construct or reconstruct a vaginal canal and its mucous membrane. As such, the term **vaginoplasty** generally describes any such vaginal surgery, and the term **neovaginoplasty** specifically describes the procedures of either partial or total construction, or reconstruction, of the vulvovaginal complex. These bodily structures might be absent from a woman, because of congenital disease (e.g. vaginal atresia) or because of an acquired cause (e.g. physical trauma, cancer).

In male-to-female sexual reassignment surgery, some trans women patients opt for vaginoplasty as part of their physical gender transition. In biological women, menstruation and fertilization are assured when the uterus and the ovaries have preserved their normal functions; in a few cases, vaginal childbirth is possible.

The post-operative outcome of vaginoplasty is variable; it usually allows sexual intercourse (coitus), although sensation is not always present. The limiting factors to vaginal dimensions are from the *Denonvilliers' Fascia* (depth) and the *Levator ani muscle* (diameter); thus in trans women patients, the lower pelvis can reduce the available area to use for vaginoplasty.

Vaginoplastic surgery techniques

There are many vaginoplasty surgical techniques, some involve using autologous (patient-derived) biological tissue, from other parts of the body of the patient, to construct areas of vagina and areas of the vulvovaginal complex. The tissues that may be used include the oral mucosa, skin flaps, skin grafts, the vaginal labia, penile skin, penile tissue, scrotal skin, intestinal mucosa, and tissue from other, like areas. In praxis, it is important that, when using a hair-bearing skin graft, the hair be removed preoperative via electrolysis, unless the surgeon directs otherwise, in which case, the hair follicles are removed intraoperatively, via electrocauterization or by manually scraping them off. Besides the surgical techniques, herein discussed, for effecting vaginoplasty, earlier plastic surgery procedures do exist, however, they have grown out of technical–surgical style, because of the more effective results afforded by the current vaginoplasty techniques.

Penile inversion

For trans women patients, penile inversion is the most common surgical technique for male-to-female genital reassignment that is used to construct a neovagina from a penis; occasionally, it also is used for people born intersex. Moreover, with the colovaginoplasty, penile inversion is one of the two, main vaginoplasty procedures used in creating a vagina. Applying a flap technique, first used by Sir Harold Gillies in 1951, the erectile tissue of the penis is removed, and the skin, with its blood and nerve supplies still attached, is used to create a vestibule area and labia minora, which then are inverted into a cavity created in the pelvic tissue. Part of the tip (glans) of the penis, still connected to its blood and nerve supplies, usually is used to create a clitoris; and the urethra is shortened to end at a place appropriate to the female genital anatomy. Another common technique for creating a neoclitoris utilizes the urethral spongiform tissue. This was the most common penile inversion technique, and was so used by Dr. Burou and Dr. Stanley Biber; however, some surgeons do not create a neoclitoris as part of a penile inversion.

Colovaginoplasty

The colovaginoplasty (*colon section*) technique creates a vagina by cutting away a section of the sigmoid colon and using it to form a vaginal lining. This surgery is performed on women with androgen insensitivity syndrome, congenital adrenal hyperplasia, vaginal agenesis, müllerian agenesis, and other intersexual conditions wherein non-invasive forms of deepening the vagina cannot be performed (mostly on trans women patients) as an alternative to penile inversion, with or without an accompanying skin graft (usually from the thigh or the abdomen). Because of the potential complications (e.g. diversion colitis) most surgeons will recommend a colovaginoplasty procedure only when there is no alternative.

Wilson Method

The penile-inversion technique of the Wilson Method is different from the traditional penile-inversion technique in that it is a three-stage surgery, comprising a two-stage initial vaginoplasty. The Wilson Method surgery is initially performed like a traditional penile inversion, until the vaginal-vault creation step, in which the vault of the vagina is left as a raw surface, and is packed with a sterile stent, which, after 5–7 days, then is lined with a skin graft from the buttocks. The penile skin is used to create the labia minora, clitoral hooding, and the anterior fourchette; the glans penis is used to create the clitoris, and the scrotum is used to create the labia majora.

Balloon vaginoplasty

In the balloon vaginoplasty technique, a foley catheter is laparoscopically inserted to the recto-vesical space (recto-pubic space), whereupon gradual traction and distension are applied to create a neovagina. Moreover, balloon vaginoplasty also is a new technique for treating vaginal aplasia that also is applied as a technically simple, physically safe, and

medically effective alternative vaginoplasty technique for creating a neo-vagina, especially when conventional laparoscopic surgery is either infeasible or unsafe.

Buccal (oral) mucosa

A relatively novel surgical approach to treating vaginal agenesis is utilizing the buccal mucosa as the tissue for lining the vagina (ca. 8.0 cm. deep). The medical advantages of this vaginoplasty technique include the biological and healing qualities of the buccal mucosa tissue, minimal scarring, and a short, post-operative recovery for the patient. The disadvantages include limited vaginal dimensions (depth and width), and the possibility of either intraoral damage, when tissue-harvesting, or of complications.

In praxis, the tissue donor site in the cheek (ca. 2.5 x 8.0 cm.) is marked to avoid damage to the *Stensen's duct* and to the *parotid gland* duct. To create the vaginal lining, the buccal mucosa tissue graft is micro-perforated to allow shaping it to a larger size, then it is formed upon a stent, and afterwards affixed to the vaginal space (created earlier in the operation), with its edge sutured to the minor labia and to the perineal skin. The vaginal mold of buccal mucosa is then (temporarily) secured to the perineal skin, to allow the patient's recovery.

Don Flap (labia minora flap)

In the Don Flap treatment of vaginal agenesis, the labia minora are sutured together to create a neovagina, using a technique similar to that for penile inversion. A technical refinement of this type of vaginoplasty is its utilization of the prepuce of the clitoris as a horse-shoe-shaped, one-piece flap. Yet, although the Don Flap technique is a relatively simple surgery, the most obvious disadvantages of the labia minora flap surgery include the need for restorative labiaplasty and cervical dilation to produce adequate vaginal dimensions (depth and width).

Vecchietti procedure

In treating müllerian agenesis, the Vecchietti procedure is a laparoscopic surgical technique that produces a vagina of dimensions (depth and width) comparable to those of a normal vagina (ca. 8.0 cm. deep). A small, plastic sphere ("olive") is threaded (sutured) against the vaginal area; the threads are drawn through the vaginal skin, up through the abdomen, and through the navel. There, the threads are attached to a traction device, and then daily are drawn tight so that the "olive" is pulled inwards and stretches the vagina, by approximately 1.0 cm. per day, thereby creating a vagina — ca. 7.0 cm. deep by 7.0 cm. wide — in 7 days. Depending upon the patient, such an outcome might require more time. The Vecchietti vaginoplasty procedure surgery is of approximately 45 minutes' duration.

McIndoe technique

The McIndoe vaginoplasty technique utilizes split-thickness skin grafts that cover a mold, which then is inserted to a surgically created space, between the bladder and the rectum. The main difference between the McIndoe technique vaginoplasty and the Vecchiotti procedure vaginoplasty, is *which* tissue is utilized as the vaginal lining. Each surgery has its own positive and negative factors, especially regarding upon whom such a plastic surgical technique can be applied, because the post-operative outcome varies with the patient, and by the surgeon performing the vaginoplasty.

Related surgical techniques

Labiaplasty

Labiaplasty is a vaginoplastic surgery technique for reducing the elongation of the genital labia — either the majora or the minora — which are any of the four folds of tissue of the vulva. As a labial reduction, a labiaplasty can be performed as a discrete surgery, or as a subordinate procedure within a vaginoplasty.

Vaginal rejuvenation

A “vaginal rejuvenation” is a non-reconstructive vaginoplasty that restores the muscle tone and the æsthetics of the vagina, by removing excess tissues and tightening the supportive structures of the vulvovaginal complex, in effort either to reduce or to reverse the effects of aging and parturition (childbearing). The advantages are a physically comfortable health and an improved self-image (mental health); the potential disadvantages are decreased clitoral and genital sensation, and complications, such as infection, tissue adhesions, and scarring. Sociologically, the increased North American popularity of elective genitoplasty (cosmetic surgery to change or to enhance a woman’s genital æsthetics) engendered the colloquial term “designer vagina” — connoting a *physical* ideal image of a woman’s genitalia. Medically, *Committee Opinion No. 378: Vaginal “rejuvenation” and Cosmetic Vaginal Procedures* (2007) of the American College of Obstetricians and Gynecologists (ACOG) reported that non-reconstructive vaginoplasty surgical technique lacks documentary data supporting its practical safety and medical efficacy.

Terminology

Linguistically, in Medical English, the term *vaginoplasty* also is applied to these surgical procedures:

- Hymenotomy, the creation of an opening in an imperforate hymen
- Hymenorrhaphy, the recreation of a ruptured hymen