Phalloplasty [1]

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Phalloplasty is a type of surgery that takes existing skin, tissue, and nerves from surrounding areas on a patient’s body to repair or form a neophallus, or a new penis structure. In 1946, Harold Gillies, a plastic surgeon who practiced in England, performed one of the first modern phalloplasties that entailed creating an entire neophallus for a transsexual, called transgender as of 2022, man in London, England. The reconstructive need for phalloplasties started as a result of treating blast wounds during World War I [5] and World War II. The techniques from that time allowed Gillies to perform a phalloplasty with urethral lengthening. Lengthening the urethra allows the patient to use the neophallus to urinate, for a transgender person as a means of affirming their gender identity. Phalloplasty procedures improve the quality of life for people who have congenital conditions, physical trauma, or are seeking gender affirmation surgery.

Phalloplasty can consist of multiple procedures, but generally involves taking skin from a donor site to use in the creation of a neophallus. The surgeon takes skin, tissue, and nerves from a donor site and forms them into the desired shape. The donor site varies depending on the patient and their goals or sensitivity and aesthetics of the donor site and how easily they would like to hide the scarring. As of 2022, the three most common donor sites are the forearm, back, and thigh.

Techniques used in modern phalloplasty procedures come from the work of surgeons like Gillies in the 1900s. Anthony Wallace, a surgeon at St. Bartholomew’s Hospital in London, England, wrote that Gillies was a pioneer for the use of a tubed pedicle, beginning during World War I [8]. A pedicle is a part of a skin graft that temporarily stays attached to the original site for improved blood flow. Gillies started using pedicles for facial reconstruction surgeries during World War I [9], in London, England. Gillies was stationed in England as Surgeon General, the highest rank for a military medical officer and the most senior uniformed medical officer in the British Armed Forces. He commanded the work of a hospital dedicated to reconstructive surgery for wounded soldiers, later called The Queen’s Hospital or Sidcup in London, England. Decades later in 1946, Gillies performed the first successful phalloplasty that included urethral lengthening on a transgender person seeking out the procedure. The length of the urethra in a typical penis allows its user to urinate standing up, so the addition of urethral lengthening in a phalloplasty makes the patient’s neophallus more closely reflect the function of a typical penis. In the phalloplasty from 1946, Gillies utilized tubed pedicles when forming the neophallus.

Pedicles were the safest options for phalloplasty and other reconstructive surgical operations requiring a skin graft during Gillies’ time. Pedicles are a type of autologous skin graft, or a patch of skin that a surgeon removes from one area of a person’s body and transplants onto another area on the same body. A surgeon creates a pedicle by cutting a nearby area, usually about 0.75 inches down into the skin and tissue. The surgeon leaves the area of skin attached at one end so that they can rotate it and use it as skin on the surgical site while keeping blood flowing to the skin. For example, a surgeon can cut an area of skin and tissue away from the groin, leaving it attached at a point closest to the area the new skin will cover. The surgeon then turns around the flap of skin created by the incisions so that the exposed underside of the flap can cover the intended surface. The difference between a pedicle and a tubed pedicle is that instead of leaving the underside of the flap exposed between the newly covered area and the donor site, as the practice had been for years, the surgeon sews that intermediary section together to create a tube and avoid infection.

The area the surgeon takes skin from for the pedicle depends on where the graft is needed. While using the technique in World War I [9] for facial reconstruction, surgeons would use the skin from the neck and down the chest or shoulders. Pedicles for phalloplasty historically came from the groin region. Once the surgeon cuts a pedicle, they can treat the donor site in different ways depending on how wide an area is exposed. If the site is thinner, the surgeon can sew together the skin on either side or, if the gap between skin is too wide, the surgeon can leave it exposed and treat it as an open wound so that the area can develop more healthy tissue, depending on how wide an area is left exposed.

In 1936, Nikolaj Bogoraz performed one of the first recorded phalloplasty procedures in Russia that gave a neophallus to a person called a cisgender male as of 2022. A cisgender male is someone born with a penis and declared male at birth who continues to comfortably identify as a male or man. The patient Bogoraz operated on had sustained an injury that severed his penis at the base, close to his pubis. Bogoraz utilized tubed pedicles and rib cartilage to achieve external appendages with some rigidity for sexual intercourse [8]. However, he did not lengthen the urethra, so the patient could not urinate while standing up. In that case, the urethra ended right below the base of the neophallus. Decades later, in 1970, three doctors, Milton Edgerton, Norman Knorr, and James Callison from the Division of Plastic Surgery and the Psychiatric Liaison Service at The Johns Hopkins Hospital [7] in Baltimore, Maryland, credited Bogoraz for being one of the first to form a phallus from surrounding tissue. Despite Bogoraz receiving credit, the final result of the 1936 surgery was unsuccessful as the patient died from complications.

In 1946, Gillies performed one of the first complete phalloplasty surgeries that included urethral lengthening, which allowed the
patient to actually use the neophallus to urinate. He was also one of the first surgeons to perform the procedure on a transgender person, Laurence Michael Dillon. In that series of operations, Gillies used a tube-in-a-tube procedure to lengthen the urethra, as his patient wanted the ability to urinate standing up. Gillies created an extension to the existing urethra with a tube of tissue, which he then surrounded with a separate pedicle. The tube-in-a-tube procedure is still considered the standard way of lengthening a urethra in 2022. While the intricacies of that technique have changed, the procedure largely has not. The series of operations to achieve the desired results took four years and thirteen surgeries and ultimately succeeded.

While society accepted the use of phalloplasty to treat wounded soldiers during World War I and World War II, it did not extend the same acceptance to transgender people seeking out the procedure. Years after his phalloplasty, Dillon's brother outfitted him due to Dillon's claim to an aristocratic title. Dillon's older brother inherited the title of Baronet of Lismullen, Ireland, a title that gives the family noble status. The title would have gone to a younger brother but not a sister. In 1958, Dillon's brother, who did not have any sons, fell ill, and made a statement to the press that he would rather end their family name's ties to nobility than hand it over to Dillon. At the time, Dillon was working as a physician on a French ship, Liberté. Reporters showed up on the ship requesting to take Dillon's picture and asked numerous invasive questions. 

The techniques Gillies used in his procedures remained standard until the mid-1980s, when surgeons devised how to carry out a complete phalloplasty in less time. Advancements in microsurgical techniques allowed surgeons at the time for Gillies to perform in 1946. Such advancements made it possible for a significantly more precise extraction of the donor skin, tissue, fat, and nerves, which led to the use of a free flap. With a free flap, the skin does not stay attached, as opposed to the pedicle that Gillies used. Advancements in microsurgical techniques also allowed surgeons to make and sever more precise connections between nerves and between blood vessels. Despite those advancements, the general structure and steps of phalloplasties have remained the same as of 2022.

As of 2022, before patients can undergo a phalloplasty, they must choose a donor site with the help of their doctor. The skin that the surgeon takes from the donor site needs to be long enough and wide enough to account for the length and girth of the neophallus. The patient and their doctor decide the size of the neophallus, but the patient's body size, along with the availability of excess skin, determines how big of a neophallus is possible. Previously, starting with Gillies and his contemporaries, surgeons most often used a groin flap. However, modern phalloplasty surgeries, which can use three different flaps, have better outcomes and more returned sensation. Using a forearm flap tends to give the best cosmetic results for the neophallus as well as the better sensation, according to Johns Hopkins Medicine. However, the scarring left behind on the forearm is much more difficult to hide, which may be a downside to some patients. A flap from the outer thigh gives more length options and the resulting scars on the donor site are easier to hide. Using the back or side as the donor site has the least amount of scarring and the chance of being able to get an erection without the use of a separate device compared to the other flap methods. However, the nerve associated with the back flap is a motor nerve, which sends information from the central nervous system to the body to make it move. The nerves associated with the forearm flap and the thigh flap are sensory nerves, which send information in the opposite direction, from the body to the brain. As the back flap has a motor nerve, sensation in a neophallus with that donor tissue is unlikely.

After the patient and doctor select a donor site, a phalloplasty typically happens in three separate stages. If a patient elected to remove other female reproductive organs such as the uterus or ovaries, they would need to finish those procedures before any stage of their phalloplasty. Once healed from that, a phalloplasty can begin. The first stage of a phalloplasty is the creation of the phallus. The first stage includes taking the skin, fat, nerves, arteries, and veins from the donor site, rolling it into a tube the shape of a phallus, sewing it together, and attaching it to the groin. When attaching the neophallus to the groin, the surgeon connects the blood vessels and nerves in the donor tissue to those in the groin. With the accurate connection of nerves that were available in the donor site, patients have the best chance for the return of sensation as well as reducing the chance of phallic atrophy or loss.

Phallic atrophy can occur when the donor tissue loses some malleability and the neophallus loses girth. Researchers have not found additional harm from phallic atrophy aside from the unsatisfactory aesthetic result. Phallic loss occurs when the donor tissue in the neophallus does not have proper circulation and the surrounding tissue dies. Researchers estimate the risk of full phallic loss to be 1.69 percent, with many steps in place to prevent it. However, if there is partial phallic loss, the medical team will remove the dead and dying tissue, control any infection with antibiotics, and reconstruct the area with skin grafts. During the first stage, the surgeon will include a tube made from the tissue from the donor site inside of the skin graft if the patient will be undergoing urethral lengthening in the next stage.

The second stage of a phalloplasty occurs around six months after the first stage and includes the procedures that the patient chose. Those procedures may include lengthening the urethra to allow for urination out of the tip of the neophallus, creation of the scrotum using the outer labia, glansplasty to shape the tip of the neophallus to resemble that of a cisgender male's penis, or removal of the vagina. The patient will need to decide ahead of time if they would like to opt into any of the second-stage procedures as that will decide whether the second stage is the final stage or a third is necessary. If the patient does not choose to have urethral lengthening, they cannot go back and do it at another time. To lengthen the urethra, the surgeon connects the existing urethra to the previously constructed one within the neophallus by connecting the adjacent blood vessels to one another. Risks associated with urethral lengthening include strictures, fistula, and diverticulum. Strictures occur when the urethra narrows in areas and stops the flow of urine. A fistula is an abnormal opening between the urethra and somewhere, which leads
to urine leaking into the surrounding areas. A diverticulum is an abnormal sac or pouch that forms at a weak point in the wall of the urethra.

Also in the second stage, surgeons can perform a scrotoplasty, which uses the labia of the vagina to form a scrotum, as well as clitoral burying. Clitoral burying is where the surgeon takes the top layers of skin off the clitoris, so it is exposed, and transposes the main nerve of the clitoris to be in the base of the neophallus. That process preserves the sensation of pleasure and the ability to orgasm. The second stage is also where a patient can undergo a vaginectomy or vaginal mucosal ablation to remove all or part of the vagina. The two surgeries can also close the vaginal opening if the patient chooses to do so.

The third stage typically takes place about twelve months after the second stage and includes testicular implants and a prosthesis if the patient decides that they would like them. Testicular implants are round sacks filled with saline that are soft to the touch to give a realistic look when inserted into the healed scrotum from the second stage’s scrotoplasty, so the patient can have a scrotum that looks like that of a cisgender male. Surgeons use a prosthesis to give the neophallus rigidity. The use of cartilage or bone from a donor site for rigidity was once a popular method to achieve rigidity but has fallen out of favor with the introduction of new technology for the same rigidity. The previous method carried risks such as the bone fracturing or additional infection. As of 2022, surgeons can achieve enough rigidity for penetrative sexual intercourse by implanting an erectile prosthesis, or penile implant.

The kind of prosthesis used in phalloplasty can be one of two types, semirigid or inflatable. A semirigid prosthesis is a rod that will not change in rigidity but can sometimes have segments to help the neophallus bend outward for sex or downward when not in use. One of the downsides is that it can be more difficult to conceal underneath clothing as its rigidity will not change. Another concern is that that kind of prosthesis puts constant pressure on the neophallus, which can cause injury. Inflatable prostheses are more common. They function by pumping fluid from a reservoir into two or three cylinders within the neophallus. An inflatable prosthesis requires a surgeon to implant a reservoir, which holds the fluid, in the abdomen and has more pieces than the semi-rigid rods. However, it provides the most realistic erection as well as flaccidity when deflated.

Patients can typically choose between a semi-rigid prosthesis or an inflatable one, depending on the effect they desire. According to Megan Lane and five other plastic surgeons who studied prosthesis use in transgender patients, patients were mostly enthusiastic about their prostheses. However, the authors wrote that some surgeons are wary of prostheses because of the risk of infections, extrusions, which occur when the prosthesis is rejected and forced out of the body, or other malfunctions. The risk of infection is prevalent at each stage, particularly in the first stage with the forming of the neophallus and in the third stage when implanting the erectile prosthesis.

Phalloplasty is a complex and exhaustive procedure that requires both patients and medical staff to work together toward the same aesthetic goals. It is necessary for physicians to be transparent with patients about the achievability of their goals with their body. In the US, if the patient is transgender, they also need to have multiple letters documenting their mental health as well as evidence of having taken hormones for a certain number of months. The surgeons and medical staff need practice and very explicit understanding of the minute tasks and operations to attain the goals of the patient’s specific phalloplasty. While the main process of a phalloplasty, the use of a pedicle or flap, has not changed much, the advancements made in developing modern phalloplasty procedures help in other areas of plastic surgery. As of 2022, phalloplasty continues to help people who have undergone genital trauma as well as transgender people seeking gender affirmation.

Sources

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