Courtesy of American Medical Systems

EXPLORING THE

Penile Prosthesis Procedure

by Debbie Gutierrez, CST

Insertion of a penile implant is often performed in men with erectile dysfunction. This surgery is performed when prescribed medications or penis pumps do not work for the patient.[1] There are different types of implants used for this type of surgery. The two most popular types of implants are the inflatable implant and the semi-rigid implant. This procedure usually takes one to two hours and the patient usually is discharged the same day as the surgery.[8]

In this particular case study, the patient is a 60-year-old male who was scheduled to have outpatient surgery for the insertion of a semi-rigid prosthesis or implant. The patient's height was six feet, three inches and weighed 180 pounds. The patient's vital signs were taken preoperatively by the nurse: his blood pressure was 120/71; his heart rate was 83 beats per minute; his respirations were 18 breaths per minute; his oxygen saturation was at 96%; and his temperature was 36 degrees Celsius. His total Braden score was 23. The patient's NPO status also was checked prior to surgery. He was NPO for 12 hours upon his arrival to the hospital.[11]

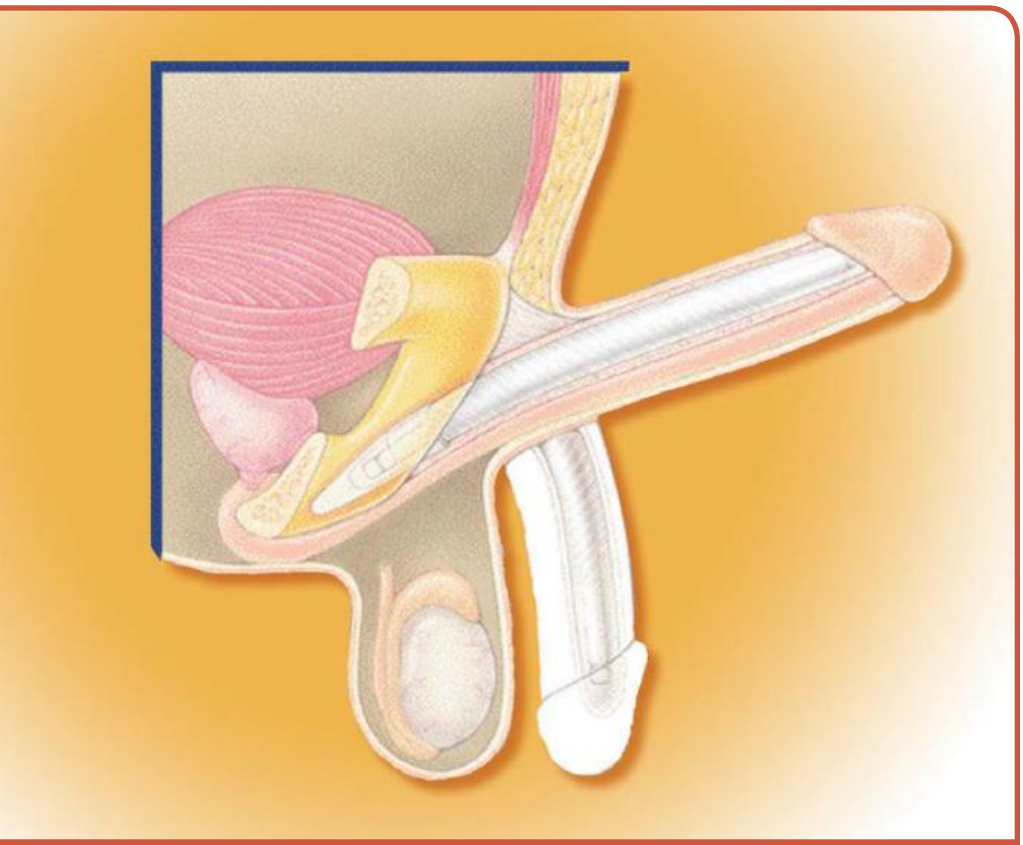
PATHOPHYSIOLOGY

The patient was diagnosed with a malfunctioning penile implant. The patient had an inflatable implant inserted three years prior to this surgery.[11] The implant malfunctioned because the balloon or reservoir was leaking fluid.

The inflatable prosthesis has two silicone rods that are surgically placed inside both sides of the corpus cavernosum of the penis.[9] A pump and a reservoir are attached together with tubes. The balloon or reservoir is filled with liquid and is placed underneath the sartorius muscle and the adductor magnus muscle, the muscles of the groin. The pump lies in the scrotum and is attached with tubing to the reservoir and the silicone rods that are placed in the penis. The implant inflates and the liquid is displaced or transported to the silicone rods in the corpus cavernosum of the penis. The water transports to and from the reservoir

LEARNING OBJECTIVES

- Learn about the procedure for the implantation of a penile prosthesis
- Compare the pros and cons of the different types of penile implants
- Identify the equipment needed to insert a penile prosthesis
- Examine the complications that can occur with a penile implant
- Access the relevant anatomy and physiology associated with this procedure



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and the pump. This action inflates and deflates the penis.[14]

The fluid leak can occur in any part of the prosthesis. This type of complication can occur immediately following surgery. This is due to improper implantation of the prosthesis or a defect in the product. This requires the implant to be replaced by a surgeon.[2] Improper implantation is only one of the problems that can occur with a penile implant. Other complications can include tubing kinks, aneurysm, lack of dilation of the cylinders, breakage of the wire, silicone spillage, loss of rigidity to the prosthesis, erosion of the reservoir, spontaneous deflation, spontaneous inflation, penile curvature or pump or pump reservoir migration. Most male patients receive penile implants in order to treat erectile dysfunction. Medications also can help with ED and surgery is considered a last resort. Erectile dysfunction occurs more frequently in the United States because the life expectancy is rising. It mostly affects males that are 65 and older.[1] "Approximately 25 million American men and their partners are affected by erectile dysfunction, the inability to achieve an erection."[3] There are different causes of erectile dysfunction. The nerves of the penis could be damaged by a pelvic surgery. A prostatectomy is an example of a pelvic surgery that can lead to erectile dysfunction. "Erectile dysfunction is essentially a vascular disease."[1] Some other causes of ED include diabetes mellitus and cardiovascular disease.

Males that suffer from type 2 diabetes have a higher risk of ED, and advancing age increases the risk by more than 15 percent. "It is been estimated that about 35-75% of men with diabetes will experience at least some degree of erectile dysfunction during their lifetime."[13]

The nerves in the penis and the small blood vessels that supply the penis become damaged due to diabetes mellitus. The hormones produced in males may still allow them to feel like they can achieve an erection, but they physically are unable to.[13]

Cardiovascular disease also is associated with erectile dysfunction. In males, smaller blood vessels in the extremities and the penis are the first parts in the body that have poor circulation due to vessel damage. "Studies estimate vascular diseases may be responsible for causing erectile dysfunction in as many as 50 to 70 percent of men who develop the condition." Erectile dysfunction can be a sign of heart disease since it is usually caught first; if males are experiencing erectile dysfunction they should seek medical attention to check for any problems with cardiovascular disease.[12]

DIAGNOSTIC TESTING

A patient history and physical is taken for every patient. For this patient, the physician conducted an H&P and a physical examination. The doctor then inflated the prosthesis to make a diagnosis. An X-ray also was taken. Radiographic studies are done to find any malfunctions in the penile implant. A contrast medium is used to fill the inflatable implant. This allows the doctor to see how the implant is situated and to see if any fluid is leaking from it. The physician will take an X-ray of the implant while it is inflated and then again when it is deflated, allowing the physician to analyze the entire prosthesis system.[2]

RELEVANT ANATOMY AND PHYSIOLOGY

The penis, the male reproductive organ, is composed of spongy tissue and is separated into three parts. The parts are called the corpus. "The cavernous structures of the penis, the two corpora cavernosa are positioned on the dorsal side of the penis and lie side by side.[5] The third corpus is called the corpus spongiosum. The corpus spongiosum is smaller and houses the urethra. The corpus spongiosum eventually forms the glans penis; this is the distal portion of the penis. The corpora cavernosa are surrounded by connective tissue; this attaches the corpus spongiosum to the corpora cavernosa. The foreskin, also called the prepuce, starts at the base of the penis and extends over the glans penis. The foreskin is not thick and does not contain hair.[5] The foreskin can be removed by a circumcision, but it is not necessary.[3] The head of the penis is called the corona. "The urethra passes through the corpus spongiosum and opens to the exterior via a slit-like opening, the external urethral orifice or meatus."[5]

The penis' blood supply comes from the dorsal artery and the central artery. The two central arteries run through the corpora cavernosa and the dorsal arteries are located on the dorsal side of the penis. The veins of the penis are called the dorsal veins and the external pudendal veins. The dorsal veins are located next to the dorsal arteries and the pudendal veins are located at the base of the penis. The dorsal nerve also runs on the dorsal side of the penis.

The process of an erection occurs because of the autonomic nervous system and the arteries and veins of the penis. "Sexual arousal stimulates parasympathetic nerves in the penis to release a compound called nitric oxide, which activates the vascular smooth muscle enzyme guanylyl cyclase."[3] This causes the rise in blood flow into the penis. The blood enters the corpora cavernosa and creates

COMPARING IMPLANT TYPES

The decision about which type of implant is based on a patient's preference and his medical situation. Factors including age, risk of infection, and health conditions, injuries or medical treatments should be considered before a penile prosthesis surgery.[13]

TYPE OF IMPLANT	PROS	CONS
Three-piece inflatable	• Creates a more natural erection than a semirigid implant • Creates a firmer erection than a two-piece implant • Takes pressure off the inside of the penis when deflated, reducing the chance for injury	• Has more parts that could malfunction than any other implant • Requires the most extensive surgery of any implant • Requires a reservoir inside the abdomen
Two-piece inflatable	• Requires a less complicated surgery than the three-piece implant • Creates a more natural erection than a semirigid implant • Takes pressure off the inside of the penis when deflated, reducing the chance for injury	• Requires more extensive surgery than does a semi-rigid implant • Is mechanically more complicated than a semirigid implant • Results in a bulkier scrotum than a three-piece implant • Provides less firm erections than a three-piece implant
Semirigid	• Requires the least extensive surgery of all implant types • Has fewer parts than any other implant, so less chance of malfunction	• Results in a penis that is always slightly rigid • Is more difficult to conceal under clothing than other devices • Puts constant pressure on the inside of the penis, which can cause injury in some men

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an erection.

The external genitalia of the male are the penis and the scrotum. The scrotum contains the testes. The tunica albuginea surrounds each testicle. The tunica albuginea is made up of connective tissue. The tunica vaginalis covers the tunica albuginea and the spermatic cord. The nerves, testicular artery, and testicular vein insert into the testes on the posterior side; the tunica vaginalis does not cover this part of the testicle. Each testicle contains seminiferous tubules. "A large number of convoluted seminiferous tubules lie between the septa of the testis. There are approximately 800 of these tubules."[5] The seminiferous tubules help in the production of spermatozoa. The tubules eventually leave each testicle and enter into the epididymis.[3] The epididymis receives blood from the vessels that branch off of the testicular artery.

The sperm runs through the vas deferens after the epididymis. These eventually form into the seminal vesicle and the ejaculatory duct. The urethra is connected to the ejaculatory ducts and the sperm is emptied into the urethra.

SURGICAL INTERVENTION

The room set up for this specific insertion of a penile implant consisted of a normal set up. The operating table was placed in the center of the room and the anesthesiologist cart was placed at the head of the operating table, above the patient's head. The surgical technologist opened the pack on the back table and began the sterile set up. The surgical team consisted of a surgeon, a surgical first assistant and a surgical technologist. The sterile set up began approximately 20 to 30 minutes prior to the patient's arrival. Some of the supplies opened onto the back table included a Lonestar Retractor, the Dura Hooks to the Lonestar Retractor, Heagar Dilators, the surgeons gloves, suture, #15 blade, bulb syringe, extra Mayo stand cover, Foley catheter tray and instrument sets.

BACK TABLE SET-UP

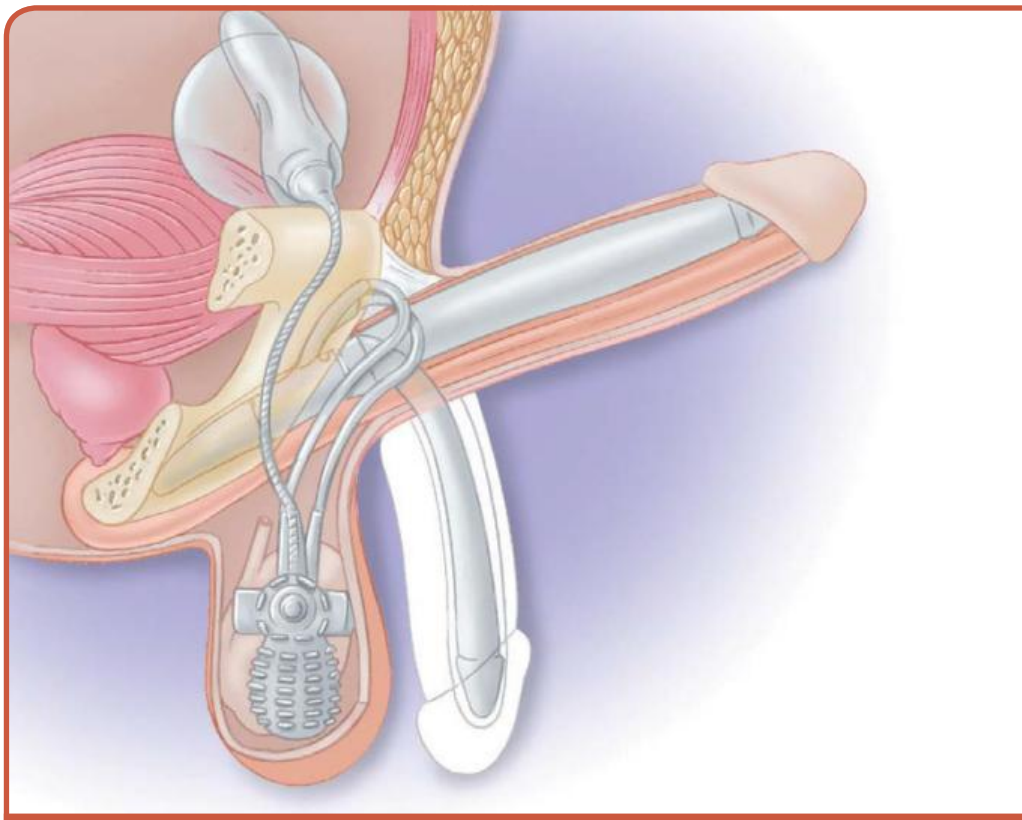
After the supplies were opened, the surgical technologist scrubbed in and began organizing the back table with all of the opened supplies. For this procedure, four blue towels were laid out; two vertically at the end of the table and two horizontally in the middle of the table. This allowed for more durable protection of the sterile field. Two Mayo stands were brought into the room prior to set up. The surgical technologist placed the Mayo stand covers over the Mayo stands. Two blue towels were set out on each of the Mayo stands and tucked in. A blue drape sheet was placed over one Mayo stand in order to prevent lint from getting on the instruments from the blue towels. The basin was moved to the corner of the table and the sharps box, kidney basin, small basin and medicine cups were organized on the table. The surgical technologist checked the indicators on the instrument sets one at a time. The drapes were stacked on the left side of the table and placed in the order that they would be draped on the patient. An extra basin was opened on a single ring stand.

Once everything was organized, the surgical technologist called the circulator over to start the initial count. Both the circulator and the surgical technologist counted the sharps, sponges, suction tip and scratcher. The sharps counted were the suture needles, tip for the electrosurgical pencil, knife blades and the Dura Hooks from the Lonestar Retractor. The circulator wrote down the count on the white board and a sheet of paper. The instruments were not counted during the initial count because the abdominal cavity would not be entered during this procedure. Once the count was complete, the surgical technologist asked the circulator for all of the medications, irrigation, sterile water and alcohol to be poured onto the sterile field. Each solution was poured one at a time and the surgical technologist labeled each basin or medicine cup with the correct name and percentage.

MAYO STAND SET-UP

After the initial count, the first Mayo stand was set up. The surgical technologist removed two Army-Navy retractors, two Mayo clamps, six Allis clamps, two DeBakey forceps, curved Mayo scissors, straight Mayo scissors and the Met-

zenbaum scissors from the instrument set and organized them on the Mayo stand. Two Raytec sponges and the #15 knife blade were placed on the Mayo stand. The Mayo-Hegar needle holder was used to load two 2-0 Vicryl CT-1 sutures, one dyed and one un-dyed, and placed them on the Mayo stand. The second Mayo stand was for the penile implant as well as a right angle clamp, Iris scissors and a retractor. A small basin was filled with irrigation, a mix of saline and polypeptide antibiotic, would help get rid of bacteria in the wound when irrigating it.



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PREPARATION OF THE PATIENT

Once the surgical technologist set up the preoperative sterile field, the patient was ready to be brought into the operating room by the nurse. The nurse introduced the patient to everyone in the room and asked him to state the name of the surgery he was receiving and the site of the surgery. The gurney was then locked and parked next to the operating table. The patient was transferred from the gurney to the table and positioned by the staff. The anesthesiologist gave the patient some oxygen and began to intubate him. After the patient was positioned, the nurse began the patient skin prep.

POSITION AND POSITIONING AIDS

The patient was placed in the supine position. His arms were extended out on padded arm boards at a 90-degree angle bilaterally and restrained with safety straps.[11] The patient's legs were separated in order to allow access to the penis and scrotum. All boney prominences, including the elbows and the heels of the foot were padded with egg crates. Padding also was placed under the patient's head for head support. A blanket was placed over the patient's arms to prevent hypothermia. The patient was an older male so the surgical team was aware of any places on the patient's body that would be prone to pressure injuries. "These areas include the occiput, scapula, olecranon, sacrum, ischial tuberosity and calcaneus."[5] After the patient was positioned, the electro-surgical unit dispersive pad was placed underneath the patient's left lower buttocks.[11]

SKIN PREP AND PREP SOLUTION

Before the skin prep was initiated, the circulator had to shave the patient. The patient's hair on the scrotum and part of the shaft of the penis was removed with clippers. This was done for the peno-scrotal incision.[10] Once the shave was finished, the circulator began the skin prep. A povidone-iodine scrub and solution was used for the prep.[11] A drape was placed in order to cover the anus of the patient to prevent infection. The entire perineal area was prepped. The scrotum and penis were prepped first, starting at the incision site. The prep extended up to the patient's umbilicus and down to the patient's mid thighs. The prep extended laterally down to the operating table on both sides.

DRAPING

The surgical technologist began the draping process along with the surgeon. The surgeon placed one folded blue towel under the scrotum. Then, four folded blue towels, three folded toward the surgical technologist and one folded away, were handed to the surgeon one by one and placed around the patient's surgical site or the pubic area. Once

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the four blue towels were placed by the surgeon, the surgical technologist grabbed and passed the drape. A laparotomy drape was placed on the surgical site; the bottom of the drape was extended over the patient's lower extremities and then the top of the drape was extended toward the patient's head. The anesthesiologist secured both sides of the drape to the IV poles.

SUPPLIES

A small plastic blue drape was needed for the Mayo stand with the implant. A #15 knife blade was needed for the incision and a #10 blade was needed to cut the previous penile implant. The suture was organized on the back table. The suture included: 2-0 Vicryl CT-2 (X3), 3-0 Vicryl SH (X3) and a 4-0 Vicryl PS-1. The suction tubing and the electrosurgical pencil were brought up to the sterile field by the surgical technologist and then the surgeon threw the cord and tube off to the circulator so they could be plugged in. The suction tube and electrosurgical pencil cord were secured to the drape using nonperforating towel clip from the instrument set. One basin set was needed and another sterile basin was opened onto a single ring stand to be used as a bird bath. It was filled with alcohol that was used for the surgical team to dip their hands into. Two bulb syringes were needed for irrigation, and lubricant was used for the Hegar dilators. Other supplies used included pop-up light handles, a needle magnet and a needle counter, gloves for all of the sterile team members, sterile marking pen and labels for labeling the medications used during the procedure, a 10 cc syringe with a 22-gauge needle for the injection of the local anesthetic and a Foley catheter with a drainage unit.[10] A semi-rigid penile implant was also requested by the surgeon since the inflatable implant malfunctioned in the patient. The type of implant used was the AMS Spectra Concealable Penile Prosthesis.

INSTRUMENTS AND EQUIPMENT

A sequential compression device with disposable leg wraps was applied to the patient's legs in order to prevent emboli and thrombi. The suction tube was hooked up to a suction unit. The last piece of equipment included the electro-surgical unit.

A minor instruments tray was necessary for basic instruments used during the procedure. A penile instrument set was also necessary. Heagar dilators were needed to dilate the corpus cavernosum of the penis. The 11/12, 13/14 and 15/16 dilators were used during the procedure. The Lonestar Retractor with Dura Hooks was requested by the surgeon for the retraction of the skin flaps. A caliper was needed to measure the diameter and the length of the corpus cavernosum on both sides of the penis. This was necessary to request the correct size implant. Mayo clamps were used to load the Dura Hooks and to stabilize the Foley Catheter after it was inserted into the penis. Other instruments used during the procedure included a #3 knife handle, Debakey forceps, Weitlander Retractor, straight Mayo scissors, curved Mayo scissors, Allis Clamps, Babcock clamps and Mayo-Heagar needle holders.

MEDICATIONS

A 3% hydrogen peroxide solution was used for irrigation. Normal saline or sodium chloride (1000 cc) was used for irrigation as well. 50,000 units of polypeptide antibiotic and 1 gram of kanamycin were mixed with the normal saline and used as irrigation. A bupivacaine hydrochloride (0.25%) with epinephrine (50 mL) was used for the local anesthetic. The anesthesiologist gave the patient gentamycin and cefazolin through the IV.[11]

PROCEDURAL STEPS

After the patient was brought into the room and prepped and draped, the surgical technologist brought up the first Mayo stand and adjusted it over the patient's legs. Then the back table was brought up to the sterile field and the second Mayo stand was placed by the side of the back table. The suction tube and electrosurgical pencil cord were secured to the drape with a nonperforating towel clip and the holster for the electrosurgical pencil was secured to the Mayo stand with the scratcher attached to it. The sterile basin filled with 70% isopropyl alcohol was brought up to the field and all of the team members dipped their hands in the alcohol. The surgical technologist provided the Foley catheter with lube on the tip for easy insertion. The catheter was secured to the drape with a Mayo clamp because it needed to stay sterile throughout the entire case so the surgeon can easily identify the urethra.

After the Foley was secured, the surgical technologist provided the 10cc syringe for the injection of the local anesthetic. Bupivacaine hydrochloride (0.25%) with epinephrine was used for the local anesthetic. As the surgeon injected the anesthetic at the base of the penis, the surgical technologist verbalized to the circulator the amount of local anesthetic used and then placed two laparotomy sponges on the field. The syringe with the needle on it was prepared and it was placed next to the sharps box on the back table. Then the surgical technologist provided the #15 knife blade and the surgeon made an incision at the base of the penis on the dorsal side that was approximately four centimeters in length. The surgeon cut through the subcutaneous tissue and the connective tissue of the penis using the electrosurgical pencil and smooth tissue forceps. Hemostasis was achieved with laparotomy sponges. The thin layers of subcutaneous and connective tissue were dissected and the Weitlander Retractor was positioned for better visualization so the surgeon could identify the structures of the penis. The tunica albuginea was then dissected with the electrosurgical pencil and the corpora cavernosa was exposed.

> A penile prosthesis is usually the last option for men that suffer from erectile dysfunction. There are other, safer options that a man can do before having surgery.

After the Weitlander Retractor was removed, the surgeon placed the Lonestar Retractor around the wound. The Dura Hooks were loaded and passed to the surgeon on Mayo clamps and the surgeon carefully placed eight hooks for retraction.

After the retractor was placed, the previous implant was identified. The surgeon cut the right side of the inflatable prosthesis and removed it. The surgeon placed a 2-0 Vicryl CT-2 dyed suture on the right side. This suture was placed as a stay suture. The straight Mayo scissors were used to cut the suture. The dilators were soaked in the warm saline with a polypeptide antibiotic and then dipped in a lubricant. The surgeon removed the other side of the implant (left side) and once both sides of the prosthesis were removed, it was placed in the kidney basin and passed off to the product rep. The surgical technologist provided the 3-0 Vicryl SH un-dyed suture on a needle holder so the surgeon could place the stay suture on the left side. After the stay sutures were placed, the surgeon irrigated the wound to prevent infection. The surgical technologist had two basins for two different medications; one basin contained 3% hydrogen peroxide solution and the other contained polypeptide antibiotic mixed with saline. These were used for irrigation. The surgeon then irrigated the corpora cavernosa and alternated between both irrigates.

The surgeon started with an 11/12 Heagar dilator and then used a 13/14 dilator to obtain an accurate measurement of the corpora cavernosa. When the corpora cavernosa was dilated, the surgeon took the distal and proximal measurements. The measurements were added and the correct size semi-rigid prosthesis was obtained by the rep. The surgical technologist provided the surgeon with the antibiotic and he applied the antibiotic with a bulb syringe.

Before the surgeon began to place the new implant in the patient, he had the sterile team dip their hands in the

basin with alcohol. The irrigation basin was used to sterilize both sides of the prosthesis before insertion. The Lonestar Retractor and the Dura Hooks were removed and the surgical technologist loaded a 2-0 Vicryl CT-2 suture on a needle holder and passed it to the surgeon with smooth tissue forceps. This suture was the dyed suture and it was placed on the same side as the other dyed suture (right side). The surgical technologist provided the first assistant with the straight Mayo scissors. Then the surgeon performed the same actions on the left side. The skin was closed with 4-0 Vicryl PS-1 suture and the surgical technologist initiated the final count.

Adhesive strips were cut in half for placement on the wound. Dressings were then placed over the adhesive strips. The surgical technologist placed the bandage rolls over the dressings and then taped them to the patient with two-inch paper tape. These materials were used for penile support.

POSTOPERATIVE CLEANUP

The drape was removed in order to wipe off the patient. A wet sponge cleaned up the prep and blood and another sponge dried off the patient. The surgical technologist began the cleanup process while the anesthesiologist woke the patient. All instruments were gathered and placed in the case cart for sterilization. By the time the surgical technologist was finished gathering the instruments, the patient was ready to be transferred to the gurney. The surgical technologist was in charge of moving the feet of the patient. Once the patient was transferred, the surgical tech finished the cleanup.

SPECIAL CONSIDERATIONS

The patient was not obese or a diabetic. A sequential compression device was placed under the operating table and disposable leg wraps were placed on the patient's legs to prevent embolus formation and thrombus formation.

Another consideration is that there was an implant placed in the patient. The circulator recorded these all of these descriptions in the patient chart. The chart read, "Procedure Implants, OR description: AMS Spectra Concealable Penile Prosthesis, diameter 14 mm, length 20 mm, total quantity: 1, Lot number: 637210005, catalog number: 720056, and site implanted: penis."[11]

COMPLICATIONS

In this case, the patient had no intraoperative or postoperative complications while he was at the hospital. Possible complications can include hemorrhaging, surgical site infection, malfunctioning implant and injury to nearby structures such as the urethra, blood vessels, testicles and nerves of the penis. Infection is a major complication that must be considered during this procedure. A surgical site infection occurs in about five percent of patients who undergo a penile implant surgery for the first time. However, the risk almost doubles if the patient is replacing a previous implant. This may require the patient to go through another surgery to fix the problem if antibiotics do not clear the infection.[8]

Newer models have fewer problems, but a penile implant can malfunction over time. According to statistics, "85% or more are working well 5 years after implantation and 67% are working at 10 years."[8]

POSTOPERATIVE CARE

The patient was transported from the operating table to the gurney and was transported to the PACU. A jock-strap and gauze dressing was in place when the patient arrived in the PACU. The anesthesiologist then assessed the patient based on the Aldrete scale. The patient was assessed right away and every fifteen minutes afterward for a total of one hour.[12]

The patient's pain was controlled with oral medications and needed oxygen immediately after surgery to maintain a level of 90% oxygen saturation. Fifteen minutes after surgery his oxygen saturation was at 97%. The patient's vital signs were then compared with his preoperative values. His blood pressure and his pulse rate were both within 20% of his preoperative values. His blood pressure was 97/71 and his pulse rate was 88 beats per minute.[12]

The patient was ready to be released after one hour. His dressings remained clean and dry and the patient was discharged to his wife.

OTHER OPTIONS BESIDES SURGERY

A penile prosthesis is usually the last option for men that suffer from erectile dysfunction. There are other, safer options that a man can do before having surgery. Medications can be taken orally by the patient. These medications raise the amount of nitric oxide in the body which produces an erection. However, they do cause certain side-effects and a physician will decide what medications, if any, the patient can take to help with erectile dysfunction. Low hormone levels also may have an effect on the ability to produce an erection. In this case, the physician may put the patient on the hormone testosterone. Penis pumps are also an option for the male patient. The pump works like a vacuum to bring blood through the corpora cavernosa, which creates

an erection. After the erection occurs, a ring is placed at the base of the penis in order for the man to keep his erection.[7]

ABOUT THE AUTHOR

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