

Orchiopexy

Orchiopexy, also known as orchidopexy, is a surgical technique that can correct cryptorchidism and was successfully performed for one of the first times in 1877 in Scotland. Cryptorchidism, a condition where one or both of the testicles fail to descend before birth, is one of the most common male genital birth defects, affecting approximately 2 to 8 percent of full-term male infants, and around 33 percent of premature infants. Typically in the womb, male testes form within the abdomen, then descend into the scrotal area between twenty-five to thirty-five weeks' gestation. If one or both testicles fail to descend before birth, physicians use orchiopexy to surgically relocate the undescended testes to their normal position in the scrotum. According to many researchers, most cases of cryptorchidism do not resolve on their own, and therefore, orchiopexy surgery is often necessary. Orchiopexy, when performed before puberty, can decrease the risk of testicular cancer and infertility associated with cryptorchidism.

In the 1700s, surgeons Albrecht von Haller from Bern, Switzerland, and later, John Hunter from Glasgow, Scotland, established the theoretical framework that eventually led to the advent of orchiopexy. In 1755, von Haller described the origin of the testes in fetal development. Later, in the 1760s, Hunter made further observations about the timing of fetal testicular descent and recommended waiting for the testicles to descend for a period of time following birth before turning to medical intervention. Because orchiopexy did not exist around that time, doctors would either completely remove the undescended testes, or instruct the patient to wear a truss. A truss is an undergarment that can be used to support protruding tissue caused by undescended testes, since fetal testes normally displace surrounding tissue as they descend. Discomfort caused by displaced tissue is a symptom of cryptorchidism, although the main symptom of cryptorchidism is visible absence of one or both testicles. While some of the early beliefs and observations about cryptorchidism were inaccurate, further anatomical examination of fetuses of varying gestational ages demonstrated knowledge that eventually resulted in orchiopexy as it is modernly known. As of 2020, scientists generally agree that normal testicular descent happens in two stages. The first stage happens between eight to fifteen weeks of pregnancy, where the testes move from the back of the torso to the groin area, or the general area where the torso ends and the legs begin. The second stage happens from twenty-five to thirty-five weeks of pregnancy, where the testes move from the groin to their final position hanging in the scrotum.

Some of the first attempts at orchiopexy began in the early 1800s but were not recorded until later in the century. One of the first documented attempts of orchiopexy was done in 1871 by James Adams, who was a senior assistant surgeon at the London Hospital in London, England. Adams operated on an eleven-week-old infant because he stated that early operation could prevent chronic pain and the loss of fertility caused by deterioration of the undescended testicle. Although Adams successfully relocated the testicle into the scrotum, the infant developed a wound infection three days later and died. During the 1870s, antibiotics did not exist and infection from minor surgical procedures commonly resulted in death. The risk of fatal infection was greatly reduced with the invention of an antiseptic wound dressing technique that was developed in the 1860s by surgeon Joseph Lister, who worked at the University of Edinburgh in Edinburgh, Scotland. Using that antiseptic technique, Lister's colleague Thomas Annandale performed one of the first successful orchiopexies on a three-year-old boy in 1877.

From the nineteenth century to the twenty-first century, physicians have continued improving orchiopexy procedures, and, as of 2020, it is usually completed in one or two stages through laparoscopy. For laparoscopic procedures like orchiopexy, a surgeon makes a small incision on the patient's abdomen and inserts a thin tube with a camera attached to enable the surgeon to see

the inside of the body. If laparoscopy reveals that the undescended testicle is near the groin area, the physician will complete a standard one-stage orchiopexy. If the undescended testicle is located high in the abdomen, such as near the kidneys, the surgeon will clip and divide the supplying blood vessels to the testicle during the first procedure to reduce blood supply. A second surgery is usually completed three to four months later, after the testicle forms a new blood supply, which creates a safer relocation. Because x-rays cannot reliably tell a physician whether the undescended testicle is in the abdomen or not, surgery is generally the only way a physician can accurately determine whether the procedure will require one or two steps.

The single-step orchiopexy is a same-day procedure that usually lasts around one hour per testicle. After administering an anesthetic, the physician makes small keyhole-like incisions on one or both sides of the groin, and then inserts a laparoscope into the incision to enable the surgeon to locate the undescended testicle or testicles. Once they locate the testicle, the surgeon may rarely remove the testicle entirely if they determine it is severely damaged. Otherwise, the surgeon will proceed in moving the testicle to the scrotum. Once the physician repairs or removes any extra protruding tissue in the scrotal area, the surgeon relocates the testicle by first making a second incision inside of the scrotum. That incision makes a pocket for the testicle, which the physician then internally guides and fixes in place, often securing it with sutures.

When conducted before puberty, orchiopexy is generally associated with a decreased risk of testicular cancer. Around 5 to 10 percent of all men diagnosed with testicular cancer have a history of cryptorchidism. While there are disagreements on the origin of testicular cancer and the overall impact of orchiopexy, there have been studies that have looked at creating a causal link between age of orchiopexy and instances of testicular cancer. For example, in 2007, a group of physicians investigated the risk of testicular cancer in 16,983 men who underwent surgical treatment of undescended testes between 1964 and 1999. Men who underwent orchiopexy after the age of thirteen were twice as likely to get testicular cancer than men who underwent orchiopexy before the age of thirteen. The authors claimed that most boys generally undergo puberty around the age of thirteen. Despite the promise of early surgical intervention, the authors claimed that it is important to note orchiopexy does not eliminate all risks of testicular cancer. Similar results obtained by many additional smaller studies suggest that puberty is a crucial event in the development of testicular cancer, although, as of 2020, the reasons why are not completely understood by researchers.

As of 2014, the American Urological Association recommends that boys with cryptorchidism undergo orchiopexy anywhere from six to eighteen months of age. Several researchers have corroborated those recommendations based on evidence that sex cell development may begin to deteriorate in undescended testes after one year of life. The abnormal sex cell development could lead to inadequate amounts of sperm produced, potentially resulting in infertility. Additionally, researchers suggest that the risk of infertility caused by a lack of sperm increases with age in males with cryptorchidism. Another theory claims that internal body temperature negatively affects the ability for the testes to produce sperm. Normal testicular temperature is lower than average body temperature and is ideal for sperm production, meaning that undescended testicles can suffer from thermal injury that might not be improved even if orchiopexy is done as early as one year of age. While physicians often identify most cases of cryptorchidism while the patient is in infancy, sometimes men may not learn about an undescended testicle until they seek out fertility help later in life. At that point, many physicians must remove the testicle entirely and determine if there are any indications of cancer as a result.

Though there is some disagreement among researchers on an ideal age for orchiopexy, existing evidence suggests that orchiopexy generally lowers the risk of infertility in males with cryptorchidism. Males with both testicles undescended, or bilateral cryptorchidism, are much more likely to suffer from fertility issues than males with only one undescended testicle, or unilateral cryptorchidism. Without surgical or hormonal treatment, up to 89 percent of adult males with bilateral cryptorchidism have a complete or nearly complete lack of viable sperm. In comparison, in men with bilateral cryptorchidism treated with orchiopexy in childhood, at least 28 percent of those men possess enough sperm to impregnate a fertile woman without additional medical intervention. While orchiopexy improves fertility in both unilateral and bilateral cryptorchidism cases, it is not a guarantee a man is or will be fertile later in life.

Sources

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