

# Nonsurgical Treatment of Varicocele

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## Abstract

An estimated 70,000 to 80,000 men in American undergo surgical correction of a varicocele annually. Varicocele embolization is a highly effective, non-surgical procedure that is a widely available, but underutilized technique in this country.

## Introduction

Varicocele, the presence of varicose veins of the pampiniform plexus, has been the source of much controversy in the medical literature. It has been called the commonest correctable cause of male infertility, and is known to cause pain, and testicular atrophy in some patients. Tulloch first described surgical correction of varicocele in 1952<sup>1</sup>. Now, almost 50 years later, open surgery is still the most common method of varicocele repair in the U.S.A. by a wide margin.

Varicocele embolization is a newer, non-surgical method of correcting varicocele. This catheter-based technique is performed by interventional radiologists, and has some potential advantages over open surgical treatment.

## Pathophysiology of Varicocele

Approximately 10% of all men have varicoceles. Most are asymptomatic and many are not associated with infertility. Infertility is defined as no pregnancy

after 1 year of unprotected intercourse. Among infertile couples, the incidence of varicocele increases to 30%<sup>2</sup>.

Varicoceles most commonly occur on the left side of the scrotum due to absent or incompetent valves in the left internal spermatic vein (ISV), and reflux of blood down the vein in the upright position. On physical exam, large varicoceles are visible, palpable, and increase in size with the Valsalva maneuver. Engorgement of the left pampiniform plexus and venous collaterals in the scrotum lead to elevated scrotal temperature, which may result in decreased sperm count, abnormal sperm motility and morphology<sup>3,4</sup>. The commonest semen abnormality in patients with varicocele and infertility is poor sperm motility (less than 60% motile forms), followed by abnormal morphology, and to a lesser extent, depression of sperm count below the normal World Health Organization (WSHO) value of 20 million/ml<sup>2</sup>. This has been referred to as a "stress pattern".

In adolescent boys, varicoceles are often discovered incidentally by a pediatrician or during a sports physical. They may cause pain and testicular atrophy that is reversible after repair<sup>5,6</sup>.

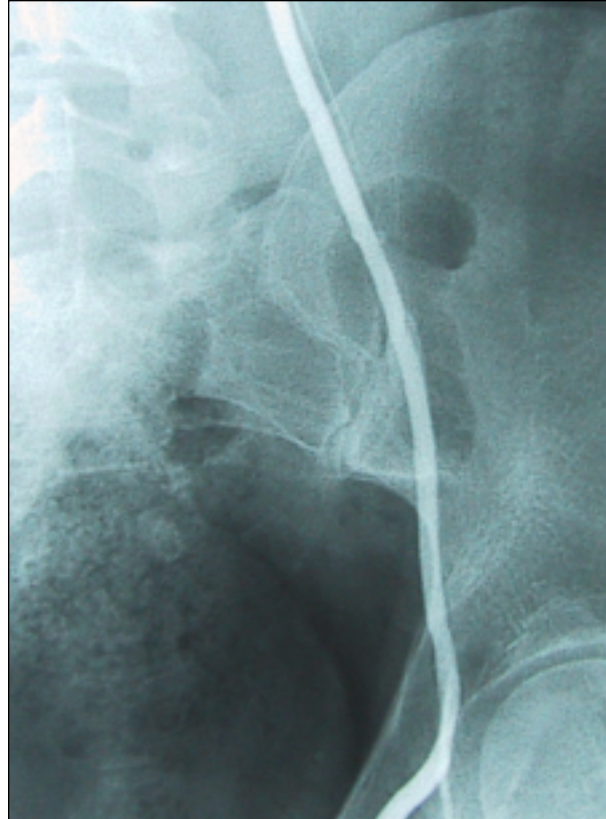
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**Figure 1a:** Contrast injected via a catheter in the left renal vein refluxes down the internal spermatic vein (ISV).



**Figure 1b:** Contrast injected into the upper ISV refluxes down into the scrotum indicating a varicocele.

## Diagnosis of Varicocele

Large varicoceles are often visible as a "bag of worms" appearance of the scrotum, especially in the upright position. The spermatic chord may be thickened on palpation. There are three clinical grades. Grade I is palpable only with valsalva maneuver. Grade II, a moderate varicocele is palpable without valsalva and Grade III is a large varicocele that is visible without palpation<sup>7</sup>.

High resolution and color flow ultrasound can be useful in evaluating varicocele patients. Accurate diagnosis of testicular atrophy is straightforward, and ultrasound can be used to detect smaller subclinical varicoceles<sup>8-11</sup>. Repair of these smaller varicoceles is controversial, but there is evidence that results of treatment are as good as the results of repair of clinical varicocele<sup>9,12,13</sup>. Ultrasound can also be used to evaluate the success of varicocele repair.

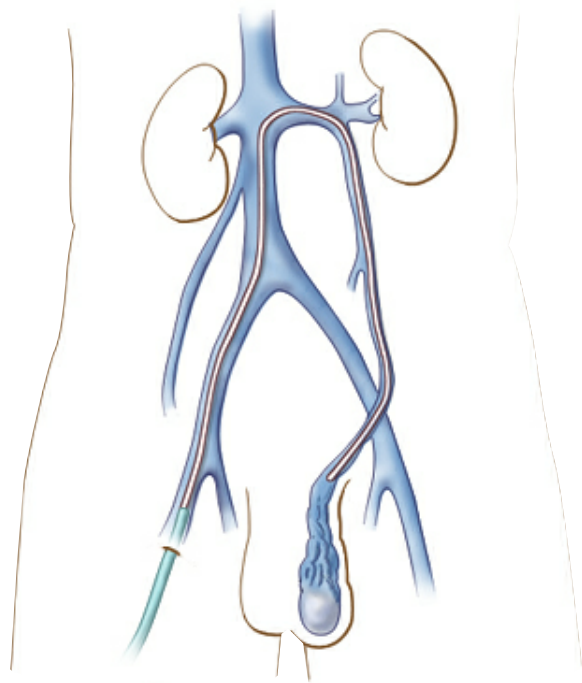
## Techniques of Varicocele Repair

### *Surgery*

Surgical repair of a varicocele is usually performed as outpatient surgery under general anesthesia. An incision is made, and the ISV or its branches are located and ligated, to divert blood flow into other normal veins in the pelvis. The incision may be retroperitoneal ("high ligation") inguinal, or subinguinal. Laparoscopic ligation of the ISV is not widely performed. Care must be taken to ligate all branches of the vein in order to avoid post surgical recurrence or persistence of the varicocele. After vein ligation, the layers of the abdomen, or scrotum are sutured in standard fashion. The patient is recovered, and usually can go home later in the day.

### *Embolization*

Varicocele embolization is performed using mild IV sedation and local anesthesia. It is an outpatient procedure. A small angio catheter is introduced into the venous system either via the right femoral vein, or



**Figure 2a:** A catheter is passed from the right femoral vein, up the vena cava, into the left renal vein, and down the left ISV.

the right jugular vein. The catheter is guided with the aid of fluoroscopy into the left renal vein (in the case of the more common left varicocele) and a contrast venogram is performed. A selective ISV venogram is then performed, and serves as a "road map" for embolizing the vein. The catheter is then maneuvered down the vein to the level of the internal inguinal ring. Usually the vein or its branches are embolized by injecting steel or platinum spring-like embolization coils (Figure 1A and 2B). The vein is blocked at the internal inguinal ring level, at the sacroiliac joint level, then in the upper one-third of the vein. In effect the incompetent vein is "tied off" internally, accomplishing what the urologist does, but without surgery.

Right-sided varicoceles are embolized with the same basic technique. Detachable silicone balloons can be used to block the vein with equal effect<sup>5,14</sup>, and various liquid sclerosing agents may also be injected (with caution) to successfully cure varicoceles<sup>15-19</sup>. A completion venogram is performed to insure that all branches of the ISV have been blocked, then the catheter is withdrawn. Manual pressure is applied to the puncture site for 10 minutes to achieve hemostasis. No sutures are used. The patient is observed for a few hours then discharged home.



**Figure 2b:** With the catheter tip near the internal inguinal ring, an embolization coil is deposited. More coils will be placed higher in the vein.

## Discussion: Controversies in Varicocele Management

It is well known that the swelling and pain associated with large varicoceles are reduced after varicocele repair<sup>5,20</sup>. The first controversy is whether varicocele is associated with male infertility. This is a difficult question to answer because many infertile couples are unwilling to submit themselves to randomized trials. It has been shown in multiple studies, however, that male partners of infertile couples do have an increased incidence of varicocele (20-40%) when compared with men in general, in whom the incidence of varicocele is no greater than 10%<sup>21</sup>. Nagao et al. showed that men with varicocele (whether infertile or not) had abnormal semen analysis and increased baseline gonadotropins on average when compared to normal fertile men. They concluded that varicocele is associated with some degree of testicular dysfunction regardless of fertility status<sup>22</sup>.

The secondary controversy is linked to the first: does infertility improve after varicocele repair? Some studies have suggested there is no improvement<sup>23</sup>. Many other studies have shown a significant



**Figure 3:** After embolization is complete the coils block flow into the varicocele.

improvement in semen analysis and pregnancy rates after varicocele repair. A meta-analysis of 65 studies by Schlessinger et al. found an average pregnancy rate of 37% in infertile couples in whom surgical varicocelectomy was performed. Okuyama compared semen analysis and pregnancy rates for men with corrected varicocele, with a control group with uncorrected varicocele. The treated group had significant improvement in both<sup>23a</sup>. In a randomized trial, Laven et al. noted significant improvement in semen analysis in patients treated with embolization versus a control group<sup>24</sup>.

The third controversy, which seems to be resolving as more series are reported, is whether varicocele embolization is as safe and effective as varicocele surgery. Reviewing seven studies that directly compare open surgery versus embolization, embolization was found to be equal to surgery in

ultimate pregnancy rate. Significant improvement in semen analysis was equal in four studies, with one showing superiority of surgery, and one superiority of embolization. The recurrence rate of varicocele ranged from 2% to 11% for embolization and 0% to 45% for surgery<sup>25-31</sup>. One of the studies compared cost of surgery versus embolization and found them equivalent<sup>30</sup>.

These studies also revealed some potential advantages of embolization over surgery. There was a general trend of lower morbidity with embolization overall. Dewire et al. and Feneley et al.<sup>26</sup> analyzed the length of time until resumption of full activity after embolization versus surgery. They found an average of 2 days for complete recovery for embolization and 2-3 weeks for surgery<sup>26,30</sup>. Dewire found 24% of surgical ligation patients required overnight hospital stay, but no embolization patient did<sup>30</sup>.

Other potential advantages of embolization vs. surgery include: no need for general anesthesia, and no incisions, sutures, or reported infections. Also, bilateral varicoceles can be treated with embolization from a single femoral venipuncture, whereas surgery requires two separate incisions.

Fenely et al. questioned patients who had undergone both surgical ligation and embolization as to preference. All preferred embolization<sup>32</sup>.

Despite the equivalence or potential advantages of embolization vs. open surgery it is likely that 99% of varicocele repair in the U.S. is performed surgically. Dewire et al. informed patients of the option of choosing embolization versus surgery and noted that about half chose embolization<sup>30</sup>. From this we may conclude that most American men are not being informed about the option of varicocele embolization, although it is now widely available.

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