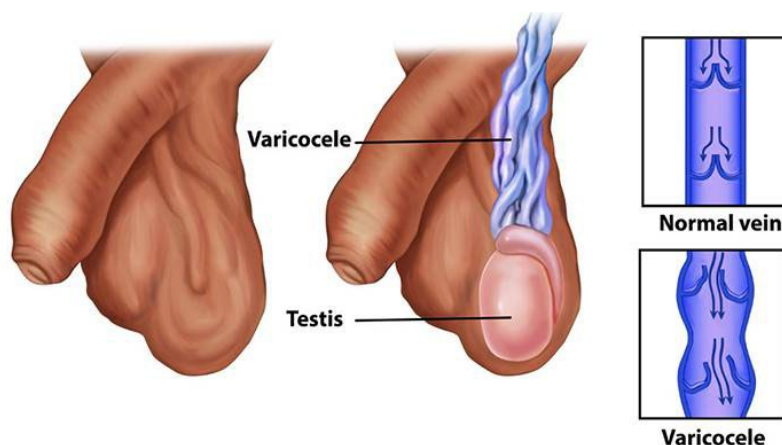


Varicoceles

This handout explains what a varicocele is and how it can potentially affect fertility in men. **For an electronic copy of this brochure and more information on Male Fertility, we encourage you to visit our website at www.MensHealthIN.com/services/male-infertility.** There we have several educational resources including video content and other handouts. If you ever have any questions or concerns, please feel free to call the Men's Health Center at (317) 564-5104.

What is a varicocele?

A varicocele is an abnormal dilation of the spermatic veins that drain the testicle. Although varicoceles are asymptomatic in ~80% of men who have them, they can be associated with discomfort and a progressive decline in testicular sperm and testosterone production in ~20% of men. Varicoceles are the most common identifiable cause of male infertility worldwide. Although varicoceles are present in ~15% of the normal male population, they are found in up to 40% of patients with male infertility. For infertile men with a prior history of normal fertility (also known as secondary infertility), a varicocele is the cause in up to 70% of cases.



What causes varicoceles?

The testicles are paired male genital organs that produce both sperm and the male hormone testosterone. The epididymis is a small, tubular structure attached to the testicle that serves as a reservoir where the sperm mature and are stored.

The vas deferens connects to the epididymis and is the tube through which sperm travel during ejaculation. The vas deferens is a part of a larger tissue bundle called the spermatic cord that also contains blood vessels, nerves, and lymphatics coming from the testicle. The veins of the spermatic cord are known as the pampiniform plexus, and it may become tortuous and dilated (like varicose veins in the leg). A scrotal varicocele is simply a varicose enlargement of the pampiniform plexus around the spermatic cord above the testicle. The other two veins that drain the testicles (cremasteric and deferential) are rarely involved in the varicocele process.

How are varicoceles classified?

Varicoceles are thought to be more common on the left than on the right because the left and right testicular veins drain into different blood vessels as they carry blood back to the heart. The left testicular vein is much longer than the right and exits from the renal vein. The right testicular vein exits from the vena cava, which is a larger vessel with greater upward flow compared to the renal vein that the left testicular vein drains into.

Grade	Examination
Subclinical	Not visible, not palpable
Grade I	Palpable varicocele detected upon Valsalva maneuver, not visible
Grade II	Palpable varicocele detected while standing up, not visible
Grade III	Large visible varicocele while standing up

Varicoceles vary in size and can be classified into three groups: large (Grade 3), moderate (Grade 2), and small (Grade 1). It is debatable whether or not the size of the varicocele correlates to the potential degree of changes in sperm and testosterone production. However, it is important to remember that all varicoceles have the potential to affect both processes regardless of size. In addition, many infertile males will have bilateral varicoceles. More importantly, a one-sided varicocele can still have an effect on the opposite testicle.

Several theories have been proposed to explain the harmful effects of varicoceles on sperm quality. These include the possible effects of pressure, oxygen deprivation, heat injury, or retrograde flow of toxins. The theory of elevated heat causing impaired circulation appears to be the most reproducible defect. Regardless of the mechanism, a varicocele is indisputably a significant factor in decreasing testicular function and worsening semen quality in a large percentage of men seen for infertility.

How are varicoceles diagnosed?

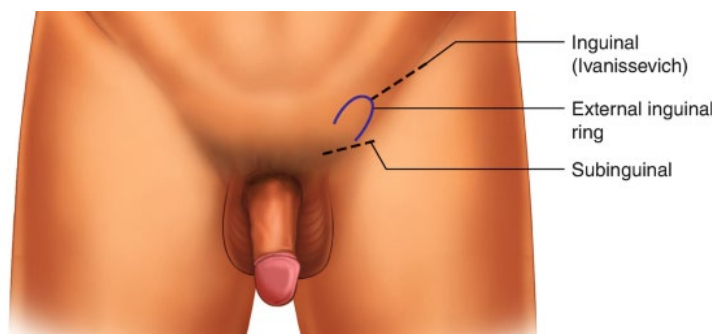
Because of its potential role in causing testicular damage, it is important to confirm or rule out the presence varicocele on physical examination. If present, the reasons for surgical correction include pain, impairment of testicular function, or significant loss of testicular size. The mere presence of a varicocele does not mean that surgical correction is necessary.

Often, when a patient is being seen primarily for a male fertility evaluation and a varicocele is identified, that varicocele is asymptomatic. However, upon reflection some men may complain of an occasional pain or heaviness in the scrotum.

Careful physical examination remains the primary method of varicocele detection. It is important for men to be examined in the standing position while performing a Valsalva maneuver (i.e. coughing or taking a deep breath and bearing down) in order to magnify any small varicoceles that may be present. When varicoceles are difficult to diagnose or anatomy is more challenging, high-resolution color-flow Doppler ultrasonography of the scrotum may be utilized. However, doppler ultrasound is not recommended outside of these circumstances.

How are varicoceles repaired?

There are several commonly used surgical approaches for the correction of a scrotal varicocele. Under routine conditions, we prefer the either the inguinal (groin) or sub-inguinal approach utilizing an operating microscope to ensure precise identification of all contributory veins and the testicular arteries.



All spermatic veins are permanently tied off to prevent continued abnormal blood flow. This forces the testicle to drain blood through a second set of testicular veins known as the gubernacular veins. Unlike the spermatic veins that contribute to varicoceles, the gubernacular veins drain along the outside of the scrotum and radiate heat away from the body quite effectively.

With our preferred inguinal or subinguinal approach, a 1-2 inch incision is used. Men return home the same day with prescriptions for comfort and frequently return to work in a few days. Two weeks of recovery and avoidance of strenuous activity is recommended.

The side effects following this type of varicocele repair are remarkably low. There is less than 1% risk of hydrocele (fluid around the testicle), 1% risk of hematoma and/or superficial wound infections, and small risk of recurrent varicocele.

The retroperitoneal approach is rarely used in modern practice as it is more invasive with lower success rates compared to the inguinal and sub-inguinal microscopic approaches. The laparoscopic route, although commonly used by pediatric urologists even today, carries a greater risk of recurrence and hydrocele (swelling around the testicle) compared to the inguinal and sub-inguinal microscopic approaches. Consequently, we do not typically utilize this approach in our practice.

An alternative approach for repair that we do utilize in our practice is that of varicocele embolization. Varicocele embolization is not performed by a urologist with microsurgical training, but is instead performed by an interventional radiologist. This is a physician who specializes in image-guided procedures. Varicocele embolization is performed via a percutaneous trans-venous route, usually through the upper thigh. This allows the problematic veins to be accessed and blocked internally. This is compared to surgical repair, which allows a surgeon to block them externally.

The relative efficacy of varicocele embolization compared to microsurgical varicocele repair for the treatment of male fertility is a topic of significant debate. Currently, we recommend microsurgical repair for most of our fertility patients. However, embolization is quite effective for pain relief. Consequently, it has become our treatment of choice for men seeking medical care for painful varicoceles.

How effective is varicocele repair? What kind of outcome should I expect?

Although the mechanisms whereby varicoceles cause impairment in sperm production and semen quality remain theoretical, the statistical association between varicocele and male infertility is unquestionable. Furthermore, improvement in semen quality after varicocele correction has been repeatedly demonstrated.

The resulting improvement in semen quality occurs in close to 70% of patients, and the pregnancy rate is as high as 40%. Correction of varicoceles has been shown to *improve sperm motility, density, and* specific functional sperm defects including oxidative damage (ROS) and breaks in DNA. Studies have also shown the return of motile sperm after varicocele repair in patients who have complete absence of sperm on semen analysis (azoospermia). Varicocele treatment improves pregnancy and live birth rates among couples undergoing intrauterine insemination (TUI) and in vitro fertilization (IVF) with intracytoplasmic sperm injection (ICSI) for male factor infertility. The chance of miscarriage is decreased if varicoceles are treated before assisted reproduction.

On average, pregnancy occurs 6-7 months following surgery which is when most men will see an improvement in their semen analysis. However, some men may improve their counts sooner, so the first semen analysis is usually obtained at 3-4 months. Generally speaking, spermatogenesis (the formation of sperm) takes about 3 months for mature sperm to develop but the temporary swelling that's involved in the surgical healing process can delay improvement until 6-7 months. The scrotal varicocele remains the most correctable factor when treating for semen quality. Therefore, when present in the infertile male who

demonstrate abnormalities of semen quality, surgical correction should be strongly considered.

Who should I call if I have any questions or concerns?

If you ever have any questions or concerns, please don't hesitate to call the Men's Health Center at (317) 564-5104. If you want to learn more about male fertility, please visit our website at www.MensHealthIN.com/services/male-infertility. There we have several educational resources including video content and other handouts. If you still need to schedule your consultation, call our scheduling office at (877) 362-2778 to make your appointment today!

Relevant Research

1. Varicolectomy improves intrauterine insemination success rates in men with varicocele. Daitch JAI, Bedaiwy · MA, Pasqualotto EB, Rend.in BN, Hallak J, Falcone T, Thomas AJ Jr, Nelson DR, Agarwal A. *J Urol.* 2001 May;165(5):1510-3.

Purpose: We determined whether varicocele treatment before intrauterine insemination significantly affects intrauterine insemination success rates.

Materials and methods: A total of 58 infertile couples, of whom the women had normal evaluations and men had abnormal semen analyses and a history of varicocele, were included in this study. They were identified after reviewing the charts of all women undergoing intrauterine insemination for male factor infertility at our center. Of the men 24 participated in 63 intrauterine insemination cycles without varicocele treatment, while in the remaining 34 varicocele was treated before a total of 101 intrauterine insemination cycles. Variables associated with pregnancy or live birth were analyzed using repeat measures logistic regression with generalized estimating equation techniques. An initial stepwise generalized estimating equation was performed without including varicocele treatment status. Subsequently varicocele treatment status and the significant associated factors were included in analysis. The semen characteristics of untreated and treated varicocele groups were compared with repeat measures analysis of variance.

Results: On pre-wash semen analysis patients with untreated varicocele had significantly higher mean motility plus or minus standard error than patients whose varicoceles were treated (48.6% +/- 2.3% versus 38.1% +/- 1.8%, $p = 0.02$). However, no statistically significant difference was noted in the mean post-wash total motile sperm count in the treated and untreated groups (7.2 +/- 1.0 versus 14.8 +/- 2.6, $p = 0.1$). Despite these findings the pregnancy and live birth rates per cycle were significantly higher in patients in whom varicocele was treated than in those without varicocele treatment (11.8% versus 6.3%, $p = 0.04$ and 11.8% versus 1.6%, $p = 0.007$, respectively).

Conclusions: Varicocele treatment may not improve semen characteristics in all men but it appears to improve pregnancy and live birth rates among couples undergoing intrauterine insemination for male factor infertility. A functional factor not measured on routine semen analysis may affect pregnancy rates in this setting. Men should be screened for varicocele before intrauterine insemination is initiated for male factor infertility.

2. Clinical outcome of intracytoplasmic sperm injection in infertile men with treated and untreated clinical varicocele.

Esteves SCL, Oliveira FV, Bertella RP. *J Urol.* 201 Oct;184(4): 1442-6.

Purpose: We evaluated the impact of varicolectomy on intracytoplasmic sperm injection outcomes in infertile men with clinical varicocele.

Materials and methods: We studied 242 infertile men with a history of clinical varicocele who underwent intracytoplasmic sperm injection. Of the men 80 underwent prior subinguinal microsurgical varicolectomy (treated group 1) and 162 had any grade of clinical varicocele (untreated group 2) at sperm injection. We compared semen

analysis results before and after varicocelectomy, and the sperm injection procedure outcomes. Mean time from surgery to sperm injection was 6.2 months. Logistic regression was done to verify whether varicocelectomy influenced the odds of clinical pregnancy, live birth and miscarriage.

Results: We noted an improved total number of motile sperm (6.7×10^6 vs 15.4×10^6 , $p < 0.01$) and a decreased sperm defect score (2.2 vs 1.9, $p = 0.01$) after vs before varicocele repair. The clinical pregnancy (60.0% vs 45.0%, $p = 0.04$) and live birth (46.2% vs 31.4%, $p = 0.03$) rates after the sperm injection procedure were higher in the treated than in the untreated group. The chance of achieving clinical pregnancy (OR 1.82; 95% CI 1.06-3.15) and live birth (OR 1.87, 95% CI 1.08-3.25) by the sperm injection procedure were significantly increased while the chance of miscarriage was decreased (OR 0.433, 95% CI 0.22-0.84) after varicocele was treated.

Conclusions: Results suggest that varicocelectomy improves clinical pregnancy and live birth rates by intracytoplasmic sperm injection in infertile couples in which the male partner has clinical varicocele. The chance of miscarriage may be decreased if varicocele is treated before assisted reproduction.