ASK THE EXPERT

What is a varicocele? How is the diagnosis made and what is the significance of varicocele?

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Primary Varicocele

A primary (idiopathic) varicocele is an abnormal tortuosity and dilatation of the testicular veins and pampiniform plexus.

The exact etiology of varicocele development is not known, but absence of valves within the spermatic veins or incompetency of the valves are considered to contribute to its pathogenesis and are not the underlying cause.1 Bradel et al found that 26.2% of patients with a competent valve system still had a varicocele.2

Two other factors attributed to varicocele formation are increased venous pressure in the left renal vein and collateral venous anastomoses.2 Increased venous pressure may be attributed to one of several factors, including compression of the left renal vein between the aorta and the superior mesenteric artery (proximal “nutcracker” phenomenon) effect, described by Coolsgaet compression of the left common iliac vein by the common iliac artery, which results in retrograde flow via the deferential and external spermatic veins (distal “nutcracker”) and anomalies of the left renal vein.3 Vascular changes associated with varicocele include endothelial prominence, intimal fibrosis, increased collagen in the media and hypertrophy of the longitudinal smooth muscle fibers.4, 5

Primary varicoceles are almost always present on the left side.6 Unilateral right-sided varicocele can be seen in patients with situs inversus or in association with retroperitoneal cancers in less than 0.02% of right-sided renal tumors.7

Secondary Varicocele

Secondary varicoceles result from increased pressure on the spermatic vein produced by disease processes such as hydronephrosis, cirrhosis or abdominal neoplasm. Neoplasm is the most likely cause of non-decompressible varicocele in men over 40 years of age. It is classically from a left renal malignancy invading the renal vein.

Intratesticular varicocele

Diagnosis of intratesticular varicocele is made on identification of tubular or oval structures within the testicle with venous flow and a positive response to the Valsalva’s Maneuver on color flow Doppler sonography. Intratesticular varicoceles are more common in infertile men but its relationship to infertility is not well established.

Diagnosis

The mainstay of varicocele diagnosis is physical examination by a skilled physician. Other methods of diagnosis include ultrasound examination with color flow Doppler, venography, infrared thermography, scintigraphy and magnetic resonance imaging. Varicocele is a clinical diagnosis, and palpation reveals a scrotal mass that may feel like a bag of worms, with or without a palpable thrill and relative ipsilateral testicular atrophy.8, 9 Based on physical examination, varicoceles are arbitrarily graded into three grades.

Grade I Small varicocele, palpable with only Valsalva’s Maneuver (vein diameter 1cm)

Grade II Moderate varicocele, palpable with patient standing (vein diameter 1-2cm)

Grade III Large varicocele, visible through scrotal skin, and palpable with patient standing (vein diameter>2cm)9, 10

Grayscale ultrasound with color flow Doppler (US) capability has significantly improved our ability to diagnose varicoceles. In addition, it helps to diagnose other associated pathologies in the scrotum.9 Color Doppler ultrasound is highly sensitive and specific for the detection of varicocele, with rates approaching 100%.11

Sonographically, varicocele appears as multiple, serpiginous, tubular structures with diameters between 2 to 3 mm (normal diameter of the pampiniform plexus veins ranges from 0.5 to 1.5 mm) that are best visualized superior and lateral to the testis. Venous flow within the varicocele demonstrates phasic variation and retrograde filling with Valsalva’s Maneuver.12, 11

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Intraoperative use of Doppler for varicocele repair has resulted in a reduced intraoperative complications rate and increased success of testicular vein ligation, by helping to identify testicular artery.\textsuperscript{13, 12}

\textbf{Subclinical varicoceles}

Varicoceles not palpable on physical examination and only diagnosed by imaging such as ultrasound examination are called subclinical varicoceles. Subclinical varicoceles are less than 3 mm in diameter.\textsuperscript{14} Radiographic testing to diagnose a varicocele should be performed only when there is uncertainty on a physical examination or to identify recurrent or persistent varicoceles.\textsuperscript{12}

\textbf{Significance}

The varicocele is the most common cause of male infertility worldwide. Patients with primary varicoceles usually present between the ages of 15 and 25 years. Varicoceles have been found in 15\% of the normal male population and in up to 40\% of patients with male infertility.\textsuperscript{15} The presence of varicocele results in progressive testicular injury, resulting in testicular growth failure, semen abnormalities, Leydig cell dysfunction and histologic changes (tubular thickening, interstitial fibrosis, decreased spermatogenesis, maturation arrest).\textsuperscript{16} The presence of a clinically detectable varicocele associated with an abnormal semen analysis in an infertile couple is an appropriate indication for treatment after the female partner has been evaluated.\textsuperscript{17}

Semen analysis of patients with varicocele reveals impairments of semen parameters, most commonly a decrease in motility (90\%) and a sperm concentration less than 20x10\textsuperscript{6} (65\%).\textsuperscript{18} Varicocelectomy results in significantly improved semen parameters in 60\% to 80\% of men and pregnancy rates of 20\% to 60\%.\textsuperscript{19} Improvement in semen parameters and pregnancy rate is directly related to the severity of varicocele. Patients with grade III varicocele have better outcomes.

A review of randomized and non-randomized controlled studies performed to evaluate outcomes of varicocelectomy in subclinical varicocele patients did not demonstrate any significant improvement in pregnancy rates.\textsuperscript{22}

\textbf{Conclusion}

Varicocele is the most common cause of correctable infertility worldwide. Ultrasound examination not only helps in the detection of varicoceles but also other associated pathologies in scrotum. Most of the varicoceles detected by ultrasound examination are subclinical. Repair of clinical varicocele in infertile men leads to improved semen quality and increased pregnancy rates.

\textbf{References}


**Members in the News**

**Ira Shaywitz** has become the Director of Ultrasound at Staten Island University Hospital, where he is active in resident education and research.

**John McGahan** has been selected as an RSNA International Visiting Professor. He will give a series of lectures in Malaysia in April.

**Jonathan Rubin** has also been selected as an RSNA International Visiting Professor. He will visit Mexico in July.

The following SRU members participated in the ultrasound educational programs at the recent RSNA annual meeting:

- Douglas L. (Rusty) Brown
- Maitray D. Patel
- Deborah Levine
- Mitchell E. Tublin
- R. Brooke Jeffrey
- Sharlene A. Teefey
- Nirvikar Dahiya
- Robert A. Kane
- Carol B. Benson
- Mary C. Frates
- Peter M. Doubilet
- Edward I. Bluth
- Leslie M. Scoult
- John S. Pellerito
- Deborah Rubens
- Edward G. Grant
- Stephanie R. Wilson
- Thomas C. Winter, III

*If you have professional news that you would like to share with the membership, please send the information to sroberts@acr.org.*