Varicocele

Synonyms: acute varicocele = lover's nut

What is a varicocele?

A varicocele is an abnormal dilatation of the testicular veins in the pampiniform venous plexus, caused by venous reflux. Varicocele is caused by dysfunction of the valves in the spermatic vein. Varicocele is believed to be associated with male subfertility, although reliable evidence is sparse. The natural history of varicocele is unclear.[1]

Causes of varicoceles (aetiology)

Varicoceles are more common on the left for anatomical reasons:

- The angle at which the left testicular vein enters the left renal vein.
- Lack of effective valves between the testicular and renal veins.
- Increased reflux from compression of the renal vein (between the superior mesenteric artery and aorta). This is sometimes called the nutcracker syndrome or aorto-left renal vein entrapment syndrome.[2]

Pathophysiology of effect on sperm quality

Randomised controlled trials and prospective studies assessing semen parameters clearly demonstrate that varicocele repair is associated with a significant increase in sperm concentration, motility and normal morphology. Furthermore, recent studies indicate that the pathophysiology is associated with seminal oxidative stress and sperm DNA damage.[3]

Three protein spots have been identified whose expression was significantly lower in sperm samples before varicocelectomy compared with after surgery. They include heat shock protein A5 (HSPA5), superoxide dismutase 1 (SOD1) and the delta subunit of the catalytic core of mitochondrial adenosine triphosphate synthase (ATP5D). These proteins are all essential for normal sperm production and are affected by the heat generated by the existence of a varicocele.[4]

Varicocelectomy helps to reverse these factors. Evidence supports the view that varicocelectomy will improve fertility in young men with impaired seminal parameters who are not yet interested in pregnancy. The operation also appears to improve the prospects of men with varicocele whose partner has experienced first-term recurrent miscarriage.[3]

Testicular biopsy shows that hypospermatogenetic patients have a better chance of improvement in their semen analysis after varicocelectomy than non-obstructive azoospermia patients with Sertoli cell-only syndrome or maturation arrest.[5]

How common are varicoceles? (Epidemiology)

- It is unusual in boys under the age of 10 years.[6]
- Incidence increases after puberty.
- The incidence is 15% of the general population and is similar in adults and adolescents.[6] [7]
- Varicocele has been implicated as a cause in 35-50% of patients with primary infertility and up to 81% of men with secondary infertility.[8]

Symptoms of varicoceles (presentation)

History

- It is usually asymptomatic (between 2% and 10% have symptoms) and only rarely causes pain.
- The scrotum is often described as feeling 'like a bag of worms'.
- Patients may report scrotal heaviness.

- It may be an incidental finding, being discovered at routine medical examinations or noticed in children by parents.
- Infertility investigations. The high prevalence of varicoceles in subfertile males emphasises that they are the most important cause of poor sperm production and reduced semen quality.

Examination

- Careful examination, with the patient standing, is the most important method of detection:
    - The scrotum on the side of the varicocele hangs lower than on the normal side.
    - Dilation and tortuosity of the veins increase with standing and usually decrease on lying down. The varicocele cannot usually be palpated with the patient lying down.
    - Performing the Valsalva manoeuvre whilst standing increases the dilation.
    - There may be a cough impulse.
- Most are in the left testicle (80-90%), some bilateral (as many as 35-40% radiologically) and very few just on the right side.[9]
- Size. They vary in size and may be classified as:
    - Large. Easily identified by inspection alone. Sometimes called grade III.
    - Moderate. Identified by palpation but without performing the Valsalva manoeuvre. Grade II.
    - Small. Identified only by 'bearing down' to increase intra-abdominal pressure (impedes varicocele drainage) and increase the size of varicocele. Grade I.
- However, examination is not the most accurate method of detection and, where detection is important (particularly in infertility), other methods of investigation are required.[10]

Differential diagnosis

The diagnosis is not usually difficult. However, beware of secondary varicocele. Varicocele can (rarely) be secondary to other pathological processes blocking the testicular vein.[11] For example, tumours of the kidney and other retroperitoneal tumours may involve the renal vein and obstruction of the left testicular vein.[12] [13] If on the right, consider situs inversus.[14]

Diagnosing varicoceles (investigations)

- Sperm counts may be done as part of fertility investigations. They should also be offered to men in their 20s with varicocele, irrespective of presentation, as studies document a significant increase in abnormal semen parameters compared to controls.[15]
- Colour Doppler studies. This is the method of choice to diagnose varicocele but is not indicated unless physical examination is inconclusive.[7] They define both anatomical and physiological aspects of varicoceles by combining real-time ultrasonography with pulsed Doppler in the same scan. Colour demonstrates direction of blood flow, including reverse flow in the varicocele. Various ultrasonographic parameters, such as the spermatic cord diameter, diameter of the veins in the pampiniform plexus and venous retrograde flow in either supine or upright positions with or without Valsalva manoeuvre, have been investigated to assess patients suspected of having varicocele. There is as yet no consensus on which is the best method. The general consensus is that dilation of the pampiniform plexus veins to a width of 2 mm or more is diagnostic of varicocele.[16]

- Other imaging methods used to evaluate varicoceles include:
    - Venography - this was formerly the gold standard but is more expensive and more invasive than Doppler ultrasonography.
    - Radionucleotide angiography - offers no advantage over ultrasonography.
    - Thermography - a useful non-invasive technique. Thermography is a technique using a flexible film containing heat sensitive liquid crystals, which detects changes in scrotal temperature.[17]
    - CT scans - may be required to identify tumours obstructing the testicular vein.[14]
- Serum follicle-stimulating hormone (FSH), luteinising hormone (LH) levels and response to luteinising hormone-releasing hormone (LHRH). Testicular injury can be assessed by a supranormal LH and FSH response to LHRH.[6]

Management of varicoceles

- There are no established effective medical treatments. There is some evidence that bioflavinoids slow the progress from subclinical to palpable varicoceles but they have no effect on the onset of testicular growth arrest.[18]
- Surgical repair of subclinical varicoceles is not usually recommended, although opinions differ.[19]
- Not all varicoceles require surgery. Surgery has the potential to cause testicular damage.

However, the primary treatment of varicoceles is surgery and indications include:[14]

- Pain.
- Infertility possibly (controversy surrounds this recommendation).
- To prevent testicular atrophy.

Approaches to surgery include:[20]

- Inguinal.
- Retroperitoneal.
- Infra-inguinal or subinguinal.
- Laparoscopic.
- Microscopic.

All methods involve ligation of veins to prevent abnormal blood flow. The recurrence rate is usually less than 10%. Lymphatic-sparing microscopic surgery has the advantage of minimising the risk of recurrence and of the development of hydrocele.[21] Embolisation of the gonadal vein has a higher technical failure rate than that of surgery but is a better option for the treatment of post-surgical recurrence.[20] [22]

Infertility

It was common practice to recommend referral for repair of varicoceles if:

- Varicocele was palpable.
- The couple had documented infertility.
- The female partner had normal fertility or correctable infertility.
- The male partner had one or more abnormal semen parameters or sperm function test results.

There is evidence suggesting that treatment of a varicocele in men from couples with otherwise unexplained subfertility may improve a couple's chance of pregnancy. However the quality of the available evidence is very low. It is not advocated by the National Institute for Health and Care Excellence (NICE).[23]

A Cochrane review found:[24]

- Based on the limited evidence, it remains uncertain whether any treatment (surgical or radiological) compared to no treatment in subfertile men may be of benefit on live birth rates. However, treatment may improve the chances for pregnancy.
- The evidence was also insufficient to determine whether surgical treatment was superior to radiological treatment.

- However, microscopic subinguinal surgical treatment probably improves pregnancy rates and reduces the risk of varicocele recurrence compared to other surgical treatments.

When to refer[25]

- Refer urgently to a urologist if:
    - A varicocele appears suddenly and is painful.
    - The varicocele does not drain when lying down.
- Refer routinely to a urologist if there is pain or discomfort.
- Do not routinely refer the male partner of an infertile couple for varicocele surgery solely as a form of fertility treatment.
- However, consider seeking specialist advice for men with clinical varicocele, abnormal semen parameters, and otherwise unexplained infertility.
- Refer to a urologist if there is uncertainty about the nature of a scrotal swelling.

Refer adolescents with a varicocele to a urologist if:[6]

- Varicocele associated with a small testis as asynchronous testicular growth can account for a temporary asymmetry also in a considerable number of healthy adolescents.
- Symptomatic varicocele. Pain is present in 2-10% of varicoceles. However, the association between varicocele and pain is unclear and pain can persist after varicocelectomy in 20% of cases.
- Additional testicular condition affecting fertility such as a contralateral testicular condition.
- Bilateral palpable varicocele.
- Pathological sperm quality (in older adolescents).
- Large varicocele, causing physical or psychological discomfort.

Prognosis after surgery

NICE recommends that men should not be offered surgery for varicoceles as a form of fertility treatment because it does not improve pregnancy rates.[23] However, this is based on 2004 evidence and does not take into account more recent research. Studies suggest that surgical treatment should be considered when the semen analysis shows oligospermia, asthenozoospermia (reduced sperm motility), teratospermia (abnormal morphology) or co-existence of these abnormalities even if the total sperm count is normal.[26]

Varicoceles can recur after surgery. There is evidence that recurrence can be associated with low body metabolic index.[27]

Some have also questioned the need for surgery with the advent of intracytoplasmic sperm injection (ICSI) techniques. However, further research is needed to clarify the effectiveness of this on conception rates in infertile couples.[21]

Repair in children and adolescents

There is no evidence that early operation in adolescents gives better andrological results. Referral is recommended as above.[6]

Further reading

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