Varicocelectomy: microsurgical subinguinal technique is the treatment of choice

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A key mission of our journal is to challenge readers with new concepts and provide new ideas and insights. To accomplish this mission, we have started this new section — Point / Counterpoint. This regular feature will highlight the most important debates in urology. The purpose of the section is to encourage vigorous and informed discussion on controversial issues in urology through the presentation of diverse opinions. We aim for a dispassionate discussion of controversies, recognizing that strong passions may exist in support of some positions.

It is reported that 35% to 40% of infertile men have a palpable varicocele (dilated testicular veins), whereas the prevalence of a varicocele in the general male population is about 15%.[1–3] Although varicoceles have been associated with impaired male fertility potential, it is also clear that a significant proportion of men with a varicocele (about 75%) are fertile.[2,4,5] As such, a cause and effect relationship between varicocele and male infertility has not been conclusively established.[6] The effect of varicocelectomy on male fertility is also controversial.[6–10] Uncontrolled studies have generally shown improved semen quality and pregnancy outcome after surgery.[11] On the other hand, the results of randomized controlled studies of varicocelectomy for clinical varicocele (only a few such studies are published) are equivocal.[12–15]

Despite the absence of clear evidence for a positive effect of varicocelectomy, many clinicians consider the data sufficient to support the practice of this surgery, and varicocele is the most commonly treated condition in men with infertility in North America.[8] The benefit of varicocele repair must be balanced by the risk associated with the procedure itself. As such, it is important to select the procedure with the highest success and lowest complication rate. Also, it is important to consider assisted reproductive technologies (ARTs) as an alternative to varicocelectomy in infertile couples.[16]

Etiology of varicocele

The etiology of varicocele is multifactorial. The anatomic differences between the left and right internal spermatic vein (accounting for the predominance of left-sided varicocele), the incompetence of venous valves resulting in reflux of venous blood and increased hydrostatic pressure are the most popular theories.[17,18] Increased intra-abdominal pressure during childhood and early adolescence may be a predisposing factor in the development of a varicocele.[19]

Mechanisms of varicocele-induced pathology

Scrotal and intratesticular temperatures are elevated in humans and in experimental animal models with varicocele, and varicocelectomy may reduce testicular temperature.[20–24] Scrotal hyperthermia likely represents the primary factor by which a varicocele affects endocrine function and spermatogenesis, both sensitive to temperature elevation (testicular proteins exhibit a reduced thermal stability compared with proteins from other organs).[25–27] The detrimental effect of hyperthermia may also be exerted on the epididymis.[28] Experimental elevations in epididymal temperature reduce the storage capacity of this organ, resulting in decreased sperm count and quality in the ejaculate.[28]

Increased hydrostatic pressure in the internal spermatic vein from renal vein reflux may also be responsible for varicocele-induced pathology.[29]

Pathophysiology of varicocele

The adverse effect of varicocele on male fertility is most clearly manifested by the testicular atrophy generally associated with this condition.[4] Using scrotal ultrasound, we objectively demonstrated that left testicular volume is less than right testicular volume in men with a left varicocele.[30]

A varicocele is associated with bilateral spermatogenic abnormalities and Leydig cell dysfunction.[31–35] The testicular histology in infertile men with varicocele is variable, but most studies report reduced spermatogenesis (hypospermatogenesis). The observed increase in germ cell apoptosis is thought to occur as a result of hyperthermia and low testosterone levels in the testicle.[26] Testosterone concentration (testosterone is secreted by Leydig cells) is lower in older (> 30 yr) compared with younger men with varicocele, which is a trend not seen in men without varicocele and suggests a progressive, adverse effect of varicocele on Leydig cell function.[4]

MacLeod (1965) and other investigators observed that most semen samples from infertile men with varicocele have poorer sperm parameters (lower sperm counts, increased number of spermatozoa with abnormal forms and decreased sperm motility) than fertile men.[4,23,36] However, this "stress pattern" is not a specific marker for varicocele and therefore is not diagnostic of this condition.[37] Surprisingly, few studies have been conducted over the past 40 years to better define the pathophysiology of varicocele, in particular, the effect of this prevalent condition on human sperm function. This is especially critical in light of the inherent limitations (e.g., high biological variability) and modest predictive value of the standard sperm parameters in terms of reproductive outcomes.[38,39]

Varicocelectomy: approaches

There are several approaches for varicocelectomy. These include retroperitoneal and conventional inguinal open techniques, microsurgical inguinal and subinguinal approaches, laparoscopic repairs and radiographic embolization.[40–44] The microsurgical varicocelectomy is considered the "gold standard" because it is associated with the lowest risk of complications (varicocele recurrence, hydrocele formation [fluid collection around the testicle] and testicular atrophy).[41,45–47]

We have favoured the microsurgical subinguinal approach because it is associated with a higher success rate (disappearance of varicocele) and a lower complication rate (recurrence rate and hydrocele formation), compared with non-microsurgical techniques.[46,48] The subinguinal approach is also associated with less operative and postoperative pain than inguinal approaches.[49,50] However, the subinguinal approach is more challenging owing to the greater number of vessels (arteries and veins) encountered at this level, compared with the inguinal canal.[51]

Microsurgical sub-inguinal varicocelectomy

We start with a 2–3-cm oblique skin incision centred over the external inguinal ring, as previously described.[52] The incision is deepened through Camper's and Scarpa's fascias and the spermatic cord is then grasped with a Babcock clamp, delivered and placed over a large (1-inch) Penrose drain. The testicle is then delivered and the gubernacular veins and external spermatic perforators are isolated and divided (Fig. 1). The testicle is returned to the scrotum and the spermatic cord is elevated on a large Penrose drain. The microscope is then brought into the operating field and the cord examined under 8–15 power magnification. The internal and external spermatic fascias are incised and the cord structures are again examined (Fig. 2).

To simplify the procedure and protect the vas deferens and its vessels from potential injury dur-

Fig. 1. Testicle delivered through the subinguinal incision depicting the spermatic cord (held by Penrose drain; bottom left) and the gubernaculum (held by Penrose drain; right).

ing subsequent cord dissection, we first create a window between the internal spermatic vessels and the external spermatic fascia so that the internal spermatic vessels are separate from the external spermatic fascia and its associated structures (cremasteric fibres, external spermatic vessels, vas deferens and its vessels).[52] A second Penrose drain is then introduced between the internal spermatic vessels and the external spermatic fascia and its associated structures.

We first dissect the contents of the internal spermatic fascia (lying on top of the most superficial Penrose drain). Subtle pulsations will usually reveal the location of the underlying internal spermatic artery (or arteries). Once identified, the artery is dissected free of all surrounding veins and encircled with a 2-0 silk ligature for identification. Care is taken to identify a number of lymphatics (usually 2–5 channels) and these are also encircled with a 2-0 silk ligature. All internal spermatic veins are clipped or ligated (with 4-0 silk) and divided. At the end of the first dissection, the cord is skeletonized so that only the identified artery (or arteries) and lymphatics are preserved.

We then elevate and dissect the contents of the external spermatic fascia (lying between the 2 Penrose drains). The vas deferens and its associated vessels are readily identified and preserved. Any cremasteric artery is also preserved. The remaining cremasteric fibres and veins are ligated and cut thus skeletonizing the cord. At the completion of varicocelectomy, the cord should contain only the testicular artery or arteries, vas deferens, and associated vessels and spermatic cord lymphatics. The wound is irrigated with 1% Neomycin irrigation, and Scarpa's and Camper's fascia are closed with a single 3-0 chromic catgut suture. The incision is infiltrated with 0.5% Marcaine solution with epinephrine, and the skin is closed with a running 4-0 Vicryl subcuticular closure reinforced with Steri-Strips. A dry sterile dressing is applied.

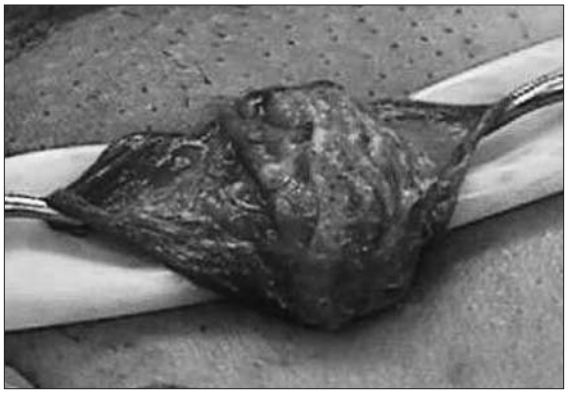

Fig. 2. Spermatic cord with Penrose drain beneath it (the internal and external spermatic fascias have been opened).

Summary

A variety of approaches have been advocated for management of varicoceles but recent evidence supports the premise that the microsurgical technique is the "gold standard."[46,48] In a number of studies, it has been shown that microsurgical varicocelectomy (inguinal or subinguinal) is superior to non-microsurgical procedures with respect to the development of postoperative complications such as hydrocele or recurrence.[41,46,47] Hydrocele formation is believed to be due to ligation of lymphatic channels and recurrence generally results from incomplete ligation of collateral venous channels.[53,54] Magnification of the spermatic cord with the use of the operating microscope reduces the potential for development of such complications.[41,46,47] However, microsurgical varicocelectomy, particularly the subinguinal approach, remains a technically challenging procedure that requires microsurgical expertise.

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This article has been peer reviewed.

Competing interests: None declared.

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