VARICOCELE AND MALE SUBFERTILITY*

PERINChERY NARAYAN, M.D.*
KURT AMPLATZ, M.D.
RICARDO GONZALEZ, M.D.

Departments of Urologic Surgery and Diagnostic Radiology, University of Minnesota College of Health Sciences, Minneapolis, Minnesota 55455

Unilateral and bilateral subclinical varicocele was found by internal spermatic venography in 10 of 30 men with stress-pattern semen and normal endocrine profiles. Seven of the 10 had no clinical evidence of varicocele. Right-sided varicocele may be almost as common as varicocele on the left and may be responsible for much of the bilateral effect of clinical left-sided varicocele. Transjugular venography has a low morbidity rate and can be used to clarify the relation between subclinical varicocele and infertility. The technique also permits nonsurgical treatment of varicocele.


Primary (idiopathic) varicocele results when absent or incompetent valves in the internal spermatic vein permit retrograde blood flow. Nearly a century ago, changes were noted in the testis as a result of varicocele;1 and for more than half a century an association between varicocele and infertility has been recognized.2 More recent studies have shown that approximately one-third of subfertile men have clinical varicocele.3 4 The size does not influence the degree of infertility.5

The existence of subclinical varicocele—retrograde blood flow without physical signs—has been suggested by several diagnostic techniques, but there are few direct studies of the prevalence of this condition or of its relation to subfertility. We used retrograde internal spermatic venography to determine the prevalence of both right- and left-sided subclinical varicocele. A nonsurgical technique was used for spermatic vein occlusion, and the effects of the procedure on semen quality are being studied.

METHODS

Thirty men, aged 25 to 37, who had normal endocrine values (serum follicle-stimulating hormone, luteinizing hormone, and testosterone) and had been infertile for at least 18 months were included in the study. All had semen analyses on at least three occasions. All were examined independently by three physicians, who classified the varicoceles as grade III (large, easily visible, and palpable), grade II (palpable but not easily visible), grade I (not visible but definitely present during the Valsalva maneuver), or grade 0 (no clinical evidence even during the Valsalva maneuver).

Retrograde internal spermatic venography was performed by the transjugular approach (Fig. 1).6 On the right side, the internal spermatic vein usually was located at the level of the second lumbar vertebra, approximately 2 cm below the renal vein, and 3 to 5 ml of contrast medium was injected at this point. Reflux was demonstrated by free flow of contrast medium into the scrotum.

Received January 28, 1981; revised and accepted March 24, 1981.


†Reprint requests: Perinchery Narayan, M.D., Department of Urologic Surgery, University of Minnesota Medical School, Box 394 Mayo Memorial Building, 420 Delaware Street S.E., Minneapolis, Minnesota 55455.
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RESULTS

Semen Analysis. The mean volume was 2.5 ml (range 1.5 to 6 ml), with a mean count of $2 \times 10^7$/ml (range $<10^6$ to $6 \times 10^7$/ml). Motility after half an hour averaged 30% (range 5% to 60%). There was an average of 20% tapering, amorphous, and immature forms (range 10% to 60%).

The follow-up after occlusion or ligation of the internal spermatic vein(s) for subclinical varicocele is too short to permit firm conclusions about the results.

Venography. Thirteen of the 14 patients with clinical left-sided varicoceles had reflux on the left side. Six of these men had bilateral studies, and subclinical right-sided varicocele was found in all of them. Three of the four men with clinical bilateral varicoceles had bilateral reflux. In the fourth, the right internal spermatic vein could not be catheterized.

Of particular note are the findings in the 12 men without clinical signs of varicocele. Seven had subclinical varicoceles on the left. Bilateral studies were attempted in eight men, and five—all with left-sided reflux—also had right-sided reflux. In two patients, it was not possible to catheterize the right side, and one patient had competent valves bilaterally. Thus, at least 42% of these infertile men without clinical varicocele

(Fig. 2). The procedure was repeated on the left side (Fig. 3). Whenever reflux was observed, the catheters were advanced deep into the veins, and more contrast medium was injected for studies of the anatomic detail. Competent valves were clearly visible (Fig. 4), and catheters could not be negotiated past them.

Steel coils or Ivalon plugs were used for embolization in several cases where incompetent valves were noted. Two or more devices were placed, one usually just below the junction of the internal spermatic vein and the renal vein or inferior vena cava and another below all collateral vessels (Fig. 5). In cases where Ivalon plugs were used to occlude the veins, steel umbrellas were placed above the plugs and downstream to prevent long thrombi from migrating from the internal spermatic vein.

FIG. 1. Percutaneous transjugular puncture and approximate position of catheters for injection of contrast material.

FIG. 2. Venogram illustrating reflux in the right internal spermatic vein, with free flow of contrast all the way down into the scrotum. Clinically, the patient had left-sided varicocele but no evidence of reflux on the right.
had bilateral reflux (subclinical varicocele), and at least 70% of those with reflux on the left also had reflux on the right.

Several features of practical importance were noted during venography. On the right side, all the internal spermatic veins that ended in the renal vein rather than in the vena cava had incompetent valves. In two patients, there were two right internal spermatic veins, one entering the vena cava and the other the renal vein. Variations in venous anatomy were more common on the left. In some cases, there were multiple spermatic veins, often widely spaced and tortuous (Fig. 5). In one case, the internal spermatic vein entered the intrarenal portion of the left renal vein and in another the intrasegmental portion (Fig. 6). In two patients, there were filling defects in the internal spermatic veins, suggesting defective valves. There were no significant differences in the sizes of refluxing and nonrefluxing internal spermatic veins and the corresponding renal veins.

In several patients, there were collateral veins that had to be considered in planning treatment (Fig. 7). Frequently, there were communications between the proximal portion of the internal spermatic veins and the ureteral, renal capsular, lumbar, or retroperitoneal veins. In such cases, ligation or occlusion performed above the entrance of the collateral vessels would not correct the reflux. Figure 8 summarizes the findings.
FIG. 6. In this patient, the internal spermatic vein enters an intrasegmental branch of the renal vein.

The bilateral effects of clinical left-sided varicocele have been attributed to cross-communications that expose both testes to warm blood or toxins. Using our transjugular technique with injection pressures of 3 to 5 ml/sec and 15 to 20 ml of contrast material, we saw no direct cross-communications between the two spermatic veins at the scrotal, pelvic, or abdominal levels. There were no clinically significant complications associated with venography. In one patient with a grade II left-sided varicocele, a thrombus was found after venography in the left internal spermatic vein at the time of ligation.

Embolization. Seventeen veins were embolized in 11 patients—all of the nine veins attempted on the left and eight of the 11 attempted on the right. Clinical varicoceles greatly improved or disappeared whenever the embolization was successful. Satisfactory occlusion was seen in all patients during follow-up venography studies 2 to 4 months later. It is too soon for semen-analysis and pregnancy-rate data to be meaningful.

DISCUSSION

Clinical varicocele is present in 15% to 20% of the general male population, and not all of those affected are infertile. However, there is no doubt that varicocele is an important cause of infertility. Semen quality improves after spermatic vein ligation in 60% to 80% of patients with clinical varicocele, with consequent pregnancy rates of 30% to 55%. At present, hypospermatogenesis secondary to varicocele is the only form of male infertility for which effective treatment is available.

Much less is known about the prevalence and significance of subclinical varicocele. Published data suggest that it is present in 40% to 75% of infertile men. However, the condition is not easily diagnosed, especially on the right; so these figures may be low. It appears that subclinical varicocele is significant pathologically, since ligation of refluxing veins improves semen quality and leads to pregnancy. More studies are needed on this question.

Thus, there are theoretical and, perhaps, practical reasons for trying to detect subclinical varicocele. The data collected by noninvasive methods (e.g., thermography, Doppler ultrasonography) are inconsistent and often not reproducible, and their accuracy has not been confirmed by venography, the only objective method now available. Venography is invasive and has the additional disadvantage of requiring an experienced angiographer, but it makes possible a detailed study of the arrangement and function of the testicular veins (Fig. 8), necessary in planning treatment, and helps in the diagnosis of persistent or recurrent varicocele. Its reported morbidity is 0.5% to 1%. Until noninvasive methods have been...
FIG. 8. Anatomy of the internal spermatic veins as shown by venographic data; a, renal capsular vessel; b, multiple veins; c, lumbar vessels and subperitoneal connective tissue; d, anomalous entry on left; e, ureteral veins; f, branching; g, abdominal wall. The right spermatic vein enters the inferior vena cava in 85% of men and the renal vein in 15%. We could not demonstrate cross-communication between the two sides. Validated, venographic findings should be the criterion for the diagnosis of the presence or absence of reflux.

To our knowledge, ours is the first report of catheterization of the right internal spermatic vein by the transjugular technique. With the usual transfemoral approach, right-sided catheterization is often impossible; so it has been difficult to determine the incidence of subclinical varicocele. Studies of the right spermatic vein are of particular interest, because, although only 8% of men with clinical varicocele are affected bilaterally, our data and Chatel's suggest that right-sided reflux is present in 60% or more of these men. Our venographic findings have led us to postulate that the bilateral effects of left-sided clinical varicocele are caused, not by cross-communication, but by unrecognized bilateral reflux. However, because venography permits measurements of venous pressure and collection of blood samples, the earlier hypothesis of cross-contamination and bilateral circulation of warm blood and toxins can be investigated further.

We believe that retrograde internal spermatic venography by the transjugular technique is indispensable not only in the determination of the prevalence of subclinical varicocele and rightsided reflux but in the evaluation of their role in male infertility. In addition, the technique makes possible safe, nonsurgical occlusion of both internal spermatic veins. Randomized prospective studies of the effects of correcting subclinical varicocele are planned.

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