Antegrade Subinguinal Sclerotization With Temporary Clamping of the Spermatic Cord: A New Surgical Technique for Varicocele

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OBJECTIVES
The purpose of our study was to evaluate the duration, effectiveness, and complications associated with a new operating technique for varicocele, using a subinguinal surgical approach and antegrade sclerotization of the spermatic veins.

METHODS
A total of 756 varicocele patients who came under our care for infertility underwent surgical treatment with our technique. The diagnosis was based on clinical examination and confirmed by color-Doppler ultrasound of the spermatic cord. Only patients with continuous basal reflux inside the left spermatic vein detected in orthostatism underwent operation. The Colpi technique was used, which consists of a subinguinal incision with suspension of the spermatic cord; cord clamping for 8-10 minutes using two elastic bands; and injection of 1.5-3 mL of sclerosing agent during induced ischemia without any intraoperative radiological control.

RESULTS
The average operating time was 25 minutes (range: 18-45 minutes). At the 3-month postoperative follow-up, there were 15 cases of persistent reflux (1.9%), 6 cases of hydrocele requiring surgical correction (0.7%), and 50 cases of fibrotic sequelae of penile lymphangiitis (6.6%).

CONCLUSIONS
The new technique was more effective than the previous ones, with the exception of the microsurgical technique, which, however, takes 2-3 times longer to perform.

The only significant complication was superficial single-vessel lymphangiitis of the penis, which resolved within 3 months with no apparent consequences. In conclusion, this new operating technique for varicocele is simpler to perform and may be effective compared with other techniques.

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Varicocele is the most common pathologic finding in men in infertility study programs and is the most treatable cause of male infertility.1,2 The prevalence of varicocele is approximately 15% in the general population, 19%-41% in men with primary infertility, and 45%-81% in men with secondary infertility.3 In common medical practice, altered seminal parameters—in particular, total sperm count, motility, and morphology—suggest that varicocele may be the cause of infertility.4

Traditionally, varicocele is diagnosed by clinical examination of the patient and graded according to the Dubin and Amelar classification.5 A color Doppler ultrasound study provides an accurate confirmation of the reverted vein flow that was suspected in the clinical setting. The Annoni method6 makes it possible to accurately assess the varicocele, which is a prerequisite when considering surgical block of the spermatic vein.

The techniques currently used to treat varicocele are the Ivanissevich and Palomo procedures. Other treatment options include ligation using microsurgical techniques,7,8 laparoscopic ligation of the spermatic veins9 and procedures involving retrograde and antegrade sclerolization, such as the Tauber technique.10,11

The purpose of this study was to evaluate the effectiveness of a new antegrade subinguinal sclerolization technique involving temporary clamping of a segment of the spermatic cord in completely reverted spermatic veins. Reflux persistence, complications, and operating time were evaluated and compared with those of other techniques.

MATERIAL AND METHODS
The study population consisted of patients with left varicocele, as diagnosed by Doppler reverted flow in the spermatic vein and seminal fluid abnormalities based on the threshold values reported in the WHO 1999. Patients were evaluated in a standing position using color-Doppler ultrasound to measure the rate of
spermatic venous reflux and to determine whether the reflux was continuous, was intermittent, or occurred only during the Valsalva maneuver, independently of clinical palpation. Venous reflux only induced by the Valsalva maneuver or by the act of breathing was not considered an indication for surgery. Patients with continuous reflux inside the spermatic vein underwent treatment with our new sclerotherapy technique. Between January 2003 and December 2007, a total of 756 patients aged 17-52 years were treated in this way.

Our variation of the antegrade subinguinal sclerotherapy technique is derived from our experience in carrying out the operation according to Tauber and consists of the following: (a) a 2- to 3-cm subinguinal incision; (b) exposure and subsequent suspension of the spermatic cord between 2 elastic bands; (c) opening of the internal and external fasciae; (d) identification of a venous vessel afferent to the internal spermatic veins in the fat of the spermatic cord and insertion of a 25-G Butterfly needle into it; (e) clamping of the spermatic cord for 8-10 minutes using 2 elastic bands—1 upstream and 1 downstream—at 7-10 cm distance, by picking up the cord out of the small skin incision, to prevent the sclerosing agent from migrating out of the exposed tract (Fig. 1); (f) injection of 1.5-3 mL of 3% aethoxysclerol mixed with 0.5 mL air during induced ischemia and observation of the diffusion of the sclerosing agent through the vessels; (g) ligation of the vein at the injection site after sclerotherapy using Vicryl (Ethicon, Cincinnati, OH) 4/0 to prevent loss of the sclerosing agent outside the vessel; (h) approximately 10 minutes after positioning the elastic bands and 8 minutes after beginning the injection, restoration of flow through the spermatic cord first at the abdominal and then at the testicular points, maintaining the testicle above the operating plane to avoid intra gonadic reflux of the sclerosing agent; (i) ligation of any external veins adjacent to the spermatic cord; (j) continuous suture of the spermatic fasciae using Vicryl 4/0; (k) repositioning of the spermatic cord and reconstruction of the subcutaneous layer and the skin; and (l) placement of a dressing suitable for suspension of the scrotum.

The bands were secured for 8-10 minutes, which is generally the time required to completely stop the sclerosing agent within the uncannulated vessel, showing presumable district sclerolysis.

The procedure was carried out under generally spinal and rarely general or local anesthesia. For the first 24 hours, the patient was kept at rest with ice applied locally even in the absence of any pain symptoms. The patient was then allowed to resume normal physical activity. Follow-up evaluations were carried out at 1 and 3 months postsurgery, checking venous reflux in the standing position by color Doppler ultrasound. No information about semen samples was included in statistical analysis. At the moment, there must necessarily be a relationship between sure continuous reflux and the ability to stop it by an efficient technique to subsequently plan a fertility and semen empowering study.

### RESULTS

Between January 2003 and December 2007, a total of 756 patients underwent sclerotherapy using the Colpi technique. The mean time required for the operation was 25 minutes (range: 18-45 minutes). In no cases was the use of a microscope and intraoperative radiological control necessary.

Follow-up data are available for all 756 patients. At the 1 month follow-up, there were 45 cases of hydrocele (5.9%), 6 of which subsequently required surgical correction (0.7%), 40 cases of temporary orchialgia (5.2%), and 74 cases of penile lymphangiitis (9.7%) (Table 1). At the 3-month follow-up, all cases of testicular pain had resolved, and the number of patients with penile lymphangiitis had decreased to 50 (6.6%) (Table 1).

Sclerosed vessels will normally have an inflammatory reaction for 45-90 days; moderate swelling may be possible in the first 7 days, and sometimes a minimal hydrocele develops. More significant complications, such as orchitis, orchio-epididymitis, orchio-funiculitis, and testicular atrophy, were not observed in our series.

The presence of continuous venous reflux at the follow-up evaluations was classified as “persistence” of reflux. At the 3-month follow-up, there were 15 cases of persistent reflux (1.9%) among the 756 treated patients (Table 2).

### COMMENT

Antegrade sclerotherapy with temporary clamping of the spermatic cord appears to be beneficial. The option of carrying out the procedure under spinal anesthesia lowers costs, shortens the time spent in hospital, and enables the convenience of treating a large number of patients in a short period of time.
patient to return to normal activities more rapidly, compared with intravenous sedation. Local anesthesia in subinguinal position was initially attempted. It was promptly rejected because it may change the cord anatomy in the same place of the following surgical incision, leading to difficult complete cord exposure and fluid diffusion. Another important advantage of our modified procedure is that—unlike the original technique described by Tauber—it does not require fluoroscopic control, with a consequent reduction in operation-related management costs. Another important point is that the procedure is carried out on a single vein, sparing the veins of the peri-arterial plexus, thus avoiding the risk of the sclerosing agent passing into the artery through an arteriovenous microanastomosis, as reported by Tauber.\(^\text{10}\) The single-vein technique also circumvents the risk of accidental damage to the spermatic artery or lymphatic vessels occurring while isolating the veins.

### Recurrence

In a comparative study by Watanabe et al., the reported rates of recurrence in patients treated with high ligation, laparoscopy and microsurgery were 12\%, 6.1\% and 0\%, respectively.\(^\text{13}\) In a survey of 88 young patients treated using antegrade sclerotherapy, a persistence rate of 7\% was found.\(^\text{14}\) In another study of 45 patients subjected to antegrade sclerotherapy, a rate of persistence of 2.2\% was observed in the absence of any further complications.\(^\text{15}\) Among the 756 patients we treated using Colpi’s technique, the rate of persistence was 1.9\%, which is appreciably lower than the 13\% reported by Tauber.\(^\text{10}\) This recurrence rate of 1.9\%, which was accurately evaluated by Doppler ultrasound only, as before surgery, is moderately higher than that reported by Colpi (0.3\%) in his first group of patients operated on between 1999 and 2002; this difference may be due to new members of the operating team progressively learning the surgical technique.

The numerous anastomoses of the veins in the area of sclerotization probably contribute to the low persistence rate. The increase in pressure that is created by clamping the segment of the spermatic cord pushes the sclerosing agent into the venous anastomoses of the internal spermatic vein, also closing off branches subject to subsequent dilation.

### Complications

In a retrospective study comparing laparoscopic surgery and antegrade sclerotherapy, postoperative hydrocele occurred in 10.7\% of the laparoscopy group and 4.6\% of the antegrade sclerotherapy group.\(^\text{16}\) The higher incidence of postoperative hydrocele after laparoscopic surgery, together with the resulting higher healthcare costs, favors the use of strategies that preserve the main lymphatic vessels of the spermatic cord, especially in patients who have undergone previous inguinal surgery.

With regard to complications after microsurgical subinguinal sclerotherapy, Marmar and Kim and Marmar et al. reported the formation of hydrocele in 4 of 466 cases (0.86\%) and minor orchialgia in 1 case (0.2\%).\(^\text{17,18}\) In our study, hydrocele formation occurred in 45 of the 756 cases (5.9\%), and we observed 40 cases of temporary orchialgia (5.2\%). These disproportionate results, apparently unfavorable to our technique, actually proved to be clinically irrelevant. During the course of follow-up, we found that most of the cases of minor hydrocele and orchialgia regressed progressively in response to cryotherapy and nonsteroidal anti-inflammatory drugs, and surgical correction was required in only 6 cases of clinically significant hydrocele (0.7\%) (Table 1).

Although no radiological tests were used during the operation, the vein with the largest diameter in the fat of the spermatic cord was injected, allowing the sclerosing agent mixed with 0.5 mL air to diffuse into the collateral veins to close off all of the veins. Clamping the spermatic cord above and below the injection site for at least 10 minutes prevents both cranial and caudal reflux of the sclerosing agent, thus making the procedure safer. Since lymphatic vessels are spared using this procedure, the formation of secondary hydrocele can be minimized. In addition, with respect to the standard Tauber procedure, our modified technique affords greater control over the diffusion of the sclerosing agent, also contributing to a better safety profile.\(^\text{10}\)

Lastly, in the immediate postoperative period we observed 74 cases of penile lymphangitis (9.7\%) among the 756 patients we treated; over the subsequent 2 months, thanks to the use of local heparinoids and nonsteroidal anti-inflammatory drugs, the number of cases decreased to 50, so the final prevalence of this complication at 3 months postsurgery was 6.6\% (Table 1). This brief complication was probably caused by the pressure developed in a short segment of the spermatic cord, which is useful to stop all the small veins, but unfortunately also such small lymphatic vessels, however without consequences. An optical magnification aid might be used to identify unexpected diffusion of the sclerosing agent into lymphatic vessels.

### CONCLUSIONS

The Colpi variation of antegrade sclerotherapy is easier than microsurgery from an operative point of view and safer and more cost-efficient when compared with the original Tauber technique. Given the favorable results in terms of complications and persistence of reflux, this variation is a valid alternative for the first-line treatment of varicocele.

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**Table 2. Rate of persistent reflux 3 months postoperatively**

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<thead>
<tr>
<th>Period</th>
<th>Operations</th>
<th>Recurrence</th>
<th>%</th>
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<tbody>
<tr>
<td>01/2003-2/2007</td>
<td>756</td>
<td>15</td>
<td>1.98</td>
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References