Intratesticular Varicocele
Gray Scale and Color Doppler
Sonographic Appearance

Ada Kessler, MD, Shmuel Meirsdorf, MD, Moshe Graif, MD,
Paul Gottlieb, MD, Simon Strauss, MBChB

Objective. The purpose of this study was to evaluate the gray scale and color Doppler appearances of intratesticular varicocele (ITV) in a relatively large series of men and to compare the findings with those previously reported. Methods. Fifteen ITVs found in 12 men referred for sonographic examination of a variety of scrotal conditions were retrospectively evaluated. Review of the side, location, shape, and diameter of the dilated veins, the presence of an extratesticular varicocele (ETV), and the color Doppler appearance of the ITV before and during the Valsalva maneuver was performed. Results. Seven (47%) of 15 ITVs were located in the left testis, 2 (13%) in the right, and 3 (20%) bilateral. Eighty-six percent of the ITVs were associated with an ipsilateral ETV. The locations of the ITVs were subcapsular in 60% of the cases and within or near the mediastinum of the testis in 40%. The shapes of the ITVs were tubular in 46%, oval in 27%, and both tubular and oval in the remaining 27%. Color Doppler imaging showed spontaneous flow in 60% of cases, whereas in the remaining 40%, the blood flow could be seen only after the Valsalva maneuver. Conclusions. Intratesticular varicocele is a rare condition with a variable clinical and sonographic appearance. It is usually associated with ETV. It occurs in the left, right, or both testes and may be subcapsular or mediastinal in location. The prevalence of a subcapsular location of ITVs in this series was by far higher than previously mentioned in the literature. The Valsalva maneuver plays a very important role in the diagnosis of ITV because in almost half of cases, the flow will not show up spontaneously. Key words: color Doppler imaging; extratesticular varicocele; intratesticular varicocele; sonography; testicular lesions.

Intratesticular varicocele (ITV) is a rare entity characterized by dilatation of intratesticular veins. The condition was first described by Weiss et al1 in 1992, and since then, fewer than 50 cases have been reported, mostly in very small series or single case reports.2–14 It has been defined sonographically as tubular or oval structures with a diameter of 2 mm or greater in and around the mediastinum testis with venous flow and a positive Valsalva maneuver response.9 The clinical importance of this condition has not been established yet, but awareness of its appearance on sonography is important to differentiate it from other focal testicular lesions, including malignancy.

The aim of this study was to describe the gray scale and color Doppler appearances in a relatively large series of men with ITVs and to compare the findings with those previously reported.

Abbreviations
ETV, extratesticular varicocele; ITV, intratesticular varicocele

Received May 5, 2005, from the Department of Diagnostic Imaging, Tel-Aviv Sourasky Medical Center and Assaf-Harofeh Medical Center, affiliated with the Sackler Faculty of Medicine, Tel Aviv University, Tel Aviv, Israel. Revision requested June 2, 2005. Revised manuscript accepted for publication August 1, 2005.

Address correspondence to Ada Kessler, MD, Division of Ultrasound, Department of Diagnostic Imaging, Tel Aviv Sourasky Medical Center, 6 Weizmann St, Tel Aviv 64239, Israel.
E-mail: kesslera@tasmc.health.gov.il

© 2005 by the American Institute of Ultrasound in Medicine • J Ultrasound Med 2005; 24:1711–1716 • 0278-4297/05/$3.50
Materials and Methods

Approximately 600 men undergo testicular sonography each year in our 2 institutions. A retrospective study of cases collected during the last 3 years revealed 12 men with ITVs. The condition was unilateral in 9 and bilateral in 3 (15 testes altogether). Patients’ ages ranged from 19 to 74 years (mean age, 49.5 years).

Evaluation of the side, location, shape, and diameter of the dilated veins, the presence of extratesticular varicocele (ETV), and the color Doppler appearance of the ITV before and during the Valsalva maneuver was carried out. The patients were referred for sonographic evaluation for testicular pain (n = 5), ETV (n = 2), trauma (n = 2), and scrotal swelling (n = 1). Two asymptomatic patients were referred for routine scrotal check-up: 1 patient had a history of orchiectomy for seminoma, and the other was referred after orchiopexy for an undescended testis.

Sonograms were obtained with an HDI 5000 or HDI 3000 system (Philips Medical Systems, Bothell, WA) with 7- to 10- or 5- to 12-MHz linear array transducers. All examinations were performed in longitudinal and transverse views. Testicular volume was calculated in all cases. Machine settings were adjusted to detect slow venous flow. Color Doppler sensitivity was optimized with low scale settings with a low pulse repetition frequency, a low wall filter, and optimization of signal-to-noise characteristics. The maximum diameter of the intratesticular vein was measured, and its location relative to the mediastinum or capsule was noted. The dilated veins were classified as tubular when they were elongated and pipelike and oval when they were elliptical, rounded, or both. Color and power Doppler imaging was performed during normal respiration and with the Valsalva maneuver.

Results

The results are summarized in Table 1. Testicular size was normal in all 12 patients except 1 who had mild bilateral testicular atrophy. Three of the patients had hydrocele on the ipsilateral side. One patient had microlithiasis. No other additional scrotal or testicular abnormalities were seen except for the ITV-ETV condition. Of the 15 testes with ITVs found in 12 patients, 7 were in the left testis, 2 in the right, and 3 bilateral. Several patterns of ITV were found in our group of 12 patients.

Thirteen (86%) of the 15 ITVs were associated with ipsilateral ETVs: 9 of 10 on the left side and 4 of 5 on the right side. Except for 1, all men with right-sided ITVs had bilateral ETVs. In 7 patients, the ITVs were seen to be contiguous with the ETVs (Figure 1). In 9 cases (60%), the varicoceles were predominantly subcapsular in location, although dilated veins were also scattered throughout the testicular parenchyma in 5 of these cases (Figure 2). In 6 testes (40%), the dilated veins were confined to or near the mediastinum (Figure 3). The shapes of the varicoceles were also variable. In 7 (46%) they were tubular and often serpentine; in 4 (27%) they were oval; and in another 4 (27%) they were both tubular and oval (Figure 4). The maximum diameters of the ITVs ranged from 2.5 to 6 mm (mean, 3.9 mm). Spontaneous flow was detected on power or color Doppler imaging in 9 cases (60%). The flow was markedly increased in all of them after the Valsalva maneuver. In the remaining 6 cases (40%), the Valsalva maneuver was required to show flow within the intratesticular lesion (Figure 5). All but 2 ITVs were characteristically anechoic in gray scale appearance. The 2 exceptional ones were hypochoic with a tumorlike appearance. In these cases, adjacent blood vessels appeared anechoic. Color Doppler imaging combined with the Valsalva maneuver was required to reveal the true nature of those lesions (Figure 6).

Discussion

Extratesticular varicocele is a common, well-known condition that occurs in 15% to 20% of men. There are several etiologic causes of ETV, such as renospermatic reflux, the “nutcracker phenomenon,” valvular insufficiency of the left internal spermatic vein, ileospermatic reflux, neoplastic or other retroperitoneal diseases, visceral malposition syndromes, and prior surgery in the inguinal and scrotal regions.4,5 Intratesticular varicocele, conversely, is a rare and relatively new entity, reported in fewer than 2% of symptomatic men undergoing testicular sonography.6–9 Initially, it was thought to be always associated with an ipsilateral ETV; subsequent reports claimed that ITVs are more commonly found alone. In those cases in which the ITVs are a continuation of the ETVs, one may speculate that the 2 entities have a common etiology. We are not aware of any hypothesis to
explain isolated ITVs. In the only other extensive study of patients with ITV to our knowledge, Das et al found that 11 (44%) of 25 testes involved were associated with ipsilateral ETVs. In our series, most ITVs (86%) were associated with ETVs on the same side.

Our series of patients included ITVs found in 15 (12 patients) of 1200 testes (600 patients), with a prevalence of 1.2%, which is slightly less than the 1.8% to 2% previously reported.

Table 1. Patient Data and Sonographic Appearance of ITV

<table>
<thead>
<tr>
<th>Patient</th>
<th>Age, y</th>
<th>Side of ITV</th>
<th>Side of ETV</th>
<th>Location of ITV</th>
<th>Shape of ITV</th>
<th>Diameter, mm</th>
<th>Valsalva Maneuver Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>19</td>
<td>Left</td>
<td>Left</td>
<td>Subcapsular</td>
<td>Tubular + oval</td>
<td>2.5</td>
<td>+</td>
</tr>
<tr>
<td>2</td>
<td>36</td>
<td>Left</td>
<td>Left</td>
<td>Mediastinum</td>
<td>Tubular</td>
<td>4</td>
<td>–</td>
</tr>
<tr>
<td>3</td>
<td>21</td>
<td>Left</td>
<td>Right</td>
<td>Mediastinum</td>
<td>Oval</td>
<td>6</td>
<td>–</td>
</tr>
<tr>
<td>4</td>
<td>74</td>
<td>Left</td>
<td>Left</td>
<td>Subcapsular</td>
<td>Tubular</td>
<td>2.5</td>
<td>–</td>
</tr>
<tr>
<td>5</td>
<td>39</td>
<td>Left</td>
<td>Left</td>
<td>Subcapsular</td>
<td>Tubular</td>
<td>2.5</td>
<td>+</td>
</tr>
<tr>
<td>6</td>
<td>52</td>
<td>Left</td>
<td>–</td>
<td>Subcapsular</td>
<td>Tubular + oval</td>
<td>5</td>
<td>+</td>
</tr>
<tr>
<td>7</td>
<td>57</td>
<td>Right</td>
<td>Right + left</td>
<td>Subcapsular</td>
<td>Tubular</td>
<td>4</td>
<td>–</td>
</tr>
<tr>
<td>8</td>
<td>59</td>
<td>Right</td>
<td>Left</td>
<td>Subcapsular</td>
<td>Oval</td>
<td>2.5</td>
<td>+</td>
</tr>
<tr>
<td>9</td>
<td>59</td>
<td>Right</td>
<td>Right</td>
<td>Mediastinum</td>
<td>Tubular + oval</td>
<td>5</td>
<td>–</td>
</tr>
<tr>
<td>10</td>
<td>68</td>
<td>Right</td>
<td>Right</td>
<td>Mediastinum</td>
<td>Oval</td>
<td>4</td>
<td>+</td>
</tr>
<tr>
<td>11</td>
<td>60</td>
<td>Left</td>
<td>Left</td>
<td>Mediastinum</td>
<td>Tubular</td>
<td>5</td>
<td>–</td>
</tr>
<tr>
<td>12</td>
<td>32</td>
<td>Left</td>
<td>Left</td>
<td>Subcapsular</td>
<td>Tubular</td>
<td>3</td>
<td>+</td>
</tr>
</tbody>
</table>

Figure 1. Intratesticular varicocele to ETV connection. A, The ITV appears on gray scale sonography as a complex of serpentine structures (straight arrow) adjacent to the ETV (arrowheads). Note the continuity between the ITV and ETV (curved arrow). B, Color Doppler sonography shows the ITV connection to the ETV. C, Pulsed Doppler sonography shows a venous waveform in the insonated ITV.
This study, however, was not a review of all testicular sonographic examinations performed by us over the past 3 years but, rather, a series of cases collected over time. It is therefore possible that our study underestimates the true prevalence in our 2 institutions.

Extratesticular varicoceles are found in most cases on the left side. In most reports of ITVs, the dilated veins were seen on the left side,\(^2,3,6–8,11–13,16\) although the series described by Das et al\(^9\) found an almost equal distribution. In our study, 9 were left-sided and 5 were right-sided. Bilateral ITVs are not uncommon,\(^9,10,15\) having rates reported as 39\(^%\)\(^9\) and 40\(^%\)\(^10\) in previous studies. We found bilateral ITVs in 3 (25\%) of 12 patients. In early reports of ITV, the dilated veins were shown in or near the mediastinum testis. In our series, most varicoceles (9 of 15) were predominantly subcapsular in location, 7 of which were direct extensions of dilated extratesticular veins, and in 5 of them, there were dilated veins also scattered throughout the testis.

Men with ITVs may have testicular pain, attributed to the stretching of the tunica albuginea after venous congestion.\(^9\) Most of our cases, however, were not associated with pain, and the ITVs were incidental findings. Furthermore, because all of our patients who did have pain also had concomitant ETVs, it is not possible to assess the contribution made by ITV versus ETV in causing the pain. Tubular ITVs do not usually pose a diagnostic challenge and are easily differentiated from other focal intratesticular lesions such as cysts, abscesses, hematomas, and cystic neoplasms. The condition that most closely resembles a serpentine ITV is tubular ectasia of the rete testis, which is also seen in the proximity of the mediastinum.\(^17\) However, round or oval ITVs, especially when not totally anechoic, may mimic focal testicular lesions, including cystic neoplasms.\(^13\) In 2 of our patients, an oval “solid” lesion in the testis was initially interpreted as a tumor. In 1 of them, it was subcapsular in location, and in the other it was mediastinal. It was particularly alarming in 1 of these 2 patients, who had previously undergone orchiectomy for seminoma. The use of color Doppler imaging and the Valsalva maneuver, however, showed complete filling of the lesion with no evidence of an associ-
**Figure 4.** Different appearances of an ITV either as tubular subcapsular formations (long arrow) or as oval formations located more centrally (short arrow).

**Figure 5.** Effect of the Valsalva maneuver on varicosities. **A,** Power Doppler sonography shows initially minimal flow in the dilated veins. **B,** The flow is markedly increased during the Valsalva maneuver.

**Figure 6.** A lesion suspected as a tumor on gray scale sonography (**A**) was diagnosed as an ITV when color Doppler sonography was performed (**B**), particularly during the Valsalva maneuver (**C**).
ated soft tissue mass (Figure 6). Color Doppler imaging was therefore helpful in differentiating this ITV from other entities. No change was seen in these patients on repeated follow-up studies. In 40% of the cases reported here, the Valsalva maneuver was required to confirm the vascular nature of the intratesticular structure. This is a higher percentage than the 28% previously reported by Das et al.9

Lack of histologic proof and limited follow-up in most of our cases are limitations of this study. However, the gray scale features and the striking color Doppler response to the Valsalva maneuver are consistent with the diagnosis of ITV. It is also possible that some of our oval ITVs may have appeared tubular if scanned in an orthogonal plane.

In conclusion, ITV is a rare condition with a variable clinical and sonographic appearance. Most but not all cases are associated with an ipsilateral ETV and may be found in the left testis, right testis, or both testes. The notable observations of this study are related to the frequent location of ITVs in the subcapsular region of the testis and the important role of the Valsalva maneuver in showing flow, thus easily differentiating this condition from other focal intratesticular entities.

References