Adolescent varicocele: surgical versus conservative management

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Abstract:

Background: varicocele in adolescents is one of the most interesting subject in pediatric urology. Its management continues to be controversial and submits a problem for observation or treatment. Objective: to evaluate the efficacy of surgical correction of the varicocele in adolescent boys in regard to testicular growth and semen quality thereby preserving future fertility. Patients and methods: Forty-seven adolescents (aged 12-18 years) with diagnosis of varicocele confirmed by U/S, were evaluated in Al-Yarmouk Teaching Hospital / Baghdad / Iraq from January 2010 to December 2017. Semen analyses and hormone measurement were performed initially and after 1 year of follow-up. Varicocele grades and testicular volumes were measured using color Doppler U/S. patients were categorized into 2 groups; untreated group (n = 23) and treated group (n = 24). Data related to age, presenting complaint, body mass index, varicocele grade, testicular volume and semen parameters in addition to their correlation altogether were analyzed. Results: Correlating varicocele grade with body mass index (BMI), 4 (36.3%) patients with grade 1 varicocele encountered underweight, 6 (54.6%) had normal weight and 1 (9.1%) was obese. Grade 2 varicocele patients included 4 (21.1%) underweight, 12 (63.15%) normal weight and 3 (15.8%) overweight. In patients with grade 3 varicocele only 1 (5.9%) was underweight and 16 (94.1%) were normal weight. The preoperative sperm concentration, total and progressive motility significantly improved 1 year after surgical repair from a mean of 23.3 to 35.4 million / ml, from 35.1% to 42.4% and from 18.3 to 31.8% respectively. Catch-up growth of the affected testis was noted in 20 (83.3%) patients in the intervention group and in 7 (30.4%) patients in the conservative group after 1 year of follow-up. Conclusion: Adolescents with varicocele call for frequent follow-up with surgery offered to those with testicular growth arrest and abnormal semen analysis in order to prevent impaired spermatogenesis and future infertility.

Key words: adolescent, varicocele, BMI, testicular atrophy, semen analysis

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Introduction:

Varicocele is abnormal dilatation of the testicular pampiniform venous plexus\(^\text{(1,2)}\). In adolescents’ varicocele is one of the most popular genital cases seen by pediatric urologists\(^\text{(3)}\) with a prevalence of as high as 15%\(^\text{(1,4,5)}\). The precise etiology of varicocele continues to be obscure, but most theories advocate that it links to the anatomy of testicular vascularization. Anatomical variation in the venous return between right and left testicular veins may explain the presence of dilated veins of the plexus pampiniformis mostly on the left side\(^\text{(6,7)}\). The majority of adolescents with varicocele are asymptomatic\(^\text{(3)}\). It is noticed as dissymmetry in scrotal size, and displays as heaviness in the scrotum, or hardly with painful testis\(^\text{(8)}\). Varicocele is most often diagnosed during regular physical
examinations. Doppler ultrasonography is the most feasible and non invasive examinations. Semen analysis is achievable three years after the commencement of puberty when semen parameters attain adult standards (9).

Many approve that indications for surgery in adolescent’s varicocele are pain, big varicoceles, hypotrophy of the affected testis, bilateral varicocele and abnormal semen parameters on sequential analysis (9,10). There is an obvious relationship between varicocele, infertility and testicular growing halt (8), and varicoceles are considered the most widespread and repairable cause of male infertility (1,2).

The choice of varicocelectomy in adolescents and its timing carry on being debatable (11). The majority of clinicians accord that treating adolescents’ varicocele, consequently submitting a lot of them to probably undue operation tended to be inconvenient, charged and against moral regards, nevertheless awaiting till adolescents become adults with potential irreparable infertility is bound to be inappropriate (1).

This study aimed at evaluating the efficacy of surgical correction of the varicocele in adolescent boys in regard to testicular growth and semen quality thereby preserving future fertility.

**Patients and methods:**

Forty- seven adolescents (aged 12-18 years) with diagnosis of varicocele confirmed by U/S, were evaluated in Al-Yarmouk Teaching Hospital/ urology department / Baghdad / Iraq from January 2010 to December 2017.

A medical history was taken from all patients with a thorough physical examination including the weight, height and body mass index. No patient recorded past incidents of endocrine abnormalities, hydrocele, undescended testis, testicular trauma or urogenital surgery. Informed consents were obtained from all patients before enrolling in this study.

Patients were examined in a worm location to relax the scrotum with Valsalva maneuver performed both in standing and supine positions.

Varicoceles were labeled into grade 1: small (only palpable with Valsalva maneuver), grade 2: moderate (palpable without Valsalva maneuver) or grade 3: large (apparent through the scrotal skin).

All patients were fully investigated including semen analysis and hormone measurement (performed initially and during the follow-up period); serum luteinizing hormone (LH), follicular-stimulating hormone (FSH) and testosterone (T), their varicocele grades, testicular volumes and consistency were measured using color Doppler U/S. According to ultrasound evaluation testicular length, height and width were measured in mm, and its volume was estimated using the formula \( TV = \text{height} \times \text{length} \times \text{width} \times 0.71 \) (12). Testicular volume differential (TVD) was estimated using the formula: volume of unaffected testis – volume of affected testis / total testicular volume × 100 (%). Testicular atrophy index (TAI) to detect testicular atrophy was estimated by the formula: volume of unaffected testis – volume of affected testis / volume of unaffected testis × 100 (%) (13,14). Hypotrophy of the testis is realized when its volume is less than 2 ml and exceeds 20% variance in comparison to the volume of other testis assessed by ultrasonography (10).
Patients were categorized into 2 groups; intervention and conservative. Varicocelectomy was performed utilizing the inguinal approach.

Success was assessed by clinical examination and Doppler U/S 3, 6, 9 months and one year after surgery.

This study was approved by the ethical committee of the institute.

The Statistical Analysis System- SAS (2012) program was performed to detect the influence of different elements on article variables. Least T-test was applied to identify significant comparison among averages in the current research.

**Results:**

Forty-seven adolescents with varicocele (their mean age was 15.05 years) were defined at random to either the conservative group (n = 23) or the intervention group (n = 24).

The age ranges for the untreated and treated groups were 12 to 16 (14.4 ± 0.65) and 14 to 18 (15.7 ± 0.73) respectively.

Of the patients, 43 (91.5 %) had varicocele on the left side and 4 (8.5 %) on the right side, (Figure 1)

![Figure 1: Distribution of varicocele side among patients](image)

On the bases of U/S examination, 11 (23.4%) had a grade 1, 19 (40.4%) got a grade 2 and 17 (36.2%) displayed a grade 3 varicocele. 35 (74.4%) patients had left testicular atrophy. (Table 1)

<table>
<thead>
<tr>
<th>Varicocele grade</th>
<th>Untreated (conservative)group</th>
<th>Treated (intervention)group</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N (%)</td>
<td>N (%)</td>
<td>N (%)</td>
</tr>
<tr>
<td>1</td>
<td>5 (45.5)</td>
<td>6 (54.5)</td>
<td>11 (23.4)</td>
</tr>
<tr>
<td>2</td>
<td>10 (52.6)</td>
<td>9 (47.4)</td>
<td>19 (40.4)</td>
</tr>
<tr>
<td>3</td>
<td>8 (47)</td>
<td>9 (53)</td>
<td>17 (36.2)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>23 (48.9)</strong></td>
<td><strong>24 (51.1)</strong></td>
<td><strong>47 (100)</strong></td>
</tr>
</tbody>
</table>

| left testicular atrophy | 14 (40) | 21 (60) | 35 (100) |
Concerning the presenting complaint, 9 (19.1%) suffered from scrotal ache, 15 (31.9%) had scrotal swelling, 6 (12.8%) possessed contusion on the scrotal skin, 11 (23.4%) exhibited distended veins and 6 (12.8%) experienced more than one complaint. (Figure 2)

![Figure 2: the patients’ presenting complaint](image)

Of the 47 patients with varicocele, only 7 had positive familial history of varicocele.

The mean body weight and the mean height of the patients were 40.1 kg (21-63 kg) and 147 cm (120-167 cm) respectively.

In regard to BMI, 9 patients encountered underweight, 34 patients had normal weight, 3 patients manifested overweight and 1 patient was obese.

Correlating varicocele grade with BMI, 4 (36.3%) patients with grade 1 varicocele had underweight, 6 (54.6%) got normal weight and 1 (9.1%) was obese. 4 (21.1%) patients with grade 2 varicocele showed underweight, 12 (63.15%) displayed normal weight and 3 (15.8%) were overweight. 1 (5.9%) patient with grade 3 varicocele was underweight and 16 (94.1%) were normal weight. (Table 2)

<table>
<thead>
<tr>
<th>BMI</th>
<th>Grade 1</th>
<th>Conservative N (%)</th>
<th>Surgical N (%)</th>
<th>Grade 2</th>
<th>Conservative N (%)</th>
<th>Surgical N (%)</th>
<th>Grade 3</th>
<th>Conservative N (%)</th>
<th>Surgical N (%)</th>
<th>Total N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight</td>
<td>2 (18.18)</td>
<td>2 (18.18)</td>
<td>2 (10.5)</td>
<td>2 (10.5)</td>
<td>1 (5.9)</td>
<td></td>
<td>9 (19.1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal weight</td>
<td>4 (36.36)</td>
<td>2 (18.18)</td>
<td>5 (26.3)</td>
<td>7 (36.9)</td>
<td>10 (58.9)</td>
<td>6 (35.2)</td>
<td>34 (72.3)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overweight</td>
<td>1 (5.3)</td>
<td></td>
<td></td>
<td>2 (10.5)</td>
<td></td>
<td></td>
<td>3 (6.3)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obese</td>
<td>1 (9.1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 (2.12)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>11 (23.4)</td>
<td>19 (40.4)</td>
<td></td>
<td>17 (36.2)</td>
<td></td>
<td></td>
<td>47 (100)</td>
<td></td>
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</tbody>
</table>
concerning the relationship between varicocele grade and the presenting complaint, 4 (36.3%) patients with grade 1 varicocele suffered from scrotal ache, 5 (45.5%) had scrotal swelling and 2 (18.2%) possessed skin contusion. 4 (21.1%) patients with grade 2 varicocele had scrotal ache, 9 (47.3%) presented with scrotal swelling, 3 (15.8%) had skin contusion, 2 (10.5%) presented with distended veins and 1 (5.2%) had more than one complaint. 1 (5.9%) patient with grade 3 varicocele complained of scrotal ache, 1 (5.9%) had scrotal swelling, 1 (5.9%) had skin contusion, 9 (52.9%) experienced distended veins and 5 (29.4%) had more than one complaint. (Table 3)

Table 3: relation between presenting complaint and grades of varicocele

<table>
<thead>
<tr>
<th>complaint</th>
<th>Grade 1</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>Grade 2</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>Grade 3</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>Total</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>conservative</td>
<td>surgical</td>
<td>conservative</td>
<td>surgical</td>
<td>conservative</td>
<td>surgical</td>
<td>conservative</td>
<td>surgical</td>
<td>conservative</td>
<td>surgical</td>
<td>conservativo</td>
<td>surgical</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scrotal ache</td>
<td>2(18.18)</td>
<td>2(18.18)</td>
<td>3(15.7)</td>
<td>1(5.3)</td>
<td>1(5.9)</td>
<td>9(19.1)</td>
<td></td>
<td></td>
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<tr>
<td>Scrotal swelling</td>
<td>3(27.28)</td>
<td>2(18.18)</td>
<td>4(21)</td>
<td>5(26.3)</td>
<td>1(5.9)</td>
<td>15(31.9)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Skin contusion</td>
<td>2(18.18)</td>
<td>2(10.5)</td>
<td>1(5.3)</td>
<td>1(5.9)</td>
<td>6(12.8)</td>
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</tr>
<tr>
<td>Distended veins</td>
<td>1(5.3)</td>
<td>1(5.3)</td>
<td>4(23.5)</td>
<td>3(29.4)</td>
<td>11(23.4)</td>
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<td></td>
<td></td>
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<tr>
<td>&gt; one complaint</td>
<td>1(5.3)</td>
<td>1(5.9)</td>
<td>4(23.5)</td>
<td>6(12.8)</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Total</td>
<td>11 (23.4)</td>
<td>19 (40.4)</td>
<td>17 (36.2)</td>
<td>47(100)</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Table 4 demonstrated the changes in the semen analysis before and after surgery. Overall the preoperative sperm concentration, total and progressive motility significantly improved 1 year after surgical repair from a mean of 23.3 to 35.4 million / ml, from 35.1% to 42.4% and from 18.3 to 31.8% respectively.

Table 4: semen analysis in both groups

<table>
<thead>
<tr>
<th>semen parameters</th>
<th>Untreated group</th>
<th>Treated group</th>
<th>P value</th>
<th>Untreated group</th>
<th>Treated group</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Initial Mean ± SD</td>
<td>Follow-up Mean ± SD</td>
<td></td>
<td>Initial Mean ± SD</td>
<td>Follow-up Mean ± SD</td>
<td></td>
</tr>
<tr>
<td>Concentration(million / ml)</td>
<td>25.6 ± 1.48</td>
<td>26.2 ± 1.41</td>
<td>0.071</td>
<td>23.3 ± 1.30</td>
<td>35.4 ± 1.63</td>
<td>0.0038 **</td>
</tr>
<tr>
<td>Total motility(PR + NP, %)</td>
<td>34.4 ± 2.07</td>
<td>36.9 ± 1.96</td>
<td>0.092</td>
<td>35.1 ± 1.83</td>
<td>42.4 ± 2.48</td>
<td>0.0367 *</td>
</tr>
<tr>
<td>Progressive motility (PR, %)</td>
<td>17.9 ± 0.86</td>
<td>20.1 ± 0.72</td>
<td>0.0498 *</td>
<td>18.3 ± 0.83</td>
<td>31.8 ± 1.39</td>
<td>0.0075 **</td>
</tr>
<tr>
<td>Normal sperms(%)</td>
<td>57.8 ± 2.69</td>
<td>55.9 ± 2.44</td>
<td>0.349</td>
<td>53.1 ± 2.51</td>
<td>59.7 ± 2.72</td>
<td>0.428</td>
</tr>
</tbody>
</table>

PR=progressive motility, NP=non progressive motility, * (P≤0.05),  ** (P≤0.01).

During 1 year of follow-up after surgery, considerable improvement in testicular volume with less than 20% of testicular asymmetry was noted in 20 (83.3%) patients in the intervention group and in 7 (30.4%) patients in the conservative group.

Levels of FSH, LH and Testosterone in the plasma were normal in all cases initially and after 1 year of follow-up.
Discussion:

In the present study most of the patients (91.5%) had varicocele on the left side in agreement with the studies\(^{(15,16)}\).

Based on Ultrasound scanning, the larger part of our patients (40.4%) got a grade 2 varicocele in contrast to Çimen \(^{(17)}\) who reported a predominance of grade 3 varicocele in his patients. (74.4%) of our adolescent patients had testicular atrophy, similar to other study made by Allough\(^{(18)}\).

Despite varicocele in adolescents is usually symptomless, some patients do have symptoms. At times varicoceles are discovered because of dilated veins or difference in size between the 2 testes identified by the family \(^{(19,20)}\). In our study the typical presenting complaint was scrotal swelling followed by distended veins and scrotal ache.

The occurrence of varicocele in the patients with first-degree relatives having varicocele was observed to be 3-4 times elevated than the normal people \(^{(21,22)}\) in our study 7 (14.8%) patients exhibited a positive varicocele history in the family.

In the current study it was seen that higher BMI might have a preventive role on the development of varicocele, but its grade increased as BMI increased, similarly recent studies had discussed this protective influence showing that varicocele incidence is lower in patients who gained overweight and obesity \(^{(23-26)}\) and in a big series research by Liu et al\(^{(27)}\), it was reported that grade of varicocele diminished with reduced BMI, however Fazeli et al demonstrated in his study that patients with a low BMI manifested a high varicocele grade\(^{(28)}\).

Our results showed that in children with varicocele, 35 (74.4%) patients had left testicular atrophy which was reversed with less than 20% of testicular asymmetry in 20 (83.3%) of patients 1 year after surgical treatment of varicocele. Similarly the majority of researchers demonstrated atrophy of the testis due to a varicocele presence \(^{(29-34)}\) and plenty of studies proved that varicocele is accompanied by cessation of testicular growth in adolescents and that varicocelectomy result in testis “catch-up” growth \(^{(35,41)}\). On the contrary although Lipshutz and Carriere\(^{(42)}\) indicated in their study that the existence of varicocele was linked with lack of testicular body, which seemed increasing with age, they evoked the question whether early surgery would stop this process. Likewise Cayan et al\(^{(43)}\) observed in his study that only 10 (53%) out of his 19 boys did regain normal testicular growth after surgery and Decastro et al\(^{(40)}\) found that just (69%) of his patients had achieved catch-up growth following surgery.

In the present study there was a correlation between adolescent varicocele, testicular hypotrophy and diminished sperm concentration and total motility, this finding has been reported by several authors \(^{(10,32-35,44,45)}\). Significant and profound improvement was noted in seminal analysis outcome of our patients after surgical repair of varicocele, this was well supported by other studies \(^{(38,43,46-48)}\).

Conclusion:

Adolescents with varicocele call for frequent follow-up with surgery offered to those with testicular growth arrest and abnormal semen analysis in order to prevent impaired spermatogenesis and future infertility.

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Disclaimer: the views expressed in the submitted article are my own and not an official position of the institution or funder

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