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Natural history of testicular size in boys with varicoceles

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Summary

Introduction
Testicular size is commonly used as a proxy for future fertility in adolescent boys diagnosed with varicoceles. Surgery is often performed based on a 15–20% reduction in volume of the ipsilateral testicle when compared to the unaffected side. Recent European Association of Urology guidelines, however, have highlighted the risk of over-treatment. Data on the natural progression of testicular size discrepancy are limited in this population. To evaluate the role of a non-surgical approach, the present study reports on testicular size progression in 35 boys with left-sided varicoceles managed with observation alone.

Methods
In the present study, 103 consecutive boys who were seen for varicocele were retrospectively evaluated; the 35 who were seen for at least three sequential visits by the same pediatric urologist for a unilateral left varicocele were selected. In the present practice, surgical management of varicoceles in teens is offered, but not recommended unless surgery is being performed for another reason (3/103). The Prader orchidometric testicular volumes that were documented for all visits were recorded and the volume of the left testicle as a percentage of the right was calculated. This analysis was performed for the entire population, and subgroup analysis was conducted for boys with a Grade 3 varicocele, with >10% asymmetry at diagnosis, and by dividing the population into prepubertal and pubertal age groups. Boys with bilateral varicoceles, concurrent testicular masses, or volumes recorded by a nurse practitioner were excluded from the study.

Results
The mean left testicular volume in the population was found to measure 96%, 95% and 96% of the right at the first, second and third visit (median interval was 2.0 years), respectively. Among the 26 boys seen for a fourth visit (median 3.3 years) and the 15 seen for a fifth visit (median 4.3 years), the mean left testicular volumes were 98% and 97% of the right at diagnosis and 97% at both the fourth and fifth visits (Figure). Likewise, no differences were seen after dividing the population into prepubertal (9–11 years, $n = 9$) and pubertal (12–14 years, $n = 26$) groups. Among the 13 (37%) boys with a Grade 3 varicocele at presentation, the left testicular volume was 95% (SD 11.4) of the right and remained unchanged by the third visit (96%, $P = 0.69$). In addition, among the 11 boys (31%) with greater than 10% size difference at the first visit, the left testicle measured 82% of the right (SD 5.3) at diagnosis and increased to 92% (SD 6.3) by the third visit ($P < 0.001$).

Discussion
In the 35 boys observed over a median of 2.0 years or three consecutive visits, there was no worsening of testicular asymmetry. This finding is consistent with some previous observational data on pediatric varicoceles, but carries the advantages of a narrower age range and longitudinal follow-up in all patients. At the same time, these results differ from other studies that show no improvement or worsening of asymmetry during follow-up. This difference is attributed to the inherent characteristics of the present study population and the choice of orchidometer for measurement. The present data have the advantage of excluding selection bias. Recognizing that this study is a retrospective, single-operator study with a small sample size, prospective, randomized trials are recommended to weigh surgery vs observation in adolescent varicocele patients.

Conclusions
No progression in atrophy/hypotrophy of the left testis was found in a series of 35 consecutive patients who were followed non-surgically for left-sided varicocele. Our data thus support observation as management for childhood varicocele in younger teens.

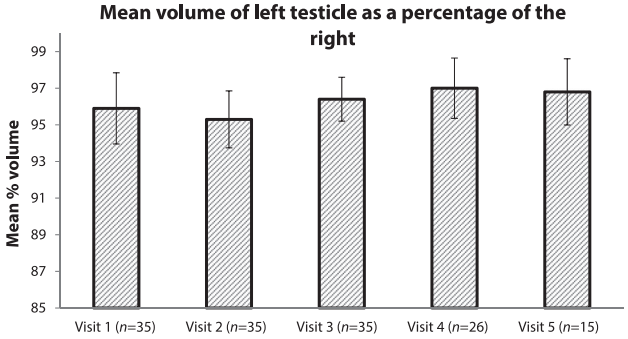

Figure No significant change noted in mean relative volume of the left testicle during follow-up. Errors bars represent Standard Error of Mean.

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Introduction

It is estimated that varicoceles occur in about 15% of adolescent boys [1]. The vast majority are asymptomatic, left sided and incidentally noted by a primary care provider. An associated finding is decreased volume of the ipsilateral testicle, which is reported in up to 70% of cases in some series, although most studies show a lower rate. The atrophy/hypotrophy of the left testis raises concerns regarding future fertility [2]. Whereas this can be addressed in adults by using semen analysis, the challenges of performing semen analysis in teenagers, especially those less than Tanner stage 5, as well as the limited data on normal semen parameters in this population, complicates their management.

In the absence of semen analysis, testicular size is a commonly used proxy for future fertility. A best-practice policy published by the AUA in 2001 recommended that all adolescents with reduced ipsilateral testicular growth should be offered varicocele repair. In subsequent years, investigators redefined criteria for surgical intervention, with the most commonly cited threshold being a 15—20% reduction in ipsilateral testicular volume compared to the unaffected side. Studies by Diamond and coworkers were instrumental in defining this criterion, as it was noted that up to 59% of Tanner stage-5 adolescents with a 20% difference in testicular volume showed abnormal total sperm counts [3]. Indeed, with 20% chosen as the marker for intervention, varicocelectomy improved testicular discrepancy to less than 20% in 85% of adolescents at 12 months post surgery [4]. Interestingly, despite these findings, the 2012 European Association of Urology guidelines on male fertility noted that 'in adolescents there is a significant risk of overtreatment' [5]. While numerous studies have sought to define the timing and necessity for intervention based on testicular size, few have reported on the natural progression of testicular growth associated with adolescent varicoceles. Furthermore, those few observational studies have several limitations, including a very wide age range, variable follow-up and variable approach towards surgical intervention, with some patients followed for as little as 6 months [4,6,7]. In order to fill this gap, a retrospective analysis of 35 boys with varicoceles, taken from a population that was non-surgically managed and seen regularly for a minimum of three visits, was performed.

Patients and methods

After Institutional Review Board approval, the records of all patients presenting with a diagnosis of varicocele between 2007 and 2013 were reviewed. The subset of patients who were seen during this period showed 103 consecutive boys who were first seen when younger than 18 years of age. All but three had been non-surgically followed; those three were operated on for their varicocele at the time of a concurrent anesthetic for a different surgical procedure. This was consistent with the practice standard, where although surgery is offered, it is not recommend prior to adulthood unless concomitant surgery is being performed for another reason.

Seventy boys were found with orchidometric measurement at the first encounter. Of these, 35 boys, who had documented follow-up for at least three annual visits by the same examiner (B.A.K.), were isolated. Thus, those with fewer than three visits were not included in the analysis. Other exclusion criteria were: having been examined by another attending examiner, an Nurse Practitioner/Physician Assistant, patients with right sided or bilateral varicoceles or those with scrotal masses. Consequently, all 35 boys had isolated left-sided varicoceles and had orchidometric measurements taken by the same pediatric urologist over at least three encounters. Furthermore, a subset of 26 and 15 boys were seen for fourth and fifth visits, respectively. None of the 35 boys underwent surgical intervention and one boy reported significant pain.

Varicocele grades were determined on a scale of 1—3: (1) palpable with valsalva; (2) palpable without valsalva; (3) visually evident without palpation. Testicular volumes were determined using a Prader orchidometer (Endocrine Society (Washington, DC)). A few boys had undergone an ultrasound, but for consistency these measurements were not used in this study. The same attending physician consistently assessed both volume and grade.

Testicular volumes and varicocele grades across all visits were recorded and then the size of the left testicle as a percentage of the right was calculated. Percent asymmetry was likewise calculated as [(Vol R—Vol L)/Vol R] $\times$ 100. Paired *t*-tests were used to compare the change in relative testicular size between visits. Data were further analyzed based on whether the boys presented between the ages of 9—11 (prepubertal) or 12—14 years (pubertal). The data were also scrutinized for boys with Grade 3 varicoceles and for those with a greater than 10% difference in testicular size at the initial visit. A difference of 10% was chosen to be inclusive, as there were concerns that orchidometric (vs ultrasound) measurements might decrease the sensitivity of the size discrepancies. All statistical analysis was conducted with GraphPad Prism 5 (GraphPad Software, Lajolla, CA) with $P < 0.05$ as the standard for significance.

Results

The study population comprised 35 boys presenting with left-sided varicoceles and at a median age of 12 years (range 9—14 years). At the initial visit, the median varicocele grade was 2 and the mean left testicular volume was 96% of the right. Eleven (31%) boys presented with a >10% difference between right and left testicles and, likewise, 13 (37%) demonstrated Grade 3 varicoceles at presentation. By definition, all 35 boys were followed for three visits, with the third visit at a median of 2.0 years. Data for fourth and fifth follow-up visits were available for a subset of 28 and 15 boys, at a median of 3.3 and 4.3 years, respectively.

Table 1 outlines the left testicular volume as a percentage of the right, across the entire study population. At visit 1, the boys demonstrated a mean left testicular volume that was 96% of the right; this remained unchanged at visit 3, with a volume of 96%. Similar findings were also seen in the boys who were followed for fourth and fifth visits, with a mean left volume of 97% of the right at each visit.