Review Article

Evaluation and Management of the Adolescent Varicocele

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Abbreviations and Acronyms

AMH = anti-müllerian hormone
FSH = follicle-stimulating hormone
GnRH = gonadotropin-releasing hormone
LH = luteinizing hormone
LTV = left testicular volume
RTV = right testicular volume
TMC = total motile count
TTV = total testicular volume
TV = testicular volume
TVdiff = testicular volume differential

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Purpose: Varicocele is one of the most common genital conditions referred to pediatric urologists. Most adolescents with varicocele are asymptomatic and their fertility future (and surgery benefit) is largely unknown. This review assesses varicocele evaluation, management and indications for repair, as well as types and success of varicocelectomy.

Materials and Methods: A systematic literature review was performed on Embase™, PubMed® and Google Scholar™ for adolescent varicocele. Original research articles and relevant reviews were examined, and a synopsis of these data was generated for a comprehensive review of clinical adolescent varicocele management.

Results: The prevalence of adolescent varicocele is similar to the adult population. While ultrasound is the most sensitive method for determining testicular volumes, orchidometer measurement may be adequate to gauge significant discordance. Significant hypotrophy of the affected testis with poor total testicular volume may indicate a testis at risk and warrant surgical repair. Similar findings have been noted with an associated high peak retrograde venous flow. Testicular hypotrophy often resolves following surgery but may also improve spontaneously if followed through adolescence. Continued scrotal pain despite adequate support or serial abnormal semen analysis in Tanner stage V boys is an indication for varicocelectomy. Artery and lymphatic sparing techniques (microscopic subinguinal or laparoscopic) are associated with the lowest risk of recurrence and complications.

Conclusions: Overtreatment and under treatment are medically and financially costly. Abnormal serial semen analysis with or without testicular hypotrophy is an indication for varicocele repair. If observation remains the treatment, followup with an adult urologist should be encouraged until paternity is achieved.

Key Words: adolescent, infertility, semen analysis, testis, varicocele

Varicocele is among the most common genital issues referred to pediatric urologists. While the condition is relatively uncommon in boys before age 10 years, its prevalence increases to 8% to 16% through puberty. In the 15 to 19-year-old age group the prevalence of varicocele is about 15%, similar to that seen in the adult population.[1] While varicocele repair in symptomatic men may improve fertility potential, it has been estimated that 85% of men with varicocele will not encounter male factor infertility.[2] In contrast, most adolescents who present with varicocele are asymptomatic and their fertility future is unknown. Thus, evaluation and treatment of the adolescent varicocele remain unclear and

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controversial despite significant research during the last several decades. This review will cover varicocele evaluation, management and indications for repair, as well as types and success of varicocelectomy.

EVALUATION

Evaluation of the patient with varicocele should be geared toward identification of possible risk factors associated with long-term subfertility. To this end, the primary points of assessment have been varicocele grade, testicular volume (differential or total), ultrasound venous investigation, endocrine evaluation and semen analysis. Varicocele grade (I, palpable when standing with Valsalva; II, palpable when standing; III, visible when standing) association with poor left testicular growth has been variable. In adolescents a direct correlation between varicocele grade and semen parameters has not been observed. Some have correlated a higher grade with poor ipsilateral growth, while Kass et al showed that the right testis may similarly be at growth risk with large grade III varicoceles.[3] However, others have observed no relationship.[4–8] Thus, varicocele grade alone is not an indicator for surgical repair.

Testicular size has been used by many authors to gauge developing spermatogenic potential in adolescent males with varicocele. The association of varicocele with left testicular hypotrophy was demonstrated several decades ago in adults and subsequently in adolescents.[9] Several studies have revealed that left testicular hypotrophy may improve after varicocele repair and so may represent a testis at risk.[10–12]

Significant LTV vs RTV differential has been identified as 10% to 20%, or a 2 to 3 ml difference in size. Possible testicular hypotrophy has generally been evaluated as either an atrophy index compared to the right, ie (RTV − LTV)/(RTV), or as a testicular volume differential similar to renal function evaluation, ie TVDiff = (RTV − LTV)/(TTV). Both formulas are interchangeable, and differential TVs can easily be converted from one formula to another with near perfect accuracy.[13]

Paltiel et al measured testicular volume in anesthesized dogs using Prader and Rochester orchidometers, and then in vivo by ultrasound.[14] The ultrasound measurements were calculated using 2 formulas, ie volume = length × width × height × 0.52 (volume of an ellipsoid) and volume = length × width × height × 0.71 (Lambert formula). These measures were compared to the volumes definitively obtained by water displacement. Paltiel et al found that ultrasound was more accurate than orchidometry and the Lambert formula was superior to the formula of an ellipsoid for determining testicular volume.[14] Diamond et al examined this matter in humans and concluded that orchidometer measurement is too insensitive to assess volume differentials to determine growth impairment compared to ultrasound.[15] However, testis ultrasound measurement may also be somewhat imprecise regarding the placement of cursors for determining length, width and depth. This inherent variability seen in clinical practice is why many have maintained that the decision for surgery should not be based on a single measure at a single point in time, but that several measures through time will settle true significant asymmetry.

Recently Goede et al obtained reference data for testicular volume measured by ultrasound in asymptomatic boys 0.5 to 18 years old.[16] For Tanner stage V boys individual testis volumes ranged from 20 to 40 cm^3. They found an accurate correlation between volume measurements by ultrasound and by the Prader orchidometer ($R^2 = 0.956$), and concluded that orchidometry can be used as a valid parameter for monitoring testicular growth. The exact method of testicular volume measurement is left to the discretion of the urologist. The key point is that a consistent method needs to be used to obtain a reliable measure of testicular growth in an individual adolescent through time.

MANAGEMENT

Management of the adolescent with varicocele remains controversial. Coutinho et al recently queried members of the American Academy of Pediatrics Section on Urology regarding varicocele management.[17] They found that if significant testicular size discrepancy is identified, 32% of practitioners immediately intervene surgically, while 59% repeat measurements in 6 to 12 months. When there is no volume differential identified, 37% of practitioners discharge their patients with no followup, 23% refer to an infertility specialist and 31% evaluate with semen analysis. Interestingly 57% of practitioners had never sent patients for semen analysis.

Pastuszak et al similarly surveyed members of the Society for Pediatric Urology.[18] Most respondents operate for decreased ipsilateral testis size, while some operate for varicocele grade alone. Only 39% operate because of altered semen parameters, and 89% were unaware of the later fertility status of the patients they operated on. Unfortunately with a low response rate in both surveys (28% to 54%) a definitive practice pattern consensus could not be reached.

While some have argued for surgical correction if the affected testicular volume is 10% to 20% less than that of its contralateral normal mate, others have noted that nearly 80% of these volume