Varicocele in adolescent: a literature review

Emadoddin Moudi
Department of urology, Babul University of Medical science, Babul, Iran
Emadmoudi@gmail.com

ABSTRACT
Varicocele is mostly asymptomatic, rarely causing pain at this age. The guidelines for managing varicocele in adolescent are not fully elicited, but the major surgical indications are testicular loss of volume followed by testicular pain. Young adult males with varicoceles, who have normal semen parameters, may be at risk for progressive testicular dysfunction and should be offered monitoring with semen analyses every one to two years. No study has detailed the influence of pediatric and adolescent varicocelectomy on testicular volume according to age. This review article describes the varicocele during adolescent. An electronic search has been conducted, during 2016, via PubMed and Medline database English literature. Peer-reviewed articles were targeted following key-words have been used: Varicocele, Children and Adolescent. Available full-text articles were read. Related articles were also scrutinized. Hand search was also driven.

Keywords: Varicocele, Adolescent

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I. INTRODUCTION
The non-palpable enlargement of the venous plexus of the spermatic tone, which can be diagnosed only by imaging techniques, is defined as varicocele (Naugton et al. 2001). There is growing report on varicocele incidence in adolescents. Varicocele is normally known as the cause of subfertility in men (Chrouser et al. 2004; Chen and Huang, 2010). Varicocele has implications on the quality of sperm and fertility in children and adolescents (Feber et al. 2008). The adverse influence of varicocele increases with time. Testicular catch-up growth and improvement in sperm parameters after varicocelectomy has been reported in adolescents. Varicocele is mostly asymptomatic, rarely causing pain at this age. The guidelines for managing varicocele are not fully elicited, but the major surgical indications are testicular loss of volume followed by testicular pain (Chrouser et al. 2004). For instance, Hernia surgery (Darzi et al. 2013) and Varicocelectomy are of the most common operations (Zini, 2007). This review article describes the epidemiology and etiology as well as diagnose and treatment of the varicocele in adolescent. An electronic search has been conducted, during 2016, via
PubMed and Medline database English literature.

II. MATERIAL AND METHODS
The keywords used for the literature search for this review was peer-reviewed articles following key-words: Varicocele × Adolescent. Available full-text articles were read. Related articles were also scrutinized.

Hand search was also driven. The search was carried out using Biological Abstracts, Chemical Abstracts, and the data bank of the PubMed and Medline database updated to 2016. The references found in the search were then studied in detail.

III. WHAT IS THE VARICOCELE?
Varicocele is defined as a dilatation or tortuosity of the veins of the pampiniform plexus varicoceles (Masson and Brannigan, 2014). Clinically, they are found more commonly on the left side, although there is wide variation among the reported prevalence of bilateral varicoceles (Rattansingh et al. 2009). Most anatomic research was conducted on the internal spermatic vein and varicocele formation; however, there are some data to suggest that dilated external spermatic veins can also contribute to primary or recurrent varicoceles (Masson and Brannigan, 2014). The pathophysiology of testicular damage in varicocele is not completely elicited (Celik-Ozenci et al. 2006).

Their findings suggest that varicoceles cause a progressive decline in fertility and can continue to induce impairment of spermatogenesis, despite prior fertility (Celik-Ozenci et al. 2006; Masson and Brannigan, 2014). Abnormal dilatation of the peri-testicular veins is more commonly encountered on the left side and is better seen when examining the patient in an upright position or during the Valsalva maneuver (Gorman et al. 2005).

III. EPIDEMIOLOGY
Varicocele is identified in pre- and post-pubertal males. The higher frequency in elderly males and in men with secondary infertility suggests that it is a progressive disease (Esteves et al. 2011). Anecdotal experience suggesting that lean men are more prone to varicocele has been supported by recent studies showing that varicocele occurrence is inversely correlated with body mass index (Esteves et al. 2011). Approximately, 30-50 percent of males with primary infertility have varicocele. The prevalence of varicocele in the general population varies from 4-30 percent. This variation indicates either that the prevalence of varicocele is varying among the different populations (Nagler et al. 1997). Young adult males with varicoceles, who have normal semen parameters, may be at risk for progressive testicular dysfunction and should be offered monitoring with semen analyses every one to two years, in order to detect the earliest sign of reduced spermatogenesis (Nagler et al. 1997). Adolescent males with unilateral or bilateral varicoceles and evidence of reduced testicular size should consider for varicocele repair (Nagler et al. 1997).

IV. ETIOLOGY
There are several theories attempting to explain the etiology of varicocele. The predominance of the left side varicocele and the unique anatomy of the left testicular vein are the basis for several theories explaining the etiology of varicocele (Cayan et al. 2009). The non-palpable enlargement of the venous plexus of the spermatic tone, which can be diagnosed only by imaging techniques, is defined as subclinical varicocele (Naugton et al. 2001). Most researchers agree that the detection of a subclinical varicocele is not an indication for surgical repair, because the prospective controlled studies which have included men with subclinical varicocele failed to report an increase in the pregnancy rate postoperatively (Lund et al. 1999). Because the left testicular vein is longer than the right, the hydrostatic pressure difference could be a factor causing a left varicocele (Cayan et al. 2009). Even though the numerous theories that aim to explain the effect of varicocele on testicular function, none can fully clarify the variable conclusion of
Varicocele on male fertility (Agarwal et al. 2009). Proposed mechanisms include hypoxia and stasis, testicular venous hypertension, autoimmunity, elevated testicular temperature, reflux of adrenal catecholamine’s and increased oxidative stress (Hsieh et al. 2006).

Venous hypertension, defined as the hydrostatic column that entails pressure over the already sick gonadal venous valves, along with reflux of toxic adrenal and renal metabolites into the testicles, can cause chronic vasoconstriction of testicular arterioles (Agarwal et al. 2009). The diagnosis of male infertility routinely begins with a basic semen analysis, which measures various semen parameters including semen volume, color, pH, liquefaction time, viscosity, sperm count and motility, sperm morphology and sperm viability (Agarwal et al. 2014). A relationship reported between varicoceles and semen parameters. As observed in this study, sperm characteristics significantly diminished in varicocele-induced animals than normal groups.

IV. I. TESTICULAR VOLUME

Varicocelectomy has been shown to improve several specific functional sperm defects. Following varicocele repair, improvements have been seen in the sperm penetration assay, strict morphology quantification, oxidant determination (ROS) and DNA fragmentation (Miyaoka and Esteves, 2012).

Testicular volume upsurge after varicocelectomy in adolescents with preoperative testicular volume difference or atrophy (Papanikolau et al. 2000). The volume of the involved left testis increased to normal in treated boys and varicocele repair in adolescents resulted in catch-up growth within 12 months of surgery (Papanikolau et al. 2000). To our knowledge, no study has detailed the influence of pediatric and adolescent varicocelectomy on testicular volume according to age. This finding may be explained by the fact that testicular growth is mostly completed by age and only interstitial of the testes may partially develop to produce testosterone (Misseri et al. 2001). In this regard, Gershbein et al (1997) described left testicular hypertrophy (left at least 10% greater than right testicular volume), regardless of age at surgery, in 38% of boys who underwent varicocele repair. Also, left testicular hypertrophy after varicocelectomy was seen in only 1 (5.2%) of 19 boys with preoperative left testicular atrophy (Misseri et al. 2001). In post pubertal adolescents, varicocele repair is indicated for abnormal semen analysis, low serum testosterone (Misseri et al. 2001).

IV. II. FERTILITY

Male fertility is a complex phenomenon and several factors can affect it such as physical damage or chemical and toxins (Pasqual Otto et al. 2005) or pathophysiologic conditions such as prostate (Ali Ramaji et al. 2014b). On the other hand, it is well known a correlation exists between varicocele and fertility (Ali Ramaji et al. 2014a). There is still an ongoing debate among researchers to the extend varicocele affects semen parameters, which usually vary from normal to mild asthenospermia, teratospermia or asthenoteratospermia. Initially, sperm concentration is not seriously affected; though later all three sperm parameters can gradually deteriorate, resulting in azoospermia in very few cases (Pasqual Otto et al. 2005).

The low sperm concentration is attributed to the high germ cell apoptosis usually observed in those men, while the low motility is attributed to the increased concentration of ROS or to the presence of antiserum antibodies (Pasqual Otto et al. 2005). Oxidative stress occurs when there is an imbalance between ROS and the antioxidants that scavenge surplus free radicals (Hwang and Lamb, 2012). The ROS are natural products of cellular metabolism which, in physiological amounts, are essential requirements of spermatozoa for sperm processes leading to successful fertilization, such as capacitation, hyper activated motility and acrosome reaction (Agarwal et al. 2004).

A correlation detected among varicocele and semen oxidation where elevated ROS levels leads to diminished antioxidant capacity in the semen of varicocele-induced animal (Hsieh et al. 2006). These changes lead to abnormal sperm function and the infertility (Masson and
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Brannigan, 2014). So, the neutral levels of ROS are critical for normal fertilization, capacitation, hyper activation and motility (Agarwal et al. 2009). varicocelectomy reduce ROS levels increase in the antioxidant capacity of semen in infertile men (Masson and Brannigan, 2014). Varicocele that develops in early life is a progressive but surgically correctable disease that deteriorates testicular function and semen mortality (Papa Nikolaou et al. 2000).

V. DIAGNOSIS

Evaluation of a patient with a varicocele should include a careful medical and reproductive history, a physical examination and at least two semen analyses. The physical examination should be performed with the patient in both the recumbent and upright positions. A palpable varicocele feels like a “bag of worms” and disappears or is very significantly reduced when the patient is recumbent. When a suspected varicocele is not clearly palpable, the scrotum should be examined while the patient performs a Valhalla maneuver in a standing position (Naugton et al. 2001). Since the adolescent with a varicocele is often asymptomatic it is usually found on routine physical exam (Tekgül et al. 2011). The varicocele is graded based on the severity of the disease into 3 grades. The scrotum is first visually inspected for any obvious distention around the spermatic cord (Naugton et al. 2001). Routine evaluation of infertile men with varicoceles should include a medical and reproductive history, physical examination and a minimum of two semen analyses. Imaging studies are not indicated for the standard evaluation unless physical exam is inconclusive (Agarwal et al. 2004).

If a varicocele is not palpable but the patient performs a Valhalla maneuver which distends the pampiniform plexus of veins, then a small (grade 1) varicocele is present. More subtle varicoceles may feel like a thickened or asymmetric cord. The nonvisible, but palpable varicocele is considered to be moderate in size (grade 2).

A visible varicocele is considered grade 3 varicocele (Elbendary and Elbendary, 2009). Idiopathic varicocele is more prominent in the upright position and disappears in the supine position (Zheng et al. 2009). Testicular size needs to be measured to determine if the varicocele is adversely affecting the growth of the testis. The volume of a normal testis measures 1 to 2 ml in the prepubertal male (Zheng et al. 2009). Testicular ultrasound is the most accurate and reproducible method to assess testicular volume and significant testicular size variations. A volume difference of less than 2 ml can be due to the measurement technique alone. Therefore, size variation of greater than 2 ml by ultrasound is currently the best indicator of testicular damage and should serve as the minimal requirement for surgical repair of the adolescent varicocele (Elbendary and Elbendary, 2009).

V.I. TREATMENT

There are two approaches to varicocele repair: surgery and percutaneous embolization. The ideal technique for varicocele repair should include preservation of optimal testicular function, elimination of the varicocele and lower complication rates (Misseri et al. 2001). Treatment of varicocele in infertile men aims to restore or improve testicular function (de Urologia et al. 2011). Nonsurgical treatment modalities for varicocele-related infertility are poorly studied, and there is a need for well-designed trials. L-carnation in combination with the non steroidal anti-inflammatory agent cinnoxicam have been studied but failed to show improvement in seminal parameters in men with clinical varicocele (Galatioto et al. 2008). Early use of menotropin in combination with surgical repair provided additional improvement in semen parameters when compared with varicocelectomy alone (Weedin et al. 2010). The gold standard treatment currently accepted for varicocele is surgical repair either by open approach associated or not with magnification, laparoscopy, or through percutaneous embolization of the internal spermatic vein. Regardless of the chosen technique, the ultimate goal relies on the occlusion of the dilated veins that compose the pampiniform plexus. The high
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retroperitoneal (Palomar), radiologic, and laparoscopic approaches allow the ligation of the gonadal vein. The inguinal (Ivanissevich) and sub inguinal approaches permit ligation of the external spermatic and cremasteric veins that may contribute to the varicocele and may play a role in recurrence (Inci et al. 2009). Open surgical varicocelectomy is performed by retroperitoneal, inguinal, or sub inguinal approaches. The retroperitoneal high ligation of the internal spermatic vein (Paolo’s technique) although easy to perform is associated with high recurrence and hydrocele formation rates. Inguinal and sub inguinal approaches allow for ligation of external spermatic vessels (Inci et al. 2009).

VI. FOLLOW-UP

Patients should be evaluated after varicocele treatment for persistence or recurrence of the varicocele. If the varicocele persists or recurs, internal spermatic venography may be performed to identify the site of persistent venous reflux. Either surgical ligation or percutaneous embolization of the refluxing veins may be used. Semen analyses should be performed after varicocele treatment at about three-month intervals for at least one year or until pregnancy is achieved (Lee et al. 2007).

VII. CONCLUSION

In conclusion, the children with a varicocele present the clinician with an interesting and challenging problem. There is a great need for further basic research to help better select the patient who needs surgical correction of his varicocele. We think further research needed to determine finite protocol for treatment of children varicocele.

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