

Treatment of Adolescent and Pediatric Varicocele - Continues to be A Dilemma - A Mini Review

Dr. Kulvinder Kochar Kaur^{1*}, Dr. Gautam Allahbadia², Dr. Mandeep Singh³

¹Scientific Director, Dr. Kulvinder Kaur Centre for Human Reproduction, Jalandhar, Punjab, India.

²Scientific Director, Ex-Rotunda-A Centre for Human reproduction, Kalpak Garden, Bandra, Mumbai, India.

³Consultant Neurologist, Swami Satyanand Hospital, Jalandhar, Punjab, India.

kulvinder.dr@gmail.com

***Corresponding Author:** Dr. Kulvinder Kochar Kaur, Scientific Director, Dr. Kulvinder Kaur Centre for Human Reproduction, Jalandhar, Punjab, India.

Abstract

A Varicocele, defined as an abnormal dilation of the pampiniform plexus of veins in the scrotum. This begins at puberty in roughly 15% of males. Though common in the general population, it is often asymptomatic, varicoceles are commonly associated with gonadal dysfunction, that includes testicular atrophy, infertility, and hypogonadism in a subgroup of men diagnosed later in life. In view of high prevalence and uncertain pathogenesis, definitive guidelines for varicoceles diagnosed in the pediatric and adolescent population remain poorly defined. Varicoceles are the most common etiology of male factor infertility and improve fecundity in adulthood. Examination of the pediatric and adolescent varicoceles needs to include history, physical exam, and measurement of testicular volume with orchidometer or ultrasound. Testicular volume differentials and peak retrograde flow varicoceles populations. Semen analysis (SA) and reproductive endocrine parameters assessment should also be considered as part of workup of adolescent patients. Different treatment approaches exist for varicocele and although microsurgical subinguinal approaches is considered the gold standard for adult population, it has not been confirmed to be superior for adolescent population. Referral to an andrologist for the adolescent patient with varicocele should be considered in equivocal cases. Though active treatment remains a concern it is clear that some unrelated patients will suffer symptoms later in life, while overtreatment remains a concern for this large, vulnerable population. Hence surveillance strategies along with improved accuracy in diagnosis of clinically important pediatric varicoceles prompting treatment are required in future.

Keywords: adolescent varicocele, fertility, pediatric varicocele, surgery, observation

INTRODUCTION

In the pediatric and adolescent population varicoceles are a clinical challenge in view of the nonpredictive effects on future fertility, with no guidelines at present for management of pediatric patients presenting with varicoceles. To find out facts on how varicoceles effect future fertility is problematic due to multiple issues in children/adolescents, that include limitations in obtaining and interpreting semen analysis (SA), ii) potential regarding unequal differential testicular growth during puberty irrespective of presence of varicoceles, iii) potential for a long interval between any surgical intervention for varicoceles in adolescence and any attempt at paternity.

Thus aim of this review is to evaluate what evidence

is available regarding the effects of varicoceles in children and adolescents on future fertility.

METHODS

A pubmed search was done using MeSH terms pediatric, adolescent varicoceles, future fertility, surgical intervention, observation from 1980-2019.

RESULTS

We found a total of 264 articles of which we used 61 articles for this systematic review. No meta-analysis was done.

EPIDEMIOLOGY AND PRESENTATION

Defintion along with grading system used for characterizing varicoceles is same in children/

adolescents and adults. Thus a varicocele is defined as an abnormal dilatation of pampiniform plexus in the scrotum, and children/adolescents with varicocele mostly present to a urologist after an incidental diagnosis by their pediatricians. Varicoceles in children /adolescents are graded clinically as per the classification system that was originally described by Dubin and Amelar in 1970 [1], where grade 1 indicates that the varicocele is palpable with Valsalva, grade 2 indicating palpability on standing only, and grade 3 means visibility with standing.

The prevalence and grade distribution differs in children /adolescents based on epidemiological or clinical level studies are getting evaluated. The reports in most European studies regarding population prevalence estimates of pediatric / adolescent varicocele are mostly derived from school screening protocols. In total the prevalence varies from 4.1%-35.1%, which seems to increase with increasing patients age [2-7]. Like in a Turkish study it was found that prevalence was 0.8% in boys aged 2-6 yrs, which increased to 11% by age 11-19 yrs [2]. Akbay E also noticed a sharp increase in prevalence in boys aged 10-14 yrs [2]. In these studies carried out as population level studies, grade 1 was commonest, followed by grade 2 and then grade 3. A cohort study carried out by Woldu in 960 boys from Montenegro, overall prevalence was found to be 9.7%.51% of 94 boys had a grade 1 varicocele, 33% grade2 and 16% grade3 on screening examination [7]. Niedzielski et al found stable prevalence of grade 1 varicocele in Polish school boys with increasing age but found that grades 2 and 3 became commoner as boys progressed through adolescence[4]. The prevalence of bilateral varicoceles varies from 10.8-59.1% with subclinical right varicoceles in an additional 8.7-7.16% of individuals [8-12]. Higher rate of varicoceles are seen in taller boys having lower body mass index (BMI) and whose phallus sizes are large, though reasons for these is not clear [3,13].

Just like population level screening, clinical studies done on pediatric / adolescents population for varicocele in urology clinics show that these patients present in mid-late adolescence. In a study extending over 17 yrs period found a mean (+_SD) age at presentation of 15.2+_3.5 yrs [14]. Boys very rarely present to urologic clinic with a grade 1 varicocele, rates vary from 0-15% [15-18]. Here patients tend to present with grade 3 varicocele. In one study patients

with grade 3 varicocele made up 68% of the study sample[18]. This difference in the 2 type of studies seems to be due to referral bias.

EVALUATION AND WORKUP

Children /adolescents suspected of having varicoceles need to undergo a thorough physical examination, that includes examination of scrotum in the standing and supine position in a warm environment. Dependent on the room temperature and scrotal thickness ,the bag of worms is not readily apparent even with a grade 3 varicocele. But in general grade 2 and 3 varicoceles are easily identified on physical examination and mostly referred to a urologist.

Conflicting data is present in literature regarding impact of adolescent varicocele presence on testicular volume differentials and the correlation between varicocele grade and testicular volume. Typically testicular growth is not considered to be affected by varicocele grade having an inverse relationship[19]. Yet this relationship is not seen in other studies[20]. Because of which grade of varicocele alone is not an indication for surgery in most of the patients[21].

Testicular volumes are usually measured using physical exam, orchidometer, or ultrasound. Ultrasonography (USG), including Doppler flow studies is very sensitive and specific for the diagnosis of varicocele, especially in paediatric patients [22] rather than physical exam alone and serial USG's can be used in active surveillance of varicocele impact on testicular growth[23]. Though USG is a better study to measure testicular volumes accurately ,orchidometer is a reasonable option [24,25].

Total testicular volume predicts total motile sperm count in adolescents. Though one study suggested neither age nor testicular volumes differential can predict semen volume, sperm density, sperm motility or total motile count (TMC) [26]. Total Testicular volumes improve following surgical repair of varicocele. As per Paduch and Niedzielski, varicocele repair in patients aged 15-19 with grade 2-3 varicoceles reversed testicular growth arrest and => catchup growth within 12 mths of surgery [27]. Improved testicular growth, in theory might then cause improved semen parameters, but this has not been established thoroughly in pediatric / adolescents populations.

In USA SA is not done by most of pediatric urologists in paediatric & adolescent patients with a varicocele.

Only 13% of pediatric urologists included SA routinely in their practice, and had some degree of discomfort discussing semen collection with the patients as found in a 2016 survey. Patients and parents were also surveyed and similar findings like discomfort with the idea of getting a semen specimen, especially stating lack of knowledge [28]. It is of concern as it has been found that Varicoceles might impact semen parameters in this population. A decrease in total sperm count was found in patients 17-20 yrs of age having a left varicocele and ipsilateral hypertrophy by Hans et al, although sperm concentrations, motility and morphology were not changed [29]. Similarly Paduch and Niedzielski showed that varicoceles can affect spermatogenesis in patients of 17-19 years giving reduced motility, vitality and morphology on patients with varicocele as compared to controls. Moreover they found that sperm motility reduces as maximal blood flow velocity and pampiniform vein diameter increases [30]. But Christmas et al in 2007 reported contrasting findings in a 2007 study done on 57 Tanner V adolescents aged 14-20 found that patients having testicular volume differentials >10% had significantly lower sperm concentrations and total motile sperm counts as compared to patients with differentials <10% [26]. More dramatic change was found if testicular volume differentials were >20%. Almost 60% of Tanner V boys having >20% testicular volume asymmetry were shown to have a total motile count of <10 million [20]. Adolescent males with an untreated unilateral varicocele had semen profiles more similar to those patients with surgically treated bilateral, not unilateral cryptorchidism with lower sperm density and total motile counts [31].

It may be of benefit to carry out hormonal profiles in working up a varicocele in paediatric & adolescent male patient, just like in adult population. Higher levels of follicular Stimulating hormone (FSH) and luteinizing hormone (LH) with lower inhibin B levels was reported in one study in these patients with varicoceles [32].

In contrast as per Romeo et al only inhibin B was reduced, but all other hormones like FSH, LH, Testosterone were normal and no correlation with semen parameters was found [33]. Hence currently no consensus exists on utilizing hormone profile laboratory values in the workup of this particular population.

ESTABLISHED GUIDELINES

Right now, the American society of reproductive medicine (ASRM), American urological association (AUA), and European association of urology (EAU) endorse varicocele management in the realm of male infertility, though with some inconsistent recommendations. Further guidelines that address varicocele management are even more vague.

Based on ASRM practice committee's most recent update, adolescents with detectable unilateral or bilateral varicoceles might be considered for varicocele repair [34]. This recommendation was based on the AUA/ASRM Report on varicocele and Infertility made in the beginning in 2001. This report stated that if objective evidence of decreased testicular size is present or SA is abnormal, varicocele repair is indicated [34]. Important here is the necessary objective measurement of testicular size. Reliable measurements are needed at every patient meeting for documenting testicular size and to find out volume differentials. In case varicoceles are found but testicular size is equal, annual follow up needs to be advised to be able to identify the 1st sign of testicular impact related to varicocele presence. On early detection and treatment of varicoceles, there is evidence that testicular size might recover following varicocele repair [27]. Similarly abnormal semen values might also return to normal.

The EAU guidelines in male infertility discuss adolescent varicocele briefly along with future fertility implications. Varicoceles that develop during adolescence have chances of causing slow but progressive testicular damage => infertility in some men as per 2012 update [35]. Yet as far as management is concerned they state adolescent varicoceles are mostly overtreated. Moreover as per EAU, untreated adolescent varicocele are not likely to cause future fertility concerns in most unaffected men. So it is not clear how this can be applied to adolescent varicocele treatment (table 1).

In view of limited studies in pediatric / adolescents population evidence regarding treatment and progressive damage is poor in this population. A meta-analysis on treatment of pediatric / adolescents varicoceles showed that there is lot of heterogeneity and lack of RCT's [36]. With the limited data in literature and lack of quality evidence, guidelines that have got established are needed that may set a foundation for

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future studies. Thus need is set clinical standards for diagnosis and index parameters of treatment. Very recently another systematic review and meta-analysis was carried by the European Association of Urology /European Society for Paediatric Urology Guidelines panel [37].

Table 1. Summary of ASRM/AUA and EAU Guideline recommendations in Adolescent Varicocele

Title	ASRM/SMRU/AUA	EAU
	Report On Varicocele & Infertility A Committee Opinion	Guidelines On Male Infertility 2012 Update
Most Recent Update	2014	2019
Varicocele Detection	Dubin & Amelar Grading	Dubin & Amelar Grading
Method	Classification: Grade I-III	Classification: Grade I-III
Role Of Scrotal Ultrasound	If Exam Is Inconclusive	Used To Confirm Physical exam
Indication for Treatment	Unilateral/Bilateral varicoceles	Not Indicated, States
The Adolescent Varicocele	With Reduced Testicular Size or Semen Abnormalities	Adolescent Varicoceles Are Often Overtreated
Contraindications to Rx	Subclinical varicocele	Not Stated
Review of Rx Approach, Laparoscopic, Inguinal Mentioned	Surgical Repair Vs Percutaneous Embolization. Superiority Not Determined. Recurrence rates Lowest With Microsurgical Subinguinal Approach	Open & MicroSubinguinal No Clear Benefit Of single Approach. States Subinguinal Microscopic Has Lower Recurrence rates And Complications. In 2019 Update State Use Lymphatic Sparing Surgery To Avoid Hydrocele
Followup advised	Annual followup With Subjective Measurement	Not Stated

MANAGEMENT

In pediatric/adolescents populations, management remains controversial. On questioning 70 pediatric urologists regarding indications for testicular repair, Lee et. al found that most important indication for varicocelelectomy was a reduction in ipsilateral reduction in testicular size [78%], followed by testicular/scrotal pain(11%). Surgical approaches mostly used were subinguinal microsurgical(54%), followed by inguinal (24%) and laparoscopic(14%) [38]. On surveying in US in 2014, Pastuszak et al found that varicocelelectomy was mostly done for reduced ipsilateral testicular size (96%), testicular pain (79%) and changed SA parameters (39%). Commonest surgical approaches for varicocelelectomy were laparoscopic (38%), subinguinal microsurgical (28%), followed by inguinal (14%) and retroperitoneal (13%) In this study [39]. Thus there is lack of consensus regarding diagnosis, management and operative approaches for pediatric/adolescents varicoceles among pediatric urologists. Further the degree of heterogeneity limits the development of standardized guidelines in this population.

Some advocate conservative management with observation and surveillance of varicoceles in pediatric and adolescent population. Almost 80%

of testicular volume discrepancies, resolve in time without surgery [40]. Yet there is a confusion that bilateral testicular volume might equilibrate when each testis volume is compared to one another, although that does not basically suggest that normal testicular volume has been achieved. Potential for unilateral varicoceles having deleterious effects on bilateral testicular maturation is there.

In active followup of the varicocele in the adolescent population, serial USG, and Tanner V annual physical examinations, with or without the inclusion of semen samples are proposed. This may => detection of an accelerated testicular injury till a patient reaches Tanner V stage, at the time point that can be handed over to an adult urologist who subsequently follows up the patient till paternity/further evaluation for fertility is done. According to Chu et al conservative management of adolescents with Tanner V development, asymptomatic left varicocele, and normal testicular volume was a reasonable result. Here 45% of patients had initial semen analysis with total motile count(TMC) defined as poor (<20million). SA were then repeated in this group on individuals with 55%, 67% and 69% of patients showing normal total motile count following an initial, second and 3rd SA respectively. This correction of total motile count

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was not dependent on varicocele grade or age. Roughly 50% of patients with an initial poor TMC would normalize without surgery and hence SA should be followed and repeated in asymptomatic Tanner V adolescent males with varicoceles. Importance of this is in the subset of patients having persistently poor TMC's since surgical intervention could be started [16]. This group also reported in another study that Tanner V males with clinically detected left

varicoceles and no testicular asymmetry treated with varicocelectomy showed improvement in TMC from a median of 2.8 million preoperatively to 18.2 million post operatively [41].

Thus a query arises, when does a varicocele in the pediatric population need intervention? Classically, significant testicular pain or other symptoms, varicocele grade, and SA parameter abnormalities have been indications for surgery (table 2).

Table 2. Signs/sympoms warranting consideration of surgical intervention

Factors That Need Prompt Surgery In Adolescent
Persistent Abnormal Semen Quality
Altered Sperm Function Tests
Pain
Markedly Altered Persistent Total Volume Differentiation(>15-20%)
PEAK RETROGRADE FLOW >38cm/S
Infertility
Failure Of Testicular Development
20/38 Harbinger(Can Be Extended To15% Asymmetry As Well)

Testicular volume differential is a useful tool in the diagnosis and management of varicoceles and testicular volume differentials of 15-20%, or >2cc in size, have been historically treated with surgery. But some patients will have catch up growth without surgery, that may limit use of testicular volume differentials as an indicator for surgical intervention. 85% of adolescents having >15% asymmetry will have catch up growth without surgery to <15% over a median follow up of 39 mths was shown by Kolon et al [40]. Thus at least 2-3 testicular volume measurements be performed over time to allow for catch up growth and thus potentially save an unnecessary surgery.

Peak retrograde flow and Doppler ultrasound was a significant predictor for worsening testicular asymmetry as per Kowakowski et al, and hence might be a useful tool in predicting persistent, progressive, and new onset asymmetry. They found patients having peak retrograde flow < 30cm/s were < likely to need surgery [18]. Van Batavia et al combined testicular volume differential and peak retrograde flow on Doppler ultrasound and gave the term "the 20/38 harbinger". Persistent or worsening future asymmetry was strongly associated with a combination of >=20% asymmetry and a peak retrograde flow of 38cm/s using Doppler ultrasound was their observation. Of the patients they diagnosed with 20/38 harbinger, 94% did not show catch up growth after a mean follow up of 15.5 mths. These findings could be extended to

patients patients having 15% testicular asymmetry as well, which gave a suggestion that surgical intervention of the varicocele might be better than observation in this subgroup of patients [42]. These findings got confirmed by other studies[43]. Hence recently Glassberg et al recommended that boys giving 15/38 cutoff and definitely those having 20/38 cutoff need surgery instead of waiting for catch up growth. Those with borderline asymmetry or peak retrograde flow can be examined using SA, that if abnormal, might warrant surgery [44].

In the paediatric and adolescent population patients "at risk" appear to be the ones who fall within the 15-20% testicular volume differential, has peak retrograde flow >38cm/s and have abnormal semen parameters. But right now no formal guidelines and definitions of "at risk" patient with a varicocele in this age group. Although treating every adolescent varicocele is not necessary, the risk of irreversible and detrimental spermatogenesis defects can occur in a small ,unknown percentage of adolescent patients that are not treated till infertility presents when they reach adulthood. This may be problematic in view of 1/3rd of adults undergoing varicocele repair for infertility don't have an improvement in semen parameters [45]. Hence finding the "at risk" paediatric and adolescent patients is very important and still not there in current literature and guidelines.

Regarding pubertal screening of varicoceles and paternity as an adult conflicting data exists. As shown by Cayan et al adolescent males (12-19 years) who had microsurgical varicocelectomy had an odds ratio of 3.63 for paternity success as compared to unrepaired controls. 77.3% of patients in the microsurgical varicocele repair group produced an offspring as compared to 48.4% in the control group. Moreover markedly shorter mean time to conception in the microsurgical varicocele repair group was there [12]. Although this study indicates intervention most of these patients had bilateral varicoceles, that may indicate a different cohort. Alternatively, no beneficial effects of pubertal screening in a large cohort of puberty boys from Belgium with asymptomatic varicocele that were treated with observation vis a vis sclerotherapy was reported by Bogaert et al. This is akin to reports that 80-85% of adults with varicoceles do not have paternity issues [46].

Small number of randomized controlled trials (RCT's) have been done regarding varicocele treatment in adolescent population. Left testicular volume increased by >40% in patients that were treated with embolization as per Laven et. al [47]. Improvement in testicular volume differential following treatment of a unilateral varicocele was shown by Paduch et. al [27]. Similarly Yamamoto et al demonstrated improvement in sperm concentration in boys undergoing varicoceles repair, although the preoperative concentration was comparable to healthy controls [48].

Locke et al conducted a meta-analysis on 9 RCT's that assessed treatment of varicoceles in paediatric population who were aged <21 years. They found that only intermediate and low levels of evidence that supported radiological or surgical intervention for varicoceles in children and adolescents for improving testicular volume and sperm concentration respectively [36]. Although they found that there was a 3.2cc improvement in testicular volume and total sperm concentration increases of 25.5 million, no evidence was there that surgical interventions improved other SA parameters. Hence concluding that long term effects of varicocelectomy on fertility remained unknown with the ultimate conclusion that a multi centre RCT having longterm follow up is needed [36]. Another systematic review and meta-analysis was carried by the European Association of Urology/ European Society for Paediatric Urology Guidelines panel [37], where they identified 1550 articles of which 98 articles that included 16130 patients (7-21

yr old), that were eligible for inclusion (12 RCT, 47, non Randomized comparative studies (NRS's), and 39 case series). They found varicocele treatment improved testicular volume (mean difference 1.52ml, 95% CI 0.73-2.31 and increased total sperm concentration (mean difference 25.54, 95% CI 12.84-38.25) when compared with observation. Open surgery and laparoscopy may have similar treatment success. A significant increase in hydrocele formation was observed in lymphatic sparing versus non lymphatic sparing (p=0.02). Although they acknowledge that data was limited by heterogeneity of data with lack of long term outcomes demonstrating semen parameters and paternity rates, they concluded that moderate evidence exists on benefits of varicocele treatment in children and adolescents in terms of testicular volume and sperm concentration. Superiority of any surgical/ intervention techniques is not found by current evidence. Long term outcomes including paternity and fertility still remain unknown. However lymphatic sparing surgery decreases hydrocele formation and hence warranted [37].

OPTIONS OF TREATMENT

In the history of varicoceles treatment multiple surgical treatments have been used, which include open inguinal (Ivannisevich), high retroperitoneal (Palumo), subinguinal, high inguinal, microsurgical (inguinal and subinguinal) and laparoscopic approaches. A greater success was found with the laparoscopic (100%) and Palomo technique (93%) as compared to subinguinal techniques (88%) as per Diamond et. al. Although a greater hydrocele rate was seen post operatively with the laparoscopic approach with 32% of patients affected postoperatively. No improvement in success rate was seen by incorporating microsurgical technique though hydrocele rate was 0%. One case of testicular atrophy occurred in the microsurgical group out of 16 total cases in this study [49]. In terms of testicular growth the microsurgical, subinguinal and high inguinal approaches have shown similar success rates (70% and 78% respectively). Significantly shorter length of surgery is found in high inguinal approaches since it needs fewer divisions of veins and is associated with a larger diameter of internal spermatic arteries, thus making them easier to identify and preserve [50].

In total there is an incidence of varicocele recurrence that is in a wide range (0-18%), and same for postoperative hydrocele formation (0-29%) in the

paediatric population. A large multicentre analysis was performed by Larvey et. al in 2015 on complications and recurrence rates for paediatric patients. 15% of the patients giving a diagnosis of varicocele ultimately ended having surgical intervention in this study. 39% had open repair, 51% undergoing a laparoscopic intervention and 9.7% underwent percutaneous embolization [51]. The retreatment rates following open, laparoscopic and percutaneous embolization were 1.5%, 3.4% and 9.9% while the incidence of hydrocele was 4.9%, 8.1% and 5% respectively. A markedly higher incidence of hydrocele formation was observed in younger patients. Though not much difference in retreatment rates and hydrocele formation was seen with open and laparoscopic treatment groups, a trend towards an increased rate was seen in the laparoscopic treatment groups. Of the commonly used procedure in adolescents, the Palomo technique, hydrocele formation is the main complication seen in upto 29% of patients, 20% of them needing hydrocelectomy [52].

In the adult population recent data suggest that the best surgical results are seen with inguinal and subinguinal microscopic approaches, though this has not been confirmed in the pediatric/adolescent population. Low recurrence rates (2%) and hydrocele formation (0.75%) have been seen with these approaches. The total pregnancy rates in adult patients is 38% with the highest rate in microsurgical inguinal technique (42%). Lower pregnancy rates were found with the Palermo (34%), embolization (32%) and laparoscopic technique (28%) were found [53]. But problem is that pediatric urologists are <likely than andrologists to use the microscopic approach in view of limited experience and concern over post-varicocoelectomy ipsilateral testicular atrophy, a rare although having devastating consequences. Harel et. al found between 2003-2012 only 2% microsurgical approach was reported in surgical repair of adolescent open varicocelectomies [54].

In the treatment of varicocele for pediatric population percutaneous embolization via antegrade and retrograde approaches is utilized. The antegrade method has been used since the 1970's, was well described by Tuber and Johnsen in the 1993 study [55]. Those in favour of percutaneous embolization state that it allows preservation of the spermatic artery, having high success rates and poses little risk of testicular atrophy or hydrocele. It is widely used

in Europe. Several modifications of the technique of antegrade sclerotherapy has been used by Keene and Cervellione to get high success rates (upto 96%) with minimal complication rates (1-2% rates of wound infection, haematoma, hydrocele)[56]. A technical success rate of 93%, recurrence rate of 13% with the theoretical benefit of preventing the testicular artery and spermatic cord damage. Malekzadeh et. al said that embolization is a superior method as compared to surgery, though similar success rates and recurrence rates were observed in the embolization and surgery groups. Although it is a promising approach risk of undesirable exposure to radiation in the pediatric/adolescent population is of concern [57].

In a 184 subject study of retrograde embolization under local sedation done by Zampieri et al in boys aged 10-14 years having left grade 2 or 3 varicocele 93% success rate and 6.5% recurrence rate at 6 mths was found [58]. Hawkins et al also observed similar findings [59]. Recently a technique of subcutaneous endoscopically assisted ligation of spermatic vessels ,known as SEAL-SV was developed by Wang et. al, where they used a modified epidural and spinal needle technique in a small study of 5 adolescent males with varicocele, with promising results [60].

CONCLUSIONS

Varicoceles are common in pediatric and adolescent population, rates that simulate those of the adult population. Though 80-85% of patients with varicocele will have no longterm impact on fertility, ASRM guidelines suggest in adolescents having reduced testicular size or abnormal semen parameters, a varicocele repair is indicated. But still no clear guidelines with clear indications for surgical repair exist for adolescent varicocele.

Examination of varicocele includes taking detailed history where importance of family history of varicocele has been emphasized by Griffiths et. al [61], in grade 2 and 3 varicocele, along with physical, testicular volume measurements using either a Prader, Rochester, Seagert or Takihara orchidometer and scrotal ultrasound with Doppler flow studies. It is strongly recommended to conduct a SA, although it is not commonly done due to physician and patient factors. Though hormonal profiles may be used right now no current guidelines regarding use of laboratory data exist while working up an adolescent varicocele.

From the current literature it is difficult to decide which pediatric and adolescent varicocele needs conservative management and that varicocele that needs surgical repair. Mostly adolescent varicocelectomy is overperformed, thus its important to pinpoint accurately the patients who are at risk for future complications because of the unknown effect it will have on fertility and risks of varicocele recurrence, hydrocele formation along with testicular injury while performing varicocelectomy. Using SA parameters like persistent poor TMC on sequential SA ,sperm function tests, testicular volume differentials and peak retrograde flow might help in finding the adolescent who is at risk. Recently some data suggest that it might be useless to follow a pediatric and adolescent patient with observation who is at or above the 20% total testicular volume(possibly 15%) differential and >38cm/s peak retrograde flow cutoff.

Different surgical techniques along with radiological approaches, give a lot of options for treatment. But rates of recurrence along with hydrocele formation needs to be considered as that may indicate additional surgery. Although the success rate and complications in adult population are best with the microsurgical approach, it has not been confirmed in the adolescent population. Since pediatric urologists are hesitant to proceed with a microsurgical approach, it prevents studies of this technique in pediatric and adolescent population. Management of pediatric and adolescent varicocele remains ill defined and might be variable within the pediatric urology fraternity. Thus on this basis referral to an andrologist who is adept in the microsurgical technique might benefit the adolescent having a varicocele.

Although active treatment of varicocele in the pediatric and adolescent population is controversial, one thing is clear that some untreated patients will suffer symptoms later in life related to infertility and possibly hypogonadism. Alternatively overtreatment remains a concern for the larger and vulnerable population. Hence strategies of surveillance and better diagnostic techniques of clinically important varicoceles that prompt treatment are required for future.

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