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Dilemma in Teenager Varicocele

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1. Introduction

There is no subject that is more controversial in the area of male infertility than varicocele. Varicocele is the most common identifiable cause of male infertility. It can develop during puberty and thus affect the testicular growth and function. The incidence of varicocele in the adolescents is about 15 percent worldwide. Varicocele is associated with a time-dependent growth arrest in adolescents. There is a clear association between varicocele, infertility, and testicular growth arrest. It is also known that varicocelectomy can reverse growth arrest in adolescents. Considerable debate regarding the etiology and effects of adolescence varicoceles has appeared in the literature. This knowledge has raised the question of how best to manage adolescents with varicocele.

The chapter will discuss the following items:

- a. The prevalence of adolescence varicocele.
- b. Regional differences of adolescence varicocele.
- c. Pathophysiology.
- d. Anatomy.
- e. The risk factors for the development of varicocele among boys.
- f. Presentations.
- g. The relations between the adolescent varicocele and puberty.
- h. Evidence from controlled studies against varicocelectomy and the reports supporting varicocelectomy.
- i. Bilaterality.

- j. Whom we should repair.
- k. Choice of repair.

2. The prevalence of adolescence varicocele

Varicocele means tortuosity and dilatation of the pampiniform plexus of veins inside the spermatic cord; it has been linked to infertility since 1955.

Varicocele is the most common identifiable cause of male infertility. It can develop during puberty and thus affect the testicular growth and function [1].

Varicocele affects 15-20% of adult men, 40% of adult men with primary infertility, 80% of men with secondary infertility, and 15 % of adolescents [2].

The incidence in older boys varies between 12.4% and 17.8% with an average of 14.2% [3].

This prevalence varies in different geographical areas.

In Balkan Peninsula, among Greece adolescents, the prevalence is only 3% among 3047 school boys. While the prevalence in Bulgarian boy's reaches 7.9% for the age group 10 to 19 years. Higher prevalence was detected in Turkish population reaching 11.02% in the age group 11 to 19 years old. [4-6].

3. Regional differences of adolescence varicocele

Kumanov et al in a prospective study evaluated 6200 boys aged 0 to 19 years from 5 regions in Bulgaria for the presence of varicocele. The incidence in whole group was found to be 4.1%, this incidence increases to 7.9% for the age group above 10 years old. The prevalence of varicocele demonstrated clear regional differences, the incidence of the disease increased rapidly during mid puberty [7].

The prevalence of varicocele was highest in the areas of Sofia and Varna, which are the largest cities in Bulgaria and was lowest in Vratza and Blagoevgrad which are the smallest towns in Bulgaria. The authors attributed the differences to be multifactorial, including environmental factors and life style factors (physical development, food intake) [7].

4. Pathophysiology

In WHO study in 1992, including 9083 patient at 34 centers in 24 countries, it was proved that varicocele is classically associated with infertility and impaired testicular function [8].

Varicocele disrupts the growth and function of the testis with ultimate effect on fertility, many theories have been suggested but none of them proved to be the ideal theory [9].

Hypothesis concerning the harmful effect of varicocele include; increase in the scrotal/testicular temperature, elevation in the serum gonadotrophins level, increase in the venous pressure, accumulation of toxins, hypoxia and hormonal imbalance [10, 11].

5. Anatomy

Paduch and Skoog in 2001 suggested four theories to explain why the left sided varicocele is more predominant more than the right side. These theories include, nutcracker effect on left renal vein, increasing the blood supply to the testis at puberty exceeding the venous capacity, incompetent valves in the venous system, and high levels of nitric oxide in the pampiniform plexus of veins [3]. On the otherhand, Raman et al in 2005 suggested genetic susceptibility as a precipitating factor, considering that half of the first degree relatives and more than two third of the brothers of the patients with varicocele, also had clinical varicocele [4].

6. The risk factors for the development of varicocele among boys

It was found that the incidence of varicocele is related to some anthropometric and somatometric parameters [12-14]. Some studies discussed the protective role of higher BMI and/or weight on the development of varicocele [12-14]. Others discussed the negative influence of height [15, 16].

Obesity and high BMI may be correlated with increased adipose tissue in the spermatic cord which may lead to decrease in the detection of varicocele by examination [12-14].

In Kumanov et al study, the age of the boys, penile length, penile circumference, and height of the children, were positively related to the development of varicocele. The dark eye color also increased the risk for the anomaly. No relationship was found with hair color. In multivariate analysis, development of varicocele correlated negatively (predictive role) with the weight and BMI but correlated positively (protective role) with penile measurements (length, circumference) in addition to the height of the patients. The predictive role of the height was only evident in the first Tanner stages only with significant differences between the three stages separately if compared with each others [7].

Tight clothing, constipation, wearing a truss, and presence of a tumor may be also a risk factor. Athletes have high incidence of varicocele, spermatogenesis will be more affected in those sport-men with varicocele if they did vigorous physical activity [17, 18].

7. Presentations

Usually the presentation of varicocele in adolescents is asymptomatic, sometimes the patient presented by scrotal mass described as a bag of worms or testicular discomfort in the form of

heaviness, dull aching pain on standing for long times. Not infrequently the presentation is small testicle if associated testicular hypotrophy occurred. Usually the diagnosis is made at routine hospital examination or as a prerequisite examination for employment or before engaging in a military service [19-23]..

8. The relations between the adolescent varicocele and puberty

With rapid linear growth spurt in adolescence at puberty, the nutcracker effect will become more evident with consequently increase in the hydrostatic pressure in the left testicular venous plexus [7, 10]. Moreover, the accelerated pubertal development with growth spurt and increased androgen secretion, in addition vasoactive compounds like inducible nitric oxide were suggested to play a role in development of varicocele in the early stages of puberty. These vasoactive compounds were over expressed in the testis and in the penile vasculature of patients with varicocele in the early stages of puberty [24].

Also, Sawczuk et al postulated that the increase in the arterial supply of the testis at puberty beyond the venous capacity may unmask an underlying hidden varicocele [25].

On the otherhand, Kumanov et al postulated that the rapid marked changes in the penile measurements and heights at puberty reflects endocrine and paracrine growth factors imbalance that act as a predisposing factor for the development of varicocele in genetically susceptible patients [7].

Testosterone is responsible for the adolescent secondary sexual characters (increase in the muscle mass, muscle tone, body hair, and level of sexual interest). Varicocele can damage the cells that make testosterone and lead to decrease over all testosterone level which may affect the adolescents in the mean time or in the future [26].

9. Evidence from controlled studies against varicocelectomy and the reports supporting varicocelectomy

In 1987, Kass and Belman found that 80% of boys with left varicocele with ipsilateral hypotrophy, exhibited catch up growth following varicocelectomy [27]..

10 years later, Sigman and Jarrold reported that a combination of varicocele and ipsilateral asymmetry was associated with higher incidence of abnormal semen parameters in a time dependent manner, this mean that varicocele is a progressive disease[28].

This opens the door for prophylactic varicocelectomy in adolescents in cases of ipsilateral asymmetry, hoping to prevent infertility when become older.

Okuyama et al reported on 24 boys who underwent varicocelectomy, 67% of whom had initial left hypotrophy (group I) and 16 boys followed conservatively without surgery, 50% of whom

had initial left hypotrophy (group II). On follow up, 24% of group I have ipsilateral hypotrophy versus 75% in group II [29].

When varicocele started early in adolescents, the damage to the germ cells as well as testicular atrophy will be greater [30-32].

Repair of varicocele in adolescents reverse the testicular growth arrest and associated with catch up growth within one year of treatment, this mean that early detection and treatment of varicocele in adolescents is a preventive measure a against infertility [33].

The grade of varicocele has no relation to the testicular tissue damage, semen parameters preoperatively or improvement of the semen parameters postoperatively. Even sub clinical varicocele in adolescents may have significant effect on the testicular parenchyma and semen parameters [34-37].

The currently agreement indication for surgical repair of varicocele in adolescents include; testicular asymmetry more than 20% and persisted for more than one year, abnormal semen parameters if available, or scrotal pain [38].

On the other hand, others found physiological catch up growth at three years on follow up without surgery in boys with original asymmetry 15-20% [39-41].

Although some authors recommend early surgical intervention to preserve fertility, others recommend non operative management based on reported physiological testicular catch up growth during development.

10. Bilaterality

Palpable varicocele is believed to occur on the left side in about 90% of cases while palpable right varicocele is found in 10% of cases of bilateral varicocele [23].

The incidence of subclinical varicocele may be underestimated; the bilaterality of varicocele may be unrecognized if only clinical examination is the only way of diagnosis in the absence of other modalities like; contact thermography, color flow Doppler sonography, and percutaneous retrograde venography to detect subclinical unrecognized right varicocele which is impossible to palpate clinically in more than 90% of cases [42].

Chatel et al noted bilateral varicocele in 60% of 178 patients using thermography; Gonzales et al noted 61% bilateral varicocele using venography [43]. On the other hand, Gat et al using both modalities, noted bilateral varicocele in 85% of patients [44].

This may explain failure of successful unilateral left varicocelectomy alone to restore spermatogenesis in many patients compared to bilateral varicocelectomy as suggested by Scherr and Gold Stien [45].

11. Whom we should repair

It is to be noted that 80-85% of patients with varicocele do not present with infertility, also adolescents with varicocele present only with testicular hypotrophy but not infertility [46].

Varicocelectomy is associated with testicular catch up growth postoperatively but whether early varicocelectomy in boys has a positive effect on future fertility or not, still a matter of discussion [47].

At the same time, catch up growth has been reported in subset of patients with varicocele at three years follow up without surgery.

The indication of varicocelectomy included, asymmetry more than 20%, bad semen parameters if available, pain, and sometimes cosmesis. Till now, no clear guidelines to operate or not to operate on right subclinical varicocele when operating on left clinical varicocele [48].

12. Choice of repair

Management of varicocele includes two categories; percutaneous embolization and surgical treatment. Percutaneous embolization can be done via intravenous injection of occlusive material (sclerotherapy) through retrograde venography. Surgical treatment includes; open varicocelectomy (inguinal, sub inguinal, microscopic sub inguinal) or laparoscopic varicocelectomy. The advantages of embolization include; local anesthesia, low cost, early ambulation, and low complication rates [49].

The failure rate in Ivanissevich repair of adolescent varicocele approached 14-16%, while Kass and Marco reported no failure in 62% Palomo varicocelectomy. The same group reported 3.9% recurrence rate and 29% hydrocele formation incidence in another study included 233 patients [50-52].

Laparoscopic varicocelectomy, sub inguinal lymphatic sparing varicocelectomy were suggested to reduce the incidence of hydrocele [53].

Other group suggested the use of microscope during the Palomo repair to identify lymphatic while others suggested the use of isosulfan blue in this regard [54].

13. Conclusion

Adolescents with varicocele may present at different stages of physical and pubertal development.

There is a need for a guideline for the indications of surgical intervention, type of surgery used, and the ideal protocol for follow up.

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