

Adolescent Varicocele: Association with Somatometric Parameters

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Key Words

Puberty · Body mass index · Testicular hypotrophy · Penile length · Varicocele

Abstract

Introduction: The developmental changes that occur as a result of puberty have been hypothesized to be important causes of varicocele. Various somatometric parameters were known to affect the occurrence of varicocele during the growth period. We conducted this study in order to examine these relationships and to determine the incidence of varicocele in adolescent males. **Patients and Methods:** We evaluated 1,200 healthy males aged 0–19 years for varicocele and correlated it with the following somatometric parameters: age, height, body mass index (BMI), pubic hair distribution, penile length and testicular volume. **Results:** Adolescent varicocele was found in 5.6% of the participants. The 13- to 19-year age-group had the highest incidence of varicocele (10.5%). Logistic regression analysis showed that the incidence was positively correlated with age, height and penile length (odds ratio 1.61, 1.04 and 1.37, respectively) and negatively correlated with left testicular volume, BMI and pubic hair distribution (odds ratio 0.87, 0.87 and 0.47, respectively). **Conclusion:** Varicocele was more

prevalent in tall boys with a lower BMI, who had quickly progressed through puberty. Our observations suggest that varicocele is associated with various somatometric parameters.

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Introduction

Varicocele is one of the oldest recognized causes of male infertility. The earliest description of varicocele dates back to the first century AD when the famous Roman physician Celsus (30 BC–45 or 50 AD) discussed testicular atrophy with swollen scrotal veins in his book *La Medicina*.

At present varicocele is recognized as the leading cause of male infertility. More than 30% of infertile males suffer from either clinical or subclinical varicocele [1]. Fifteen percent of males have varicocele [2], which is predominantly left-sided (approximately 85–90%), although bilateral varicocele has been found in up to 30% of cases [3].

Puberty is a phase of increased physical growth and development. Most of the organs in the body, especially those of the male reproductive system, enter a phase of rapid growth leading to their sexual maturity [4]. The de-

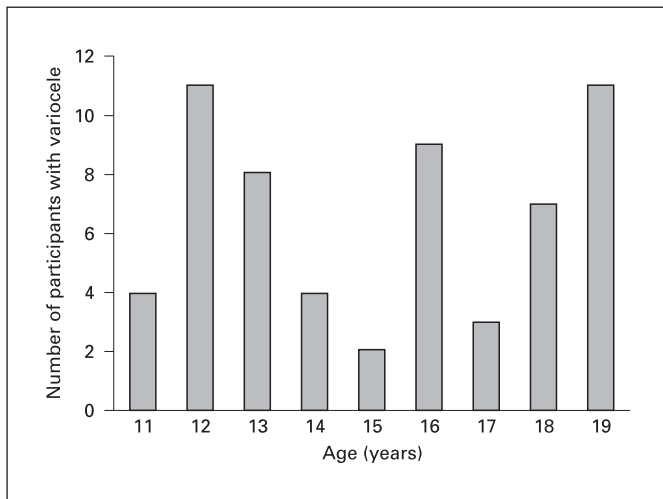


Fig. 1. Agewise distribution of adolescent patients with varicocele.

Table 1. Distribution of patients in the age-groups 7–12 and 13–19 years

Age-group	Varicocele		Prevalence rate, %
	absent	present	
7–12 years	338	22	6.1
13–19 years	376	44	10.5

Table 2. Significant factors for varicocele from logistic regression

Factors	Odds ratio	95% CI	p value
Age	1.61	1.31, 1.98	<0.0001
Body height	1.04	1.00, 1.08	0.04
BMI	0.87	0.78, 0.96	0.008
Pubic hair	0.47	0.31, 0.72	0.0005
Penile length	1.37	1.07, 1.75	0.01
Left testicular volume	0.87	0.78, 0.97	0.009

velopmental changes that occur as a result of puberty have been hypothesized to be important causes of varicocele [5]. Therefore, in our present study, we decided to evaluate the associations of various anthropometric parameters with the occurrence of varicocele in male adolescents.

Patients and Methods

This study was approved by the Institutional Review Board, Clinical Center of Endocrinology, Medical University, Sofia, Bulgaria. In a population-based cross-sectional study we evaluated 1,200 Caucasian boys between the ages of 0 and 19 years, who were from all socioeconomic classes, covering the regions of Sofia, Bulgaria. Since the study population involved boys from different sections of the society and different age-groups, it could be considered as a truly representative sample of the general population. All the boys and their parents consented to the examination. Each boy was classified into the corresponding age-group according to his completed age on the day of examination. The study population was divided into 3 groups: 0–6 years ($n = 420$), 7–12 years ($n = 360$) and 13–19 years ($n = 420$).

The boys were examined by the same investigator in order to reduce the interobserver error. The following variables were measured and recorded: height (cm), BMI [BMI = weight in kilograms/(height in meters)²], pubic hair distribution, testicular volume (cm³) and penile length (cm). Pubic hair distribution was rated in 6 stages using Tanner staging as described by Marshall and Tanner [6]. Varicocele was determined by palpation. A Prader orchidometer was used to determine testicular volume.

A multivariable stepwise logistic regression was used to assess risk factors for the presence of varicocele. A p value of 0.05 was considered statistically significant. Calculations were performed with SAS version 8.2 (SAS Institute Inc., Cary, N.C., USA).

Results

Varicocele was detected in 67 (5.6%) of the 1,200 boys (fig. 1). Only left-sided varicocele was detected, and only 1 participant <6 years of age (0.2%) had varicocele. In the 7- to 12-year age-group varicocele was present in 22 participants (6.1%). In the 13- to 19-year age-group 44 (10.5%) of participants had varicocele (table 1). The prevalence increased progressively with age, coinciding with pubertal development. Logistic regression analysis showed that left testicular volume, BMI and pubic hair distribution were negatively correlated with varicocele, whereas age, body height and penile length were positively correlated with varicocele (table 2). There was no association in our patient population between the presence of varicocele and right testicular volume.

Discussion

Varicocele is an abnormal dilation of the scrotal portion of the pampiniform plexus/internal spermatic venous system that drains the testicle, resulting in blood flow inversion. The etiology of varicocele is still unknown [7]. There are several hypotheses regarding its causes.

One such mechanism is the compression of the left renal vein between the superior mesenteric artery and the aorta, leading to increased left renal vein pressure, which is eventually transmitted to the testicular vein. Other proposed causes include an absence of valves in the testicular veins and a left testicular vein that drains into the left renal vein rather than the inferior vena cava, which increases hydrostatic pressure [2].

The developmental changes that occur as a result of puberty have also been hypothesized to be important causes of varicocele. In our current study height was positively correlated with the occurrence of varicocele. This is not surprising, given that the angle of the superior mesenteric artery with the aorta is smaller in taller males. As a result the left renal vein is compressed (nutcracker effect). Moreover in taller boys the left testicular vein is longer than the right one, which increases the hydrostatic pressure in the distal region of the left testicular vein. Increased hydrostatic pressure leads to the development of varicocele [2].

In our study BMI was a protective factor for varicocele. In other words the boys with a higher BMI were less likely to develop varicocele. The boys with less adipose tissue were more prone to develop varicocele. Since BMI is associated with adiposity, it does not exclude the possibility of increased muscle mass in patients with varicocele [8]. It is also possible that boys with a lower BMI are physically more active, which might be a causative factor in the development of varicocele.

The boys with varicocele were also observed to have an increased penile length. Penile length is an indicator of puberty and correlates with different stages of pubertal development. Our results may presumably indicate that adolescent boys who quickly progressed through puberty have an increased incidence of varicocele.

This contention is further reinforced by an increased prevalence of varicocele in the 13- to 19-year age-group. Pubertal development in boys begins at approximately age 9 and continues to the age of 15 years. In our study the prevalence of varicocele increased progressively and was highest in the 13- to 19-year age-group, which is when most boys reach complete sexual maturation. The lone case of varicocele [4] in the 1- to 6-year age-group could have been caused by some congenital anatomic abnormality requiring further evaluation.

A population-based study of Turkish boys detected varicocele in 293 of 4,052 participants (7.2%). The prevalence of varicocele in the age-groups 2–6, 7–10, 11–14 and 15–19 years was 0.79, 0.96, 7.8 and 14.1%, respectively [9]. This observation is in accordance with our cur-

rent results that found the highest frequency of varicocele in the 13- to 19-year age-group (pubertal and postpubertal adolescents).

It is widely accepted that varicocele can cause progressive damage to the affected testes, leading to reduced fertility [10, 11]. Those with varicocele are at an increased risk of arrested testicular growth, which results in testicular atrophy [4, 12, 13]. In older adolescents varicocele causes a significant deviation in seminal parameters [4, 14]. The results in our study showed that the testicular volume was smaller in those with varicocele, which is in accordance with the results observed in other studies [14].

Although we did not measure the semen parameters in adolescent boys with varicocele, we demonstrated in our previous studies that they are deteriorated in varicocele patients [15, 16]. One of the reasons for the altered semen parameters could be decreased testosterone leading to retarded spermatogenesis. In addition a shift in the hypothalamic-pituitary-gonadal axis, as indicated by increased luteinizing hormone levels in gonadotropin-releasing hormone challenge tests, was noted in these patients. This could be because of a compromised Leydig cell function, ultimately leading to infertility [2]. Therefore our study achieves further significance by identifying the patients who could be at risk of infertility.

The integrity of the growth factors is mirrored by growth, especially pubertal growth spurt, growth velocity, etc. Hence taller boys have a well-functioning hormonal growth axis, which might be exaggerated in some cases. This response stimulates the growth factors contributing to elongation of the veins and occurrence of varicocele.

In summary our study suggests that various somatometric parameters are associated with the development of varicocele. This study was limited by the fact that the participants did not undergo hormone evaluation, the results of which could have provided us with further details regarding the sexual maturity of the participants. Our study, like any other, is not completely free from confounding bias. In order to account for the potential confounders, we included subjects representing different groups according to age, physical and sexual activities, etc. This type of patient selection should help avoid both selection and confounding biases.

In addition this study consisted of Caucasian boys only. Larger trials involving boys of different races and ethnicities are needed in order to enhance the generalizability of the results. Only longitudinal studies can prove or reject the relationship between varicocele, and height and BMI that was observed in the present study.

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