Objective: To investigate the relationship between testicular volume and semen parameter in patients with unilateral high grade left varicocele.

Material and methods: One hundred eighty seven patients who had left high grade varicocele aged 19-to-25 years were included in this study. All patients underwent a standard evaluation, including medical history and physical examination. The percentage testicular volume difference between the right and left testicles was calculated. The patients were divided into the following three groups; Group 1 (n = 72) testicular volume difference <10%, testicular volume difference 10~20% Group 2 (n = 74) and testicular volume difference >20% Group 3 (n = 41).

Results: The mean age and BMI of the patients were 21.5 years and 23.1 kg/m², respectively (p = 0.596, p = 0.943). The semen parameters and testicular volumes of the three groups were compared. The total motile sperm count, percentage of motile sperm, percentage of normal morphology sperm were found to be lower in Group 3 (p = 0.011, p = 0.012, p = 0.029 respectively). The mean testicular volumes for the left and the right testis were found to be 15.2 cm³ and 17.7 cm³ (p < 0.001), respectively. No significant difference was found in the right testicular volumes between groups (17.4, 17.7 and 18.1 cm³, p = 0.573).

Conclusions: A high grade left testicular varicocele is associated with ipsilateral testicular hypotrophy and parallel to worsened sperm parameters.

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Material y métodos: Ciento ochenta y siete pacientes que tenían varicocele izquierdo de alto grado de entre 19 y 25 años fueron incluidos en este estudio. Todos los pacientes se sometieron a una evaluación estándar, incluyendo historia clínica y examen físico. Se calculó la diferencia de porcentaje de volumen testicular entre los testículos derecho e izquierdo. Los pacientes fueron divididos en los siguientes 3 grupos: grupo 1 (n = 72) diferencia de volumen testicular <10%; diferencia de volumen testicular 10–20% grupo 2 (n = 74); y diferencia de volumen testicular >20% grupo 3 (n = 41).

Resultados: La media de edad y el IMC de los pacientes fueron de 21,5 años y 23,1 kg/m², respectivamente (p = 0.596, p = 0.943). Se compararon los parámetros seminales y los volúmenes testiculares de los 3 grupos. Se descubrió que el recuento total de espermatozoides móviles, porcentaje de espermatozoides móviles y porcentaje de espermatozoides de morfología normal eran menores en el grupo 3 (p = 0.011, p = 0.012, p = 0.029, respectivamente). Se encontró que los volúmenes testiculares medios para el testículo izquierdo y derecho eran 15,2 cm³ y 17,7 cm³ (p < 0,001), respectivamente. No se encontraron diferencias significativas en los volúmenes testiculares derechos entre los grupos (17,4, 17,7 y 18,1 cm³; p = 0,573).

Conclusiones: Un varicocele testicular izquierdo de alto grado se asocia con hipotrofia testicular ipsilateral y paralela a los parámetros del esperma empeorado.

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Clinical problem with description of the series

Varicocele is the most important cause of male infertility since it can impair semen production and quality; however, the negative effects of varicocele are preventable with appropriate treatment.1 The most common indication for the repair of prophylactic varicocele in adolescents is the development of testicular hypotrophy, because this may progress to impaired fertility in adulthood by affecting testicular growth, and causing volume loss and deterioration of semen parameters.2 In our series, we investigated the relationship between testicular volume and semen parameters in patients in the early adult period with unilateral high grade left clinical varicocele.

A total of 187 men between the ages of 19–25 with a high grade left varicocele were included. All the patients were fulfilling their national service requirement. The evaluation of the patients consisted of their medical history, physical examination, height and weight measurements. Exclusion criteria were determined as having a pathology that influences testicular volume, such as an infection (e.g. mumps orchitis), trauma, cryptorchidism, or previous testicular surgery or a low grade (e 1 or 2) varicocele. The study was approved by the Institutional Review Board (ANEAH=2009/143) and all subjects provided proper informed consent. Varicocele was diagnosed by bimanual palpation and observation of the scrotum under similar environmental conditions, and all physical examination were performed during the participants period of military service by the same examiner (O.G.). A visible varicocele without palpation while patient is in standing position was considered as Grade 3 or high grade varicocele. The testicular volumes were measured by scrotal ultrasonography (USG) with a 7.5-MHz linear transducer (Sonolayer™ SSA-250A, Toshiba Corporation, Tokyo, Japan) by the same radiologist (B.U.) using a formula (length × width × height × 0.71).

The percentage of the difference in the testicular volume (%) between the right and left testicles was calculated using a formula (right testicular volume – left testicular volume) × 100/right testicular volume), and patients were classified into three groups; 1 (n = 72) with testicular volume difference under 10%, group 2 (n = 74) with testicular volume difference between 10% and 20%, and group 3 (n = 41) with testicular volume difference over 20%. Semen samples were collected from patients by masturbation after 3–7 days of sexual abstinence, and analyses included sperm count, linear and non-linear motility, total motile sperm count according to the World Health Organization 2010 recommendations, and normal sperm morphology according to the Kruger's criteria.3 Semen parameters and testicular volumes in three groups were compared using one-way ANOVA and Kruskal–Wallis test.

The mean age of the patients was 21.5 years (21.5, 21.4 and 21.7 years in groups 1, 2 and 3, respectively, p = 0.596). The mean testicular volumes for the left and right testes were found to be 15.2 cm³ (95% CI, 14.8–15.7) and 17.7 cm³ (95% CI, 17.2–18.2) (p < 0.001), respectively. The left testicular volume was found to be lower in group 3 (16.5, 15.3 and 12.9 cm³, p < 0.001) while no significant difference was found in the right testicular volumes between the groups (17.4, 17.7 and 18.1 cm³, p = 0.573) (Table 1).

The sperm count, linear progressive motile sperm, non-linear progressive motile sperm, total motile sperm count, and percentage of normal morphology parameters were significantly decreased in group 3 (p < 0.05, Table 1). As the testicular discrepancy increases, the sperm count per milliliter and total motile sperm count decreases (p = 0.011 and p = 0.023, respectively). In addition to sperm motility, sperm morphology was found to be lower in Group 3 than in the other groups (p = 0.001). The sperm morphology was similar in Groups 1 and 2 (97.2% vs. 94.6%, p = 0.424).

Comments

Varicocele can be defined as dilatation of testicular vein and pampiniform plexus in spermatic cord since untreated lesions may affect testicular growth and function over time. Varicocele is the most common preventable cause of male infertility.4 The prevalence of the disease clearly increases
with pubertal development to approximately 15% by the late teenage years, a rate similar to that in adult male populations.5

Radiological and histological testicular changes may be seen in patients with varicocele. Hassan et al. suggest that arterial blood velocity, testicular arterial diameters, and testicular perfusion significantly decreased in patients with high-grade varicocele compared with healthy controls.6 The most common findings following semen analysis are decreased motility and sperm density, and increased number of pathologic sperm forms in adults.7 Since the adult testicle is mostly composed of seminiferous and germinal cells, it is not surprising to find a correlation between testicular volume and function as defined by semen analysis in this group.8 However, in adolescents, the scenario is slightly different, for example; Haans et al. reported that adolescents with left testicular growth failure had significantly reduced sperm count, but the motility and morphology were unaffected.9 This difference from the situation in adult males may be partly explained by the occurrence of left testicular growth failure before significant decreases in semen parameters.

A previous study reported that the difference between the testicular volume increases in higher grades of a left varicocele.10 Conversely, a study reported that the varicocele grade does not correlate with testicular volume on the affected.11 In the current study, we found that the difference increased with the increasing volume discrepancy, especially when it is over 20%. However, there was no difference in the right testicular volume among these groups. To date, the relationship between varicocele and testicular atrophy has been extensively investigated in adolescents.12 To our knowledge, the current study is the first study on the relationship between varicocele and testicular atrophy in patients in the early adult period.

International literature declares that varicocele is related to testicular growth arrest in adolescents and appropriate treatment results in recovered testicular growth. The risk for testicular growth arrest is time dependent and related to the varicocele and reflux grade.13 However, in a study by Zampieri et al., 465 patients were divided into two groups; one consisting of the laparoscopic artery-preserving varicocelectomy patients (group 1) and the other comprising patients receiving open inguinal microscopic artery-preserving varicocelectomy with a venous–venous bypass (group 2).14 The authors reported that only 32% of patients had complete catch-up growth. On the other hand, Rodriguez et al. reported that the mean percentage of normal motility significantly increased after surgery, but they did not observe a significant increment in testicular volume after the varicocele repair.14 The relationship between testicular hypotrophy and infertility remains clear and a recent study confirmed that if size differences between normal and hypotrophic testicles are over 10%, this will be correlated with decreased sperm concentration and total motile-sperm count. Furthermore, this difference increases dramatically when the size difference reaches 20%. The authors suggested that patients with a size difference of more than 20% should be offered surgical intervention without further investigation.

Finally, the results of our series suggest that as the difference of testicular volume increases, the semen parameters are more and more impaired. Therefore, measurement of the difference of the testicular volume may help to predict the degradation parameters of semen analysis in patients with high-grade varicocele. Our results showed that the testicular volume difference seems to be as important in early adult period as in adolescence. We believe that these findings should be confirmed by further studies.

Conflict of interest

The authors declare that they have no conflict of interest.

References

Sperm parameters, testicular hypotrophy and varicocele