The Prevalence of Varicocele in the Military Population

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Research article

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Abstract

Objective: To analyse the prevalence and independent risk factors of varicocele in the soldiers population.

Methods: The results of ultrasound examination and clinical physical examination in military outpatient clinic were collected and analysed in our hospital between July 2019 and July 2020. The results were compared with ordinary outpatient patients.

Results: Finally, 1169 military patients and 818 general outpatients were included in this study. Totally 225 military cases (19.24%) and 119 outpatient cases (14.55%) developed varicocele. The incidence of varicocele in the military group was higher than that of the outpatients ($P<0.05$). The number of bilateral and single right varicocele in the two groups were 29, 14 and 13, 7, respectively. Military men were younger and had smaller testicular volumes than ordinary people ($P<0.05$). The analysis of the military population revealed that reduced left testicular volumes ($P=0.000$, $OR=0.896$), increased right testicular volumes ($P=0.033$, $OR=1.052$) and the disappearance of fluid around testicular ($P=0.007$, $OR=0.505$) were independent risk factors for varicocele. There was no correlation between testicular volume, age and the diameter of spermatic vein ($P>0.05$).

Conclusions: The incidence of varicocele in the military population was 19.24%, and the rate was higher than ordinary patients. Reduced left testicular volumes, increased right testicular volumes and the testicular hydrocele disappears were independent risk factors.

1. Background

Varicocele refers to the elongation, tortuosity and expansion of the vinyliform plexus of spermatic vein. It is often found in people with infertility and scrotal discomfort [1]. About half of all infertile cases of identifiable cause are caused by men [2], varicocele is the most common treatable cause [3]. It was estimated that the prevalence in the general population was 15% [4]. It accounts for 40% of primary male infertility and 78–81% of secondary male infertility [5].

A multifactorial etiology is likely involving oxidative stresses, local hormonal imbalances, stasis of blood (toxin accumulation) testicular hypoperfusion and heat stress [6]. Primary spermatic vein dilatation and reflux can be caused by the following factors: (1) The left, sometimes right, internal spermatic vein drains into renal veins or suprarenal veins at right angle [7]. (2) The spermatic vein has a longer total flow passage and a larger venous differential pressure [8]. (3) Valvular insufficient and internal variation of the spermatic vein [6]. (4) Another rare cause includes compression of the left renal vein or the internal spermatic vein [9] (such as mass lesions or left renal vein nutcracker signs). Diagnosis mainly depends on imaging and physical examination. Treatment options include operation and percutaneous embolization. Surgical repair of varicoceles can be performed using a variety of open surgical methods, including retroperitoneal, inguinal, subinguinal approaches, or laparoscopy [10]. Adolescents without surgical repair and for young adults with normal semen analysis were recommended for imaging follow-up. The early complications after varicose vein repair can be identified by ultrasonography [11].

Heterogeneous opinions lead to different incidence rates of varicocele. Considering the general high intensity of movement intensity of the military group, and the number of patients with varicose veins has increased in our hospital recently, it is necessary to explore the occurrence of varicocele. The purpose of this study was to investigate the incidence of varicocele in the military, so as to provide more help for the varicocele in the military population.

2. Methods

Study design

This study was approved by the ethics committee of the Northern Theater General Hospital and waived patients' content due to the nature of this retrospective study. The examination results and physical examination results were retrospectively collected and analysed by one author blinded to this research. The relevant risk factors were calculated by statistical methods. A comparative analysis with the outpatient department was made, and the correlation of different factors was analysed.

Inclusion criteria

Medical records of patients diagnosed with varicocele were checked. The review time was from July 2019 to July 2020. According to the recommendations of the Scrotal and Penile Imaging Working Group of the European Society of Urogenital Radiology (ESUR-SPIWG), varicocele can be diagnosed when Valsalva action (refers to inhale deeply and close the glottis tightly in a standing position then exhale forcefully, abdominal pressure need to be increased by using hand pressure if necessary [12]) was performed in standing position with an internal diameter of at least 3 mm [11].

(1) Inclusion in the military population:

- ☒ Had not received related treatments or suffered associated trauma prior to the examination.
- ☒ The patients were military personnel, not military families.
- ☒ Had received ultrasound examination and physical examination by experienced physicians at or above the attending level in the review time, and case information was available.

(2) In the outpatient cases:

- ☒ Had not received relative treatments or suffered associated trauma prior to the examination.
- ☒ Over 18 years of age.
- ☒ Had received ultrasound examination and physical examination by experienced physicians at or above the attending level in the review time, and case information was available.

Physical examination and ultrasound examination

All patients were required to undergo a testicular physical examination, including testicular size and texture, epididymis, vas deferens, spermatic cord and blood vessels, etc. Varicocele was classified into three grades [13]: grade I was defined as palpable only with Valsalva action; grade II was defined as palpable without Valsalva action; grade III was defined visually evident without Valsalva action. Varicocele shall be graded according to the above criteria. After the physical examination, ultrasound examinations were conducted by 11L-D line array conductor (4–10 MHz, GE Voluson E8, Guangzhou, China). Experienced sonographers performed testicular and spermatic vein ultrasound examinations. The patients were calm and in standing position. The inner diameter width of the spermatic vein was determined during Valsalva maneuver, and the testicular volumes were calculated by the machine. Generally, if the physical examination results were positive, the ultrasound examination must be positive, otherwise, the ultrasonic examination results were regarded as the grading standard.

Statistic

IBM SPSS version 26.0 (Chicago, USA) was used for statistical analysis. All included descriptive data were non-normal distribution by Kolmogorov-Smirnov (KS) test and expressed as median. The Mann Whitney U test was used to compare varicocele results between military and outpatient cases. Spearman correlation analysis was used to measure the correlation of varicose vein diameter, age and testicular volume. The $R \times C$ chi-square test was used to compare the incidence of varicocele and other count data. Binary logistic regression analysis was used to examine the independent risk factors of varicocele, the enter method was used to analyse the indexes item by item, and then the indexes with statistical significance were unified and analysed. P value less than 0.05 was considered statistically significant.

3. Results

Baseline Characteristics of the Patients

Totally 1202 military cases could be detected during the follow-up period, thirty-three were excluded as military family members and postoperative cases, a total of 1169 cases were included. Finally 225 cases developed varicocele (19.24%), including 182 cases of left varicocele, fourteen cases of single right varicocele and 29 cases of bilateral varicocele. The age ranged from 18 to 85 years, the internal diameter of varicose spermatic vein was between 3.00 mm and 5.80 mm, the volume of the right testis ranged from 7.34 cm³ to 50.49 cm³, the left ranged from 8.21 cm³ to 46.33 cm³. The number of people in grade I, II and III was 211, 12, 2, respectively. The comparison between the varicose veins and the normal military examination was shown in Table 1. Figure 1. showed an ultrasound image of a soldier with grade II varicocele on the left when the Valsalva action was in progress.

Table 1
Varicocele occurred in the military population compared with those without varicocele

Parameter	Varicocele cases	Without varicocele cases	P value
Age(y)	25	25	0.55
Inner diameter(mm)	3.2	1.8	0.00
Left testicular volume(cm ³)	19.68	18.28	0.00
Right testicular volume(cm ³)	18.72	19.13	0.40
Epididymis cyst	52	198	0.48
Testicular hydrocele	25	56	0.01

A total of 818 outpatient cases were included in this study, including 119 patients with varicocele (14.55%). Among them, 99 cases occurred on the left side, 7 cases occurred on the right side, and 13 cases were bilateral. The age range was 18 to 69y, the internal diameter of varicose spermatic vein was between 3.00 mm and 5.10 mm, the volume of the left testis ranged from 5.88 cm³ to 48.41 cm³, the right ranged from 7.98 cm³ to 42.69 cm³. The number of patients in class I, II and III was 108, 9, 2, respectively.

Comparisons between the two groups

The incidence of varicocele was higher in military patients than in general outpatients ($P < 0.05$), while there was no difference in varicose grade and lateral position ($P > 0.05$). Military cases were younger and had a smaller bilateral testicular volume ($P < 0.05$), there were no significant differences between varicose internal diameter of spermatic vein, the incidence of epididymal cyst and fluid accumulates around the testis ($P > 0.05$). The comparison results can be seen in Table 2.

Risk factors and correlation analysis

Age, inner diameter width of spermatic vein, bilateral testicular volumes, the presence of epididymal cyst and testicular sheath effusion were taken as risk factors for binary logistics regression analysis (Table 3). It can be found that left testis volume got smaller ($P = 0.000$, OR = 0.896), the right became bigger ($P = 0.033$, OR = 1.052) and the disappearance of fluid around the testiculars ($P = 0.007$, OR = 0.505) were independent risk factors for varicocele, while age, the inner diameter of the spermatic vein and epididymis cyst were not. Among the three independent risk factors, the first two items were continuous variables, which mean that the risk of varicocele was 0.896 times higher for each unit decreased in left testicular volume; for each unit increased in right testicular volume, the risk of varicocele was 1.052 times higher than that before the increase.

Correlation analysis revealed that there's no correlation between age, varicose inner diameter of spermatic vein, the appearance of epididymal cyst and testicular hydrocele ($P > 0.05$).

Table 2
Comparison of basic information of military personnel and general outpatients

Parameter	Military cases	Outpatient cases	<i>P</i> value
Age(y)	25	30	0.00
Inner diameter(mm)	3.2	3.2	0.93
Left testicular volume(cm ³)	19.68	22.68	0.02
Right testicular volume(cm ³)	18.72	21.24	0.00
Epididymis cyst	52	26	0.79
Testicular hydrocele	25	11	0.59
Grade	-	-	0.86
Grade I	211	108	-
Grade II	12	9	-
Grade III	2	2	-
Side of varicocele	-	-	0.58
Bilateral	29	13	-
Single right	14	7	-

Table 3
Risk factors of varicocele in military group

Parameter	β	EXP (β)	95%CI of EXP (β)	Wald	<i>P</i> value
Age(y)	0.003	1.003	0.983–1.024	0.087	0.769
Inner diameter(mm)	-153.314	0.000	0.00-∞	0.004	0.947
Left testicular volume(cm ³)	-0.110	0.896	0.860–0.934	26.770	0.000
Right testicular volume(cm ³)	0.051	1.052	1.004–1.103	4.533	0.033
Epididymis cyst	-0.124	0.883	0.624–1.250	0.493	0.483
Testicular hydrocele	-0.637	0.505	0.307–0.828	6.061	0.007

4. Discussion

According to a contemporary study from six European countries, the prevalence of varicocele was about 15.7%. Among them, 1.1% had bilateral disease and 0.2% had isolated right-sided varicocele on physical exam [12], the proportions were similar to this study (2.48%, 1.20%). The left gonadal vein usually drains into the left renal vein at a 90-degree angle, the right usually drains directly into the inferior vena cava at an acute angle [14], therefore, left varicocele is common in clinical varicocele, the single right varicocele occurs in only 1% of the patients [15]. There are also those who believe that the single-right varicocele should be of increased concern because it is a pathologically obstructing process[16].

Sigman et al. [17] found that the left varicocele was closely associated with reduced testicular volume. The conclusions of this study were the same, which may be due to the high proportion of left varicocele in the enrolled patients. In Caucasian and African males, a total testicular volume greater than 20–24 ml is considered as normal testicular size [18, 19, 20], the small testicular volume in the study can be attributed to race or varicocele.

Left testicular volume reduction, increased testicular volume on the right and the disappearance of fluid around testicle were considered as independent risk factors for varicocele in this study. Since varicocele usually occurs on the left side, it is reasonable to assume that left testicular shrinkage is caused by poor blood supply, leading to compensatory increase of the right testicular. There was no correlation among age, the inner diameter of the spermatic vein, clinical grades of varicocele and testicular hypotrophy, which is consistent with the results of Francesco et al. [21]. Peritesticular effusion is usually attributed to poor lymphatic drainage after varicocele surgery [22]. In this study, peritesticular effusion was considered as a risk factor. We did not find the exact cause, and we expect more comprehensive prospective studies to clarify the relevant mechanism in the future.

In addition, the study also included 818 general outpatients. By comparing the two study groups, it was found that the military group had a younger age (25:30) and a smaller testicular volume (the left testicular were 19.68: 22.68, the right testicular were 18.72: 21.24). We believe that this is due to the general youth of military personnel and the military population has a higher prevalence rate. Venous reflux was considered to be the main cause of testicular injury [23], if the reflux was eliminated, varicocele could be reversed [24]. Transient reflux during Valsalva (1 second) was generally considered physiological [25, 26], reflux time less than 2 s was considered an uncertain factor, reflux time greater than 2 s was considered to be the most useful parameter in diagnosing varicocele [11]. In positive cases, not all cases had reflux, some of the patients with an internal diameter of less than 3 mm had venous reflux, which contradicted each other. Therefore, we did not include venous reflux into the relevant factors for evaluation.

This study has some limitations. Firstly, testosterone levels were not included in the study. Canales et al. [27] believed that varicocele was associated with decreased testosterone levels, while Huseyin et al. [28] believed that the two were not associated. Since not all of the included patients had fertility requirements and the clinical symptoms are not typical, testosterone testing was only performed for those with fertility requirements or other medical conditions. Secondly, we did not include venous reflux time in the analysis.

Thirdly, to prevent selection bias, we did not exclude older veterans due to the wide age range of outpatients.

5. Conclusions

The incidence of varicocele was 19.24% in military men. Left testicular volume reduction, increase of right testicular volume and disappearance of testicular hydrocele were risk factors. The incidence of varicocele was about 14.25% in general outpatients, who were older in age and had larger bilateral testicular volume than the military population.

Declarations

Ethics approval and consent to participate: The ethics committee approved the research proposal and waived patients' consent due to the nature of this retrospective study.

Consent for publication: Not applicable

Availability of data and material: The data in this study are true and reliable. All data was collected by the electronic case system of our hospital and collected after the patients left the hospital. In order to protect the privacy of patients, the names of all patients were replaced by Arabic numerals, and the original data was only visible to the second author.

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Authors' contributions: In this study, MW was responsible for raising questions and writing, W-Y C collected and analysed data, H-L W was responsible for contacting. All authors have read and approved the manuscript.

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Figures

Figure 1

Sonographic image of the spermatic vein in a military patient with grade II left varicocele.

Figure 1

Sonographic image of the spermatic vein in a military patient with grade II left varicocele.