SOME CLINICAL CHARACTERISTICS RELATED TO CHRONIC EXERTIONAL COMPARTMENT SYNDROME IN MILITARY SPORTS ATHLETES

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Abstract

Objectives: To describe some clinical characteristics of the leg in training related to chronic exertional compartment syndrome in military sports athletes. ***Methods:*** A cross-sectional descriptive study on 412 military sports athletes. The characteristics of age, gender, BMI, sport, and clinical symptoms when exercising were collected. Data were processed using SPSS software IBM version 22.0. ***Results:*** The number of female athletes accounted for one-third of that of males (24.5% and 75.5%). The age groups < 20 and 20 - 29 years old accounted for the majority (24.3% and 64.1%), with an average age of 23.9 ± 5.8; there was no difference in mean age between males and females. The average BMI was 23.1 ± 1.0; the majority of athletes (96%) had normal BMI. Sports activities are mainly wrestling (18%) and athletics (17%). When exercising, athletes have a high percentage of leg pain (15%) and leg stiffness (14.6%). Over 90% of athletes experienced pain during exercise; the main pain location is leg pain (90.3%), leg numbness (81.3%), leg paresthesia (73.3%), and leg cramps (85.7%). Leg pain was relieved at 5-minute rest (41.9%), while leg numbness, leg paresthesia, and leg cramps were relieved at 10-minute rest, with a ratio of 62.5%, 50%, and 51.4%, respectively. ***Conclusion:*** The characteristics of age, gender, BMI, sport, and clinical symptoms during exercise are important information in diagnosing and predicting chronic exertional compartment syndrome.

Keywords: Leg compartment pressure; Chronic exertional compartment; Sports athletes.

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INTRODUCTION

Compartment syndrome is a state of elevated pressure in an anatomical compartment closed by fascia, leading to ischemia, and if prolonged, it will cause nerve and muscle damage in the compartment. Based on the cause of injury, compartment pressure (CP), and the recuperate ability of compressed muscle and nerve, compartment syndrome is divided into two main types: Acute compartment syndrome and chronic compartment syndrome. Among them, chronic compartment syndrome is the second most common cause of leg pain on exertion, with prevalence ranging from 27 - 33% [1]. Chronic exertional compartment syndrome (CECS) is often observed in running athletes and marching military members, with many related factors such as gender, age, anatomical features of the leg, and sports activities [1, 2]. While it is very important to investigate the clinical characteristics of the risk group, there has been no research on CP in labor, training, and sports in Vietnam. Therefore, we conducted this study to: *Describe some clinical characteristics of leg in training related to CECS in military sports athletes.*

MATERIALS AND METHODS

1. Subjects

* *Research subjects:* 412 military sports athletes.

* *Inclusion criteria:* Athletes who were living and practicing at the Military Sports Center and agreed to participate in the study.

* *Exclusion criteria:* Athletes who were injured or sick and unable to perform physical exercises.

* *Duration and location:* 04 years (from January 2018 to December 2022), at the Military Sports Center.

2. Methods

* *Study design:* A cross-sectional descriptive study.

* *Data collection:* The clinical information of the study subjects was collected through the process of examination, questioning, and recording according to the research medical record form, including the following information: Age, gender, BMI, sports activities, and syndromes (pain, shin splints, numbness, paresthesia, and cramps) in the leg when examination and after resting.

* *Data processing:* The data were processed by medical statistical methods, using SPSS software IBM version 22.0.

RESULTS

1. General characteristics of the subjects

Table 1. Age and gender characteristics of study subjects.

Gender	n	Propotion (%)	Age	
			$\bar{X}$ ± SD	Min - Max
Male	311	75.5	23.8 ± 5.8	17 - 50
Female	101	24.5	24.2 ± 5.9	17 - 46
Total	412	101	23.9 ± 5.8	17 - 50

The total number of subjects participating in the study was 412, in which the number of female athletes accounted for one-third of that of males (24.3% vs. 75.7%). The average age of athletes was 23.9 ± 5.8, and there was no difference in mean age between males and females.

Table 2. Age group characteristics of research subjects.

Age group	Male		Female		Total	
	n	%	n	%	n	%
< 20	77	24.8	23	22.8	100	24.2
20 - 29	199	64	65	64.4	264	64.1
30 - 39	27	8.7	9	8.9	36	8.7
≥ 40	8	2.6	4	4	12	2.9
Total	311	100	101	100	412	100

The age group that accounted for a high percentage of athletes participating in the study was the 20 - 29-year-old group, accounting for 64.1%; < 20-year-old group accounted for 24.3%, 30 - 39-year-old group accounted for 8.7%, and ≥ 40-year-old group accounted for a low rate (2.9%).

Table 3. BMI characteristic.

Classification	Female (n = 101)		Male (n = 311)		Total	
	n	%	n	%	n	%
Average	22.3 ± 1.1		23.4 ± 0.9		23.1 ± 1	
Underweight (< 18.5)	1	1.0	0	0	1	0.2
Normal range (18.5 - 22.9)	78	77.2	100	32.2	178	43.2
Pre-overweight (23 - 24.9)	21	20.8	200	64.3	221	53.7
Overweight (25 - 29.9)	1	1	11	3.5	12	2.9
Total	101	100	311	100	412	100

The average BMI of athletes was 23.1 ± 1.0, the majority of athletes (96%) had normal BMI.

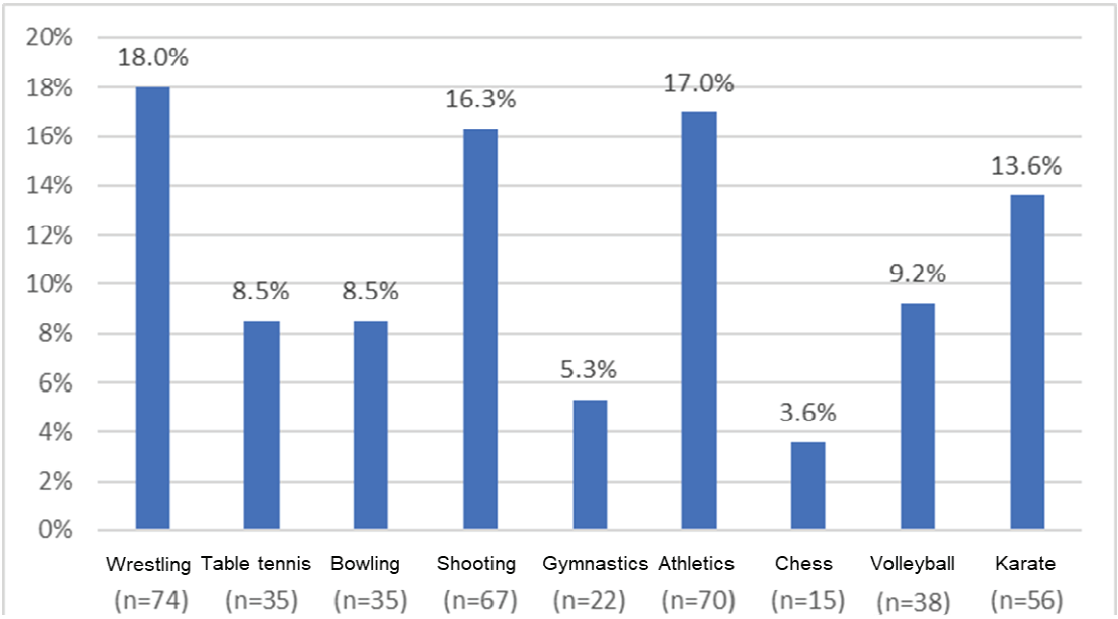

Chart 1. Sports activities of the subjects.

The sports activities of the athletes in the study included 9 sports, including wrestling (18%), table tennis (8.5%), bowling (8.5%), shooting (16.3%), gymnastics (5.3%), athletics (17%), chess (3.6%), volleyball (9.2%), and karate (13.6%).

2. Clinical examination and symptoms of research subjects

** Clinical examination:*

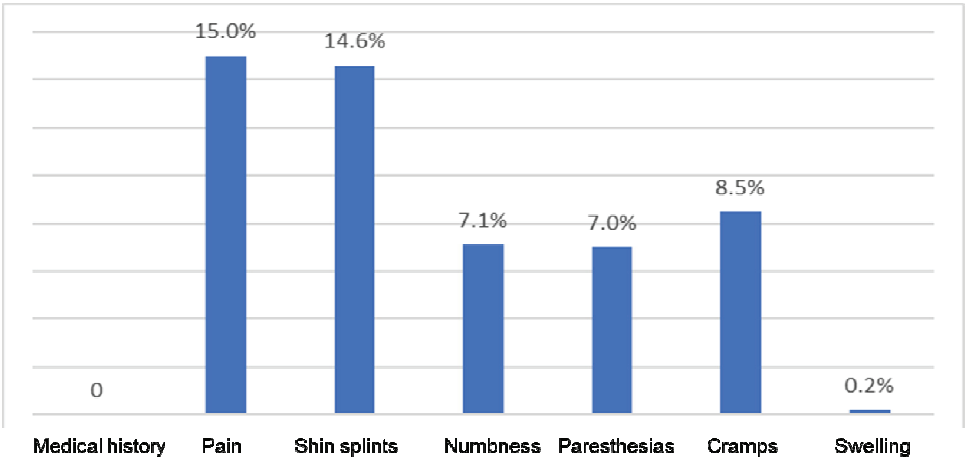

Chart 2. Clinical examination of research subjects.

When exercising, athletes had a high percentage of leg pain (15%) and leg stiffness (14.6%). Athletes suffering from leg cramps, numbness, and paresthesias accounted for 8.5%, 7.1%, and 7%, respectively.

** Symptoms:*

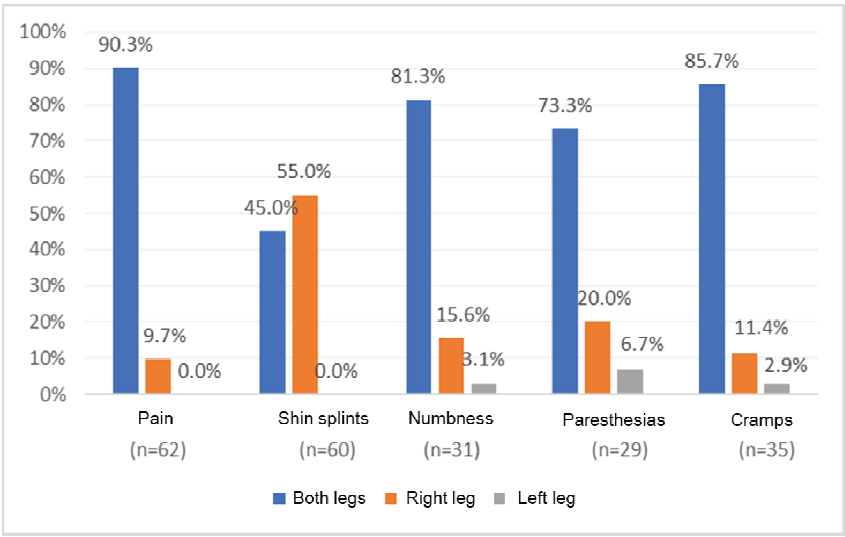

Chart 3. Pain locations of research subjects.

The main pain locations were leg pain (90.3%), leg numbness (81.3%), leg paresthesia (73.3%), and leg cramps (85.7%). There were 60 athletes with shin splints, of which 55% had pain in the right leg, and the rest had pain in both legs.

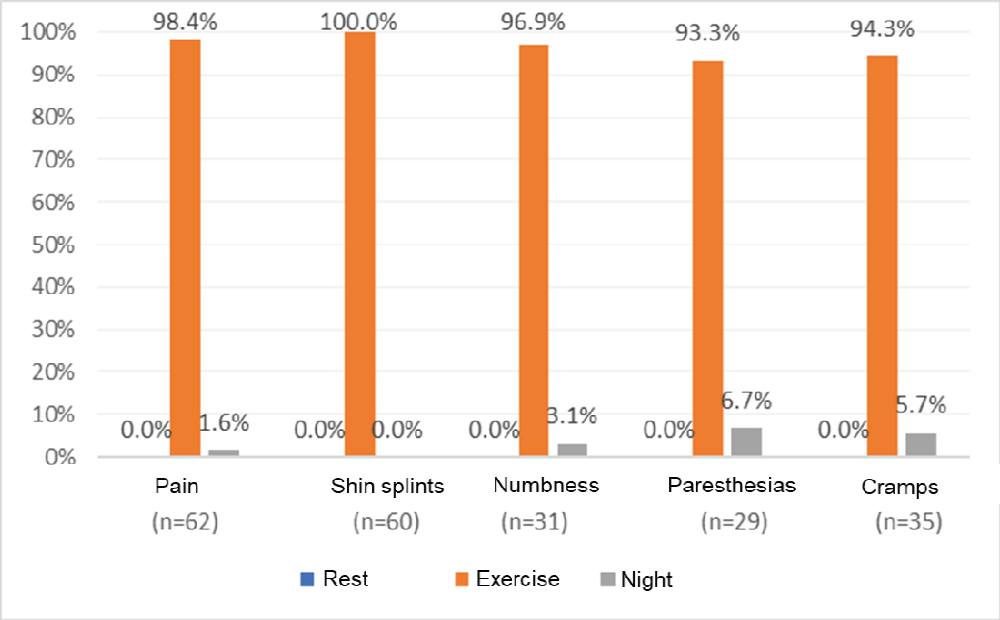

Chart 4. Pain of research subjects.

Over 93% of athletes experienced pain in areas such as leg pain, shin splints, numbness, paresthesia, and cramps during exercise. Only a small number of athletes had pain at night.

Table 4. Symptoms when exercising.

Symptoms	Pain (n = 62)	Shin splints (n = 60)	Numbness (n = 31)	Paresthesia (n = 29)	Cramps (n = 35)
Recurrent pain	1.6	45	3.1	10	2.9
Relieve after 5-minute rest	41.9	0	0	6.7	2.9
Relieve after 10-minute rest	33.9	35	62.5	50	51.4
Relieve after more 15 minute-rest	22.6	20	34.4	33.3	42.8

Leg pain was relieved after 5-minute rest (41.9%), and shin splints recured with exercise intensity (45%). Particularly numbness, paresthesia, and cramps were relieved after 10 minutes of rest, with the rate of 62.5%, 50%, and 51.4%, respectively.

DISCUSSION

In our study, males accounted for about 3 times more than women (75.5% vs. 24.5%) *(Table 1)*. According to Ogunlusi (2005) [3] and Chaudhary (2015) [4], if there is an injury with a risk of CP increase, the proportion of patients who are male is also much higher. Regarding the average age of athletes, the data showed that the mean age was 23.9 ± 5.8 years old *(Table 2)*. Most are in the age group of 20 - 29 years old; this was also the main age to take part in the competition and do most physical activities, leading to the proneness to injuries as well as the risk of increasing CP. The mean age in our study was lower than the study of Baltopoulos (2008) on 48 people (mean age of 27.5 years) [5], or Woods (2015) on 07 people (mean age of 22.71 years) [6]. However, the sample size in our study was much larger (412 athletes) so the difference was clearly shown.

A particular study on CECS was conducted by Lindorsson (2022), in which they investigated the effect of age and sex on the CP during exercise [7]. Male athletes tended to have greater pressure and increased faster than female athletes during exercise. Another study by de Bruijn (2018) focused on the effects of age, gender, and exercise level on CP in the leg during exercise [8]. The results showed that female athletes tended to have lower pressure than male athletes, and the pressure increased with exercise level. At the same time, CECS was closely related to age; the younger the age, the more likely this lesion appeared. However, results may be affected by different methods of measuring CP, exercises, and training methods.

The average BMI of athletes in the study was 23.1 ± 1.0, with over 96% of athletes having a normal BMI *(Table 3)*. The smaller percentage belongs to chess and shooting athletes, who are not required much physical strength. The assessment of BMI in identifying overweight and obesity increases the load of the lower extremities, which is a risk factor for increased CP of the legs.

On physical examination of the athletes, no athlete had a medical history *(Chart 2)*. However, athletes with leg pain during exercise accounted for 15%, and athletes with shin splints during exercise accounted for 14.6%. This showed that there was a fairly high percentage of athletes who experienced problems related to pain and shin splints in the legs during training. In addition, most athletes had pain in both legs with leg pain (90.3%), numbness (81.3%), paresthesia (73.3%), cramps (85.7%), and shin splints (45%) *(Chart 3)*. Most athletes developed leg

pain after training (93%) *(Chart 4)*, but it was much relieved after 5 - 10 minutes of rest, with only a small number of pain at night *(Table 4)*.

CONCLUSION

From all the results above, a conclusion can be drawn:

The number of female athletes was smaller than that of men with mainly people aged from 21 - 29 years old. The majority of athletes (over 96%) had a normal BMI, mainly in wrestling (18%) and athletics (17%). During exercise, athletes experienced leg pain (15%), and shin splints (14.6%). Over 90% of athletes experienced pain during exercise, mainly leg pain (90.3%), numbness (81.3%), paresthesia (73.3%), and cramps (85.7%). Most symptoms were relieved after a 5 - 10 minute break.

These clinical features are important information in the diagnosis and prognosis of the CECS.

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