

Evaluation of Frequency of Sever's Disease and Associated Factors in Children and Adolescents

Abstract

Background & Aim: The most common cause of heel pain in children is Sever's disease, also known as calcaneal apophysitis. In general, the disease is most common among children aged 8 to 15 years. The purpose of this study was to determine the prevalence of risk factors for Sever's disease in children aged 5-15 years who were referred to a medical center in Rasht, Iran.

Methods: The current study was a cross-sectional and descriptive study of 88 children referred to Poursina Medical and Educational Center between 2014 and 2015. Initially, children with a definitive diagnosis of Sever's disease were identified through clinical symptoms and a specialist's diagnosis. Notably, none of the patients had a fracture, tumor, or deformity distal to the leg's shin, infection, reactive arthritis, or rheumatoid arthritis within the preceding 12 months. Data on the participants' characteristics, including age, gender, height, weight, and disease, were collected and analyzed using SPSS software (version 21).

Results: According to this study, the occurrence of Sever's disease was 1.86% among the center's entire patient list. The mean age of the patients in this study was 10.28 ± 2.39 years, and the majority of Sever's disease patients were male children aged 5-15 years (76.1%). All of the patients with Sever's disease in this study had limited and painful ankle dorsiflexion. Males ($P=0.031$), obese children ($P=0.0001$), and those without a professional sports background, on the other hand, had a greater incidence of Sever's disease.

Conclusion: According to the study's findings, Sever's disease is directly related to factors such as a lack of professional exercise, gender (unathletic males), and age (5-15 years).

Keywords: Bony Apophysis, Calcaneus, Heel, Adolescent, Pain

Received: 11 months before printing; Accepted: 1 month before printing

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Introduction

The most common cause of heel pain in children is Sever's disease, also known as calcaneal apophysitis. The disease is most prevalent in athlete children between 8 and 15 years⁽¹⁻⁴⁾. However, males are more likely to contract the disease than females⁽⁵⁾. Sever's disease is calcaneal apophysitis, a self-limiting inflammatory condition caused by inflammation of the apophysis of the heel bone, a cartilaginous growth located at the point where the Achilles tendon inserts into the heel bone⁽⁶⁾.

The disease's basic pathophysiology is related to microtrauma caused by damage to the calcaneal apophysitis. Numerous theories have been advanced to explain why this disease causes heel pain, including the growth and stiffness of the gastrocnemius/soleus muscles, which is thought to increase traction in the apophysis as a result of a period of rapid growth and relative pressure increase in the Achilles/triceps muscle complex^(4,5,7,8), as well as foot biomechanics, infection^(5,8), trauma⁽⁸⁾, and obesity⁽⁹⁾. While various mechanisms have been discussed in different articles, the disease's pathology has not yet been fully clarified^(10,11).

Typically, the clinical manifestation is pain that can be localized to the posteroinferior region of the calcaneus via palpation. Clinical diagnosis may be aided by the medial-lateral squeeze test or triceps surae muscle squeeze⁽⁸⁾. Nonetheless, the disease's symptoms worsen with increased activity and improve with rest. However, pain is also observed during rest if the disease is progressing.

The Sever's test is typically administered to girls aged 8-13 and boys aged 11-15. Sever's disease is estimated to account for between 2% and 16% of musculoskeletal injuries in children. Nevertheless, the disease is believed to have a much higher incidence rate in children who participate in sports ⁽²⁾. Additionally, radiography may reveal apophysis sclerosis and fragmentation, which is unnecessary for diagnosis ⁽¹²⁾. Sever's disease is a benign condition that responds well to conservative treatment. Resting, applying ice, strengthening the calf muscles, elevating the heel, using heel-elevating supports or orthoses, and taking anti-inflammatory drugs, as well as mechanical strategies aimed at altering the factors that contribute to the disease's progression (e.g., using insoles, elevating the heel, bandage, orthosis, and gastrocnemius, soleus, and Achilles tendons tension) can all help to largely resolve the problem.

In rare, persistent cases, fixation with a resting plaster has been reported ⁽¹⁰⁾. While the disease is not incurable in the long run, it does cause pain, which can impair a child's performance and participation in sports. Furthermore, if left untreated, it can significantly disrupt simple daily activities ⁽³⁾. There is insufficient evidence regarding the cause-and-effect relationship of Sever's disease ^(6, 8). As a result, increasing physicians' knowledge of the disease can aid in diagnosis. Moreover, they can treat the disease based on clinical symptoms and fewer radiographic examinations, which may be harmful to the patient ⁽¹⁰⁾.

While there is no accurate information about the disease, it is recognized as a relatively uncommon disorder among growing children. Given the scarcity of data on the disease's incidence, the purpose of this study was to determine the prevalence of factors associated with Sever's disease in children referred to Poursina Hospital in Rasht, Iran.

Methods

This cross-sectional study was conducted between 2014 and 2015 on children referred to Poursina Hospital in Rasht. A simple non-probability sampling technique was used to select participants. An age range of 5-15 years and a history of unilateral or bilateral ankle pain associated with Sever's disease were used to determine inclusion criteria. An orthopedic surgeon diagnosed the patient using the squeeze test in the apophyseal region. Another indicator of disease was the presence of positive, simple foot radiology results (sclerosis and apophysis fragmentation). In the preceding 12 months, there were no signs of fracture, tumor, or deformity in the distal region of the leg, infection, reactive arthritis, or rheumatoid arthritis in the patients. All participants provided informed consent, and the demographic characteristics of the subjects, including their age, gender, height, weight, and disease history, were recorded.

Moreover, limited and painful ankle dorsiflexion and equinus in the gastrocnemius-soleus complex were examined and recorded. Finally, data analysis was performed in SPSS (version 21) using the t-test (to compare quantitative variables) and the chi-square test (to compare qualitative variables) (to compare the qualitative variables). Additionally, a P-value of less than 0.05 was deemed statistically significant.

Results

This study diagnosed Sever's disease in 88 of 4730 children aged 5-15 years, indicating a 1.8% incidence rate. The patients' mean age was 10.28 ± 2.39 years. Additionally, the subjects' mean weight was 42.28 ± 12.93 kg, and their equinus range of motion was 20.18 ± 3.25 degrees.

According to the findings, female patients ($P=0.031$) had a significantly higher incidence of Sever's disease than obese individuals ($P=0.0001$) or those without a professional sports background ($P=0.0037$).

Table 1. Frequency distribution of gender in children with Sever's disease at Poursina Hospital in Rasht			
Variable		N	%
Gender	Male	67	76.1
	Female	21	23.9
Obesity based on the high weight of 95th percentile	95 th percentile and higher	59	67.1
	Below 95 th percentile	29	32.9
A history of pain similar to other children	Yes	18	20.5
	No	70	79.5
History of professional sports	Yes	26	29.5
	No	62	70.5
Equinus	Yes	88	100
	No	0	0
Radiographic evidence of the disease	Yes	81	92.1
	No	7	7.9
Total		88	100

Table 2. Evaluation of frequency of normal anteroposterior and lateral radiographic evidence based on gender, sports background, and obesity						
Radiographic evidence in favor of the disease	Gender N (%)		Obesity N (%)		Professional sports background N (%)	
	Male	Female	95 th percentile and higher	Below 95 th percentile	Yes	No
Yes	62 (88.7)	19 (11.3)	54 (66.7)	27 (33.3)	20 (24.7)	61 (75.3)
No	5 (71.4)	2 (28.6)	5 (71.4)	2 (28.6)	6 (86.7)	1 (13.3)
P-value	P=0.031		P=0.0001		P=0.0037	

Discussion

According to the current study's findings, the Sever's test transpired at a rate of 1.86% in individuals aged 5-15 years who were referred to Poursina hospital. In the Netherlands, according to a study conducted by Johonnes et al. (2014), the disease had an incidence rate of 0.37%⁽¹³⁾. Ceylan and Caypinar reported a 0.35% incidence rate of Sever's disease in Turkey during a four-year period (2014-2017)⁽¹⁰⁾. The population studied in this study was the clients of Poursina Hospital in Rasht, and we were only able to estimate the prevalence of this disease, which may account for the discrepancy with similar studies conducted on the general population. The current research found that 76.1% with Sever's disease were male, consistent with

previous research. For example, Perhamre et al. (2012) estimated the prevalence of Sever's disease in Sweden to be 68.9% in male patients and 32.1% in female patients⁽¹⁴⁾. Furthermore, Price et al. (2004) reported that 7.13% of Sever's disease patients were male, consistent with our findings⁽⁷⁾. According to Inocencio, Sever's disease affected 67.6 male patients out of 1000 children with musculoskeletal problems⁽¹⁵⁾. Thus, males may be more susceptible to the disease due to their increased physical activity and participation in sports such as soccer, resulting in injuries. As a result, it is expected that males will have a higher incidence of Sever's disease than females. In the current study, the highest percentage of patients with Sever's disease in obese children were referred because they were above the 95th percentile (67.1%), while 32.9

percent of children were below the 95th percentile. Moreover, there was a significant relationship between equinus and obesity based on values above the 95th percentile, indicating the critical role of obesity in disease progression. Perhamre et al. (2010) evaluated 38 children with apophysitis calcanei who presented with heel pain to a Sports Medicine Clinic. According to their findings, 67.1% of Sever's disease patients were obese, and there were signs of limited equinus in the gastrocnemius-soleus complex and painful foot dorsiflexion⁽¹⁶⁾. Furthermore, Micheli and Fehlandt established that most patients with equinus symptoms were overweight^(6, 17).

Numerous studies have demonstrated increased tension in the apophyse caused the gastrocnemius-soleus complex to grow and stiffen due to a rapid growth course and increased relative pressure in the Achilles/triceps complex tendon^(7, 10). Multiple factors, such as obesity, increase the relative pressure on the Achilles complex tendon in this regard⁽¹⁸⁾.

According to the current study's findings, 29.5% of patients with Sever's disease had a history of professional sports, while 62 (70.5%) had no such history, consistent with previous research. For example, Perhamre et al. (2011) studied 51 children aged 9-14 years and discovered that 18.8% of Sever's disease patients participated in professional sports such as soccer, hurdles, basketball, track, and athletic sports⁽¹⁶⁾. Similar findings were obtained in Spain by Becerro et al. (2011) in a case-control study⁽¹¹⁾. Ceylan and Caypinar hypothesized that during adolescence, bones grow faster than muscles and tendons. Achilles tendon traction is exacerbated by running and jumping, particularly on hard ground. Basketball, football, and gymnastics all place stress on this tendon. Additionally, prolonged standing and wearing shoes with an unsuitable heel height can result in Achilles tendon overstretching.

While Sever's disease can develop in adolescents, the following conditions increase its probability⁽¹⁰⁾. A study discovered a significant correlation between radiographic evidence of the disease and a patient's history of professional sports, with 24.7% of patients

with Sever's disease who had a professional sports background exhibiting disease symptoms such as sclerosis and apophysis fragmentation, which is consistent with other studies^(14, 19). According to the findings, physical activity and obesity were identified as two risk factors for Sever's disease^(4, 20).

In the current study, 100% of Sever's disease patients had limited and painful ankle dorsiflexion and equinus. Becerro et al. studied 22 male patients with unilateral calcaneus apophysis and 24 healthy individuals recruited from a soccer academy. According to the findings, all patients with Sever's disease had bilateral equinus, whereas none of the control group participants did. As a result, equinus was suggested to be a risk factor for Sever's disease⁽¹¹⁾.

One significant limitation of the current study was the absence of assessment of the results of patient treatments. All patients in this study received nonsteroidal anti-inflammatory drugs, immobilization, and heel pads. Additionally, patients with severe cases were treated with a short plaster. Another constraint was the disease's diagnosis via simple clinical examination and X-ray. The squeeze test and observation of the graph's increasing calcaneal density of apophysis and fragmentation confirmed the diagnosis. Meanwhile, these findings are not pathognomonic and exclusive and might be observed in healthy children as well⁽²¹⁻²⁴⁾.

Conclusion

According to the findings of this study, Sever's disease was discovered in males aged 5 to 15 years who did not participate in sports. It is recommended that awareness of the disease's diagnosis and associated factors be increased to avoid unnecessary radiography.

Acknowledgments

The authors wish to express their gratitude to Guilan University of Medical Sciences' Vice-Chancellor for Research and Technology and Poursina Hospital's Clinical Research Development Center for assisting us in conducting this research.

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