

# A Clavicular Overuse Injury in A Teenage Male Gymnast: A Rare Case Report

Tiago Guedes Almeida<sup>1</sup>, Giacomo De Marco<sup>1</sup>, Oscar Vazquez<sup>1</sup>, Christina Steiger<sup>1</sup>, Romain Dayer<sup>1</sup>, Sana Boudabbous<sup>2</sup> and Dimitri Ceroni<sup>1</sup>

<sup>1</sup>Pediatric Orthopedics Unit, Pediatric Surgery Service, Geneva University Hospitals, CH-1211 Geneva, Switzerland

<sup>2</sup>Radiology Department, Geneva University Hospitals, CH-1211 Geneva, Switzerland

## \*Corresponding Author:

Tiago Guedes Almeida, Faculty of Medicine University of Geneva Rue Michel-Servet 1 CH-1211 Geneva, Switzerland

**Received:** 26 Mar 2025

**Accepted:** 31 Mar 2025

**Published:** 05 Apr 2025

**J Short Name:** AJSCCR

**Copyright:** ©2025 TG Almeida, This is an open access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and build upon your work non-commercially.

**Citation:** TG Almeida. A Clavicular Overuse Injury in A Teenage Male Gymnast: A Rare Case Report. *Ame J Surg Clin Case Rep.* 2025; 8(16): 1-3

## 1. Abstract

Overuse injuries are the result of repetitive stress on the musculoskeletal system. Typically reported among teenagers and adolescents, chronic axial loading on the physis can cause lesions related to the vascularisation of the metaphyseal growth plate, thereby interrupting normal endochondral ossification. This phenomenon is well known in upper limb physes, which are put under significant loads during gymnastics practice. Unless appropriate measures are taken, repetitive physal injuries can lead to disrupted endochondral ossification, joint remodelling and long-term pain. We report the case of a 12.5-year-old gymnast who sustained a repetitive physal injury of the medial clavicular extremity. We highlight the rarity of this lesion, providing valuable insights into its clinical presentation and the crucial role of magnetic resonance imaging in making this diagnosis in paediatric patients.

## 2. Introduction

The number of children and adolescents participating in sports activities has increased dramatically in recent decades. Indeed, participating in organised sports is now regarded as a rite of passage in childhood development. Growing participation in organised competitive sports has inevitably led to a surge in acute and overuse injuries [2, 4]. Overuse injuries are usually the result of repetitive stress on the musculoskeletal system, especially if insufficient time has been allotted to recovery. They are common among teenagers and adolescents because these young athletes are experiencing rapid physical growth and an imbalance between muscle strength and flexibility.

Gymnastics is a popular sport among these age groups, and most young participants do it intending to achieve a high level of performance. During gymnastics practice, skills and routines are repeated again and again, placing extraordinary stress on their upper limbs' growing physes. Thus, high-level child gymnasts' arms are subject to tremendous torsional forces with axial loading. The most common stress injuries among these children are widely recognised as stress fractures, traction apophysitis, repetitive physal injuries and epiphyseal osteochondrosis. Indeed, the two latter injuries are of particular concern, given their potential to disrupt growth. We describe a 12.5-year-old male gymnast patient with a very rare repetitive physal injury of the clavicle's medial extremity, resulting in a functional disorder and pain in the sternoclavicular joint. This case report contributes valuable insights into the clinical presentation and diagnosis of this problem in paediatric patients.

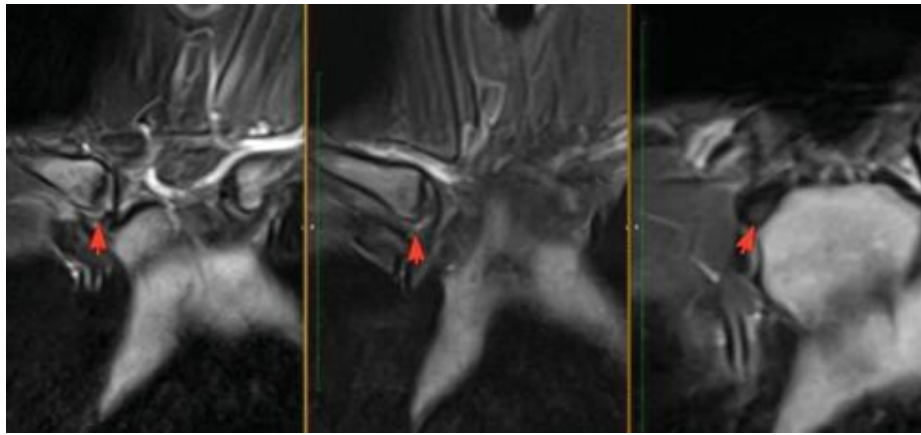
## 3. Case Report

A healthy 12.5-year-old boy was referred to our university hospital paediatric orthopaedics unit by a specialist sports medicine paediatrician because of a painful swelling in his right sternoclavicular joint. In his anamnesis, the patient reported no trauma, no history suggestive of inflammatory arthropathy in his family and no previous

infectious arthritis. However, the patient reported participating in high-level artistic gymnastics, with a training schedule of 15-20 hours per week. His complaints revolved around the chronic and progressive pain he felt during gymnastics activities at the level of the right sternoclavicular joint. Locally, the patient had also noticed the development of a protrusion on the clavicle's medial extremity. Pain was triggered by direct palpation of the sternoclavicular joint and by movements of this articulation. Conventional radiography revealed an enlargement of the right clavicle's medial metaphysis and the irregular appearance of the physis. Magnetic resonance imaging revealed the dysplastic appearance of the right clavicle's proximal end (Figure 1A), with synovial capsular dehiscence (Figure 1B) and a widening of the articular facet with no erosion or signs of bone oedema (Figure 1C). However, there was no inflammation per se of the joint cavity. A computed tomography scan confirmed the irregularity of the metaphysis, which appeared enlarged (Figure 2). This examination mainly highlighted an endochondral ossification disorder originating in the physis, which appeared scalloped. The diagnosis was a repetitive physal injury of the medial clavicle extremity.

## 4. Discussion

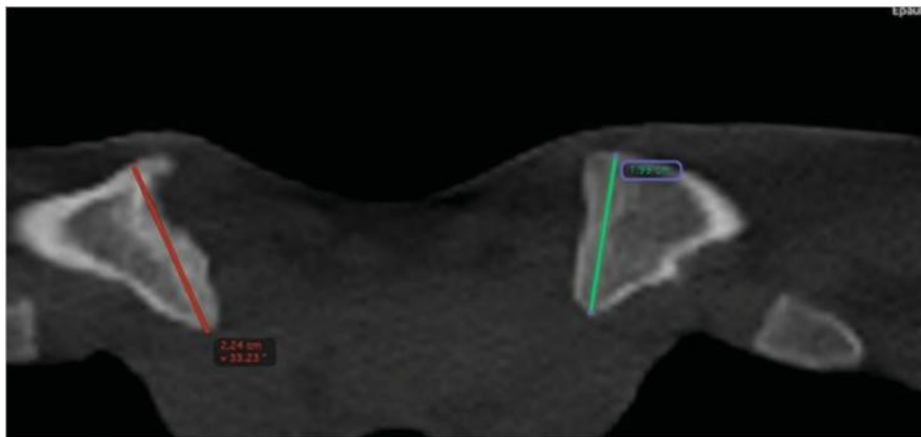
Although overuse is well recognised as a factor leading to chronic strain and inflammation of the sternoclavicular joint in adults, there is little or no information about the equivalent mechanism among skeletally immature athletes [1, 3, 5, 10, 15-18, 20]. To the best of our knowledge, the case described here is the first to report a repetitive overuse lesion presenting as a physal injury of the clavicle's medial extremity. These sites are only considered to be 20 to 50% as strong as other structures [5]. Thus, it is not the sternoclavicular joint that constitutes the limb's weak link, as in adults, but the physis itself. Although inactivity causes difficulties for proper bone growth in paediatric populations, so does joint overuse [6, 8, 12, 14]. Overuse injuries among paediatric populations differ from those among adults because of the inherent vulnerabilities of their immature musculoskeletal system, particularly at the sites of growing cartilage. These injuries are generally correlated with inadequate preparation, poor training, a rising intensity of training and incomplete physical maturation. They are often observed among poorly conditioned athletes during periods of rapid increases in the tempo of training and among elite athletes training at consistently high tempos. Another factor is that children are often not accorded enough time to rest during and between practice sessions. It has been demonstrated that sports activities requiring high-level training involving repetitive loading can disrupt endochondral ossification of the long bones and alter metaphyseal perfusion. This is not an insignificant phenomenon as it can interfere with mineralisation's processing of hypertrophied chondrocytes in the provisional calcification zone, resulting in a widening of the primary physis and the deposit of "tongue-like" focal extensions of non-mineralised cartilage in the metaphysis and its subsequent deformation. Injuries similar to those observed in



**Figure 1A:** MRI showing dyplastic appearance of the right clavicle’s proximal end (red arrow)

**Figure 1B:** MRI showing a synovial capsular dehiscence (red arrow)

**Figure 1C:** MRI showing a widening of the articular facet without erosion or signs of bone oedema (red arrow)



**Figure 2:** CT showing the irregularity of the metaphysis with enlarged aspect (red line).

skeletally immature children participating in high-level sports and sustaining repetitive and axial load traumas have been produced by disrupting the metaphyseal blood flow in experimental animal models [9, 11, 13, 19]. Indeed, the case reported here perfectly matches descriptions of lesions called repetitive physeal injuries. However, it is important to remember that we must distinguish these from epiphyseal osteochondrosis, which constitutes an overload problem that can also be encountered among gymnasts, particularly at the level of the capitulum [7]. Artistic gymnastics is a breathtaking sport to watch, but it subjects the upper limbs to tremendous torsional forces and axial loading due to repetitive weight bearing. Overuse injuries in gymnasts are more common among females than males, and the most affected joints are wrists and elbows [3, 5, 10, 15, 17, 18, 20]. The skills practised during gymnastics put extraordinary stresses on the growing ends of the radius and ulna, on carpal bones and bones in the hand, and on the many ligaments that stabilise these structures. The most common stress injuries reported among skeletally immature gymnasts are stress fractures, repetitive physeal injuries and epiphyseal osteochondrosis, all of which risk disrupting growth. Common gymnastics injuries of the upper limbs include shoulder instability, ulnar collateral ligament injuries, capitellar osteochondritis dissecans and several wrist pathologies [4]. It is crucial, therefore, that these athletes progress under medical supervision as part of overarching strategies designed to prevent musculoskeletal pain and injuries.

### 5. Conclusion

Gymnasts are exposed to a high risk of acute and overuse injuries, but also of developing musculoskeletal pain. The most common stress injuries among skeletally immature gymnasts are stress

fractures, repetitive physeal injuries and epiphyseal osteochondrosis. The most frequent gymnastics injuries or lesions of the upper limbs involve the wrist, the elbow and the shoulder. The case described here involved a repetitive overload of the sternoclavicular joint that led to an atypical form of repetitive physeal injury..

### References

1. Alaia EF, Rosenberg ZS, Rossi I, Zember J, Roedl JB. Growth plate injury at the base of the coracoid: MRI features. *Skeletal Radiol.* 2017;46(11):1507- 12.
2. Bedoya MA, Jaramillo D, Iwasaka-Neder J, Laor T. Stressed or fractured: MRI differentiating indicators of physeal injury. *Skeletal Radiol.* Nov. 2024;53(11):2437-47.
3. Caine D, DiFiori J, Maffulli N. Physeal injuries in children’s and youth sports: reasons for concern? *Br J Sports Med.* Sep. 2006;40(9):749-60.
4. Connolly LP, Jaramillo D. Imaging of sports injuries in children and adolescents. Delgado J, Jaramillo D, Chauvin NA. *Imaging the Injured Pediatric Athlete: Upper Extremity.* *RadioGraphics.* 2016;36(6):1672-87.
5. Delgado J, Jaramillo D, Chauvin NA. *Imaging the Injured Pediatric Athlete: Upper Extremity.* *RadioGraphics.* 2016;36(6):1672-87.
6. DiFiori JP. Overuse Injury of the Physis: A “Growing” Problem. *Clinical Journal of Sport Medicine.* Sep 2010;20(5):336-7.
7. Dwek JR, Chung CB. A systematic method for evaluation of pediatric sports injuries of the elbow. *PediatrRadiol.* Mar. 2013;43(S1):120-8.

8. Ecklund K, Jaramillo D. Imaging of Growth Disturbance in Children. 2001.
9. Jaramillo D, Laor T, Zaleske DJ. Indirect trauma to the growth plate: results of MR imaging after epiphyseal and metaphyseal injury in rabbits. *Radiology*.1993;187(1):171-8.
10. Kocher MS, Waters PM, Micheli LJ. Upper Extremity Injuries in the Paediatric Athlete:Sports Medicine. 2000;30(2):117-35.
11. Laor T, Hartman AL, Jaramillo D. Local physeal widening on MR imaging: an incidental finding suggesting prior metaphyseal insult. *Pediatric Radiology*. 1997;27(8):654-62.
12. Malina RM. Critical Review: Exercise as an Influence Upon Growth: Review and Critique of Current Concepts. *Clin Pediatr (Phila)*. 1969;8(1):16-26.
13. Maynard JA, Pedrini VA. Morphological and Biochemical Effects of Strenuous Exercise on Immature Long Bones. 1995.
14. Nguyen JC, Markhardt BK, Merrow AC, Dwek JR. Imaging of Pediatric Growth Plate Disturbances. *RadioGraphics*.2017;37(6):1791-812.
15. Ogawa K, Inokuchi W, Matsumura N. Physeal Injuries of the Coracoid Process Are Closely Associated with Sports Activities: A Systematic Review. *Orthopaedic Journal of Sports Medicine*. 2020;8(12):2325967120967914.
16. Ojeda PI, Kresse ME, Lazo CR, Delucia TA, Gaskin CM. Proximal fibular physeal stress injury: a known entity in an unusual location. *PediatrRadiol*. 2023;53(1):175- 8.
17. Roy S, Caine D, Singer KM. Stress changes of the distal radial epiphysis in young gymnasts: A report of twenty-one cases and a review of the literature. *Am J Sports Med*. 1985;13(5):301-8.
18. Shih C, Chang CY, Penn IW, Tiu CM, Chang T, Wu JJ. Chronically stressed wrists in adolescent gymnasts: MR imaging appearance. *Radiology*. 1995;195(3):855-9.
19. Trueta J, Amato VP. The Vascular Contribution to Osteogenesis: III. Changes in the Growth Cartilage Caused by Experimentally Induced Ischaemia. *The Journal of Bone and Joint Surgery British volume*.1960;42-B(3):571-87.
20. Yong-Hing K, Wedge JH, Bowen CV. Chronic injury to the distal ulnar and radial growth plates in an adolescent gymnast. A case report. *The Journal of Bone & Joint Surgery*.1988;70(7):1087-9.