Case Resolution

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Normal Glenoid Ossification Mimicking a Fracture in an Adolescent Patient

ABSTRACT
Differentiating normal ossification variants from fractures in children and adolescents with shoulder trauma is a common diagnostic challenge. We report the case of a 14-year-old male who, after a sports-related injury, was initially diagnosed with a glenoid fracture based on radiographs and computed tomography (CT). Subsequent evaluation, including a detailed physical examination and contralateral shoulder radiographs, showed that the suspected fracture represented normal ossification of the scapular growth centers. This case underscores the importance of a solid understanding of developmental anatomy, a thorough clinical examination, and the use of comparative imaging to avoid misdiagnosis and unnecessary treatment in this population.
Keywords: Ossification; fracture; pediatrics; shoulder; diagnosis.
Level of Evidence: IV

Osificación normal de la glenoides que simula una fractura en un adolescente

RESUMEN
La diferenciación entre las variantes normales de la osificación y las fracturas en pacientes pediátricos y adolescentes con traumatismos de hombro es un desafío diagnóstico común. Presentamos el caso de un varón de 14 años que, tras un traumatismo deportivo, fue inicialmente diagnosticado con una fractura glenoidea sobre la base de estudios radiográficos y tomográficos. Una evaluación posterior, que incluyó un examen físico detallado y radiografías contralaterales, reveló que la supuesta fractura correspondía a la osificación normal de los centros de crecimiento escapulares. Este caso subraya la importancia de un conocimiento profundo de la anatomía del desarrollo, un examen clínico exhaustivo y el uso de estudios comparativos para evitar diagnósticos erróneos y tratamientos innecesarios en esta población.
Palabras clave: Osificación; fractura; pediátrica; hombro; diagnóstico.
Nivel de Evidencia: IV

DIAGNOSIS: Normal glenoid ossification mimicking a fracture in an adolescent patient.

DISCUSSION

Shoulder injuries in children and adolescents are increasing, largely due to earlier and greater participation in contact and competitive sports that demand intensive upper-extremity use.[1,2] Interpreting imaging in this population is particularly challenging: the normal evolution of ossification centers and variations of the physes around the glenohumeral joint can mimic pathology and cause confusion, even for experienced orthopedists.[3] This diagnostic difficulty may lead to unnecessary, costly studies (with attendant radiation exposure), delays in diagnosis, inappropriate treatment, and uncertainty about return-to-sport timelines.

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Accurate knowledge of the timing, location, radiographic appearance, and fusion patterns of the relevant ossification centers, together with a thorough history and physical examination, is crucial for proper diagnosis and management after shoulder trauma in skeletally immature patients.

In this case, comparison radiographs of the contralateral shoulder (Figure 3) and MRI (Figure 4) were obtained to confirm the diagnosis and identify associated injuries. Given favorable clinical progress within the first 48 hours and the absence on MRI of findings suggestive of fracture or injury to the epiphyseal growth plate at the base of the coracoid, conservative treatment was indicated: analgesics for 3 days followed by a progressive return to sports over 21 days. The patient progressed well and returned to sports without restrictions.

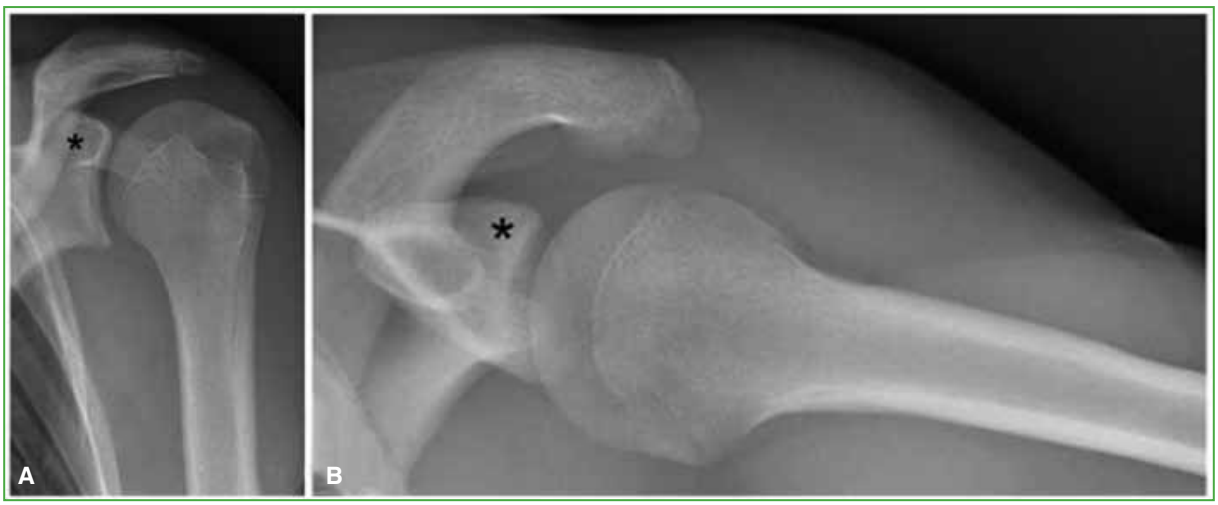

Figure 3. Left-shoulder radiographs of the same patient, anteroposterior (**A**) and axial (**B**) views. A radiolucent line extends from the base of the coracoid to the glenoid articular surface (*), similar to the contralateral side.

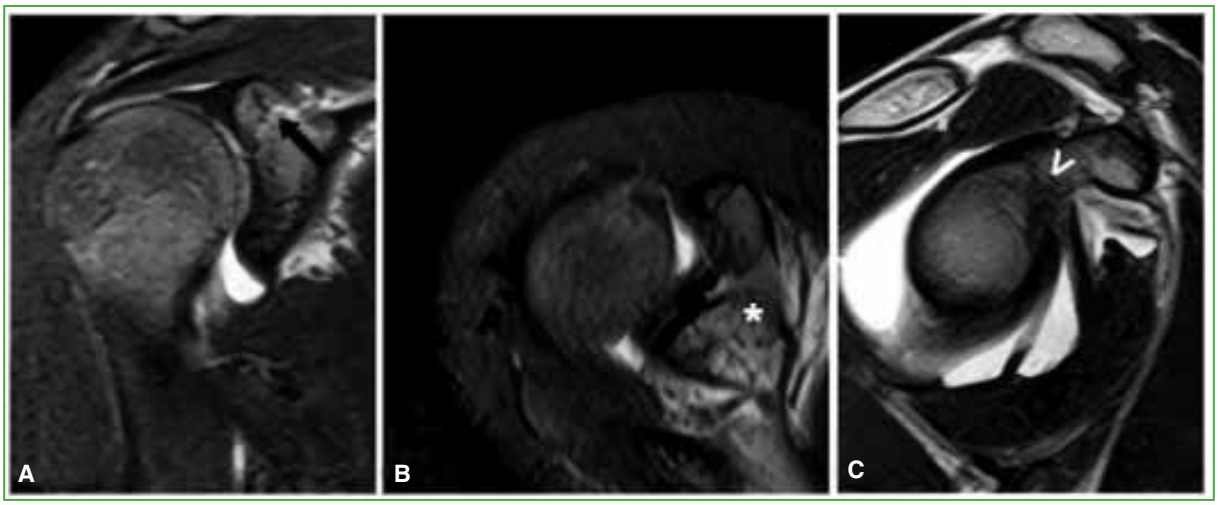

Figure 4. MRI of the right shoulder: coronal STIR (**A**), axial STIR (**B**), and sagittal T2 (**C**). The secondary ossification center of the coracoid (indicated by ↑, * and >, respectively) is seen extending toward the physis between the coracoid base and scapula, with signal intensity similar to the surrounding scapular bone.

Collision sports such as rugby are increasingly popular among children and adolescents, and upper-extremity injuries are common, on par with lower-extremity injuries and head trauma.[3,4] In the setting of high-energy trauma, interpreting advanced imaging can be challenging and may result in misdiagnosis and mistreatment.[3,4]

In this patient, the normal secondary ossification center of the coracoid was initially mistaken for a fracture of the superior glenoid extending into the coracoid. Development of the glenoid and coracoid base in childhood and adolescence is complex, with a bipolar growth plate and multiple secondary ossification centers. The coracoscapular physis begins to close around age 13 and is usually fused by age 17.[5]

The scapular secondary ossification centers include two main components (Figure 5): 1) Coracoid secondary ossification center: the first scapular secondary center to appear; it contributes to the upper third of the glenoid articular surface. It typically appears between 9 and 12 years and fuses with the scapular body between 12 and 16 years; 2) Inferior glenoid secondary ossification centers: multiple centers arranged in a horseshoe configuration that form the lower two-thirds of the glenoid. These usually appear between 11 and 14 years and fuse between 12 and 16 years.[5] Comparison radiographs of the contralateral shoulder are an important tool, allowing reliable distinction between a pathologic fracture line and a normal physis.[6,7] On CT, ossification centers appear on all planes as linear foci of bone and should not be confused with fracture lines, as occurred here. Similar diagnostic confusion has been reported—e.g., Galán-Olleros et al.[8] described a comparable case in a 13-year-old basketball player—highlighting how common and relevant this pitfall is in pediatrics.

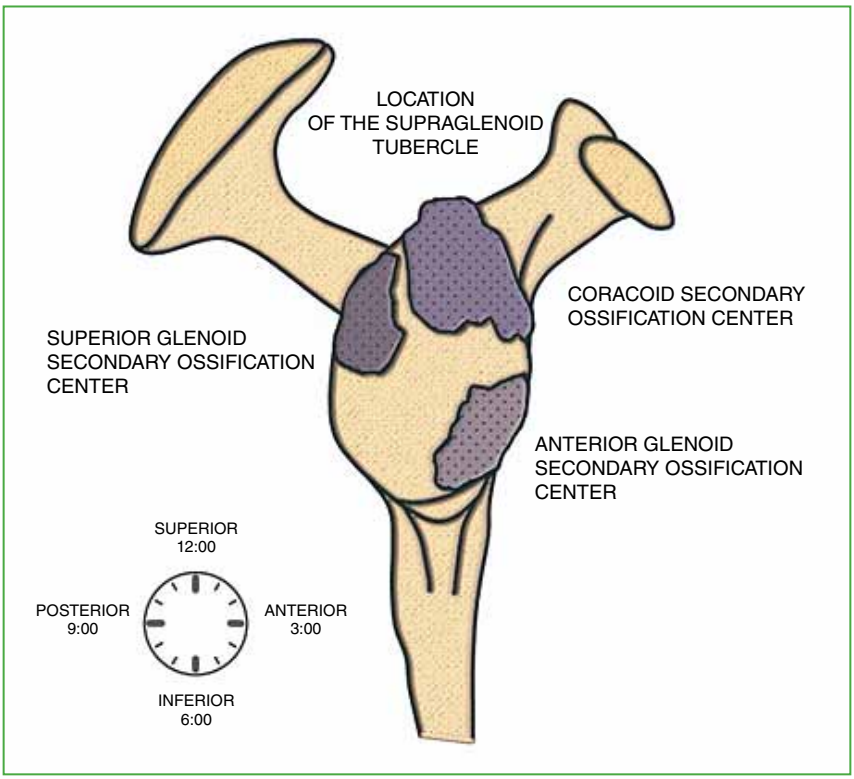

Figure 5. Clockface schematic of the glenoid with the supraglenoid tubercle at 12 o'clock. The anterior ossification center extends from 3 to 6 o'clock; the coracoid secondary ossification center, from 12 to 2 o'clock; and the superior ossification center, from 10 to 12 o'clock.

Finally, the sequence of glenoid ossification and fusion should guide interpretation of pediatric shoulder MRI. Recent studies show that the anteroinferior ossification center may ossify and fuse later than the rest of the glenoid, a variability that can confound assessment of glenohumeral instability and mimic a Bankart lesion on MRI.[1]

CONCLUSIONS

Orthopedic clinicians must be thoroughly familiar with the ossification centers of pediatric joints and their age- and sex-related variability, particularly in light of the rising incidence of high-energy sports trauma in youth. In addition to a comprehensive physical examination, it is essential to complement imaging with comparison views of the contralateral shoulder to ensure accurate diagnosis and avoid unnecessary or erroneous treatment.

Conflicts of interest: The authors declare no conflicts of interest.

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REFERENCES

1. Sidharthan S, Greditzer HG 4th, Heath MR, Suryavanshi JR, Green DW, Fabricant PD. Normal glenoid ossification in pediatric and adolescent shoulders mimics Bankart lesions: A magnetic resonance imaging-based study. *Arthroscopy* 2020;36(2):336-44. https://doi.org/10.1016/j.arthro.2019.08.011
2. Goldberg AS, Moroz L, Smith A, Ganley T. Injury surveillance in young athletes: a clinician's guide to sports injury literature. *Sports Med* 2007;37(3):265-78. https://doi.org/10.2165/00007256-200737030-00005
3. Zember JS, Rosenberg ZS, Kwong S, Kothary SP, Bedoya MA. Normal skeletal maturation and imaging pitfalls in the pediatric shoulder. *Radiographics* 2015;35(4):1108-22. https://doi.org/10.1148/rg.2015140254
4. West SW, Shill IJ, Bailey S, Syrydiuk RA, Hayden KA, Palmer D, et al. Injury rates, mechanisms, risk factors and prevention strategies in youth rugby union: What's all the ruck-us about? A systematic review and meta-analysis. *Sports Med* 2023;53(7):1375-93. https://doi.org/10.1007/s40279-023-01826-z
5. Kothary S, Rosenberg ZS, Poncinelli LL, Kwong S. Skeletal development of the glenoid and glenoid-coracoid interface in the pediatric population: MRI features. *Skeletal Radiol* 2014;43(9):1281-8. https://doi.org/10.1007/s00256-014-1936-0
6. Delgado J, Jaramillo D, Chauvin NA. Imaging the injured pediatric athlete: Upper extremity. *Radiographics* 2016;36(6):1672-87. https://doi.org/10.1148/rg.2016160036
7. Lin DJ, Wong TT, Kazam JK. Shoulder injuries in the overhead-throwing athlete: Epidemiology, mechanisms of injury, and imaging findings. *Radiology* 2018;286(2):370-87. https://doi.org/10.1148/radiol.2017170481
8. Galán-Olleros M, Egea-Gámez RM, Palazón-Quevedo Á, Martínez-Álvarez S, Suárez Traba OM, Pérez ME. Normal ossification of the glenoid mimicking a glenoid fracture in an adolescent patient: a case report. *Clin Shoulder Elb* 2023;26(3):306-11. https://doi.org/10.5397/cise.2022.01151