



Slipped upper humerus epiphysis in an adolescent child soccer player: a rare case report



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Proximal humerus fractures are rare in children, accounting for approximately 0.45% to 3 % of all fractures reported in the pediatric population.^{1,3} The Salter-Harris classification, introduced by Salter and Harris in 1963, is presently the most commonly used classification system in the pediatric population within the literature.^{12,13} Salter-Harris type I and II injuries are the most common types of fractures in the proximal humerus.¹³

The Salter-Harris II injury is frequently seen in adolescents who have had blunt shoulder trauma. Salter-Harris I injury is more prevalent in children under the age of 5 and is caused by an overuse injury that leads to a fracture.^{6,14} A thorough medical history and a meticulous physical examination are crucial and highly valuable in diagnosing a proximal humerus fracture. Plain radiographs are considered the most reliable method for diagnosing this type of injury, with the use of a contralateral view being the preferred approach, according to most literature.⁷

A case-specific assessment needs to be made regarding the choice between conservative and operative intervention, taking

into account factors such as the potential for age-related remodeling, acceptance of alignment, fracture pattern, fracture site, fracture type, grade of displacement, functional demands, and associated injuries.^{7,8} We report an uncommon case of a 13-year-old male who presents with a transitional fracture of the proximal humerus.

Case report

A 13-year-old male presented to our provincial hospital casualty department with right shoulder pain and difficulty moving the glenohumeral joint two days after a fall to the ground during a soccer game. He was brought in by his parents using public transport after being referred by the local public clinic. He was cleared using advanced trauma life support by the orthopedic medical officer on call. He was a scholar and right-hand dominant. He was a healthy young man and denied the use of substances or drugs.

On physical examination (Fig. 1), he was generally well with vital signs within the normal limits. His right shoulder was swollen, held in a mild abduction posture, tender, had a decreased active range of motion due to pain, and was neurovascularly intact. Plain radiographs were performed of the right shoulder on the anteroposterior and axillary views, as well as the contralateral anteroposterior view, and revealed a displaced right proximal

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Figure 1 Images of the right shoulder revealed a closed injury.

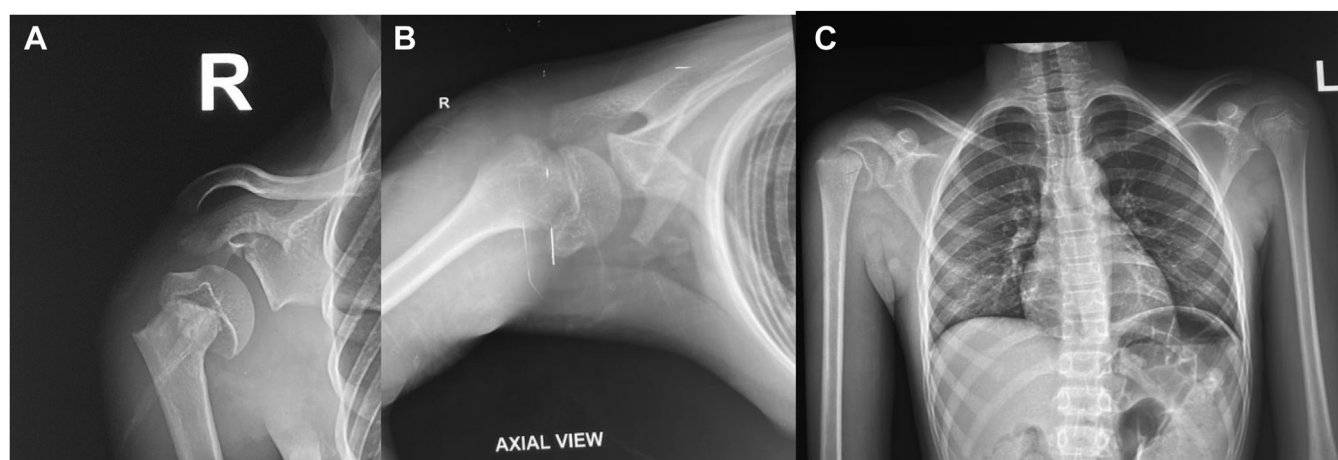


Figure 2 (A and B) Preoperative anteroposterior and axillary views of the X-ray show a displaced physal fracture of the right proximal humerus. (C) Right shoulder X-ray with the contralateral anteroposterior views.

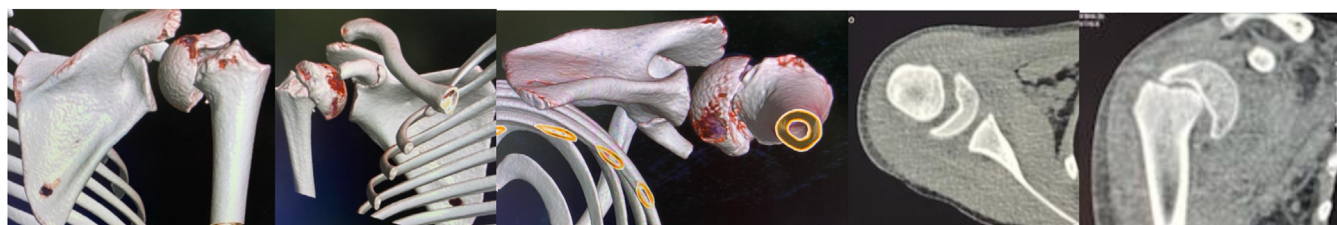


Figure 3 Right shoulder computed tomography scan images showed a displaced fracture of the proximal humerus.

humeral physal injury, which was classified as a Salter-Harris type 1 fracture (Fig. 2) and Neer-Horwitz grade III with 42° angulation of the epiphysis (Fig. 2, C). A computed tomography 3-dimensional reconstruction was performed to delineate the fracture pattern (Fig. 3).

After lengthy discussion with the parent and the patient regarding the various treatment choices, it was decided to proceed with a closed reduction and percutaneous pinning using Kirschner wires. The parent provided informed consent by signing the necessary documentation. The patient was placed in a supine

position on a radiolucent theater table and under general anesthesia. An aseptic close reduction procedure was then performed under the C-arm and fixed using 2 Kirschner wires (Fig. 4). Finally, a dry dressing was applied. Postoperatively, he was immobilized with a collar and cuff.

On review at 3 weeks, the K-wires were removed, and he showed no signs of pin track infection (Fig. 5). The physiotherapy team initiated the range of motion protocol. At the 29-month follow-up, the patient exhibited great range of motion comparable to the contralateral shoulder without limitation,

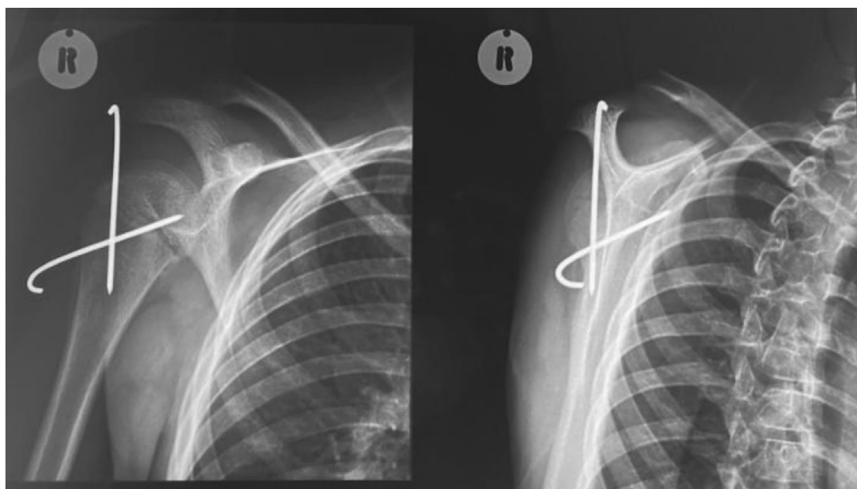


Figure 4 Day 1 postoperative X-ray images of the right shoulder.



Figure 5 Images illustrate post-K-wire soft tissues.

and his radiographs revealed a well-healed fracture (Fig. 6). The patient's visual analog scale score was 0 at the 29-month follow-up.

Discussion

Slipped upper humerus epiphysis (SUHE) is a condition of the proximal humerus physis that leads to slippage of the metaphysis relative to the epiphysis, also known as Salter-Harris type 1, which is the separation of the epiphyseal.⁶ Proximal humerus epiphyseal injuries are rare traumatic growth injuries that account for 0.45% to 2% of pediatric fractures.⁷

One might assume that the concept of SUHE is relatively new in the literature, but it is not. In 1975, Mehls et al reported slipped epiphyses in renal osteodystrophy, which included SUHE

cases in their cohort.⁹ In 1982, Edeiken et al reported 2 cases of SUHE as an undesirable consequence of radiotherapy for Ewing's sarcoma, which included the glenohumeral joints in the treatment field.⁵

Traumatic slipped upper humeral epiphyses are rarely reported and mostly appear in case reports in the English literature. Ballinger reported a case of a 14-year-old male baseball player who was diagnosed with right SUHE.² Elfeky reported a case that had a comparable presentation to a fall. The case involved a male patient, aged 15 years, who presented with a left SUHE after a month. Additionally, their case had a radiological appearance that resembled our case in this study.⁶ Dalldorf and Bryan reported a case of an adolescent professional gymnast who experienced gradual and persistent shoulder discomfort, leading to the diagnosis of a slipped upper humeral epiphysis.⁴ In this study, we

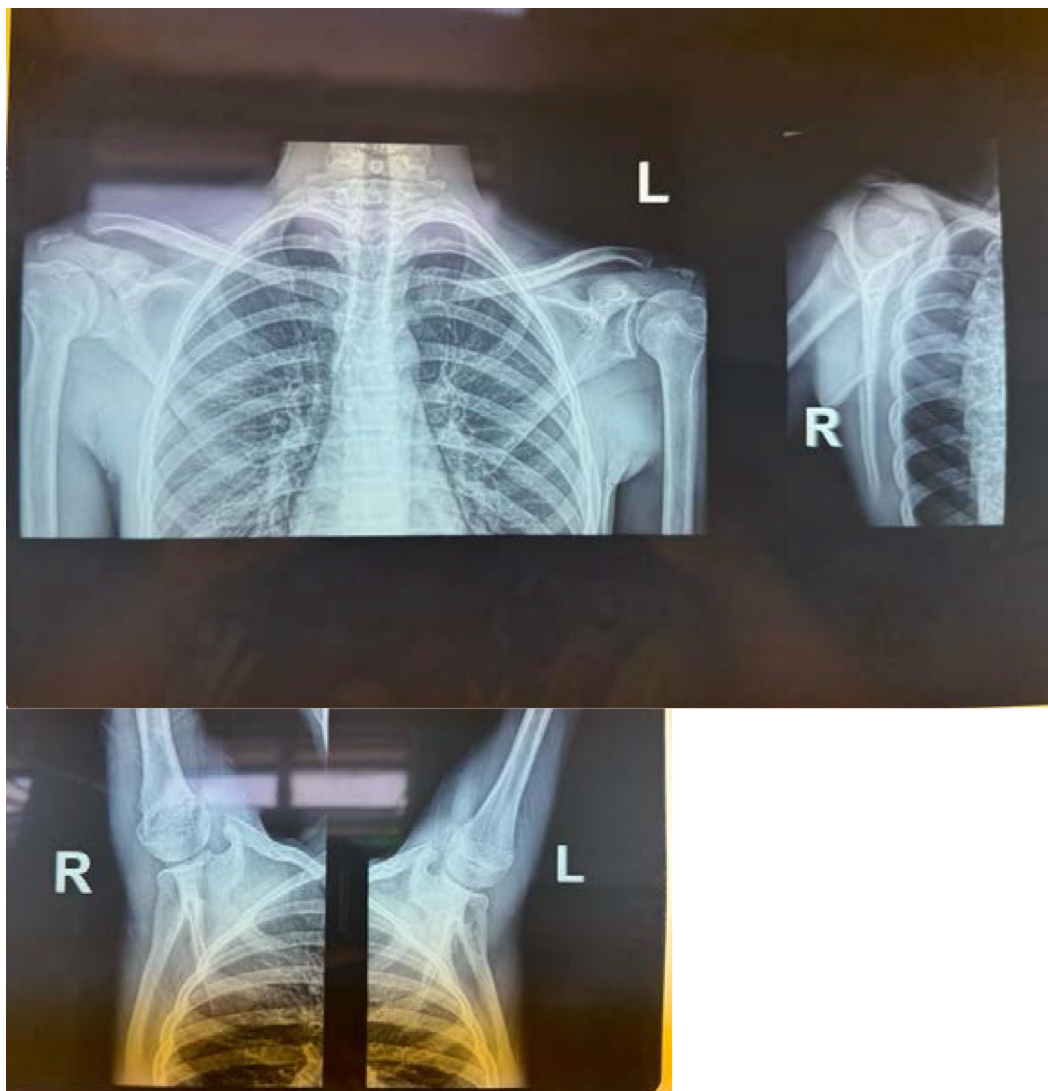


Figure 6 Postoperative X-ray images at 29 months of follow-up.

report a rare case of a 13-year-old who sustained a SUHE during a soccer game.

The SUHE presentation manifests as a shoulder dislocation accompanied by soft tissue swelling and fullness.¹¹ The following are markers or signs that one should look for in plain anteroposterior radiography of the right slipped upper humeral epiphysis (Fig. 7). Radiologic signs include a *SUHE reserve Klein's line* is a line drawn along the inferior border of the humeral neck should ordinarily not cross the epiphysis; the epiphysis falls below Shenton's line in slippage upper humeral epiphysis. A *SUHE steel sign* is observed as a double density at the metaphysis, resulting from the superimposition of the posterior lip of the epiphysis on the metaphysis. The *SUHE bisector line* is an anatomical line traced from the shaft to the epiphyseal that is supposed to bisect the epiphysis; however, it does not in SUHE. The *SUHE triangle sign* is created by the base of the epiphyseal and superior surfaces of the metaphyseal

bones, and it represents the superior migration of the humeral and epiphyseal slippage.

In this case, a close reduction maneuver with percutaneous pinning produced successful results. The maneuver involved the patient lying supine in line traction with counter traction of the shoulder, shoulder abduction, rotation of the arm, and immobilization on a collar cuff sling. This technique has been previously described with favorable results by Kim et al.⁷ and Binder et al.³

Nicoletti reported a case involving a 15-year-old male, diagnosed with a SUHE during a soccer match, who underwent treatment with close reduction and percutaneous pinning. Their case developed avascular necrosis of the humerus head, and they recommend early surgery to minimize this complication.¹⁰ Our case in this study did not suffer any complications and had excellent outcomes.

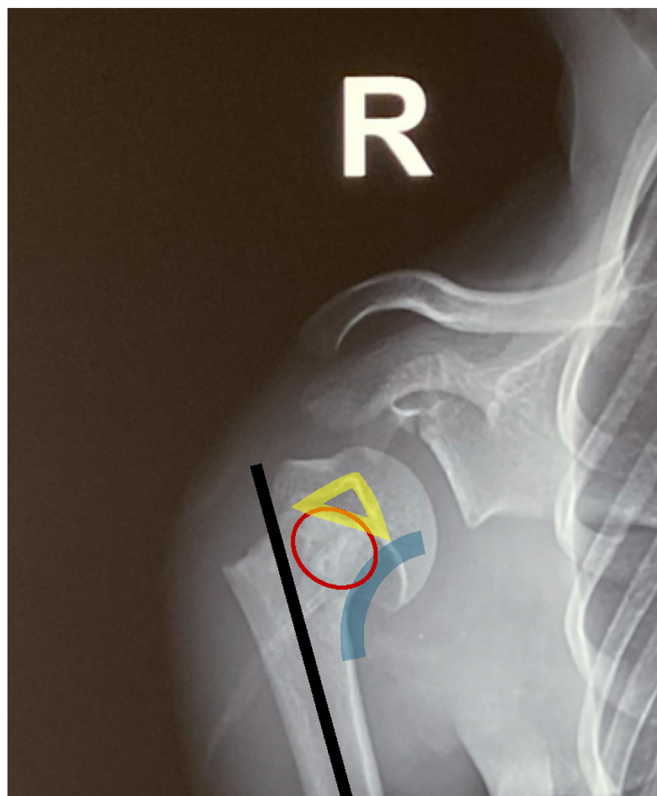


Figure 7 The blue line presents a reverse Klein's line; the yellow triangle presents the SUHE triangle sign; the sign of steel is represented by the red circle; and the black line represents the epiphysal bisector line.

Conclusion

In this study, functional results of SUHE were excellent. Currently, a minimally invasive surgical method should be used as the conventional strategy for addressing this patient population until a bigger study is conducted.

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References

1. Abbot S, Proudman S, Ravichandran B, Williams N. Predictors of outcomes of proximal humerus fractures in children and adolescents: A systematic review. *J Child Orthop* 2022;16:347–54. <https://doi.org/10.1177/18632521221117445>.
2. Ballinger J. Slipped proximal humeral epiphysis. Case study, Radiopaedia.org. <https://doi.org/10.53347/rID-24959>. Accessed June 8, 2024.
3. Binder H, Schurz M, Aldrian S, Fialka C, Vécsei V. Physeal injuries of the proximal humerus: long-term results in seventy two patients. *Int Orthop* 2011;35:1497–502. <https://doi.org/10.1007/s00264-011-1277-8>.
4. Dalldorf PG, Bryan WJ. Displaced Salter-Harris type I injury in a gymnast. A slipped capital humeral epiphysis? *Orthop Rev* 1994;23:538–41.
5. Edeiken BS, Libshitz HI, Cohen MA. Slipped proximal humeral epiphysis: a complication of radiotherapy to the shoulder in children. *Skelet Radiol* 1982;9:123–5.
6. Elfeky M. Proximal humerus physeal fracture – Salter-Harris type I. Case study, Radiopaedia.org. <https://doi.org/10.53347/rID-165860>. Accessed June 8, 2024.
7. Kim AE, Chi H, Swarup I. Proximal humerus fractures in the pediatric population. *Curr Rev Musculoskelet Med* 2021;14:413–20. <https://doi.org/10.1007/s12178-021-09725-4>.
8. Lefèvre Y, Journeau P, Angelliaume A, Bouty A, Dobremez E. Proximal humerus fractures in children and adolescents. *Orthop Traumatol Surg Res* 2014;100(1 Suppl):S149–56. <https://doi.org/10.1016/j.otsr.2013.06.010>.
9. Mehls O, Ritz E, Krempien B, Gilli G, Link K, Willich E, et al. Slipped epiphyses in renal osteodystrophy. *Arch Dis Child* 1975;50:545–54.
10. Nicoletti D. Post-traumatic osteonecrosis of the proximal humerus after Salter Harris I fracture. Case study, Radiopaedia.org. <https://doi.org/10.53347/rID-170191>. Accessed June 8, 2024.
11. RCEMlearning. Traumatic conditions (other): Slipped upper humeral epiphysis. <https://www.rcemlearning.org/modules/shoulder-and-brachial-plexus/lessons/management-50/topic/traumatic-conditions-other-slipped-upper-humeral-epiphysis/>. Accessed June 8, 2024.
12. Salter RB, Harris WR. Injuries involving the epiphyseal plate. *J Bone Joint Surg* 1963;45:587–622.
13. Verdano MA, Pellegrini A, Lunini E, Porcellini G, Ceccarelli F. Salter-Harris type II proximal humerus injuries: state-of-the-art treatment. *Musculoskelet Surg* 2012;96:155–9. <https://doi.org/10.1007/s12306-012-0214-3>.
14. Wheelless. Proximal humeral physeal injuries. <https://www.wheellessonline.com/bones/humerus/proximal-humeral-physeal-injuries/#:~:text=Proximal%20humerus%20physeal%20fractures%20are,blunt%20trauma%20to%20the%20shoulder>. Accessed January 2, 2024.