



## Case Report

## Entrapped long head of biceps tendon in pediatric proximal humerus fracture dislocation: A case report and review of the literature

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## ABSTRACT

**Introduction and importance:** Combined proximal humerus fracture and glenohumeral dislocation in the pediatric population is extremely rare, with only few reports of such cases been reported. We review all cases of combined proximal humerus fracture and glenohumeral dislocation in the pediatric population and present a case of left proximal humerus fracture dislocation in a healthy 5-year-old girl.

**Case presentation:** A 5-year-old girl fell from 2 m height and landed on her left shoulder where she started to complain from severe left shoulder pain, inability to move her left shoulder and bruising. She was diagnosed at our facility to have left proximal humerus fracture combined with glenohumeral dislocation and was treated with open reduction, K-wires fixation and immobilization in a shoulder cast.

**Clinical discussion:** Traumatic proximal humeral fracture associated with glenohumeral dislocation is a rare presentation in pediatric age group. This type of fracture is usually managed by closed reduction and casting, with a minority being managed with open reduction. Indications for surgical intervention are open fractures, severely displaced fractures, fractures that are associated with neurovascular compromise, or irreducible fracture due to soft tissue obstacles.

**Conclusions:** A high index of suspicion is required to diagnose such injuries along with appropriate radiographic evaluation. We recommend open reduction with K-wires fixation for irreducible combined proximal humeral fracture and glenohumeral dislocation.

### 1. Background

Proximal humerus fractures are uncommon in the pediatric population accounting for less than 5% of all pediatric fractures. Most of these injuries occur at the physis and are Salter Harris type II fractures in the adolescent population with the remaining being SH type I fractures in the younger children. Type III & IV fractures are extremely rare [1].

Due to the abundant remodeling potential of the proximal humerus, particularly in younger patients, treatment is nearly always non-operative [2]. Most common direction for traumatic shoulder dislocations is anterior and in rare circumstances, posterior (<5%) or inferior (<1%) glenohumeral dislocations can occur [3].

The combination of glenohumeral dislocation and proximal humerus fracture is extremely rare in children with the exception of some cases

reported during obstetrical injury [4]. A grade III or IV severely displaced fracture according to Neer-Horowitz classification presents a challenge to most orthopedic surgeons.

Proximal humeral physis fractures compromise 0.45% of all pediatric fractures [5] & 4–7% of all epiphyseal fractures [6]. The potential for remodeling is very high as the proximal humeral growth account for 80% of the length of the humerus. The ability to remodel is age dependent which explains why younger children have higher ability to remodel. Neer and Horowitz classified proximal humerus fracture from grade I-IV, according to the severity of displacement (Table 1).

Less than 2% of all traumatic glenohumeral dislocations occur in patients younger than 10 years of age, and about 20% occur in patients between the ages of 10 and 20 years [7].

Here we present an unusual case of combined left proximal humerus

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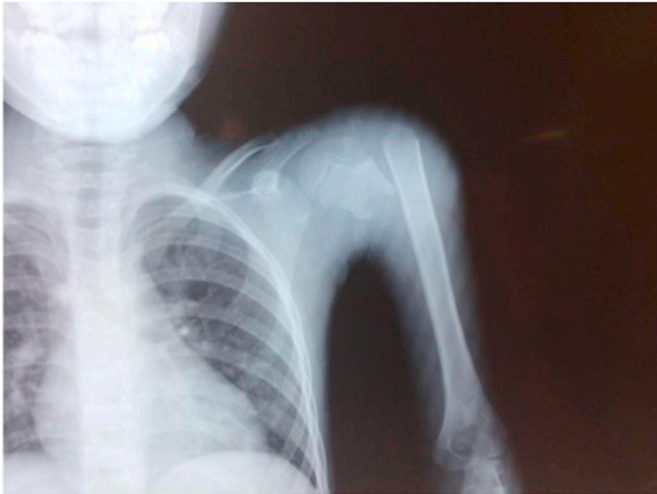
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**Table 1**  
Neer & Horowitz classification for proximal humerus fracture.

Grade	Displacement
I	<5 mm shaft diameter
II	<1/3 shaft width
III	2/3 shaft width
IV	>2/3 shaft width



**Fig. 1.** Pre-operative anteriorposterior radiograph of left humerus & shoulder, demonstrating left proximal humerus shaft comminuted displaced fracture.

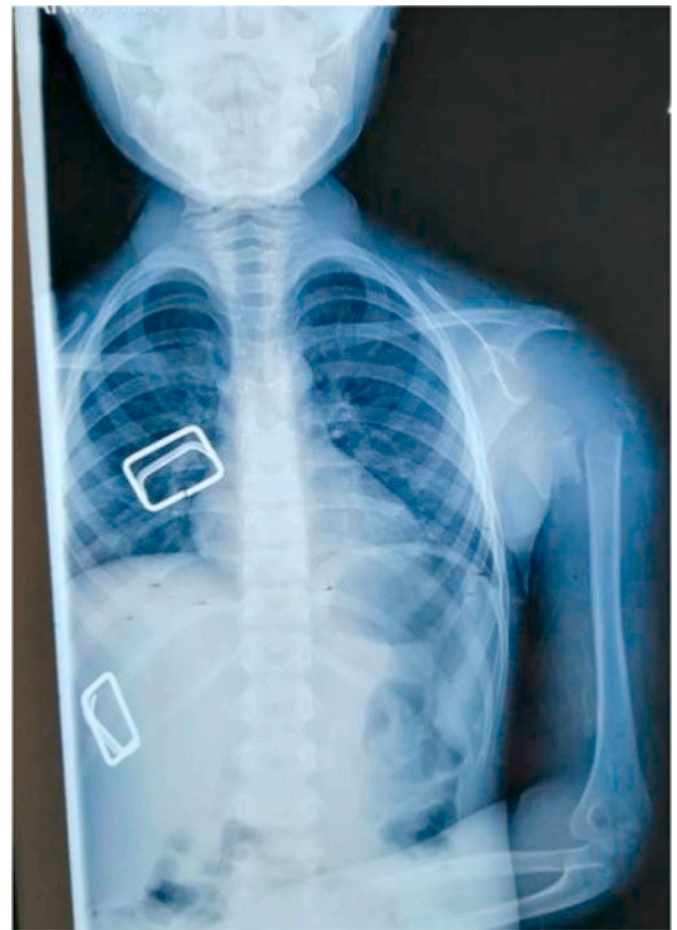
fracture and glenohumeral dislocation in a 5 year old girl who was treated with open reduction, K-wires fixation and immobilization in a shoulder cast. The case proves that a high index of suspicion with appropriate imaging is needed for selecting the appropriate modality of treatment to avoid missing or delays in the diagnosis of such injuries.

## 2. Methods

Systematic literature search was applied via MEDLINE and EMBASE for cases reported in English-language journals. A similar search was made in China Knowledge Resource Integrated database to identify the reported cases in Chinese journals. The primary key words used were “Pediatrics”, “Trauma”, “Glenohumeral fracture dislocation”, “Proximal humerus fracture”, and “K-wires”. Written informed consent was obtained from the patient for publication the clinical information and any accompanying images. The Institutional Review Board is not required. This case has been written and reported according to SCARE 2020 guideline [8].

### 2.1. Case presentation

A 5-year-old girl; medically and surgically free, was referred to our orthopedics emergency department 1 week following a falling accident from 2 m' height. The patient was playing with her siblings when she jumped from a 2 m wall landing directly on her non-dominant left arm. She was initially evaluated at a primary hospital complaining from left shoulder pain. Imaging revealed closed left proximal humerus fracture and was admitted for a trial of closed reduction. Multiple attempts for closed reduction under sedation were attempted, by senior orthopedic resident, but failed. Last attempt for closed reduction at the primary hospital was under general anesthesia but also failed and resulted in iatrogenic glenohumeral dislocation. The patient was then referred to



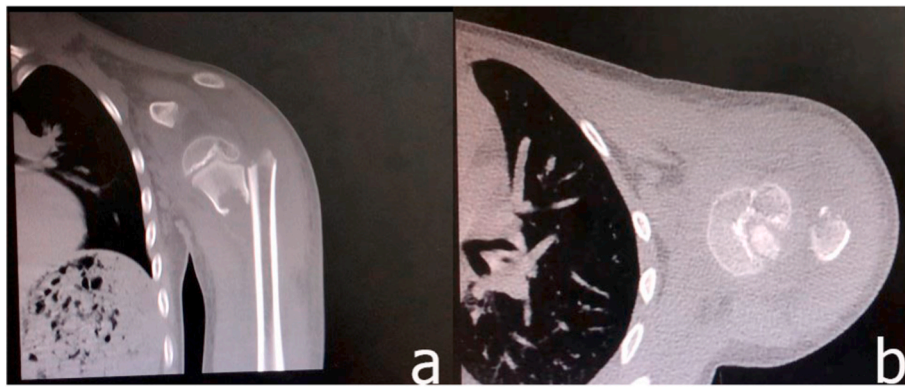
**Fig. 2.** Pre-operative anteriorposterior view of left shoulder, demonstrating left proximal humerus fracture combined with.

our level 1 trauma center for further intervention. Upon presentation to the emergency department, her left arm was in a U-shape cast on an arm sling. She was complaining from left shoulder pain.

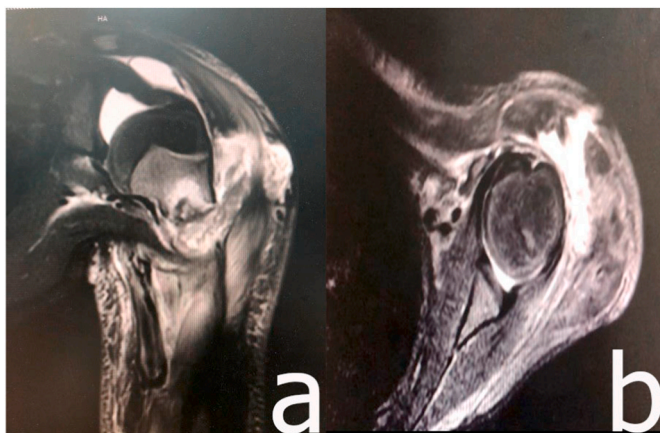
Physical examination after removing the cast and arm sling revealed left shoulder abduction, and external rotation with gross deformity. Minimal swelling and ecchymosis were noted over the left shoulder. Both active and passive range of motion couldn't be assessed due to pain. Fullness was palpated at the anterior aspect of the shoulder with loss of normal contour of the deltoid. Distal neurovascular exam was normal with signs of limb perfusion and no signs of compartment syndrome.

Imaging studies were conducted. Anteriorposterior radiographs from the primary hospital of left humerus and shoulder demonstrated left proximal humerus shaft comminuted displaced fracture Fig. 1. Anteriorposterior view at our emergency department of left shoulder demonstrated left proximal humerus fracture combined with glenohumeral dislocation Fig. 2. In addition, Computed tomography (CT) of left shoulder revealed severely displaced comminuted fracture line seen involving the left proximal humerus, the left humeral head appears anteriorly and inferiorly displaced associated with surrounding hematoma tracking alongside the after mentioned fracture line. Moderate amount of hemarthrosis seen surrounding the left shoulder joint Fig. 3.

Moreover, magnetic resonance imaging (MRI) to rule out obstacles for reduction revealed evidence of severely displaced comminuted fracture line seen involving the left proximal humerus, the left humeral head is displaced anteriorly resulting in humeral shortening, associated with different ages hematoma tracking alongside the after mentioned fracture line and into the subcutaneous tissues with bone marrow edema



**Fig. 3.** CT scan (A) coronal view (B) axial view demonstrating severely displaced, comminuted fracture line seen involving the left proximal humerus, the left humeral.

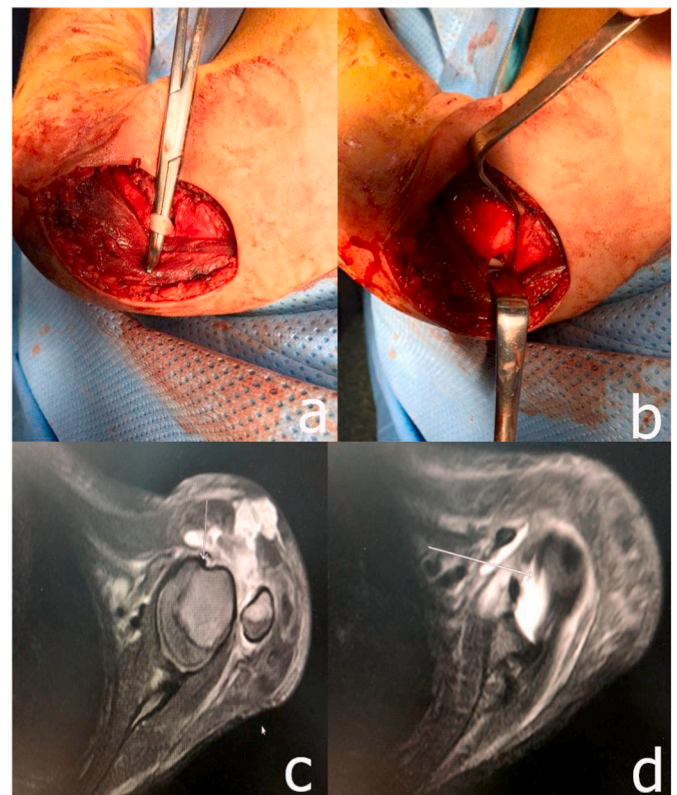


**Fig. 4.** MRI-T2 weighted image (A) coronal view and (B) axial view revealing, severely displaced comminuted fracture line seen involving the left proximal humerus.

and extensive soft tissue and intramuscular edema also noted. Moderate amount of hemarthrosis seen in the left shoulder joint [Fig. 4](#).

The patient's family was consented for closed versus open reduction and fixation. Under general anesthesia, a trial of closed reduction of the shoulder dislocation was attempted, by consultant orthopedic surgeon, but failed due to mechanical block of reduction. Therefore, an open reduction was performed, by consultant orthopedic surgeon, through a deltopectoral approach with failure of reduction after clearing the joint space. Interposition of the long head of the biceps tendon was found as a mechanical obstacle that impeded closed reduction intra-operatively [Fig. 5](#). The long head of biceps tendon was tenotomized from its proximal origin at the superior glenoid tubercle for glenohumeral reduction. Shoulder joint was reduced but unstable followed by reduction and internal fixation of the surgical neck of humerus fracture by 3 K-wires [Fig. 6](#).

The long head of the biceps tendon was reattached to its origin. After checking stability and wound closure, the left upper limb was immobilized in a U-shape cast & arm sling. Distal neurovascular exam was normal post-operative. Immediate post-operative Anteriorposterior view of bilateral shoulders confirmed fracture dislocation reduction [Fig. 7](#).



**Fig. 5.** Intraoperative gross images (A&B) of the long head of, biceps tendon acting as a mechanical obstacle impeding closed.

Patient was discharged after a couple of days following ORIF. Four weeks following the surgery, the cast, arm sling and K-wires were removed and patient was commenced on physical therapy for shoulder range of motion and muscle strengthening.

Follow up radiographs showed abundant callus formation and stable reduction of left shoulder joint. During the 3 year follow-up period, the patient was pain free, with full active range of motion over the left shoulder and symmetric limb length [Fig. 8](#).



Fig. 6. Intra-operative radiograph of left shoulder demonstrating, glenohumeral re-location & fracture fixation with 3 k-wires.

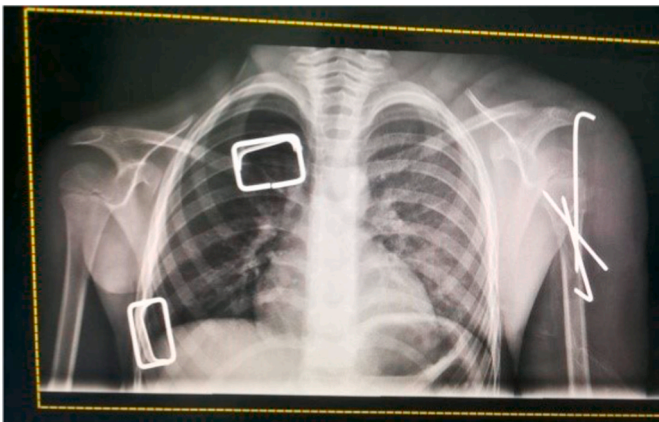


Fig. 7. Immediate Anteriorposterior radiograph of bilateral shoulders demonstrating, fracture dislocation reduction & fixation with 3 k-wires.

Recent radiograph of bilateral shoulders revealed symmetry of bilateral shoulders and no evidence of avascular necrosis (AVN) of the humeral head Fig. 9.

### 3. Discussion

Traumatic proximal humerus fractures in concurrence with glenohumeral dislocation is a rare entity in the pediatric population. Majority of cases can be treated by closed reduction and casting with the minority requiring surgical intervention [9]. Fractures or dislocations requiring

surgical intervention are mostly open fractures, severely displaced, associated with neurovascular compromise, or irreducible due to soft tissue obstacles. Obstacles to reduction the impede successful reduction include: interposition of the long head of biceps tendon, subscapularis tendon or labrum, bony fragments from greater tuberosity, or impaction of humeral head on the glenoid [10–14]. Michael et al. reported a case of acute irreducible anterior glenohumeral dislocation in a 57 year old that required open reduction due to incarcerated long head of biceps tendon [15], Abdel Nour et al. reported a case of a multi-fragmentary proximal humeral fracture in a 43 year old male patient who was planned to undergo percutaneous fixation with K-wires and cannulated screws but due to failed trials of anatomic reduction, the decision for open reduction was made and surprisingly the long head of the biceps tendon was found to be entrapped and subsequently tenotomized for proper anatomic reduction [16].

To our best of knowledge, only a few cases in literature have been reported regarding proximal humerus fractures combined with glenohumeral dislocation in the pediatric population. Rowe reported in an article published in 1956, that out of 500 patients with glenohumeral dislocation only 8 (1.6%) were <10 years old [17]. One of the first cases reported regarding shoulder fracture dislocation was described by Nicastro and Adair in 1982 in a 32 month old child, suspected of being victim of abuse with SH-I fracture proximal humerus and anterior shoulder dislocation that was treated with open reduction and single smooth K-wire fixation [18]. The first youngest age of shoulder fracture dislocation case that was successfully treated by closed reduction and percutaneous K-wire fixation was described by Winmmon et al. in a 2 year old child with SH I proximal humerus fracture and anterior shoulder dislocation [19].

Fannouch et al. described an unusual pediatric case in a 10 year old girl who presented with traumatic surgical humeral neck fracture with a posterior glenohumeral dislocation that was treated by closed reduction and flexible intramedullary nailing [20]. They concluded that a trial of closed reduction with TEN (intramedullary nailing) is a good option with excellent results without complications.

Only 19 cases have been documented regarding such injuries. A table summarizing the reported cases in literature of combined proximal humerus fractures with ipsilateral shoulder dislocation in the pediatric population is shown below (Table 2).

As summarized in the table above, open reduction has been reported on patients with unsuccessful trials of closed reduction due to entrapment of soft tissue as mentioned previously. Similarly in our case that we present, a trial of closed reduction was performed which failed and the patient required open reduction of the glenohumeral joint through the deltopectoral approach due to interposition of the long head of biceps tendon. Therefore, we highly recommend open reduction internal fixation for irreducible glenohumeral dislocation combined with severely displaced proximal humerus fracture in the pediatric population.

In our combined case of proximal humerus fracture and glenohumeral dislocation, open reduction of the glenohumeral dislocation to remove the incarcerated long head of biceps tendon and fixation of the proximal humerus fracture with 3 K-wires along with a U-shaped cast resulted in rewarding outcomes with full range of motion at 3 years follow up and neither avascular necrosis of the humeral head nor subsequent dislocation.

In terms of managing severe proximal humerus fractures in the pediatric population, appropriate physical examination and imaging is mandatory to avoid missing diagnosis of combined glenohumeral dislocation. Imaging techniques such as arthrography, CT and MRI complement conventional imaging modalities to allow identification of obstacles that impede closed reduction.

### 4. Conclusion

Traumatic pediatric proximal humerus fractures combined with glenohumeral dislocation have been reported in literature although rare.



Fig. 8. 3 years following ORIF, the patient was pain free with full active range of, motion over the left shoulder & symmetric limb length.



Fig. 9. Anteriorposterior & lateral shoulder radiograph views 3 years post-operatively, demonstrating complete fracture remodeling, no signs of avascular necrosis, or.

A high index of suspicion is required to diagnose such injuries along with appropriate radiographic evaluation. Open reduction is needed in severely displaced fractures combined with glenohumeral dislocation with failed trials of closed reduction. Concluding the results of our case, we recommend open reduction with K-wires fixation for irreducible combined proximal humeral fracture and glenohumeral dislocation.

**Ethics approval and consent to participate**

Not applicable.

**Consent for publication**

Written informed consent was obtained from the patient’s parent for publication of this Case report and any accompanied images. A copy of the written consent is available for review by the Editor of this journal. Institutional review board is not required.

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**Authors’ contributions**

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**Research registration**

Not applicable.

**Table 2**

Reported cases in literature of a combination of proximal humerus fracture with ipsilateral shoulder dislocation in the pediatric population.

Author	Sex/ Age	Traumatic event	Direction of dislocation	Treatment modality	Follow- up	End results
Nicastro & Adair <sup>18</sup>	32 m/ F	Fall from crib, child abuse	Anterior	OR, Single KW fixation	2 y	Full ROM, No signs of AVN, Open epiphysis
Winmoon et al. <sup>19</sup>	2 y/M	Fall from stroller	Anterior	CR, 2 KW fixation	30 m	Full ROM, Normal humerus length, Open epiphysis
Fannouch et al. <sup>20</sup>	10 y/F	Fall from 1 step stairs	Posterior	CR, 2 TEN fixation	4 m	Full ROM, Negative apprehension test
Gregg-Smith and White [21]	12 y/F	Fall from horse	Anterior-inferior	OR, KW fixation	4 m	Full ROM, No pain
Jin et al. [22]	6 y/F	Fall from ladder	Anterior	OR, 2 ESIN fixation	2 y	Full ROM, No signs of AVN
Obremsky & Routte [23]	11 y/F	Fall from height	Anterior	CR, Sling	15 m	Full ROM, No recurrence
Canosa & Areste [24]	16 y/ M	MCA	Anterior	CR, Intramedullary pin	15 m	Complete healing, Full ROM
Hong et al. [25]	9 y/M	Fall from slide	Posterior	CR, KW fixation	12 m	Complete healing, Full ROM
Ji et al. [26]	5 y/F	Fall from tree	Inferior	CR, KW fixation	2 y	Full ROM, Pain free
Isik et al. [27]	7 y/F	Fall from height	Posterior	OR, KW fixation	6 m	Full ROM, Complete healing
Wang et al. [28]	10 y/ M	Fall from bike	Anterior	OR, KW fixation	2 y	Full ROM, Devascularization & subsequent revascularization of the humeral head
Do & Kellar [29]	14 y/F	MVA	Inferior	CR, KW fixation	10 m	Full ROM & strength
Choi et al. [30]	12 y/ M	Slip & fall	Anterior	CR, Sling	3 m	Pain free, Full ROM & strength, Completely healed osteochondral fracture
Micic et al. [31]	18 y/F	MVA	Anterior	OR, External fixation	3 y	Near full ROM without pain or limitation of activities
Sasashige et al. [32]	18 y/ M	MCA	Anterior	CR, Küntscher nail	11 y	No limitations in activities of daily living
Lee et al. [33]	16 y/ M	Fall from bike	Posterior	OR, KW fixation	16 m	Full ROM, AVN of humeral head
Nugpok et al. [34]	3 y/F	Fall from height	Anterior	OR, KW fixation	12 m	Full ROM
Gupta et al. [35]	3 y/M	MVA	Anterior	CR, 3 KW fixation	12 m	Full ROM, No evidence of growth arrest
Azevedo et al. [36]	6 y/M	Fall from tractor	Anterior	CR, KW fixation	5 y	Full ROM, No signs of AVN

OR = open reduction, CR = closed reduction, y = year(s), m = month(s), KW=Kirschner wires, AVN = avascular necrosis, ROM = range of motion, MVA = motor vehicle accident, MCA = motorcycle accident, M = male, F = female, TEN = titanium elastic nail, ESIN = elastic stable intramedullary nail.

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Ali Alomari

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**Declaration of competing interest**

The authors declare that they have no competing interests.

**Abbreviations**

CT	Computed tomography
MRI	Magnetic resonance imaging
AVN	Avascular necrosis
ORIF	Open reduction internal fixation

**Appendix A. Supplementary data**

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.amsu.2021.102510>.

**References**

- C.S. Neer 2<sup>nd</sup>, B.S. Horwitz, Fractures of the proximal humeral epiphyseal plate, *Clin. Orthop. Relat. Res.* 41 (1965) 24–31.
- R. B Salter, Injuries of the epiphyseal plate, *Instr. Courses Lect* 41 (1992) 351–359.
- R. B Salter, Injuries of the epiphyseal plate, *Instr. Courses Lect* 41 (1992) 351–359.
- R. Lemperg, B. Lilliequist, Dislocation of the proximal epiphysis of the humerus in newborns; report of two cases and discussion of diagnostic criteria, *Acta Paediatr.* 59 (1970) 377–380.
- S.H. Rose, L.J. Melton III, B.F. Morrey, et al., Epidemiologic features of humeral fractures, *Clin. Orthop.* 168 (1982) 24–30.
- C.A. Peterson, H.A. Peterson, Analysis of incidence of injuries to the epiphyseal growth plate, *J. Trauma* 12 (1972) 275–281.
- J.Y. Bishop, E.L. Flatow, Pediatric shoulder trauma, *Clin. Orthop. Relat. Res.* (2005) 41–48.
- R.A. Agha, T. Franchi, C. Sohrabi, G. Mathew, A. Kerwan, SCARE Group, The SCARE 2020 guideline: updating consensus surgical CAse REport (SCARE) guidelines, *Int. J. Surg.* S1743–9191 (20) (2020) 30771–30778.
- C.F. Larsen, T. Kiaer, S. Lindequist, Fractures of the proximal humerus in children: 9 year follow-up of 64 unoperated cases, *Acta Orthop. Scand.* 61 (1990) 255–257.
- S. Inao, T. Hirayama, Y. Takemitsu, Irreducible acute anterior dislocation of the shoulder: interposed bicipital tendon, *J Bone Joint Surg Br* 72 (1990) 1079–1080.
- C.J. Jannecki, D.C. Barnett, Fracture-dislocation of the shoulder with biceps tendon interposition, *J Bone Joint Surg Am* 61 (1979) 142–143.
- S.H. Bridle, B.D. Ferris, Irreducible acute anterior shoulder dislocation of the shoulder: interposed scapularis, *J Bone Joint Surg Br* 72 (1990) 1078–1079.
- O.A. Ilahi, Irreducible anterior shoulder dislocation with fracture of the greater tuberosity, *Am J Orthop (Belle Mead NJ)* 27 (1998) 576–578.
- Christian Bahrs, Sebastian Zipplies, Björn Gunnar Ochs, Jörg Rether, Justus Oehm, Christoph Eingartner, Bernd Rolauffs, Weise, Kuno proximal humeral fractures in children and adolescents, *J. Pediatr. Orthop.*: April 29 (3) (2009) 238–242.
- Michael S. Day, David M. Epstein, Brett H. Young, M. Laith, Jazrawi, Irreducible anterior and posterior dislocation of the shoulder due to incarceration of the biceps tendon, *Int. J. Shoulder Surg.* 4 (3) (2010 Jul-Sep) 83–85.
- H.G. Abdel Nour, N. Joukhadar, J. Maalouly, R.A. Ayoubi, D.K. Aouad, G.S. El Rassi, Entrapment of the long head of the biceps in a multi-fragmentary proximal humeral fracture: a case report, *J Physiother Res* 2 (4) (2018) 10.
- C.R. Rowe, Prognosis in dislocations of the shoulder, *J Bone Joint Surg Am* 38-A (1956) 957–977.
- J.F. Nicastro, D.M. Adair, Fracture-dislocation of the shoulder in a 32-month old child, *J. Pediatr. Orthop.* 2 (1982) 427–429.
- C. Winmoon, V. Sathria-Angkura, S. Kunakornsawat, et al., Fracture dislocation of the glenohumeral joint in a 2-year-old child: case report, *J. Trauma* 54 (2003) 372–375.
- G. Fannouch, Y.I. Al Khalife, A.S. Al Turki, A.H. Jawadi, Traumatic pediatric shoulder fracture dislocation treated with closed reduction and intramedullary nailing, *Trauma Case Report* 9 (2017 Jun 4) 22–26.
- S.J. Gregg-Smith, S.H. White, Slater-Harris III, fracture-dislocation of the proximal humeral epiphysis, *Injury* 23 (1992) 199–200.
- Sheng Jin, Haiqing Cai, X.U. Yunlan, Shoulder dislocation combined with proximal humerus fracture in children, *Medicine (Baltim.)* 96 (48) (2017 Dec) e8977.
- W. Obremsky, Routt MLJr, Fracture-dislocation of the shoulder in a child: case report, *J. Trauma* 36 (1994) 137–140.
- J. Canosa i Areste, Dislocation of the shoulder with ipsilateral humeral shaft fracture, *Arch. Orthop. Trauma. Surg.* 113 (1994) 347–348.
- S. Hong, J.H. Nho, C.J. Lee, et al., Posterior shoulder dislocation with ipsilateral proximal humerus type 2 physeal fracture: case report, *J. Pediatr. Orthop. B* 24 (2015) 215–218.

- [26] J.H. Ji, M. Shafi, S.E. Park, et al., A severely displaced metaphyseal fracture of the proximal humerus with dislocation of the shoulder in a child, *Chin. J. Traumatol.* 17 (2014) 54–56.
- [27] M. Isik, M. Subasi, O. Cebesoy, et al., Traumatic shoulder fracture dislocation in a 7-year-old child: a case report, *J. Med. Case Rep.* 7 (2013) 156–158.
- [28] P.Jr Wang, K.J. Koval, W. Lehman, et al., Salter–Harris type III fracture dislocation of the proximal humerus, *J. Pediatr. Orthop. B* 6 (1997) 219–222.
- [29] T. Do, K. Kellar, Transitory inferior dislocation of the shoulder in a child after shoulder injury: a case report and treatment results, *Iowa Orthop. J.* 24 (2004) 119–122.
- [30] Choi YS, Potter HG, Scher DM. A shearing osteochondral fracture of the humeral head following an anterior shoulder dislocation in a child.
- [31] I.D. Micic, M.B. Mitkovic, D.S. Mladenovic, Unreduced chronic dislocation of the humeral head with ipsilateral humeral shaft fracture: a case report, *J. Orthop. Trauma* 19 (2005) 578–581.
- [32] Y. Sasashige, T. Kurata, Y. Masuda, et al., Dislocation of the shoulder joint with ipsilateral humeral shaft fracture: two case reports, *Arch. Orthop. Trauma. Surg.* 126 (2006) 562–567.
- [33] S.H. Lee, D.H. Lee, J.R. Baek, Proximal humerus Salter type III physeal injury with posterior dislocation, *Arch. Orthop. Trauma. Surg.* 127 (2007) 143–146.
- [34] O. Nuggok, J. Menon, P. Satyanarayana, Fracture dislocation shoulder in 3-year old, *Eur. J. Orthop. Surg. Traumatol.* 20 (2010) 333–334.
- [35] R. Gupta, A. Singh, K.K. Singh, et al., Fracture of proximal humerus with dislocation of glenohumeral joint in a 3 year old child: a case report, *J. Orthop. Case Rep.* 3 (2013) 26–28.
- [36] J. Azevedo, B. Maia, J. Correia, Fracture-dislocation of the proximal humerus in a 6-year-old child: case report, *J. Shoulder Elbow Surg.* 22 (2013) 16–19.