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## Open inferior Glenohumeral fracture dislocation with interposition of the Subscapularis and greater tuberosity

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### Abstract

Open dislocations of the shoulder are extremely rare. Emergency stabilisation of the trauma patient, prompt joint reduction, and careful exploration of neurovascular structures are fundamental management principles.

The report describes the case of a young male cyclist who suffered an open inferior Glenohumeral fracture dislocation. Urgent stabilisation of the patient was necessary prior to reduction of the fracture dislocation. Significant bleeding was observed from an axilla wound, the humeral head was found protruding through the skin. Emergency imaging revealed the integrity of the major upper limb arteries and persistent humeral head subluxation following emergency reduction. Early surgical exploration of the major axillary vessels was performed by a multi-disciplinary team. The Subscapularis was found reflected into the joint with a fragment of the greater tuberosity. Fracture fixation and reconstruction of the rotator cuff was performed. A review of the literature is included. Avascular necrosis and impaired function are common complications of this injury.

**Keywords:** Open dislocation, Glenohumeral joint, trauma, neurovascular

### Introduction

Closed glenohumeral joint dislocations are a common injury managed routinely through emergency departments and musculoskeletal services [1]. In contrast, open dislocations are very rare and specific management is required to lower the risk of avascular necrosis and reduce functional impairment. This report describes the first documented case of a traumatic open inferior glenohumeral fracture dislocation with interposition of the subscapularis and greater tuberosity. The assessment and management of a patient with a high-energy open glenohumeral joint dislocation are discussed alongside a review of the literature.

### Case Presentation

A 31-year-old male cyclist was hit by a car travelling at high speed and thrown onto the windscreen. Paramedics found him agitated with evidence of a head injury and open shoulder trauma. Significant bleeding was observed from a 15cm right axilla wound and the humeral head was visible protruding through the skin (figure 1). Bilateral lung needle decompressions were performed at the scene followed by thoracostomies and intubation. An attempt was made at reduction of the shoulder and the axilla wound was packed firmly.

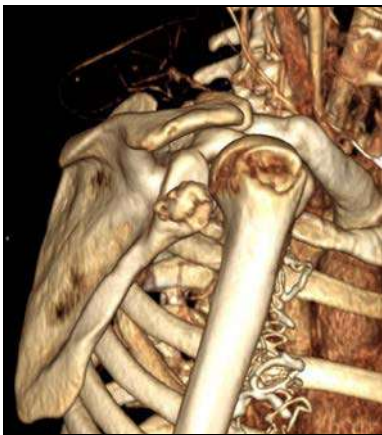


**Fig 1:** Open dislocation at the roadside.

He was transferred to the regional major trauma centre. He was haemodynamically unstable on arrival and managed via the hospital major haemorrhage protocol. A trauma computed tomography (CT) scan revealed an acute subdural haemorrhage, parietal fracture, bilateral pneumothoraces and an open fracture dislocation of the glenohumeral joint (figures 2&3).

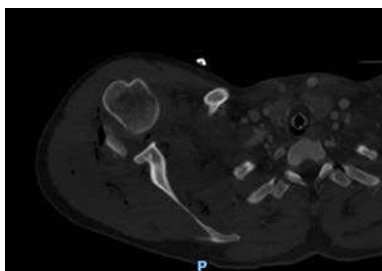


**Fig 2:** CT reconstructions of the subluxed humeral head and greater tuberosity fragment.



**Fig 3:** CT reconstructions of the subluxed humeral head and greater tuberosity fragment

There was widespread surgical emphysema (figure 4) and active contrast extravasation posterior to the right pectoralis minor muscle which extended medially along the course of the right brachial plexus.



**Fig 4:** Axial CT demonstrating the greater tuberosity fragment and surgical emphysema.

The contrast extravasation was venous in origin, figure 2 shows the intact brachial artery. His upper limb radial and ulna pulses were present on bedside Doppler assessment. The patient was transferred to the intensive care unit and an intracranial pressure bolt was inserted.

He was taken to theatre the next day by a multi-disciplinary surgical team. Wound exploration confirmed the axillary artery and vein were intact and the dislocated humeral head was compressing the axillary vein. Several small veins were severed. The subscapularis had been torn from the humeral insertion and was reflected into the glenohumeral joint along with a fragment from the greater tuberosity. The long head of biceps had displaced from the bicipital groove. The greater tuberosity fragment and avulsed subscapularis were in continuity forming an intra-articular block to reduction from anterior to posterior. A separate deltopectoral approach was made to the shoulder. The musculocutaneous and axillary nerves were intact. The humeral head was relocated, and the greater tuberosity fracture was fixed in place with a single screw, supported by transosseous Ethibond sutures (figure 5). The subscapularis was repaired with transosseous sutures.



**Fig 5:** Post-operative shoulder radiograph

The patient was reviewed at 3 months post-procedure. He was pain free and his wounds had healed. He reported sensory disturbance over the medial and lateral forearm. His range of motion and power was restricted in abduction and internal rotation, this was improving with rehabilitation exercises. His power was otherwise normal through all myotomes of the upper limb.

### Discussion

Significant force is required to drive the humeral head from its glenoid articulation, through the surrounding soft tissue envelope. Four previous cases of inferior open glenohumeral joint dislocation were found dating back to 1852 (table 1). This is the first reported open glenohumeral dislocation with interposition of the subscapularis and greater tuberosity. The clinical presentation was further complicated by axillary vein compression by the humeral head, which remained subluxed following emergency reduction. Reports of four further open glenohumeral joint dislocations were available; two anterior and two posterior (table 1).

**Table 1:** Open glenohumeral dislocations. LHB - long head of biceps, GT - greater tuberosity.

Authors	Direction	Management
Faur <i>et al.</i> 2019 [2]	Anterior	Emergency debridement and rotator cuff repair. LHB fixed in bicipital groove
Garrigues <i>et al.</i> 2011 [3]	Inferior	Emergency debridement, RCR at 72hrs. LHB tenodesis, revision GT fixation at 1 week
Maroney & Devinney 2011 [4]	Posterior	Emergency washout in the emergency room, rotator cuff repair at 48hrs.
Gregory & Lord 1996 [5]	Anterior	Emergency debridement. No rotator cuff repair performed.
Davison & Orwin 1996 [6]	Inferior	Emergency debridement with rotator cuff repair. Greater tuberosity not fixed. LHB fixed in groove. Re-look at 48hrs
Lucas & Peterson 1977 [7]	Inferior	Debridement & packing of leaking wound and cast immobilisation 4 weeks
Moeller 1975 [8]	Posterior	Debridement with rotator cuff repair due to persistent instability. Cast immobilisation 56 days, re-look at 5 months due to persistently draining wound.
Middledorff 1859 [9]	Inferior	No rotator cuff repair, patient died of sepsis.

Patients should be assessed and stabilised according to the Advanced Trauma Life Support protocol followed by joint reduction, antibiotics and preparation for surgical exploration, debridement and washout. Avascular necrosis of the humeral head is described in 50% of reported cases of open dislocations (table 1). The humeral head is supplied by the anterior and posterior humeral circumflex arteries which are branches of the third part of the axillary artery. The posterior circumflex is the dominant vessel and passes posteriorly through the quadrangular space where it divides into anterior and posterior branches before supplying the superior, inferior and lateral portions of the humeral head [10]. The anterior circumflex humeral artery passes around the anterior humeral neck where it gives off an ascending branch. The high energy trauma required to sustain an open dislocation puts these vessels at significant risk. Delayed reduction and fixation of fracture dislocations may increase the risk of avascular necrosis [11].

Early rotator cuff repair should be considered. Two previous cases where the rotator cuff was not reconstructed led to significant functional impairment (table 1). Delayed repair may lead to tendon retraction and fatty infiltration, reducing the chance of a successful subsequent repair. Furthermore, intraoperative anterior glenohumeral instability was demonstrated in our patient and repair of the subscapularis was necessary to achieve stability.

All patients should be investigated for evidence of neurological injury. The incidence of nerve compromise following all shoulder dislocations ranges from 5.4 – 55% and is increased in older patients and in cases of delayed shoulder reduction [12]. The evidence for an increased risk in high energy trauma is mixed [12].

Brachial artery injury is a rare but potentially severe complication of shoulder dislocations. The multiple arterial anastomoses around the shoulder may result in a radial pulse despite discontinuity of the brachial artery. The third segment is the most commonly injured portion of the vessel, potentially due to its relative immobility anchored by the subscapular and humeral circumflex branches [13]. Persistent ischaemia following reduction necessitates urgent exploration and repair of the vessel if damaged.

### Conclusion

Stabilisation of the trauma patient followed by prompt reduction and assessment of vascular status is necessary in open glenohumeral dislocations. Early surgical exploration and reconstruction should be performed to reduce the risk of avascular necrosis and minimise long-term functional impairment.

### Conflicts of interest

The authors have no conflicts of interest to declare.

### References

- Shah A, Judge A, Delmestri A, Edwards K, Arden NK, Prieto-Alhambra D, *et al.* Incidence of shoulder dislocations in the UK, 1995-2015: A population-based cohort study. *BMJ Open* 2017;7:e016112
- Faur CI, Anglitoiu B, Ungureanu AM. Open anterior glenohumeral dislocation with associated supraspinatus avulsion: A case report. *World J Clin Cases* 2019;7(7):849–54.
- Garrigues GE, Nagda SH, Yu J. Open luxatio erecta: A case report and literature review. *J Orthop Trauma* 2011;25(4):e34–7.
- Maroney SS, Devinney S. Open Glenohumeral Dislocation: Skeletonization of the Proximal Humerus Without Associated Fracture. *Orthopaedics* 2011;34(11):e776–80.
- Gregory PR, Lord M. Case Report: Open Anterior Dislocation of the Shoulder. *J Orthop Trauma* 1996;10(2):128–30.
- Davison BL, Orwin JF. Open Inferior Glenohumeral Dislocation. *J Orthop Trauma* 1996;10(7):504–6.
- Lucas GL, Peterson MD. *J Trauma Inj. Infect Crit Care* 1977;17(11):883-4.
- Moeller J. Compound posterior dislocation of the glenohumeral joint. Case report. *J Bone Jt Surg* 1975;57(7):1006–7.
- Middledorff M. De nova Humeri Luxationis specie. *Clin Eur*, 1859, 2(12).
- Hettrich CM, Boraiah S, Dyke JP, Neviasser A, Helfet DL, Lorich DG. Quantitative assessment of the vascularity of the proximal part of the humerus. *J Bone Jt Surg-Ser A* 2010;92(4):943–8.
- Siebenbürger G, Van Delden D, Helfen T, Haasters F, Böcker W, Ockert B. Timing of surgery for open reduction and internal fixation of displaced proximal humeral fractures. *Injury* 2015;46:S58–62.
- Gutkowska O, Martynkiewicz J, Urban M, Gosk J. Brachial plexus injury after shoulder dislocation: a literature review. *Neurosurg Rev* 2020;43(2):407-423
- Allie B, Kilroy DA, Riding G, Summers C. Rupture of axillary artery and neuropraxis as complications of recurrent traumatic shoulder dislocation: Case report. *Eur J Emerg Med* 2005;12(3):121–3.