

Non-Operative Management of a Minimally Displaced Greater Tuberosity Fracture in Military Aircrew with Return to Unrestricted Flying Duties

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SUMMARY

A military aircrew member in his 40s sustained a minimally displaced fracture of the greater tuberosity of the proximal humerus following a fall onto an outstretched arm. Surgical intervention was considered but conservative management was selected. On presentation to a tertiary rehabilitation unit (DMRC), he demonstrated reduced shoulder range of motion, posterior cuff weakness, disturbed sleep requiring analgesia and functional limitation. Rehabilitation prioritised early mobility restoration, posterior cuff endurance using structured progression principles, thoracic mobility and kinetic chain integration, progressing to propulsive strength training. At discharge, shoulder flexion and abduction were restored to 180 degrees, external rotation was symmetrical at 80 degrees, and patient-reported outcome measures normalised (Disabilities of the Arm, Shoulder and Hand score 3/100; Pain Self-Efficacy Questionnaire 98%; Tampa Scale of Kinesiophobia 20). He passed formal cockpit assessment and returned to unrestricted flying duties as an instructor. This case highlights the effectiveness of structured conservative management in high-demand occupational populations.

Background

Fractures of the greater tuberosity of the proximal humerus may compromise rotator cuff function, particularly the supraspinatus, infraspinatus and teres minor insertions. Even minimal displacement can impair external rotation strength, scapulohumeral rhythm and overhead mechanics. In high-demand occupational populations such as military aircrew, small deficits in external rotation or abduction may affect cockpit control, sustained flight tolerance and emergency ejection positioning. While operative fixation is considered in selected cases, minimally displaced fractures are frequently managed conservatively. Optimising outcome requires structured rehabilitation that restores mobility, posterior cuff endurance and whole-body kinetic chain integration.

Case Presentation

A military pilot with over two decades of flying experience sustained a fall onto an outstretched arm resulting in a minimally dis-

placed fracture of the greater tuberosity of the left proximal humerus. Initial radiography confirmed the fracture without dislocation. Surgical fixation was discussed but conservative management was agreed. He was referred to a tertiary specialist rehabilitation unit. On presentation, he reported activity-related scapular discomfort rated 3/10 on a visual analogue scale. Sleep was disturbed and he required co-codamol for symptom control.

Clinical examination demonstrated:

- Active shoulder flexion: 160 degrees (left)
- Active abduction: 120 degrees (left)
- External rotation: 60 degrees (left)
- Visible reduction in muscle bulk of the posterior shoulder girdle
- Posterior cuff weakness
- Reduced kinetic control in weight-bearing positions

Baseline patient-reported outcome measures were:

- Disabilities of the Arm, Shoulder and Hand (DASH): 34.1
- Self-efficacy score: 68.3
- Musculoskeletal Health Questionnaire: 36

His occupational goal was return to unrestricted flying and instructor duties, which required full overhead mobility, symmetrical external rotation, closed chain stability and load tolerance under parachute systems.

Investigations

Plain radiography demonstrated a minimally displaced fracture of the greater tuberosity without glenohumeral dislocation. No advanced imaging was required as clinical presentation correlated with radiographic findings and there were no features suggestive of full-thickness rotator cuff rupture.

Differential Diagnosis

Initial consideration included:

- Isolated greater tuberosity fracture
- Associated rotator cuff tear
- Glenohumeral instability

The absence of significant weakness consistent with full-thickness tear, preserved albeit restricted active range of motion, and radiographic findings supported isolated minimally displaced greater tuberosity fracture without surgical indication.

Treatment

Management was conservative and rehabilitation led.

Mobility Restoration

Early emphasis was placed on restoring range of motion through:

- Mobilisation with movement techniques (inferior glide using seatbelt-assisted technique)
- Thoracic spine mobility exercises
- Latissimus dorsi flexibility work
- Capsular length restoration

Abduction improved acutely to 160 degrees following early mobilisation sessions.

Posterior Cuff Re-Education

Given the biomechanical importance of the posterior cuff in external rotation control and overhead stability, rehabilitation prioritised endurance and activation using structured progression principles. Interventions included:

- Elastic resistance external rotation progressions
- Posterior shoulder endurance drills
- Closed kinetic chain control (high plank shoulder taps)
- Progressive functional assessment tests

Functional assessment test progression demonstrated marked improvement:

Table 1.

Test	Admission	Discharge
Posterior shoulder endurance test	0	6
Posterior cuff activation repetitions	13	31
Closed kinetic chain upper extremity stability test	13	29

Kinetic Chain and Propulsive Strength

Rehabilitation progressed beyond isolated shoulder strengthening to whole-body force transfer integration including:

- Squat and lunge patterns
- Thrust-based movements
- Medicine ball throw progression (4.6 metres to 4.8 metres)
- Advanced propulsive upper limb loading

This phase aimed to replicate cockpit force transmission demands and emergency operational requirements.

Outcome and Follow-Up

At discharge:

- Flexion: 180 degrees
- Abduction: 180 degrees
- External rotation: 80 degrees (symmetrical)

Patient-reported outcome measures:

- Disabilities of the Arm, Shoulder and Hand: 3/100
- Pain Self-Efficacy Questionnaire: 98%
- Tampa Scale of Kinesiophobia: 20

He reduced body weight to 105 kilograms, below occupational weight thresholds inclusive of parachute load. He passed formal cockpit assessment and returned to unrestricted flying duties, subsequently resuming instructor-level responsibilities. He discontinued analgesia without recurrence of symptoms. No psychosocial barriers were identified; intrinsic motivation and occupational identity were strong facilitators of recovery. Follow-up confirmed maintenance of range of motion, strength and occupational function [1-15].

Discussion

Minimally displaced greater tuberosity fractures are commonly managed conservatively; however, outcomes may vary depending on rehabilitation strategy and occupational demand. In high-demand populations, restoration of passive range alone is insufficient.

This case illustrates several important considerations:

1. Early restoration of mobility reduces secondary stiffness.
2. Posterior cuff endurance is critical for external rotation symmetry and overhead stability.
3. Thoracic mobility and kinetic chain integration influence shoulder mechanics.
4. Propulsive strength training supports operational readiness beyond clinical recovery.
5. Patient-reported outcome measures assist in tracking readiness and psychological recovery.

While surgical fixation may be indicated in displaced fractures, structured conservative rehabilitation can achieve elite functional outcomes when displacement is minimal and progression is systematic. Conclusions are supported by the objective restoration of range, functional testing and occupational clearance.

Learning Points

- Minimally displaced greater tuberosity fractures in high-demand occupational groups can achieve full recovery with structured conservative rehabilitation.
- Posterior cuff endurance and external rotation symmetry are critical for overhead and operational function.
- Rehabilitation should integrate thoracic mobility and whole-body kinetic chain loading rather than isolated shoulder strengthening.
- Objective functional testing and patient-reported outcome measures assist decision-making regarding return to high-risk occupations.
- Conservative management does not imply reduced performance potential when rehabilitation is progressive and occupation specific.

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