



Inferior angle of scapula fractures: a review of literature and evidence-based treatment guidelines



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Background: Inferior angle of scapula (IAS) fractures are rare, with very few cases reported. They typically present with pain, loss of shoulder motion, and scapula winging. Operative and nonoperative treatments have been trialed with varying success. The aim of this study was to gather data relating to IAS fractures to develop evidence-based treatment guidelines as none are currently available.

Methods: A search was conducted of the PubMed and Google Scholar databases to identify cases of IAS fractures. Data collected about each case included age and gender of the patient, mechanism of injury, fracture displacement, treatment, and outcome. The authors report 2 additional IAS fracture cases.

Results: Ten cases were identified for inclusion in this study, 8 from the literature and 2 described by the authors. Of the 10 cases, 7 described displaced IAS fractures and 3 described undisplaced fractures. All displaced fractures treated nonoperatively resulted in a painful nonunion. All that underwent operative fixation, whether acutely or after failed nonoperative treatment, had resolution of pain and a good functional outcome. All undisplaced fractures were treated nonoperatively; 1 had persisting pain. Surgical exploration identified the fracture fragment attached to serratus anterior in 2 cases and attached to both serratus anterior and latissimus dorsi in 2 cases.

Discussion and Conclusions: There are limited data available about IAS fractures. From the cases reviewed, treatment recommendations include the following: (1) displaced IAS fractures should undergo operative fixation to prevent the development of a painful nonunion; (2) suture repair provides adequate fixation; and (3) undisplaced fractures have a variable outcome when treated nonoperatively.

Level of evidence: Level IV; Case Series; Treatment Study

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Inferior angle of scapula (IAS) fractures are rare, with very few cases reported in the literature.¹⁻⁶ They result from the powerful periscapular muscles avulsing the inferior tip.³⁻⁶ IAS

fractures typically present with pain over the fracture site, weakness, loss of shoulder range of motion (ROM), and winging of the scapula. Both operative and nonoperative treatments have been trialed with varying success. There are currently no published evidence-based treatment guidelines or recommendations available.

The authors present a review of the literature relating to IAS fractures as well as 2 additional cases and for the first

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time provide evidenced-based recommendations for the treatment of this unusual injury.

Methods

A search was conducted of the PubMed and Google Scholar databases to identify cases of IAS fractures. The references of relevant articles were manually searched to identify additional cases. Cases that included details about the mechanism of injury, fracture displacement, and treatment were included in this study. Data collected about each case included age and gender of the patient, mechanism of injury, fracture displacement, treatment (including intraoperative findings where applicable), and outcome. In cases in which initial treatment was unsuccessful, any data relating to additional treatment and success were also collected. In addition to the published data, the authors report 2 more IAS fracture cases to add to the data analysis.

Data from all included cases were then tabulated to identify any treatment and outcome patterns to develop evidence-based treatment recommendations.

Results

Review of literature

Six articles relating to IAS fractures covering a total of 10 cases were identified in the literature. Of these 10 cases, 8 contained sufficient detail about the fracture displacement, treatment, and outcome to be included in this study. Five cases described displaced IAS fractures, and 3 described undisplaced fractures. All 8 fractures occurred in male patients.

The first reported case of an IAS fracture was published in 1981 by Hayes and Zehr.³ A 25-year-old man sustained a displaced IAS fracture associated with scapula winging. After 8 weeks of immobilization followed by another 7 months of progressive active movement, scapula winging as well as weakness and a “grating sensation” under the scapula persisted. Operative exploration demonstrated detachment of the rhomboid major and serratus anterior muscle from the scapula, with the fracture fragment attached to serratus anterior. The bone fragment was excised and the muscles were reattached to the scapula, with good functional recovery at follow-up.

Mansha et al⁵ similarly described a displaced IAS fracture sustained after falling on the shoulder in a 31-year-old man, who also continued to be symptomatic and to demonstrate scapula winging after prolonged nonoperative treatment. Neurophysiologic testing excluded a long thoracic nerve and C5-C7 nerve root palsy. Surgical exploration approximately 2 years after the initial injury demonstrated a nonunited fracture with a 6-cm displaced fragment attached to latissimus dorsi and serratus anterior. Surgical repair using FiberWire (Arthrex, Naples, FL, USA) was performed, and several months after fixation, the patient was pain free with resolution of scapula winging.

More recently in 2014, Min et al⁶ published a series of 3 patients, all of whom sustained displaced, traumatic IAS frac-

tures. All demonstrated scapula winging. One was initially treated nonoperatively but developed a painful nonunion and underwent operative fixation 1 year after injury by a double-plating technique. The other 2 patients underwent immediate operative suture repair. All demonstrated good functional recovery with no persisting pain, and follow-up radiographs demonstrated bone union.

In contrast to these displaced fractures, Brindle and Coen¹ described a minimally displaced IAS fracture in a 17-year-old man sustained while wrestling. This fracture was treated with nonsteroidal anti-inflammatory drugs and physiotherapy. The patient had full return of function and ROM and no ongoing pain. Radiography performed 6 months after injury demonstrated bone union.

Franco et al² published a case of a nondisplaced IAS fracture in a 47-year-old man after a prolonged cough that was also treated nonoperatively. Unlike in the previous case, the patient continued to experience mild pain, and a radiograph 1 year later demonstrated fracture displacement. The patient did not undergo any further treatment.

Heyse-Moore and Stoker,⁴ in a scapula avulsion fracture case series, remarked on 3 IAS fractures. Of these, only 1 case contained details about fracture displacement, treatment, and outcome. This was a 70-year-old man who sustained a nondisplaced IAS fracture after a fall. He was treated with early mobilization and within 8 weeks had no pain, full shoulder strength, and bone union on plain radiography.

Authors' case 1

A 43-year-old fit and healthy man presented to the orthopedic outpatient clinic several days after a fall from a 3-meter height onto his left shoulder. He had abrasions over the inferior aspect of the scapula. He complained of painful “lifting” of his scapula as well as weakness, and on examination, winging of the scapula on the left side was evident. Plain radiography (Fig. 1) and computed tomography (Fig. 2) demonstrated an IAS fracture with anterior displacement. Physiotherapy was trialed for 4 weeks; however, the patient's symptoms and scapula winging persisted, and therefore the patient underwent operative fixation. He was unable to continue his work installing air conditioners.

The patient was given a general anesthetic and positioned laterally, and a longitudinal incision was made over the fracture site. The muscle planes were developed, and the superior fibers of latissimus dorsi were retracted to expose teres major. A muscle rent in teres major with surrounding soft callus-like tissue was opened to expose the fracture pseudarthrosis (Fig. 3). The anteriorly displaced fracture fragment with the periosteal sleeve avulsed was found to be attached predominantly to latissimus dorsi on its inferior surface, with some attachment to serratus anterior on its anterior surface. On the basis of the work of Min et al,⁶ the authors considered plating the inferior scapula. However, at the time of surgery, it was apparent that plate fixation would have required extensive surgical release of muscle attachments from the inferior

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