Delayed surgical management of an isolated trochlear fracture of the elbow

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ABSTRACT

We present a rare case of a 23-year-old man with an isolated trochlear fracture following an injury to the left elbow. To our knowledge, there are only a few cases previously reported in the literature. The relevant literature is reviewed.

KEYWORDS

Trochlea – Shear fracture – Laugier's fracture

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The usual pattern of distal humeral shear fractures involves the capitellum with different parts of the trochlea because the trochlea has no ligamentous or muscular attachments. An isolated trochlear fracture is an osteochondral fracture and a surgical rarity as only a few cases have been reported, especially with regard to the mechanism of injury.¹ Laugier first described this fracture pattern in 1853.² We present our case to outline the surgical approach, outcome and importance of computed tomography (CT) in the evaluation of unusual elbow injuries.

Case history

A 23-year-old man fell off a motorcycle at a speed of 30mph, landing on an outstretched non-dominant left hand. He was assessed at the emergency department complaining of elbow pain, swelling and loss of function with no neurovascular deficit. He had no deformity and there was no sign of dislocation. Initial management consisted of plaster immobilisation and follow-up review at fracture clinic.

Examination in the following week demonstrated swelling, mainly over the medial aspect of the left elbow, without any bony tenderness. There was limited range of movement and the neurovascular examination of the limb was unremarkable, including that of ulna nerve function. There were no signs of elbow instability. Routine radiography showed an anterior fat pad sign with an unusual half-moon shaped fragment anteriorly, which was very subtle and easy to miss (Fig 1).

I decided to pursue conservative management but at the review visit one week later, owing to the ongoing symptoms of pain and loss of function coupled with the vast discrepancy between the clinical and radiological findings, CT of the elbow was performed. The CT confirmed a

superiorly displaced isolated coronal shear fracture of the trochlea, with an associated Regan and Morrey type I coronoid process fracture (Figs 2 and 3).

Surgical intervention was undertaken to attempt restoration of joint congruity. The injury was already three weeks old with some evidence of partial healing. A posterior approach with a transolecranon osteotomy was therefore chosen. A chevron-type olecranon osteotomy and ulnar nerve decompression without transposition were carried out. The intra-articular trochlear fragment was anatomically reduced and temporarily held with K-wires. Absolute stability was achieved with the use of three divergent posteroanterior headless compression screws. The olecranon osteotomy was fixed with tension band wiring and a single screw (Fig 4).

Postoperatively, the patient was kept in an above-elbow backslab for two weeks, after which active physiotherapy was commenced. At the six-week follow-up visit, he had full pronosupination movements with a functional flexion–extension arc (20–130°). There were no signs of elbow instability. Owing to skin irritation and discomfort, the metalwork was removed at five months. There were no complications and at the final ten-month follow-up appointment, he achieved a pain free range of movement of the elbow joint of 0–130° (Fig 5).

Discussion

Isolated trochlear fracture is extremely rare³ and only few cases have been reported in the literature. No clear history has been described to outline the exact mechanism of injury to sustain such an injury. Of the few cases reported, only one was documented as being secondary to a fall on to an outstretched hand⁴ while the remaining cases were direct impacts to a flexed elbow.

Figure 1 Plain radiography of the elbow at the time of injury: anteroposterior (A) and lateral view (B) showing an anterior fat pad sign, with the unusual half-moon shaped fragment anteriorly (arrow)

The anatomy of the trochlea probably contributes to the rarity of this fracture as it is deeply situated in the elbow joint. In 1971 Worrell attributed the cause of an isolated trochlear fracture to a force transmitted from the palm of the hand through the ulna to the trochlea, following a fall on the outstretched hand, with the elbow extended.⁴

Conventional radiography remains an essential initial test in the evaluation of any elbow injury. One must also be familiar with the pertinent anatomy and the biomechanics of this complex joint to appreciate subtle injury patterns and articular disorders. This rare injury has been reported as a subtle articular surface irregularity on an anteroposterior view but as a characteristic half-moon shaped fragment anteriorly, with positive fat pad signs on a true lateral view of the elbow. Consequently, CT would seem far superior in terms of achieving diagnosis and further aiding with surgical planning.⁵ We recommend that

Figure 2 Sagittal computed tomography showing the superior displacement of the trochlear fragment with a small coronoid process fracture

Figure 3 Three-dimensional computed tomography reconstruction showing the isolated complete trochlear fracture and an intact capitellum

any unusual or potentially complex elbow injury requires early CT assessment.

There are different options for the treatment of intra-articular distal humeral fractures. These are dependent on the age of the injury and the degree of displacement. Non-operative treatment has been recommended for undisplaced fractures.³ This typically involves immobilisation of the elbow in 60° of fixation for 2–3 weeks, followed by gentle range of motion exercises.

There are only a few reported cases in the English literature on the management of isolated trochlear fractures. Worrell described a case of a displaced fracture of the trochlea treated with a single K-wire.⁴ The patient regained 10–120° of elbow motion at three months. Foulk *et al*

Figure 4 Plain radiography at three-month follow-up visit: anteroposterior (A) and lateral view (B)

Figure 5 Plain radiography at the final follow-up visit after metalwork removal: anteroposterior (A) and lateral view (B)

published a case with a similar injury that was treated with two cancellous screws through a standard medial approach.¹ The patient regained full range of motion (0–135°) at five months.

Nakatani *et al* reported treating the condition with two Herbert screws, using an anterior approach to the elbow, followed by immobilisation in plaster for ten days.⁶ By nine months, the patient had a pain free active range of motion of 15–135°. Kwan *et al* described treating two patients with Herbert screws through a standard medial approach, with a great outcome as full range of motion was achieved in both cases by one year.⁷

There was no reference to postoperative wound complications in the above literature, nor was there any mention

of ulnar nerve transposition for the surgical options. Smith recommended the use of posterior splint immobilisation for three weeks in an undisplaced fracture.⁸ If the fractured fragment is not amenable to surgery, excision and early motion compromise is the treatment of choice.

Excision surgery has also been adopted for this type of injury but has been reserved for chronic isolated trochlear fractures. Smith advocated this⁸ and Bashir *et al* also presented a case where an excision was carried out 6 weeks after the injury through a medial approach to the articular surface and at 14 months, there was pain free active range of motion (10–125°), with no evidence of elbow instability.⁹

To our knowledge, we are the first in the English literature to present a case of isolated trochlear fracture treated surgically through a transolecranon posterior approach. The functional result of a 0–130° flexion–extension arc was achieved by ten months. There is no evidence as to which surgical approach is superior but for non-acute, partially healed, difficult cases, using the posterior approach is an alternative option to gain more exposure than through the traditional medial approach.

Conclusions

Isolated trochlear shear fractures of the distal humerus are uncommon injuries that are difficult to diagnose and treat. High clinical suspicion and a low threshold of adequate imaging with CT can be essential in their management. Carefully planned open reduction and internal fixation, with headless screws, restores the articular congruity, even in delayed cases, and also provides a stable fixation that allows early mobilisation and subsequently a good functional outcome.

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