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Isolated Avulsion Fracture of the Lesser Tuberosity of the Humerus

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Six cases of isolated avulsions of the lesser tuberosity of the humerus were encountered within a short period of time. Although it seldom has been described in the literature, it might be a more common fracture than suspected. Physical examination revealed a painful shoulder with limited function in all six patients. In retrospect, all diagnoses could have been made on the primary plain roentgenograms. However, the fragment of the lesser tuberosity was easily misdiagnosed. An axillary view showed the fragment clearly in all cases. Computed tomography is useful for making an accurate diagnosis because it establishes the size and displacement of the fragment and determines additional injuries, such as a ruptured biceps tendon. Five patients

with displacement of the lesser tuberosity were operated on after several weeks or months. The lesser tuberosity was reattached in all cases. After 6 months three patients had slight impairment of elevation and external rotation, and one of them suffered from pain during movements of the arm. The patient with no fracture displacement was treated conservatively with a good result. In conclusion, we recommend an axillary roentgenogram as part of the posttrauma radiologic series of the shoulder. A nondisplaced avulsion fracture of the lesser tuberosity of the humerus can be treated conservatively. We recommend reattachment of displaced fractures.

Fractures of the lesser tuberosity of the humerus usually occur in association with fractures involving two or three segments of the proximal humerus or as a part of a posterior fracture dislocation.¹ An isolated avulsion fracture of the lesser tuberosity of the humerus is extremely rare. To our knowledge, only 34 cases have been reported.²⁻¹⁵ However, in the course of only 4 years, we have diagnosed six cases of isolated avulsion fracture of the lesser tuberosity of the humerus.

PATIENTS AND METHODS

From 1992 to 1994, three men and three women were treated for an isolated avulsion fracture of the lesser tuberosity (Table 1).

Case 1

A 37-year-old man fell from a height of 3 m onto the left arm and shoulder. External rotation and abduction were not possible because of pain. There was no neurovascular impairment. Roentgenograms and computed tomographic (CT) scan showed a comminuted avulsion fragment of the lesser tuberosity with displacement of the fragments to the medial side. Operation was performed through a deltopectoral approach. The lesser tuberosity fragments were reattached with two AO-screws. After 1 year he had slight pain in his shoulder; elevation was possible up to 150 degrees and there was some residual limitation in external rotation.

Case 2

A 54-year-old man presented with impaired function of the right shoulder 3 months after a fall. The diagnosis of a possible cuff lesion was made and the patient was treated with a collar and cuff sling followed by intensive physiotherapy, but this gave no improvement. Active elevation of the shoulder was possible up to 90 degrees, external rotation 40 degrees, and internal rotation also was impaired.

Roentgenograms showed a bone fragment caudal to the glenoid and a defect in the humeral head (Fig. 1). CT-arthrography revealed a leakage of contrast fluid suggesting a rotator cuff rupture. Exploration of the right shoulder through a deltopectoral approach revealed a loose lesser tuberosity with an attached subscapularis tendon. The biceps tendon was displaced out of the sulcus to the medial side. The bone fragment was reattached with two screws and the rotator cuff was repaired. One year after operation the function of the shoulder was normal and pain-free.

Case 3

A 21-year-old male rugby player fell on his left shoulder. All movements of the shoulder were impaired because of pain. After 4 months of physiotherapy the movements increased, abduction was actively possible to 90 degrees, and passive motion up to 120 degrees although accompanied by severe pain. Internal and external rotation were impaired. An axillary roentgenogram showed an avulsion of the lesser tuberosity. Computed tomography confirmed the diagnosis (Fig. 2). Because of the severe pain, the shoulder was explored through a deltopectoral approach. The small lesser tuberosity fragment was removed. The subscapularis tendon was reinserted into the humerus. Six months after operation the shoulder function had fully recovered and was pain-free.

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TABLE 1. Patient data and characteristics of 6 isolated avulsions of the lesser tuberosity

Case	Age	Sex	Delay (months)	Operation	Pain (6 months)	Elevation	Satisfaction
1	37	M	0	+	minor by elevation	150	moderate
2	54	M	3	+	no pain	180	good
3	21	M	4	+	no pain	180	good
4	63	F	0	-	no pain	180	good
5	61	F	3	+	no pain	130	moderate
6	49	F	1	+	no pain	160	good

Case 4

A 63-year-old woman fell on the right shoulder. She presented with pain in the right shoulder during rotation. Roentgenograms revealed an avulsion of the lesser tuberosity without dislocation. She was treated with a sling preventing external rotation and abduction for 3 weeks, after which pendulum exercises were started. After 2 months she was free of pain and she had a normal function of the shoulder.

Case 5

A 61-year-old woman presented with continuing pain and loss of function of the right shoulder 3 months after a fall. Initially, after the injury an anteroposterior roentgenogram had shown a small density caudal to the glenoid (Fig 3). No axillary views were made. The small density was interpreted as a small avul-

sion fracture of the glenoid joint. She was treated with physiotherapy but showed no improvement. On physical examination rotation was severely impaired and all movements were painful. Additional axillary roentgenograms showed an avulsion of the lesser tuberosity. CT-arthrography showed a cortical defect of the lesser tuberosity and a defect in the rotator cuff.

Four months after the fall the shoulder was explored. The biceps tendon was found to be ruptured. The bone fragment of the lesser tuberosity with the subscapularis was reattached with transosseal sutures. The rotator cuff was repaired. After 8 months the function had only partially recovered, possibly because of a rerupture of the rotator cuff.

Case 6

A 49-year-old woman fell out of bed after which she had severe pain and a functional impairment of the shoulder. Initial A-P roentgenograms showed no pathology. After 3 weeks, additional axillary views were made because of the severe pain and impaired function. These showed a large avulsion of the lesser tuberosity. The shoulder was explored through a deltopectoral approach (Fig. 4(A)). The lesser tuberosity was reattached with two AO-screws and nonabsorbable sutures (Fig. 4(B)). After operation the shoulder was immobilized with a sling preventing external rotation and abduction. The primary result 1 month after operation is encouraging.



FIG 1. Avulsion of the lesser tuberosity at the axillary roentgenogram.

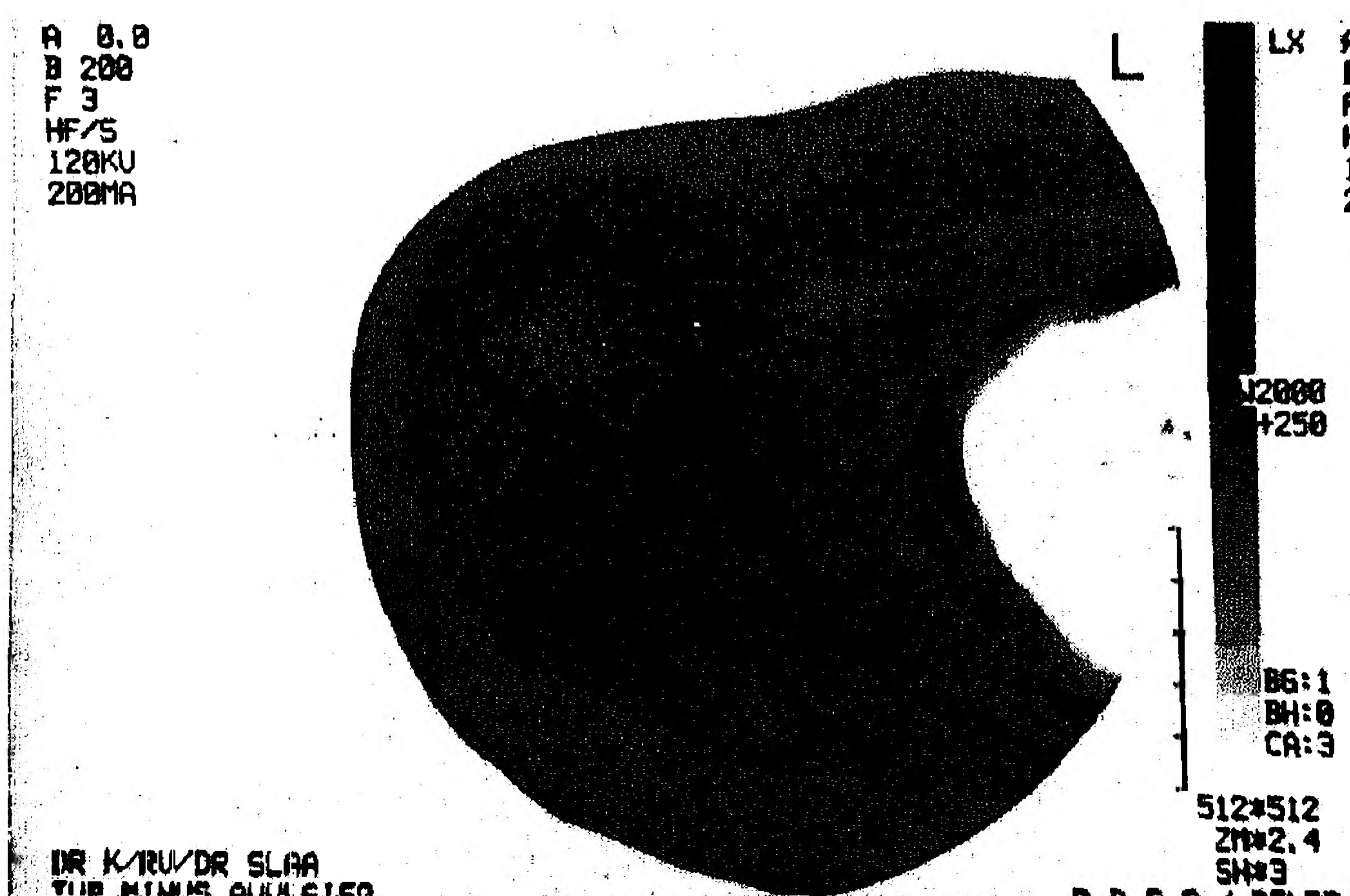


FIG 2. CT scan showing a large displaced fragment of the lesser tuberosity with attached subscapularis tendon.



FIG 3. Avulsion of the lesser tuberosity projected at the caudal edge of the glenoid.

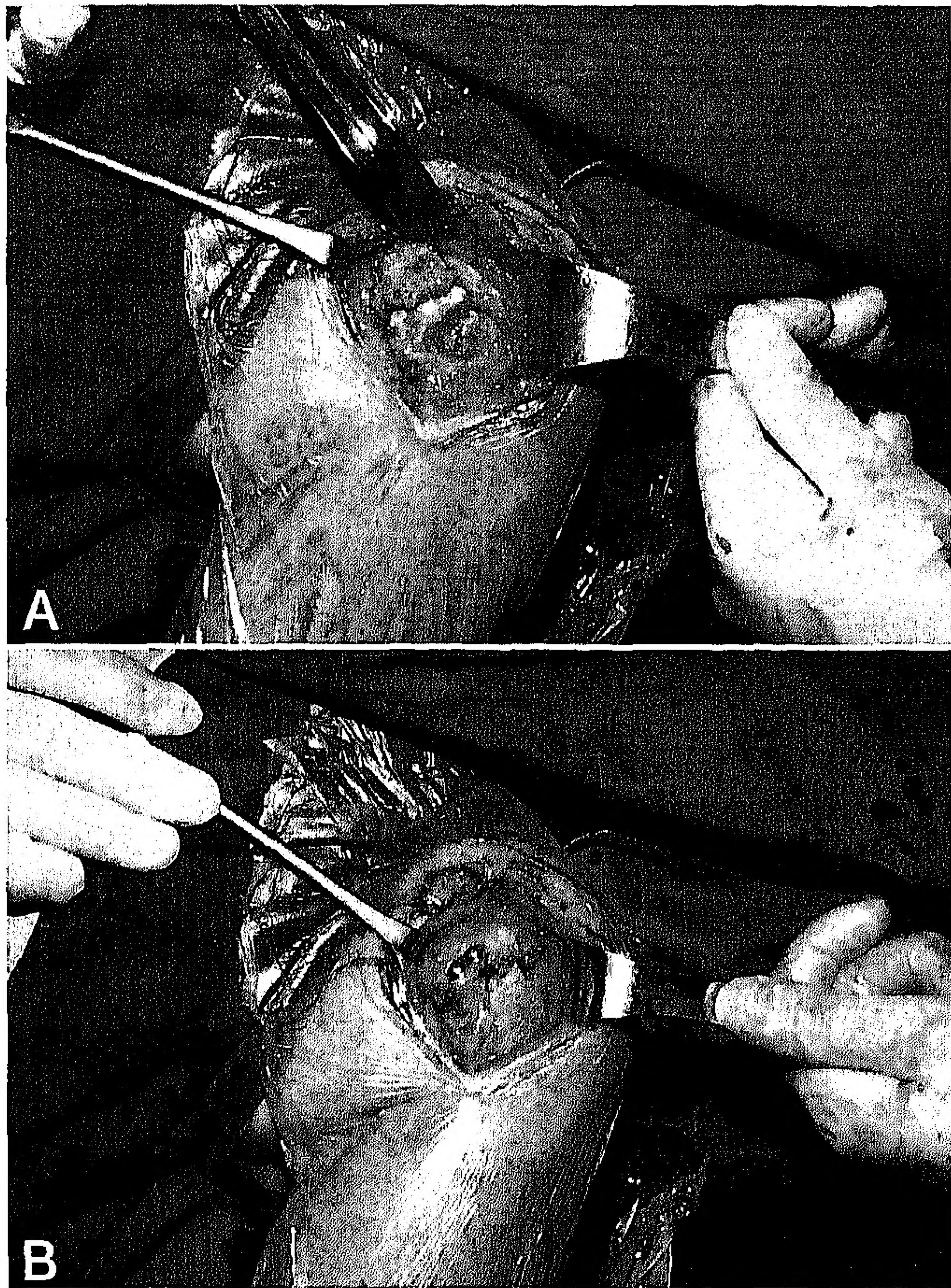


FIG 4. (A) Avulsion of the lesser tuberosity at exploration and (B) reattachment of the lesser tuberosity with 2 AO screws and non absorbable sutures.

DISCUSSION

Isolated avulsion of the lesser tuberosity of the humerus is encountered seldom and occurs after a fall with an abducted and externally rotated humerus.⁵ With the arm in this position the tension in the subscapularis muscle will be at a maximum, possibly causing an avulsion of the lesser tuberosity when additional force is applied through the trauma. Because of the position of the lesser tuberosity at the medial side of the humerus, a direct trauma is not very likely.

In a relatively short period we diagnosed six cases of isolated avulsion of the lesser tuberosity. This suggests that this might be a more common feature than was suspected. Because none of the patients could reconstruct the exact mechanism of injury that had occurred to the shoulder and arm, this had little diagnostic value. At physical examination all patients showed impaired internal and external rotation with severe tenderness. In retrospect all diagnoses could be made on roentgenograms in two directions. The fragment of the lesser tuberosity was in all the cases, but one (the nondisplaced fracture) projected at the caudal edge of the glenoid on the anteroposterior roentgenograms. The literature suggests that this easily can be misinterpreted as a calcific tendonitis or as an osseous Bankart lesion.⁴ An axillary view showed the fracture clearly in all cases. In our opinion an axillary view should be made in all posttrauma radiologic examinations of the shoulder. Computed tomography was valuable for establishing the size and displacement of the fracture and the possibility of an accompanying injury of the biceps tendon.

In one patient the avulsion was accompanied by a rupture of the biceps tendon and in another patient there was a medial dislocation of the tendon out of the sulcus. Five patients with displacement of the lesser tuberosity were operated on after several weeks to months. The lesser tuberosity was reattached in all cases and the rotator cuff repaired. After 6 months, three patients were free of pain with no impaired function. Three patients had slight impairment of elevation and external rotation, and one of them still suffered from pain during movements of the arm. One patient with no fracture displacement was treated conservatively with a good result. The few cases described in the literature showed similar results after operative treatment.^{6-10,15}

CONCLUSION

When the fracture of the lesser tuberosity is not displaced we recommend treatment with a sling preventing external rotation and abduction for 3 weeks. After this period the patient is allowed to start pendulum exercises. In cases of displacement of the lesser tuberosity we recommend reattachment of the lesser tuberosity with rotator cuff repair.

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