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Arthroscopic Treatment of Luxatio Erecta Humeri Associated with Greater Tuberosity Fracture, Bankart Lesion, and Partial Rotator Cuff Tear: A Case Report

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Conflict of interest: None declared

Patient: Male, 28-year-old
Final Diagnosis: Luxatio erecta humeri
Symptoms: Pain
Medication: —
Clinical Procedure: Arthroscopy • arthroscopic Bankart repair • arthroscopic fixation of greater tuberosity fracture • arthroscopic rotator cuff repair
Specialty: Orthopedics and Traumatology

Objective: Rare co-existence of disease or pathology

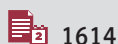
Background: Luxatio erecta humeri (LEH) is a rare injury present in only 0.5% of shoulder dislocations. Much of the relevant literature is focused on the initial management and proper reduction techniques, although the prevalence of associated injuries can reach 80%. A case of LEH associated with greater tuberosity (GT) fracture and rotator cuff (RC) tear in a young laborer managed with closed reduction and arthroscopic repair of the labrum and rotator cuff is presented.

Case Report: A 28-year-old man presented to our hospital with severe pain in his right shoulder after a high-impact motor vehicle accident. Standard anteroposterior radiographs revealed an inferior dislocation (LEH) of the right shoulder and a fracture of the GT. The patient was initially managed with closed reduction under mild intravenous sedation, using a 2-step maneuver followed by arthroscopic evaluation of the joint the next day. During arthroscopic evaluation, an anterior–inferior Bankart lesion, impaction of the humeral head with a minimal displaced GT fracture, and a partial RC tear were identified and successfully treated arthroscopically. The patient had immobilization in a simple sling for 6 weeks and he followed a standard 3-month physiotherapy protocol for rotator cuff, finally regaining almost normal range of shoulder motion at 1 year.

Conclusions: Although very good results of non-operative treatment of LEH have been reported in the literature, the co-existence of intra-articular lesions such as labral and rotator cuff tears makes arthroscopic repair an attractive alternative in individual cases.

MeSH Keywords: Rotator Cuff • Shoulder Dislocation • Shoulder Fractures

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Background

Luxatio erecta humeri (LEH), also known as inferior shoulder dislocation, was first described in 1859 by Middeldorpf and Scharm [1]. It is a rare injury accounting for about 0.5% of all shoulder dislocation cases [2–4]. The distinctive clinical presentation of fixed abduction at the shoulder with elbow flexion and forearm pronation can be the result of either a direct axial loading to a fully abducted arm or of an indirect force applied to a hyper-abducted arm combined with external rotation [3]. In the literature, LEH has been associated with various bony and soft-tissue injuries such as clavicular fractures and acromioclavicular dislocations, fractures of the acromion and scapula body, fractures of the glenoid, GT fractures, SLAP, Hill-Sachs, Bankart, and rotator cuff lesions, and even more neurovascular injuries [3,4]. Most of the reported cases and series have mainly focused on the initial management and proper reduction techniques, although the prevalence of associated injuries such as GT fractures or RC tears has been estimated to be as high as 80% [3].

We present a case of LEH with GT fracture and RC tear in a young man managed with closed reduction and arthroscopic repair of the labrum and rotator cuff.

Case Report

A 28-year-old male laborer was transferred to our hospital with severe pain in his right shoulder after a high-impact motor vehicle accident. He was riding a motorcycle and fell down on his abducted arm after a frontal collision with a bus. There was no history of previous shoulder dislocations or any other associated pathology. At clinical examination, no neurovascular impairment was found, and radial pulses were present and equal in both hands. His right shoulder was fully abducted, flexed at the elbow, and in full forearm pronation. Any effort to adduct the shoulder caused severe pain and resistance. No sensory impairment was documented, particularly at the distribution of axillary nerve.

Standard anteroposterior radiographs revealed an inferior dislocation (LEH) of the right shoulder and fracture of the GT (Figure 1). The patient was transferred to the operating theater, and closed reduction under mild intravenous sedation using a 2-step maneuver as described by Nho was performed [5]. All reduction maneuvers were performed under C-arm control. Subsequent radiographic evaluation demonstrated successful glenohumeral joint reduction and the presence of a GT fracture with minimal displacement. A CT scan was performed the following day to identify potential fracture of the glenoid rim (bony-Bankart lesion) and to assess the degree of GT fracture displacement (Figure 1D, 1E). Unfortunately, due to logistic

difficulties, an MRI could not be performed in a timely manner. Due to the young age of the patient and his occupational demands (construction worker), surgical treatment was offered to treat the tuberosity fracture and any likely concomitant intra-articular pathology.

Under general anesthesia, the patient was placed in the beach chair position. A typical posterior portal was created first for diagnostic arthroscopy, which revealed the presence of an anterior–inferior Bankart lesion (3 to 6 o'clock) (Figure 2A), a minimally displaced GT fracture with humeral head impaction (Figure 2B), and a partial tear of the rotator cuff (Figure 2C). The biceps tendon, the superior and posterior labrum, and the glenoid cartilage were intact, and no large Hill-Sachs lesion was identified.

After preparation of the antero-inferior glenoid rim with a shaver and adequate mobilization of the Bankart lesion, 3 single-loaded suture anchors (Iconix, All Suture Anchor 2.3 mm, Stryker, Greenwood Village, CO) were used to reattach the labral tissue back to the glenoid. The 3 anchors were placed in 3, 4, and 5 o'clock positions. At 5 o'clock position, the labrum was remarkably thin and damaged; therefore, the inferior glenohumeral ligament (IGHL) and capsule were mobilized and firmly reattached to the glenoid for repair reinforcement (Figure 2D). Subsequent subacromial arthroscopy revealed a partial tear near the junction of supraspinatus and infraspinatus tendons, which was repaired using the PASTA bridge technique [6]. With the scope inside the joint, 2 single-loaded suture anchors (Iconix, All Suture Anchor 2.3 mm, Stryker, Greenwood Village, CO) were placed just medial to the insertions of the supraspinatus and infraspinatus tendons (at the articular margin), at a distance of 1 cm between each other. With the medial-row anchors placed, the arthroscope was moved to the subacromial space, and 2 suture ends from each anchor were pulled outside from the lateral cannula and tied together. The knot was pulled onto the rotator cuff by pulling the other 2 strands of the anchors to create a horizontal mattress repair to stabilize the greater tuberosity in place. The remaining sutures were gathered and pulled through the lateral cannula. A ReelX STT knotless anchor (Stryker) was then attached to the sutures and fixed into position at the lateral side of the proximal humerus, securing and reinforce the fixation (Figure 2E). Throughout the whole procedure, we used 7 different portals to achieve best viewing and suitable angles for anchors positioning and fixation (Figure 2F).

A simple sling immobilization for 6 weeks was administered after discharge the next day, and the patient followed a standard rotator cuff rehabilitation protocol for 3 months, eventually regaining nearly full range of shoulder motion (Figure 3A–3C). He had 160° of forward elevation, internal rotation to the 11th thoracic vertebra, and 60° of external rotation. At 1-year

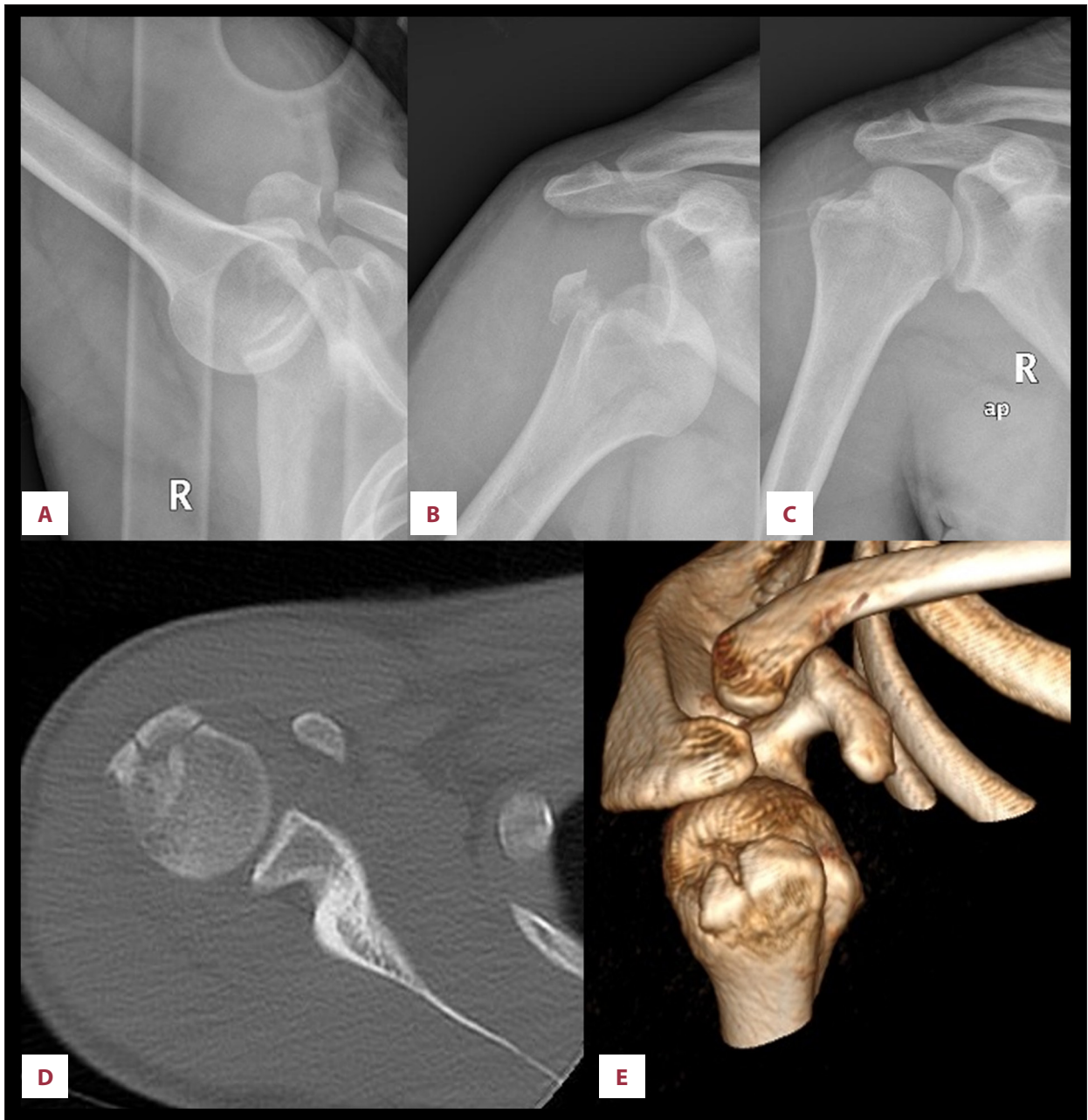


Figure 1. (A) A standard AP radiograph on admission revealed an inferior dislocation of the right shoulder and fracture of the greater tuberosity. (B) Conversion of the inferior dislocation to an anterior one. (C) Reduction of the anterior dislocation of the right shoulder. (D, E) Coronal and CT reconstruction scans showing a minimally displaced greater tuberosity fracture.

follow-up, the Constant score was 94 and he had a stable joint with excellent tuberosity healing (Figure 3D, 3E) and was therefore discharged from our care. During the follow-up period, he was evaluated with clinical examination and plain radiographs. Due to his uneventful recovery, no advanced imaging (CT or MRI) was deemed necessary in the post-operative period.

Discussion

Luxatio erecta humeri, or inferior dislocation of the shoulder, usually happens after high-energy injuries and thus is commonly associated with other concomitant shoulder injuries. As it is a rather rare injury, and the existing literature consists mostly of small case series or case reports.

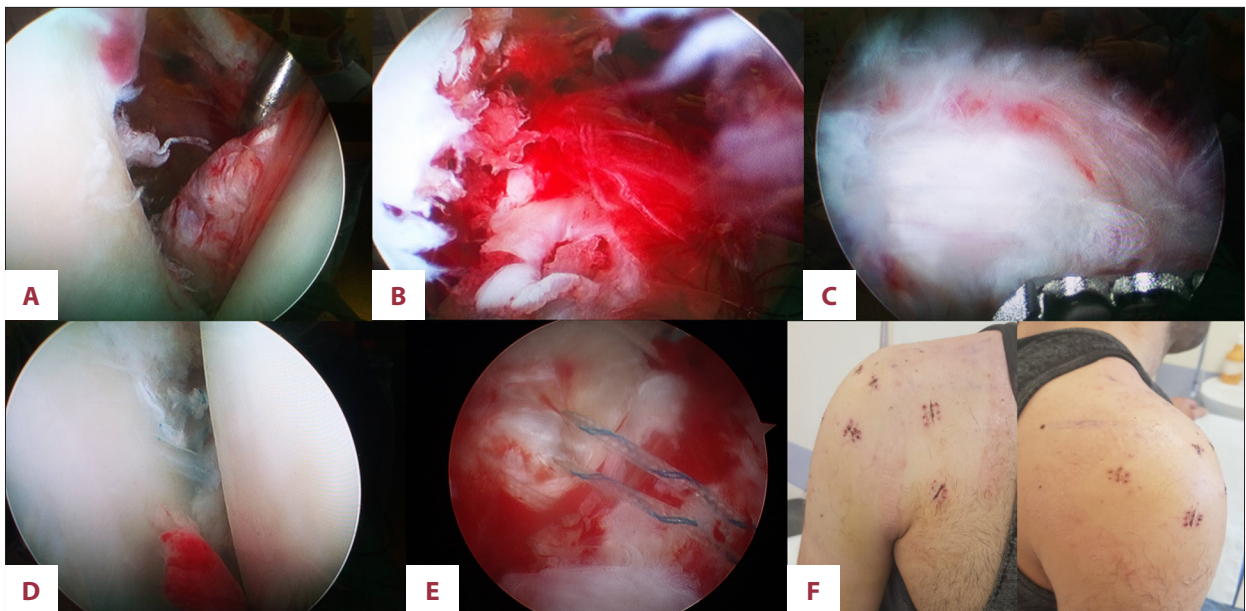


Figure 2. (A) Arthroscopic view of the Bankart lesion. (B) Arthroscopic view of the fracture line of the greater tuberosity. (C) Arthroscopic view of the partial tear at the junction of the supraspinatus and infraspinatus tendons. (D) Repair of the Bankart lesion. (E) Repair of the partial RC tear. (F) Anterior and posterior view of the shoulder showing the arthroscopic portals.

Mallon et al. [4] reviewed 80 cases and found concomitant GT fracture in 68% of cases, RC tears in 12%, fractures of the humerus in 37%, and neurologic injury (mainly axillary nerve palsies) in 60%. Vascular injury was reported to be present in 3.3% of the cases, which is still higher than in the other types of shoulder dislocation. Nambiar et al. [5] reviewed 199 patients from 101 articles and found proximal humerus fractures in 39%, neurological injury in 29% and vascular injury in 10% of patients.

Most of the literature so far has emphasized non-operative management of these injuries after closed reduction with either traction-countertraction or two-step techniques [7–11]. Shai et al. [12] first studied the role of arthroscopy in evaluating concomitant shoulder pathology, while Pandey et al. [13] reported 2 cases of inferior shoulder dislocation with associated RC tears that were treated arthroscopically, with good outcomes. Groh et al. [14] studied the outcomes of 16 patients (18 shoulders) over a 32-year period, reporting that surgery was necessary in 9 shoulders, mainly for displaced proximal humerus fractures or recurrent shoulder instability. Six of the 8 conservatively treated patients and 7 of the 8 surgically managed patients had a good or excellent result at final follow-up.

Regarding the presence of concomitant intra-articular pathology, Gagey et al. [15] showed in an experimental model that inferior dislocations produce similar patterns of labral tears as the classic anterior dislocations. Hassanzahed et al. [16] reviewed 10 cases and found that antero-inferior labral tears

were identified in all 4 patients that had undergone an MRI or MRI Arthrogram, while 2 of them also had RC tears, and the use of CT or CT arthrography 6 comminuted greater tuberosity fractures and 4 anterior–inferior glenoid fractures were identified as well. Finally, Krug et al. [17] retrospectively reviewed the MRI findings of 4 patients with inferior dislocations, and found evidence of labral tears in all 4, while 3 of them also had RC tears.

Given the above evidence, it seems reasonable to manage younger patients operatively, especially when there is a displaced GT fracture. In our case, the fracture of the GT determined our decision to perform surgery, together with the suspected intra-articular pathology, especially the Bankart lesion, which is apparently very common in inferior dislocations and has been reported to be present almost in 100% of cases with recurrent anterior dislocations [18].

The role of MRI or MR arthrography in the evaluation of soft-tissue shoulder pathology after dislocations has been clearly documented [19]. However, in a well-performed study from 2011 it was found that multi-detector CT arthrography had better accuracy than MR arthrography for bony and soft-tissue injuries [20]. In our case, we were unfortunately unable to obtain a pre-operative MRI scan within a reasonable timeframe. If one is to proceed with surgical treatment without either MRI/MRA or MDCT arthrography, it is highly recommended to be sure that all implants that might be needed to address the injuries identified during arthroscopy are indeed available.

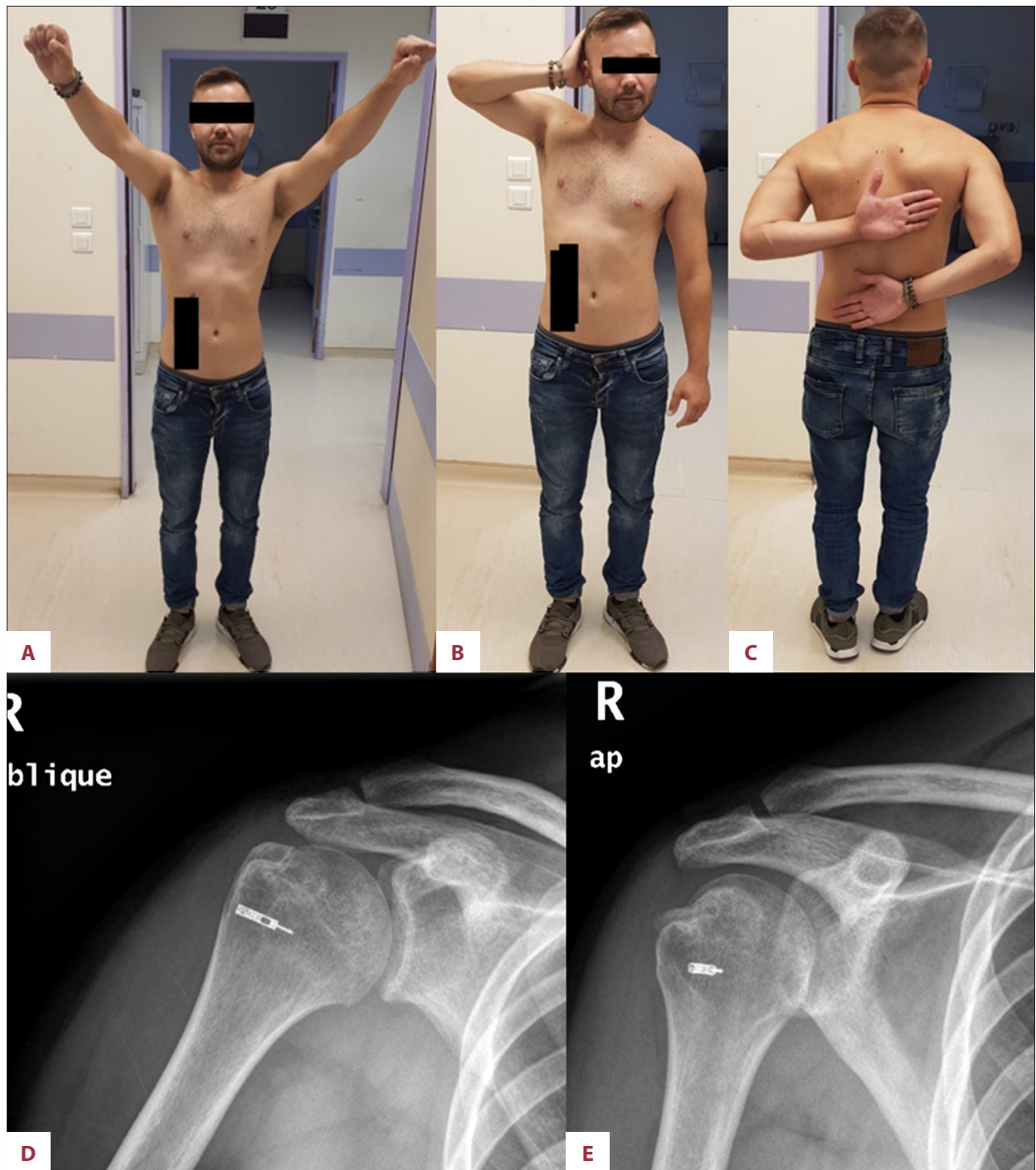


Figure 3. (A–C) Range of motion at 6-month follow-up. (D, E) AP of the shoulder in external and internal rotation showing reduction of the joint and healing of the greater tuberosity fracture at 12-month follow-up.

Our proposed strategy allows easy identification and treatment of concomitant injuries of the glenoid labrum, the RC, and the cartilage, and using the PASTA bridge technique, the fracture of the GT can also be held in place without the need for additional metalwork.

A limitation of this technique is that arthroscopic cuff repair requires a certain level of expertise and special equipment. Furthermore, the GT fracture should be adequately reduced or minimally displaced after reduction of the shoulder, because only minimal reduction manoeuvres can be performed arthroscopically. Finally, this treatment strategy is clearly not

applicable to all patients, as older and less active patients can certainly be successfully treated non-operatively, as the literature suggests.

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Conclusions

The arthroscopic technique we described offers a safe and reliable method to evaluate and address all associated lesions after closed reduction of LEH.