



Case report

Primary traumatic shoulder dislocation associated with rotator cuff tear in the elderly

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ABSTRACT

Introduction and importance: The shoulder is one of the most unstable joints of the body. Shoulder dislocation accounts for up to 60% of all major joint dislocations. This study reports two cases of primary traumatic shoulder dislocation and shows that in the elderly, primary traumatic shoulder dislocation is associated with a rotator cuff tear (RCT).

Case presentation: A case report and narrative review included two female patients, aged 63 and 100 years. Presenting symptoms were instability, pain, and restricted shoulder movement. Both were successfully treated by surgery. Arthroscopy was performed in the first patient and open reduction in the second patient.

Clinical discussion: In the first case, we found synovitis around the rotator interval, long head of the biceps tendinitis, and tears of the subscapularis tendon, supraspinatus tendon, and subacromial bursitis. The anterior labrum was normal. In the second case, complete detachment of the infraspinatus tendon was found. In both cases, rotator cuff repair was performed. Primary traumatic shoulder dislocation in the elderly is often associated with rotator cuff injury. Therefore, a detailed evaluation and management of the rotator cuff injury is essential. Rotator cuff injuries cause loss of dynamic stabilization of the shoulder, leading to recurrent shoulder dislocation and chronic shoulder instability.

Conclusion: The associated pathology of the primary traumatic shoulder dislocation in elderly are rotator cuff tear. The management of the rotator cuff tear in primary traumatic shoulder dislocation can prevent further shoulder instability events.

1. Introduction

The shoulder is one of the most unstable joints of the body [1]. Shoulder dislocation is a costly and significant problem and contributes up to 60% of all major joint dislocations [2,3]. The incidence of shoulder dislocation varies between 23.9 and 23.1 per 100,000 person per years. The incidence of pathological damage that occurs during a dislocation is high [2].

Acute shoulder dislocation is usually caused by a traumatic event involving the shoulder [3]. Dislocations can occur anteriorly, posteriorly, or inferiorly; however, the most frequent dislocations are anterior, accounting for approximately 96% of all cases [1].

The anteroinferior shoulder dislocation consists of four types, denoted by the humeral head position: subcoracoid, subglenoid,

subclavicular, and intrathoracic. Seventy percent of shoulder dislocations are subcoracoid, whereas 30% are subglenoid dislocations. The subglenoid subtype is a rare type of shoulder dislocation located beneath the inferior rim of the glenoid [4]. In this rare type, it is important to be aware of the associated potential axillary artery injury, brachial plexus complications, and rotator cuff tears (RCT). It should be excluded with a high index of suspicion [5].

The mechanism of trauma for anteroinferior dislocation may occur with the combination of abduction, external rotation, and extension [3]. Rapid hyperabduction of the arm at the shoulder, with extension at the elbow and pronated arm, usually results in subglenoid dislocation [3,4]. Complications may contribute to the severity of the subglenoid dislocation. Rotator cuff injuries occur in around 35%–86% of cases, fractures in around 30% of cases, neurological damage in approximately

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Table 1

Case presentation.

	Case 1 ♀	Case 2 ♀
Side	Right	Right
Age at diagnosis	63 years	100 years
Presenting symptoms	Pain Restricted shoulder movement	Pain Restricted shoulder movement
Trauma mechanism	Direct impact	Direct impact
Range of motion	Forward flexion 90° Extension 30° Abduction 45° External rotation 20°	Arm locked in the abduction of 130° & external rotation position
Neer test	+	N/A
Jobe test	+	N/A
Drop-arm test	+	N/A
Hawkins test	+	N/A
X-ray	N (after spontaneous reduction)	A complete inferior dislocation of the humeral head lying beneath the glenoid cavity
USG	Suggested complete/partial tear of the supraspinatus tendon, infraspinatus tendon, & subscapularis tendon	N/A
Intraoperative findings	Tear of the subscapularis tendon Tear of the supraspinatus tendon Long head biceps tenosynovitis Capsular synovitis at the rotator interval	Tear of the infraspinatus tendon

Abbreviations: N: normal; N/A: not assessed; USG: ultrasonography.

21%–50% of the cases, and vascular injury complications in 86% of patients. Immediate reduction is required to avoid such complications [3].

As in a Bankart lesion, anterior labral injury is common in the first occurrence of anterior shoulder dislocation in young adults [6]. Some authors mentioned that an RCT was involved in older patients after anterior shoulder dislocation. The cut-off age was 40 years, as mentioned by Neviasser et al., to 60 years, as mentioned by Gumina and Postacchini [7,8]. RCT injury in elderly patients must be highly suspected when they present with shoulder pain and cannot abduct the shoulder despite labral injury or axillary nerve injury possibly occurring [7–11]. The identification of an associated injury will help to predict the recurrence of shoulder dislocation [10]. Meanwhile, the decision for surgery in elderly patients would also help the surgeon avoid prolonged immobilization morbidity [11].

This study reports our experience in two cases of primary traumatic shoulder dislocation in the elderly. We made this case report and narrative review to show that the primary traumatic shoulder

dislocation in the elderly is associated with an RCT [6,8]. This case report has been reported in line with the SCARE 2020 criteria [12].

2. Case presentation

We report two primary traumatic shoulder dislocation cases in the elderly: the first case is of a 63-year-old woman and the second is of a 100-year-old woman. Both were caused by a traumatic event, namely, a fall, with direct injury to the shoulder. Table 1 presents the patients' data.

2.1. Case 1

The first case was of a 63-year-old Indonesian woman who presented with pain in the right shoulder and restricted shoulder movement at the time of the initial examination. Her dominant hand was the right hand.

She was active as a housewife. A week ago, she tripped and fell with direct impact to her right shoulder. She felt pain right after and was unable to move her shoulder. She visited a local bonesetter for massage, but she still felt pain and could not move her shoulder. On further questioning, she admitted that there was a spontaneous reduction feeling of her right shoulder when lying down. She still felt pain and restricted shoulder movement.

An examination of the right shoulder showed a decreased range of motion of forwarding flexion 90°, extension 30°, abduction 45°, and external rotation 20°. There was normal internal rotation. On presentation, her shoulder showed no swelling. There was tenderness at the anterior side of her right shoulder. Positive results were found for the Neer test, Jobe test, drop-arm test, and Hawkins test, which indicated rotator cuff pathology or RCT. A positive Speed test indicated bicipital tendinosis. The Obrien test was also positive in this patient.

An X-ray of her right shoulder was taken after she felt spontaneous reduction feeling. The X-ray demonstrated no obvious dislocation or pathology. Her right shoulder ultrasound examination suggested a complete/partial tear of the supraspinatus tendon and subscapularis tendon (Fig. 1). A presumptive diagnosis of traumatic RCT was made preoperatively. Arthroscopy was performed for diagnostic and therapeutic assessments (Fig. 2). The rehabilitation protocol was scheduled in four phases.

2.2. Case 2

The second case was of a 100-year-old woman, right hand dominant, who presented to our Orthopedic Clinic. She came with the chief complaint of pain and inability to move her right shoulder (Fig. 3). She admitted that she fell when she walked into her kitchen four weeks ago. When she fell, she injured her right shoulder directly. After the accident, the patient's complaint commenced. As she had a dementia problem, we could not obtain enough information of the injury mechanism other than a fall during walking. A physical examination showed loss of normal

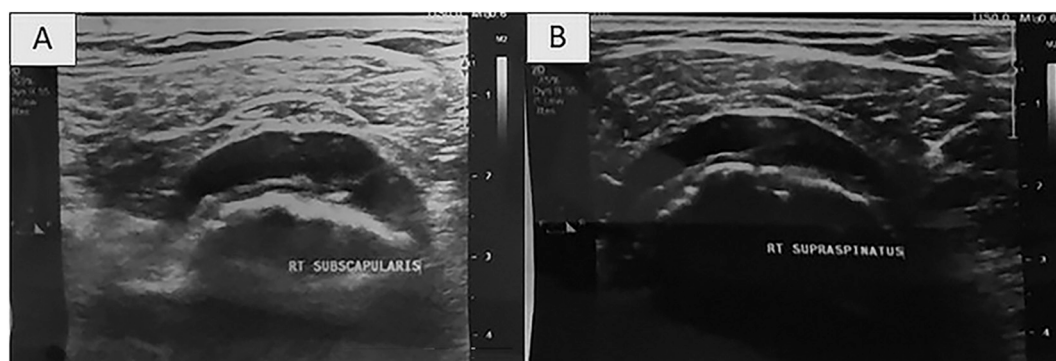


Fig. 1. A preoperative ultrasound examination suggested a complete/partial (A) tear of the subscapularis tendon and (B) supraspinatus tendon.

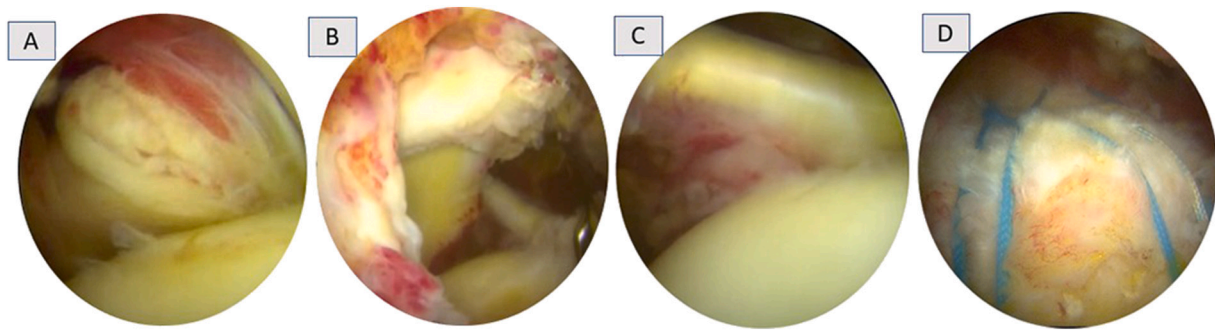


Fig. 2. The arthroscopic view shows the torn (A) subscapularis tendon and (B) supraspinatus tendon. The arthroscopic view shows (C) single-row rotator cuff repair of the subscapularis tendon and (D) double-row repair of the supraspinatus tendon.

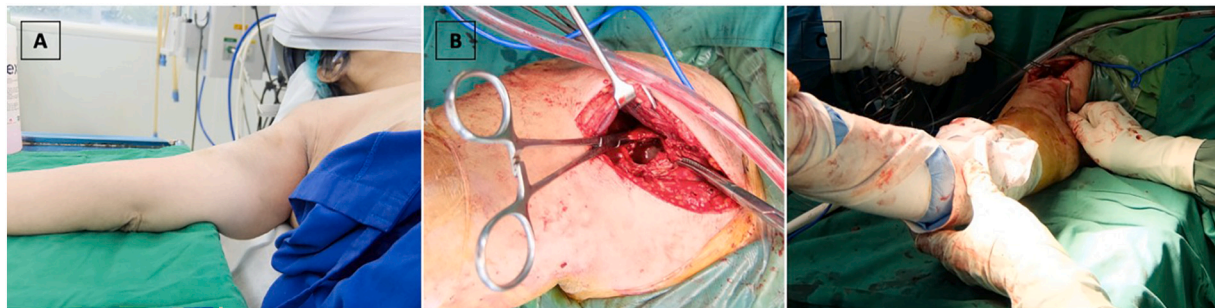


Fig. 3. (A) The patient is supine and the shoulder in the abduction position. (B) Inferior dislocation of the humeral head lying beneath the glenoid cavity. (C) Intraoperative reduction of the humeral head into the glenoid cavity.

contour of the shoulder. Her right arm was locked in the abduction of 130° and external rotation position. We also found a prominent acromion and the presence of a deep subacromial sulcus laterally, with the head of the humerus palpable in the axilla. There was a neurological deficit; the patient felt numbness at her forearm through her shoulder, which was worsening by the day.

An anterior–posterior radiograph of the right shoulder revealed no bone discontinuity and complete inferior dislocation of the humeral head lying beneath the glenoid cavity. The delay between the time of injury and reduction was a month. We performed the operative treatment with open reduction and rotator cuff repair because the patient felt uncomfortable in her right arm and had neurological deficits.

3. Results

3.1. Case 1

The beach chair position was selected for this patient, using a specially made frame for this arthroscopy surgery. The mean arterial pressure was maintained at 65 mmHg. Marking of the skin was established and showed the clavicle site, acromioclavicular joint, and acromion margin from the anterior to lateral to posterior continuously with a line of spina scapulae. The portal marking site was established for the posterior portal, lateral subacromial portal, anterior portal, Neviaser portal, and “50-yard” posterolateral portal. The posterior portal was the first portal established.

3.1.1. Arthroscopic findings

The patient underwent arthroscopy of her right shoulder, with findings of synovitis around the rotator interval, long head biceps tendinitis, and tears of the supraspinatus tendon, subscapularis tendon, and subacromial bursitis (Fig. 1). The anterior labrum was normal. The cartilage of the humeral head was found to be smooth and normal.

3.1.2. Arthroscopic treatment

We performed triple release (rotator interval, anterior and interior parts of soft tissue around the subscapularis tendon surface) to facilitate a subscapularis repair. A partially torn subscapularis tendon was repaired by a single-row anchor suture using HEALICOIL PK (Smith & Nephew, Andover, MA, USA) concomitantly with a bicep tenodesis (the lasso loop technique). The procedure was continued with the debridement of the subacromial bursa sufficiently to facilitate the supraspinatus tendon repair. The supraspinatus tendon was repaired using a double-row anchor suture using FOOTPRINT Ultra PK 4.5 (Smith & Nephew, Andover, MA, USA). Postoperative immobilization was performed by using an abduction arm brace.

3.2. Case 2

3.2.1. Open reduction and rotator cuff repair

Surgery was performed with the patient in a supine position and the right upper limb fixed in abduction with the shoulder elevated 30° (Fig. 2). We attempted reduction using traction–countertraction and the two-step method under general anesthesia, but the reduction could not be achieved [13,14]. Using the deltoid–pectoral approach, a buttonhole entrapment of the humeral head by the inferior capsule was identified. After removing the entrapment, the dislocation was reduced using the two-step maneuver. Intraoperatively, we found a complete detachment of the infraspinatus tendon. Therefore, we performed the repair of this lesion. Tenotomy of the short head biceps tendon was performed, and transferred to long head biceps tendon. The completely torn infraspinatus tendon was repaired using Twinfix Ti 5.0 (Smith & Nephew Endoscopy, Andover, MA, USA) suture anchor with an ultra-high-molecular-weight polyethylene suture (Ultrabraid no. 2, Andover, MA, USA) and needles were inserted medially and laterally into the greater tuberosity while retaining the reduction position.

Postoperative management for this patient was a sling and swathe for 2 weeks. Passive range of motion exercises were started at 3 weeks

Table 2
Review of recent literature reporting shoulder dislocation in the elderly.

Author	Study design	Participants	Associated injury	Management	Result
Sang-Jin Shin et al. [33]	Prospective	67 patients (≥ 60 years old)	33 RCT, 3 isolated Bankart lesions	Operatively & nonoperatively	Nonoperatively better than operatively ($p < 0.01$)
Valentino D Abballe et al. [34]	Prospective	104 patients (subdivided into < 60 & ≥ 60 years)	75 Hill-Sachs lesions, 16 greater tuberosity fractures, 5 coracoid fractures, 39 glenoid bone defects, 17 axillary nerve injuries	Operatively	Acute high-grade RCT higher frequency in older populations
C.M. Robinson et al. [35]	Prospective	3633 patients (mean age = 47.6 years)	492 neurological deficits, 1215 either RCT or a greater tuberosity fracture, 282 combined injuries	Operatively & nonoperatively	The prevalence of RCT, greater tuberosity fractures, & neurological injuries associated with traumatic shoulder dislocation increases with advancing age, female sex, & low-energy injury
A. López-Hualda et al. [15]	Prospective	49 patients (subdivided into > 40 & < 40 years)	Labrum injury, Hill-Sachs lesions, Bankart lesions, RCT	Arthroscopic treatment	Anterior recurrent dislocation in those > 40 years is usually associated with RCT
Makovskiy AA et al. [16]	Prospective	101 patients (subdivided < 60 & > 60 years)	–	Observation; underwent radiography & MRI	The risk of rotator cuff damage in older patients is 11.15 times (95% CI 4047–30,734) higher than in young patients
Ashraf Atef et al. [19]	Prospective	240 patients (mean age = 35.2 years)	144 associated lesions: 67 RCT, 38 axillary nerve injuries, 37 greater tuberosity fractures; all Hill-Sachs & Bankart lesions were combined; no isolated cases	Nonoperatively	RCT was the most common associated injury in anterior shoulder dislocation
Chan W.W. et al. [36]	Retrospective	146 patients (> 40 years)	Bankart lesion & RCT	Operatively	RCT should be suspected & repaired in patients with anterior instability, especially in those aged ≥ 50 years
Robinson E.C. et al. [37]	Prospective	27 patients (mean age = 55 years)	18 RCT, 18 Bankart lesions, 9 have both combined, 3 HAGL lesions, 2 ALPSA lesions	Operatively	RCT combined with a Bankart lesion were the most common associated injury in traumatic shoulder instability
Gumina S. et al. [8]	Retrospective	108 patients (≥ 60 years)	11 axillary nerve injuries, 58 RCT	Operatively & nonoperatively	20% suffer redislocation & 60% have a cuff tear
Ernstbrunner L. et al. [38]	Retrospective	35 patients (mean age = 47 years)	Bankart lesion	Operatively	Failure rate higher than that reported previously

Abbreviations: HAGL: humeral avulsion of the glenohumeral ligament; ALPSA: anterior labral periosteal sleeve avulsion; MRI: magnetic resonance imaging; RCT: rotator cuff tear.

postoperatively, and active range of motion exercises were started at 6 weeks postoperatively. Currently, the patient has improved her daily activities, with pain reduction. Three months after the injury, the shoulder function has improved to perform daily activity. No recurrent dislocation or instability was noted three months after the surgery.

4. Discussion

In elderly patients, the rotator cuff weakens and is more prone to tearing. Hsu and colleagues showed that RCT could result in abnormal glenohumeral translations in a cadaver model. Small tears resulted in anteroinferior translation, and larger tears resulted in more direct anterior translation [15]. Makovskiy showed that the humeral head dislocates in the presence of less extensive capsuloligamentous lesions when rotator cuff lesions are present [16]. Moreover, the passive stabilization provided by the rotator cuff appeared more easily disrupted when associated with ligamentous lesions on the humeral side than with lesions on the glenoid side [16].

There are two mechanisms of injury in shoulder instability. The anterior mechanism occurs in young adults whose rotator cuff is stronger and healthier. Therefore, shoulder instability is mostly because of the anterior labrum and capsule (Bankart lesion). However, in the elderly with a weakened rotator cuff, instability is caused by rotator cuff injury. Table 2 shows the review of recent literature reporting anterior shoulder instability in the elderly [2].

The association between age at first dislocation and rate of recurrent instability in those aged 15–20 and 15–30 years is approximately 50%. Lower recurrence rates are seen in people aged between 41 and 60 years and over 61 years, and the rate does not vary significantly between these two groups [17]. All studies included in this review found that age was associated with recurrent instability, with people aged 40 years and under 13.46 times more likely to suffer from recurrent instability than those over the age of 40 years. This may be due to differences in

biomechanical properties, collagen fiber type, capsule elasticity, or changes in activity level as a function of age [17,18]. Older patients who sustain a primary shoulder dislocation are much less likely to suffer from recurrence than younger patients. Differences in the mechanism of injury are largely responsible for the increased incidence of instability in younger patients and the increased likelihood of RCT in patients aged 40 years and over [15].

Shoulder dislocations in older patients tend to occur because of low-energy mechanisms and are associated with less risk of recurrent dislocation; however, pain and disability can persist for years as a result of associated RCT and nerve injuries [16]. In the young, Bankart tears render the shoulder inherently unstable, with the loss of the static restraints [19]. In patients aged ≥ 40 years, the rotator cuff usually tears [20].

RCT injury in primary traumatic shoulder dislocation in the elderly is quite common. Its incidence increases with advancing age, and the frequency ranges between 7% and 32% [21,22]. This higher finding of RCT injury than labrum injury was supported by the postulated posterior mechanism of instability by Craig where a preexisting degenerative or weak rotator cuff becomes more prone to fail during an anterior shoulder dislocation. However, either labrum injury or axillary nerve injury could occur [23].

The history of falling with the hand in an outstretched position and the suspected direct hit on the right shoulder in both patients was similar to the postulated posterior mechanism of instability. This mechanism will cause existing degeneration of RCT prone to injury. Pain and inability to move shoulder joints could be a sign of other serious injuries, including axillary nerve injury. In the first case, the patient was massaged by a bone setter, had a spontaneous relocation of her right shoulder joint, and did not suffer axillary nerve injury. The finding of limited shoulder forward flexion, abduction, adduction, and extension, followed by pain in both cases, highly indicated RCT injury.

In the first case, X-ray imaging of the right shoulder revealed no

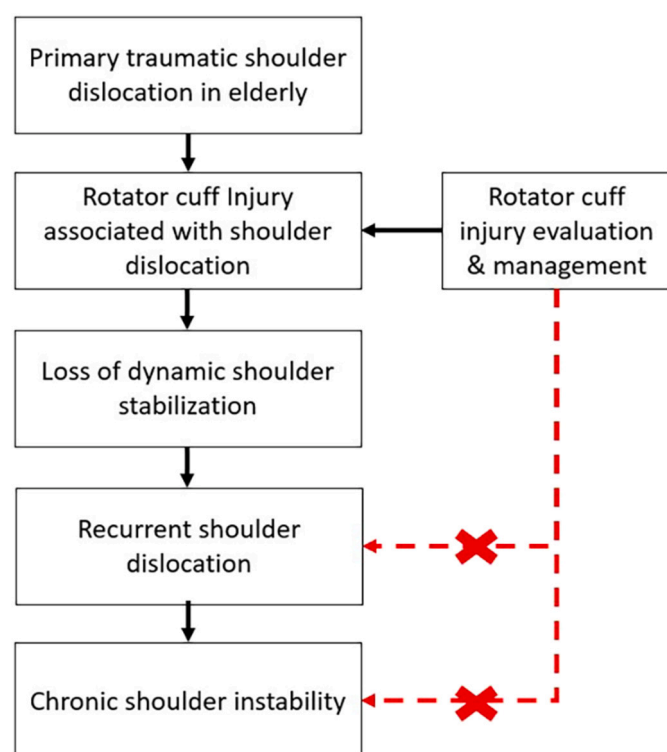


Fig. 4. An algorithm for the correlation of primary traumatic shoulder dislocation, rotator cuff injury, and chronic shoulder instability.

fractures. Ultrasound revealed fluid accumulation and tears of the supraspinatus, infraspinatus, and subscapularis tendon. This limited imaging was quite useful, even though it could not give details of the injuries. Ultrasound imaging could be useful to detect rotator cuff injury, but cannot provide geometrical details of rotator cuff injury. Details of the geometrical size or type of RCT will help decide the treatment method and expected outcome preoperatively [23]. The Anterior Shoulder Instability International Consensus Group also gives strong consensus to undertake advanced imaging when there is suspected or known shoulder instability [24]. The decision to select advanced imaging must be made for a specific purpose. It must be considered, especially in Indonesia, when advanced imaging (MRI, CT scan) facilities vary in terms of available technology, national insurance coverage, and even operational hours. Preoperative preparations must be done well when deciding against advanced imaging [25].

Diagnostic arthroscopy in the first case found synovitis around the rotator interval, long head biceps tendinitis, and tears of the supraspinatus tendon, subscapularis tendon, and subacromial bursitis. The anterior labrum was normal, and the cartilage of the humeral head was smooth and normal. These findings were expected preoperatively as this was the first occurrence of anterior shoulder dislocation in an elderly patient [21].

In the second case, because of the complete detachment of the infraspinatus tendon, the reduction was inhibited with the force couple's disruption toward the humeral head by the rotator cuff tendon. Reducing shoulder dislocations in older individuals with RCT is a challenging factor. The rotator cuff tendon applied the compressive force to the glenoid by maintaining the humeral head position centered on the glenoid and ensuring glenohumeral stability against inferior movement due to RCT associated with inferior shoulder dislocation (ISD) caused inferior instability. Instability can remain after reduction for ISD accompanying an RCT, as in this patient. Therefore, it is suggested to prepared for possible implantations to restore these lesions following reduction. In this case, the instability increased after the initial reduction because of the RCT [26].

In the first case, the supraspinatus and infraspinatus tendons were repaired using double-row anchor suture and transosseous-equivalent repair technique. In the second case, rotator cuff repair was also performed. Rotator cuff repair aims to achieve restoration of the footprint as much as a possible [27]. Some meta-analysis studies showed that double-row rotator cuff repair resulted in higher rates of structural healing and a tissue-compression effect that affected rotator cuff healing [28,29]. Although the transosseous-equivalent showed a marked improvement in biomechanical factors ultimate load, stiffness, gap formation, and contact area [30], some considerations of double-row rotator cuff repair were increased, such as implant cost and operative time [26], and might not universally translate into better overall clinical function [29,31].

Three months after the injury, the shoulder function has improved to perform daily activity. No recurrent dislocation or instability was noted 3 months after the surgery. The rotator cuff plays a lesser role in shoulder stability, and in general, only massive tears result in recurrent instability. The recurrence rate after an initial shoulder dislocation is much lower in older patients than in younger patients, possibly because the former tend to sustain rotator cuff ruptures, whereas the latter tear the anterior stabilizing structures and glenohumeral ligaments [20,32].

Primary traumatic shoulder dislocation in the elderly is often associated with rotator cuff injury. Therefore, a detailed evaluation and management of the rotator cuff injury is essential. Rotator cuff injuries cause loss of dynamic stabilization of the shoulder, leading to recurrent shoulder dislocation and chronic shoulder instability. It can be concluded that the treatment of rotator cuff injury on primary traumatic shoulder dislocation in the elderly can prevent chronic shoulder instability (Fig. 4).

5. Conclusion

The associated pathology of the primary traumatic shoulder dislocation in elderly are rotator cuff tear. The management of the rotator cuff tear in primary traumatic shoulder dislocation can prevent further shoulder instability events. Treatment should focus on early closed reduction and physical therapy to restore movement and strength. For elderly patients who have failed nonsurgical treatment, early diagnosis and treatment of the related RCT can yield satisfactory results.

Declaration of competing interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

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Ethical approval

The patients received an explanation of the procedures and possible risks of surgery and gave written informed consent. Ethical approval has been granted in this study. The privacy and personal identity information of all participants were protected in accordance with the Declaration of Helsinki.

Consent

The patient received an explanation of the procedures and possible risks of the surgery and gave written informed consent. My manuscript does not contain any individual person data. Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Author contribution

Renaldi Prasetya: Surgeon, conceptualization, visualization, methodology, writing, and supervision.

Hans Kristian: Writing.

Wendy Yolanda Rosa: Conceptualization and writing.

Adrian Fakhri Ismiarto: Conceptualization and writing.

Petrasama: Surgeon, conceptualization, and writing.

Ghuna Arioaharjo Utoyo: Surgeon, conceptualization, and writing.

Research registration

This is a case report and narrative review, not a clinical study.

Guarantor

The guarantor in this study is Renaldi Prasetya.

Provenance and peer review

Not commissioned, externally peer-reviewed.

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