Restoring Shoulder Function After AC Joint Dislocation: The Role of Adjustable Loop Fixation….

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ABSTRACT

Acromioclavicular (AC) joint injuries, common in active young adults, differ significantly from glenohumeral joint injuries in structure, function, and clinical presentation. AC joint injuries primarily result from direct or indirect trauma. These injuries are classified using the Rockwood system, with high-grade separations often requiring surgical intervention. This study evaluates the effectiveness of AC joint fixation using an adjustable loop technique with Endo-button fixation performed at KLE Hospital and MRC, Belagavi. Inclusion criteria were patients aged 15-50 with AC joint dislocations, excluding those with associated shoulder pathologies or comorbidities. Post-operative improvement was assessed using the Nottingham Clavicle Score (NCS) and range of shoulder abduction. Results indicated significant improvement in shoulder function and abduction at 6 months post-surgery. The adjustable loop technique demonstrates a high success rate in restoring shoulder function, providing stable fixation and enabling progressive rehabilitation. While complications like clavicle prominence and the need for conversion to open surgery were observed in a few cases, the technique appears reliable for restoring shoulder function with minimal long-term deficits..

Aim: To assess the functional outcome of shoulder joint after fixation of AC joint disruption.

Introduction:

The acromioclavicular (AC) joint differs from other synovial joints, in several key aspects [1,2,]. Structurally, the AC joint is a plane type synovial joint with flat articular surfaces and fibrocartilage lining [3], while the glenohumeral joint is a ball-and-socket joint allowing for a wider range of motion and is lined with hyaline cartilage [4]. Functionally, the AC joint primarily facilitates gliding movements and serves as a connection between the scapula and clavicle, contributing to shoulder girdle coordination [5,6]. In contrast, the glenohumeral joint enables extensive movements like flexion, extension, and rotation, making it essential for arm mobility. AC joint allows the transmission of forces from the upper extremity to the clavicle.
AC joint is essential for upper limb function and weight-bearing capacity [7,8]. A healthy AC joint can undergo translation and rotation to accommodate scapulothoracic motion and shoulder abduction [9, 10]. Clinically, injuries to the AC joint often result in dislocations due to trauma, whereas glenohumeral injuries may involve more complex issues related to mobility and stability [11, 12].Acromioclavicular (AC) joint injuries commonly occur due to two

primary mechanisms: direct trauma and indirect trauma. Direct trauma typically involves a fall directly onto the shoulder with the arm adducted, which forces the acromion inferiorly while the clavicle remains in place, leading to sprains or tears of the AC and coracoclavicular ligaments. Indirect trauma, such as a fall on an outstretched hand (FOOSH injury), transmits force through the humerus to the acromion, often resulting in lower-grade injuries that primarily affect the AC ligaments while sparing the coracoclavicular ligaments [13, 14]. Acromioclavicular (AC) joint dislocations are often accompanied by various associated injuries, which can complicate diagnosis and treatment. Acromioclavicular (AC) joint injuries are common, especially among active young adults, accounting for approximately 9% to 12% of all shoulder girdle injuries. The incidence of AC joint dislocation is estimated at 1.8 per 10,000 inhabitants per year. These injuries occur five times more frequently in men than women, with the highest incidence in the 20- to 30-year-old age group. Commonly observed injuries include superior labral anterior-posterior (SLAP) lesions, particularly in high-grade dislocations, and fractures of the clavicle or acromion. Additionally, there may be rare occurrences of brachial plexus injuries, which can lead to neurological deficits [15, 16]. These associated injuries highlight the importance of thorough clinical evaluation and imaging to ensure comprehensive management of shoulder trauma following an AC joint dislocation.

AC joint injuries are classified using the Rockwood classification system, which categorizes them into six types based on the severity of ligamentous damage:

Type I involves a stable joint with no disruption, while **Types II** and **III** indicate partial and complete tears of ligaments, respectively. Higher-grade injuries **(Types IV-VI)** involve significant instability and may require surgical intervention [17, 18]. And these dislocations are often accompanied by various associated injuries, which can complicate diagnosis and treatment. Commonly observed injuries include superior labral anterior-posterior (SLAP) lesions, particularly in high-grade dislocations, and fractures of the clavicle or acromion [19, 20].

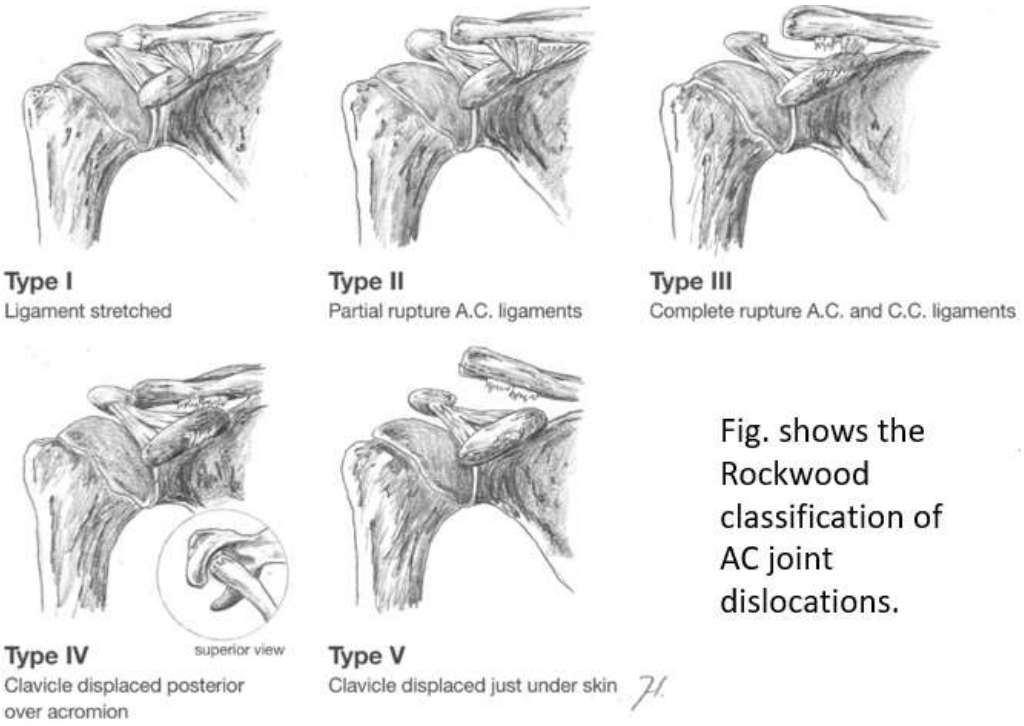


Fig. shows the Rockwood classification of AC joint dislocations.

Indications:

Acromioclavicular (AC) joint reconstruction primarily include high-grade separations, specifically Types III to V according to the Rockwood classification, where there is significant ligamentous damage and instability. Patients experiencing greater than 2 cm of displacement or those with a visibly prominent clavicle, particularly in heavy labourer occupations or athletes, may also require surgical intervention to restore function and alleviate pain. Acute injuries that do not respond to conservative treatment within three weeks may necessitate reconstruction, as timely surgical intervention can improve outcomes. Additionally, chronic cases with persistent symptoms despite non-surgical management are strong candidates for reconstruction to enhance stability and functional recovery. Various surgical techniques, including anatomic ligament reconstructions with tendon grafts, are employed based on the specific nature and timing of the injury [21, 22].

Materials and Methodology:

The inclusion criteria included patients of age group 15-50 yrs of age , presented to OPD or casualty with ac joint dislocation. Patients with other associated shoulder pathologies were excluded. And patients with co-morbidities(epileptic orders, neurological disorders , open injuries) were excluded as well for better assessment of the fixation.

All the cases collected were performed at KLE Hospital and MRC, Belagavi. The operative procedure for acromioclavicular (AC) joint fixation using an adjustable loop involves a minimally invasive technique aimed at restoring joint stability following dislocation. The patient was positioned in a "beach chair" setup under general anaesthesia, and a small incision was made near the clavicle to access the AC joint and coracoid process. After exposing the joint, two anchors were fixed at the base of the coracoid, and a hole is drilled into the clavicle to facilitate the passage of suture wires. The Endo-button, which consists of a adjustable loop design, was then placed through the drilled hole and secured by tying the anchor wires over it to maintain joint reduction. This technique allows for strong fixation without the need for implant removal post-surgery, minimizing complications such as knot slippage. This procedure typically results in satisfactory outcomes, enabling patients to resume normal activities with reduced pain and improved function within weeks post-operatively.

This above figure shows the beach chair position of the patient and dissection of the ac joint. And insertion of adjustable loop for ac joint dislocation.

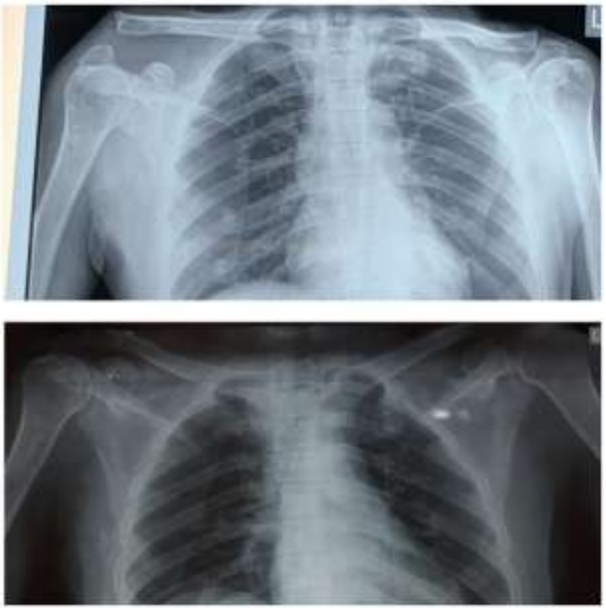


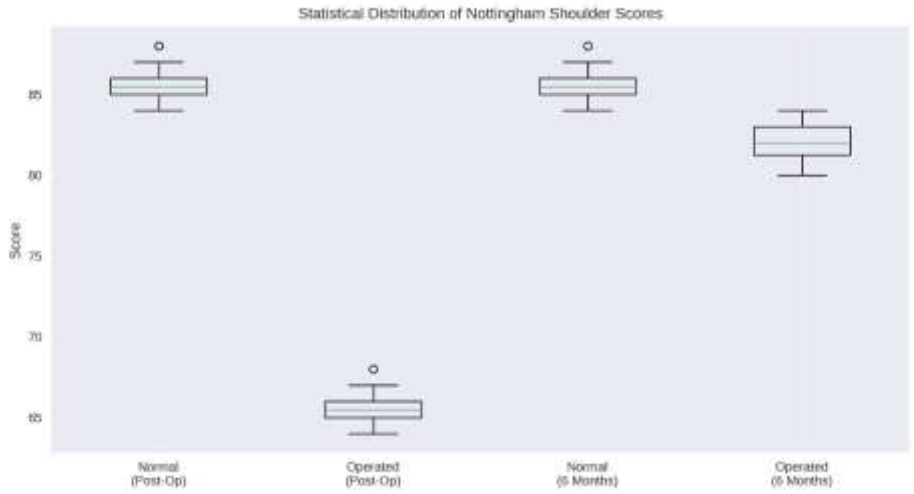
Figure shows the pre-op and post -op x-rays of the operated case of ac joint dislocation using adjustable loop.

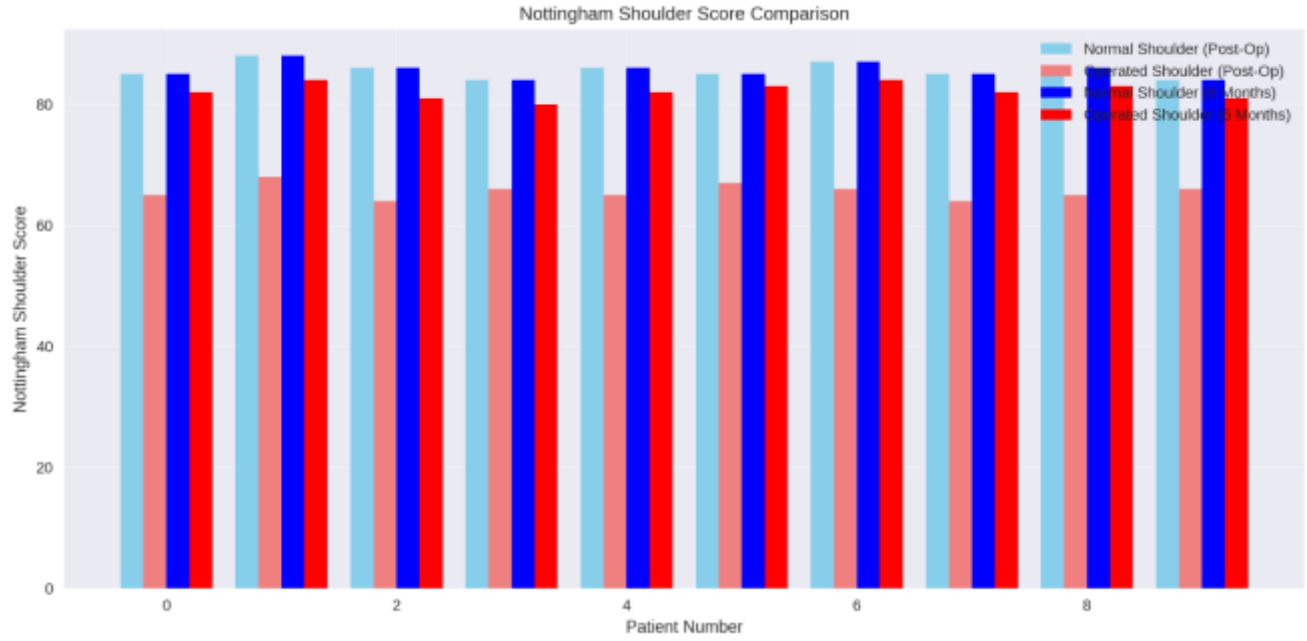
The post operative improvement was assessed using Nottingham Clavicle Score (NCS)and range of shoulder abduction. NCS is specifically designed to measure outcomes after injuries and degenerative pathologies of the clavicle, acromioclavicular joint (ACJ), and sternoclavicular joint (SCJ). It is a patient-reported outcome measure (PROM) consisting of a 10-item questionnaire.

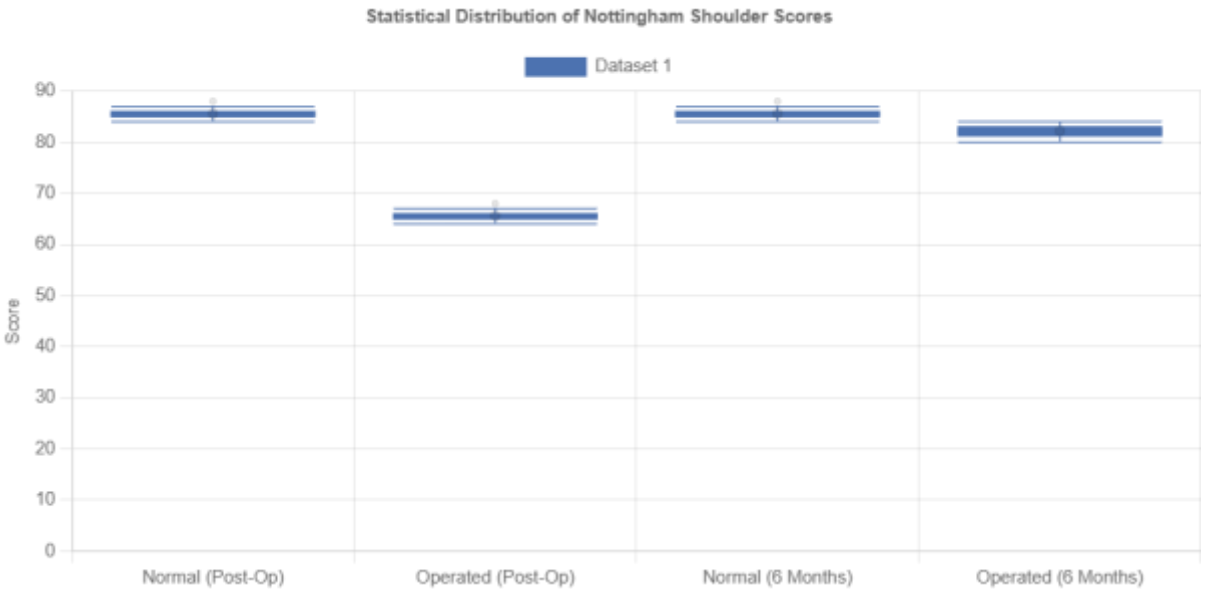
Complications:

In our series of AC joint reconstructions using Endo-button fixation, one patient required conversion to open surgery with adjustable loop fixation due to difficulty in deploying the Endo-button device. Post-operatively, we observed no infections or iatrogenic fractures. Lateral end clavicle prominence was noted in two patients; however, this did not compromise post-operative functionality. Chronicity of the AC joint injury in three cases led to increased intra-operative time. No instances of neurovascular injury were observed in any of the cases.

Interpretation:







The study shows significant improvement in shoulder function after 6 months of treatment. For the Nottingham Shoulder Score (NSS), operated shoulders improved from a mean of 65.60 ± 1.26 immediately post-op to 82.20 ± 1.32 at 6 months, approaching the normal shoulder scores (85.60 ± 1.26). Active shoulder abduction showed even more dramatic improvement. The operated shoulder range increased from 91.00° ± 2.05° post-op to 165.30° ± 1.49° at 6 months, nearly matching the normal shoulder measurements (171.90° ± 1.73°). The box plots and bar graphs demonstrate consistent recovery patterns across all patients, with minimal variability in outcomes.

Discussion:

Displaced acromioclavicular (AC) joint dislocations continue to present a complex clinical challenge, with no clear consensus on optimal management despite the availability of numerous treatment options[23]. While surgical repair of acute separations is often assumed to result in fewer complications compared to chronic separations, recent studies have demonstrated significant complication rates even with modern techniques, including clavicle or coracoid fractures, bony erosion, and fixation loss. Open procedures, such as hook plate fixation, are associated with complication rates exceeding 10% and can lead to serious complications like subacromial osteolysis, hook migration, and AC joint osteoarthritis. Long-term concerns include subacromial impingement and scapular dyskinesia, potentially leading to rotator cuff tears. Additionally, hook plate fixation necessitates a second surgery for implant removal.

Biomechanical analyses suggest that suture button techniques offer greater stability and stiffness compared to hook plates[24]. However, despite reports of lower postoperative pain scores and improved functional outcomes, arthroscopic suture button techniques still carry similar complication and revision rates. Due to the limited availability of high-quality (Level I) evidence, treatment decisions are primarily guided by surgeon experience and patient-specific factors, such as age and functional demands. Non-operative management is generally considered appropriate for acute, low-grade injuries, despite the potential risk of persistent pain and the development of chronic AC joint instability. In contrast, high-grade injuries are typically managed surgically to address the loss of shoulder girdle stability and subsequent scapulothoracic imbalance.

Our data demonstrates that EndoButton fixation is highly effective in improving shoulder function, as shown by significant gains in both the Nottingham Shoulder Score and active shoulder abduction over six months. Postoperatively, the operated shoulder's functionality closely approximates that of the uninjured shoulder, with consistent and predictable outcomes. The low incidence of complications, combined with the absence of infections or neurovascular injuries, further supports the safety and reliability of this technique. These results highlight EndoButton fixation as a robust method for AC joint reconstruction, offering excellent functional recovery and a favorable safety profile.

Conclusion:

The adjustable loop technique for AC joint fixation demonstrates a high success rate in restoring shoulder function over a 6-month period. The recovery trajectory shows significant improvement at each time point, with patients achieving near-normal function by the end of the 6 months. This technique provides a reliable and effective solution for AC joint injuries, ensuring stable fixation and progressive rehabilitation. Further studies with larger sample sizes and long-term follow-ups could provide additional insights into the durability and overall outcomes of this surgical approach.

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