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Original Research Article

ENDOBUTTON FIXATION: A GAME CHANGER IN ACROMIOCLAVICULAR JOINT DISLOCATION MANAGEMENT

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ABSTRACT

Background: Acromioclavicular (AC) joint dislocation is common among athletes and participants in contact sports, accounting for approximately 12% of shoulder girdle injuries. While the majority of AC joint injuries can be effectively managed conservatively, high-grade dislocations and certain cases of type 3 dislocations require surgical intervention. Over the years, numerous operative techniques have been developed. The aim of this study is to assess the functional outcomes of using an Endobutton in the management of AC joint dislocations. **Aims and Objectives:** To evaluate the clinical and radiographic results of patients diagnosed with Acromioclavicular joint dislocation treated with open reduction and internal fixation with Endobutton. **Objectives of The Study:** To prospectively assess the reduction and AC joint stability. To identify complications related with this procedure. To assess the functional status using DASH Score.

Materials and Methods: A total of 25 patients with acute AC joint dislocation were treated using either a double Endobutton or a combination of one Endobutton and a suture anchor. Patients were assessed pre-operatively and at 3, 6, and 12 months post-operatively using the DASH and CONSTANT scoring systems. Additionally, X-ray evaluations were conducted.

Results: Of the 25 patients, 22 (88%) were male and 3 (12%) were female, with a mean age of 34.56 years (range: 18–60 years). The right shoulder was operated on in 18 patients (72%) and the left in 7 patients (28%). Rockwood type 3 dislocations were diagnosed in 17 patients (68%), and type 5 in 8 patients (32%). At the final follow-up, the mean DASH score was 3.36 ± 2.07, and the mean CONSTANT score was 96.6 ± 2.63. Post-operative X-rays showed good reduction of the AC joint dislocation. Complications included 1 case of superficial infection and 2 cases of loss of reduction.

Conclusion: The use of a double Endobutton or a combination with a suture anchor provides both vertical and horizontal stability to the AC joint. The Endobutton technique minimises implant-related complications and eliminates the need for further surgery to remove the implant. The double Endobutton construct with No. 5 Ethibond closely replicates the coracoclavicular (CC) ligament, resulting in excellent functional outcomes. AC joint reconstruction using the Endobutton allows for early functional recovery and a full range of shoulder movement.

Keywords: Acromioclavicular Joint, Dislocation, Endobutton, Shoulder.

INTRODUCTION

AC joint injuries account for approximately 12% of shoulder girdle injuries, with the incidence rising to 40% among athletes involved in contact sports.[1] These injuries vary in severity, ranging from mild pain to significant joint displacement, chronic pain, and altered shoulder biomechanics, potentially leading to long-term disability. Males are more frequently affected, with a male-to-female ratio of 5:1, particularly in individuals under 30 years old.[2] The typical mechanism of injury involves a direct blow to the lateral shoulder, making athletes especially vulnerable.

The management of AC joint injuries has been debated since the time of Hippocrates and Galen, focusing on whether surgery is necessary and which procedure offers the best outcomes with minimal complications. Various treatment options exist, including nonsurgical and surgical approaches, depending on the extent of injury. While recent biomechanical studies have advanced the techniques for stabilizing the AC joint, no gold-standard surgical method has been established.

Early surgical techniques, such as Kirschner wires and Steinman pins, are no longer favoured due to issues like pin migration and limited joint motion.[3] The hook plate requires removal in a secondary procedure and increases the risk of ligament injury.[4] Conjoined tendon transfer improves stability but is associated with complications like coracoid fractures and brachial plexus injury.[5]

The double Endobutton technique, introduced by Struhl in 2007,[19] has become a widely adopted surgical option for both acute and chronic AC joint dislocations. It involves placing a suture button between the coracoid process and distal clavicle, providing greater strength and stiffness than natural ligaments, without requiring removal. Struhl's closed-loop design offers superior stability during healing by minimizing slippage and better accommodating multi-directional forces.[6,19]

This study aims to evaluate the functional outcomes of complete AC joint injuries treated with the double Endobutton technique. Clinical and radiological assessments will be used to analyze the effectiveness of this procedure in achieving long-term stability and joint function.

MATERIALS AND METHODS

This study includes male and female patients aged 18–60 years with closed AC joint injuries confirmed radiologically (Rockwood classification) and treated within 3 weeks of injury, provided they are fit for surgery. Excluded are patients with injuries older than 3 weeks, fractures involving the clavicle, coracoid, or shoulder joint, open shoulder injuries, or brachial plexus involvement. Also excluded are those with severe swelling or additional injuries hindering surgery, pre-existing conditions like tumors, infections, organ failure, or poisoning. Patients with less than 6 months of follow-up are not eligible.

Surgical Technique

The procedure was performed under either general anaesthesia or interscalene block, based on the anaesthesiologist's recommendation. All bony landmarks were identified and marked with a marker pen. The patient was positioned supine with a bolster placed under the interscapular region. A 2–3 cm incision was made over the clavicle, 3.5 cm medial to the AC joint, and a separate 1–2 cm incision was made over the coracoid process to expose its base. A 2.7 mm drill hole was created through the base of the coracoid in a superior-to-inferior direction.

Two holes were drilled in the clavicle—one at the distal angle and another midway between the first hole and the lateral border of the clavicle. A double-layered Endobutton, mounted with two polyester (Ethibond) RC No. 5 sutures or Fiberwire, was prepared. The Endobutton was inserted through the coracoid hole, tumbled into place, and its fixation was verified by pulling the free ends..

Once the AC joint reduction was achieved and confirmed intraoperatively using AP and Zanca's views, the suture threads were tied over a second Endobutton on the superior surface of the clavicle to maintain maximum tension. The suture ends were threaded through the soft tissues to the inferior surface of the clavicle and securely fastened. With the joint properly reduced, closure was performed in the standard fashion.

Intraoperative pictures

Figure 1: Bony landmarks were identified and marked with a marker pen

Figure 2: 3cm incision made over clavicle, medial to Acromioclavicular joint. 2 cm incision is made over coracoid process and endobutton is passed through coracoid process

Figure 3: Adjacent ends of two threads are passed separately through the two holes of clavicle reaching to the superior surface

Figure 4: closure done using nylon 2

Case 1

Incision.

ROM- internal rotation

ROM- Abduction

Pre op X-ray

ROM-Abducton more than 120

Post op X-ray

Case 2

Incision

ROM- internal rotation

ROM-Abducton more than 120

ROM- Abduction

ROM-Abducton more than 120.

Pre op X-ray

ROM- Abduction

Post op X-ray

Statistics

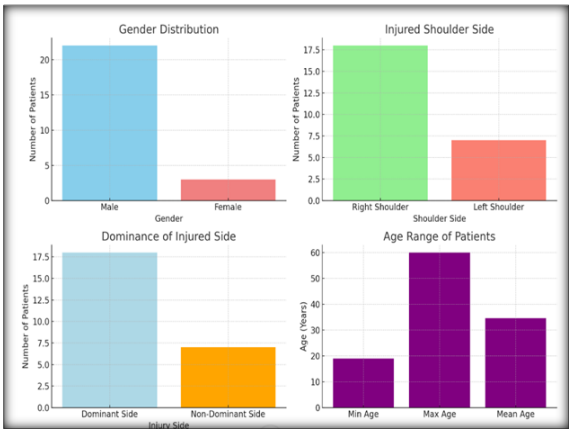
The study included 25 patients who underwent surgery for Rockwood Type 3 and Type 5 AC joint dislocations, with a minimum follow-up of 12 months. Of these, 22 patients (88%) were male, and 3 (12%) were female. The mean age at the time of surgery was 34.56 years (range: 19–60 years). Surgery was performed on the right shoulder in 18 patients and on the left in 7. A total of 18 patients injured their dominant shoulder, while 7 injured the non-dominant side.

The most common mechanism of injury was road traffic accidents, accounting for 16 cases (64%), followed by falls in 9 cases (36%). Rockwood Type 3 dislocations were diagnosed in 18 patients, while Type 5 dislocations were found in 7. The mean time from injury to surgery was 9.36 days (range: 2–17 days). All surgeries were performed by experienced surgeons.

RESULTS

The mean DASH score at the final follow-up was 3.36. The DASH questionnaire assesses activities of daily living, pain, and patient confidence, with a score range from 0 (best outcome) to 100 (poorest outcome).

No cases of deep surgical site infections, suture failure, knot slippage, perioperative fractures, or post-operative calcification were reported. The most common complication was partial loss of reduction, observed in 2 patients (8%). One patient developed a superficial infection, which was successfully treated with oral antibiotics. Another patient reported mild shoulder pain at the final follow-up, but it did not interfere with daily activities, and physiotherapy helped him regain a functional range of motion.



DISCUSSION

The AC joint ligament complex plays a vital role in transmitting weight from the appendicular to the core skeleton. This joint is stabilized by the AC joint capsule, coracoacromial (CA) ligament, conoid ligament, and trapezoid ligament, which also facilitate weight transfer.[7] Fukuda et al. emphasized that the function of each structure depends not only on the force magnitude but also on the direction of the applied force.[8] The CA ligament primarily resists posterior displacement, the conoid ligament prevents anterior and superior displacement, and the trapezoid ligament opposes compressive forces on the clavicle8. Harris found that resecting either the conoid or trapezoid ligament does not significantly affect the overall strength or stiffness of the coracoclavicular (CC) ligament. However, the conoid ligament acts as the primary load-bearing structure, with the trapezoid ligament as a secondary stabilizer.[9]

Despite numerous experimental studies, the precise role and failure mechanisms of these ligaments under physiological and pathological loads remain unclear. Treatment guidelines suggest conservative management for Grade I and II AC joint dislocations, while surgery is recommended for Grades IV, V, and VI. The management of Grade III dislocations remains controversial, with some studies advocating surgery for young, active individuals or those involved in manual labour and overhead activities.[10] Surveys indicate variability in practice—American orthopaedics surgeons often prefer conservative management, while German surgeons favour surgical treatment. Smith et al. reported that surgery can delay recovery and return to work, though it may offer better cosmetic outcomes11. Gsettner found higher Constant scores in patients treated surgically (90.4) compared to those treated conservatively (80.7).[12] However, no prospective randomized control trials currently exist to provide definitive guidelines.

Surgical treatments for AC joint dislocations can be grouped into five categories: (1) AC joint fixation with K-wires, hook plates, or tension band wiring (TBW), (2) CC joint fixation using screws, suture slings, anchors, tape, or button devices, (3) CC ligament reconstruction, (4) dynamic muscle transfers, and (5) lateral clavicle excision13. Gravity continuously strains the AC joint, so the choice of implant must ensure adequate stabilization, minimize joint reaction forces, and preserve the joint to promote recovery and reduce complications.

Bosworth introduced screw fixation between the coracoid and clavicle in 1941, but complications such as implant failure, loosening, malposition, osteolysis, and fractures were common.[14] In 1972, Weaver-Dunn described a technique involving CA ligament transfer and resection of the distal clavicle, later augmented with additional stabilization methods. However, high failure rates and complications were associated with this technique, as the CA ligament provides only a fraction of the strength of the intact CC ligament complex. This technique is unsuitable for acute injuries with potential for spontaneous healing.[15]

Grafts used in ligament reconstruction initially exhibit stiffness, but they tend to elongate under cyclic loading and during revascularization16. Without proper integration, these grafts risk eventual failure. Anatomical CC ligament reconstruction has shown improved anterior-posterior stability and better mimicry of the native joint complex, even without repairing the AC capsule ligaments.[16] In acute injuries, ligaments have high healing potential if given adequate rest. Studies have demonstrated successful healing using techniques like pinning, screws, or hook plates.

Struhl's MRI study on patients undergoing CC fixation documented thick healing tissue between the coracoid and clavicle, reinforcing the joint's natural healing capacity.[17,19] Early surgery improves outcomes by reducing infections, avoiding invasive procedures, and preventing the need for graft-related interventions or distal clavicle excision.[18] These findings highlight the importance of early intervention and the ligament's natural healing response.

In cases treated with endobutton devices, the load is borne by the endobutton surfaces rather than the sutures, reducing the risk of suture failure. A recent long-term study using closed-loop endobutton reconstruction reported excellent outcomes, with a mean Constant score of 98.[19] In our study, functional outcomes were similarly excellent, with

no coracoid or clavicular fractures, no calcification, joint degeneration, suture failure, or knot slippage. Partial loss of reduction was the most common complication observed, consistent with findings from other studies. However, this loss did not impact the final functional outcome, as also supported by existing literature. With longer follow-up, improvement in early loss of reduction is expected.

Infection remains a known risk in surgical treatment, but in our study, only one patient developed a superficial infection, which was successfully treated with oral antibiotics.

CONCLUSION

The use of a double Endobutton or a combination with a suture anchor provides both vertical and horizontal stability to the AC joint. The Endobutton technique minimises implant-related complications and eliminates the need for further surgery to remove the implant. The double Endobutton construct with No. 5 Ethibond closely replicates the coracoclavicular (CC) ligament, resulting in excellent functional outcomes. AC joint reconstruction using the Endobutton allows for early functional recovery and a full range of shoulder movement.

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