

Clinical Outcomes of Complete AC Joint Dislocations Treated Using the Double Endo button Method in a Tertiary Care Centre

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Submission Date: 26.05.2025

Accepted Date: 23.06.2025

Published Date: 30.06.2025

DOI: 10.65188/nurexus.1026

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Abstract

Background: Acromioclavicular (AC) joint dislocations, especially those classified as Rockwood types III to VI, often require surgical intervention to restore joint stability and function. The double Endobutton technique has emerged as a promising method offering strong fixation with minimal complications.

Methods: A prospective study was conducted at the Department of Orthopedics, Narayana Medical College and Hospital, Nellore, over one year, involving 50 patients aged 18–60 years with radiologically confirmed Rockwood type III–VI AC joint dislocations. All patients underwent open reduction and internal fixation using the double Endo button technique. Functional outcomes were assessed using the Disabilities of the Arm, Shoulder and Hand (DASH) score and Constant-Murley score at 6, 12, and 24 weeks. Radiological assessments and complication rates were also recorded. Data were analyzed using SPSS version 17.

Results: The mean DASH score improved from 72.4 preoperatively to 13.3 at 24 weeks, while the Constant score improved from 32.5 to 83.9 in the same period. Radiological stability was maintained in 98% of patients. Complications were minimal, with only one hardware failure (2%) and two cases of surgical site infection (4%).

Conclusion: The double Endo button technique is a reliable and effective method for managing complete AC joint dislocations, providing excellent functional recovery, stable anatomical reduction, and a low rate of complications. Its minimally invasive approach and biomechanical stability make it a preferred alternative to conventional fixation methods.

Keywords: Acromioclavicular joint dislocation, Double Endo button technique, Shoulder injury, Functional outcome, DASH score

Introduction

Acromioclavicular (AC) joint dislocations are commonly encountered shoulder injuries, particularly among young, active individuals and athletes, accounting for approximately 9% of all shoulder girdle injuries [1]. These injuries typically result from direct trauma to the lateral aspect of the shoulder, often occurring during contact sports or road traffic accidents [2]. The severity of AC joint dislocations is categorized by the Rockwood classification system, ranging from Type I to Type VI, with Type III and above generally considered for surgical intervention due to significant ligamentous disruption and instability [3]. The primary goals in managing high-grade AC joint dislocations (Type III–VI) are to restore joint stability, relieve pain, and enable early functional recovery. Over the years, multiple surgical techniques have been developed, including hook plate fixation, Weaver-Dunn procedure, and coracoclavicular screw fixation. However, these methods are often associated with complications such as implant failure, infection, and the need for secondary surgery for implant removal [4].

Recently, the Double Endobutton technique has gained attention as a minimally invasive, anatomic reconstruction method that offers the advantages of preserving normal joint biomechanics and allowing early mobilization. This technique utilizes a suture-button system to recreate the coracoclavicular ligament complex, offering superior biomechanical stability and favorable clinical outcomes with fewer complications compared to traditional methods [5,6]. Despite its increasing use, limited data are available on the clinical outcomes of the Double Endobutton technique in diverse clinical settings. Hence, this study was conducted to evaluate the functional and clinical outcomes of complete AC joint dislocations treated with the Double Endobutton method in a tertiary care center.

Materials & Methods

This was a prospective, hospital-based study conducted in the Department of Orthopaedics at Narayana Medical College and Hospital, Chinthareddypalem, Nellore, Andhra Pradesh, over a period of one year. The study was initiated after obtaining approval from the Institutional Ethics Committee (IEC). A total of 50 patients aged between 18 and 60 years, with radiologically confirmed complete acromioclavicular (AC) joint dislocations classified as Rockwood types III to VI, were included.

The inclusion criteria for the present study comprised patients aged between 18 and 60 years who were radiologically confirmed to have Rockwood grade III, IV, V, or VI acromioclavicular (AC) joint dislocation. These grades represent moderate to severe forms of AC joint injury, where surgical intervention is generally indicated for restoring joint stability and shoulder function. Only patients who were deemed medically fit to undergo surgery and provided informed written consent after being informed of the nature, risks, and benefits of the procedure were included in the study population.

The exclusion criteria were clearly defined to eliminate potential confounding factors. Patients who were medically unfit for surgery due to systemic illness or other contraindications were excluded to ensure procedural safety. Individuals with open fractures, multiple traumatic injuries (polytrauma), or hemodynamically unstable conditions were also excluded, as these factors could complicate surgical management and affect outcomes. Furthermore, chronic dislocations or cases presenting beyond three weeks after injury were not considered, as delayed presentations may require different surgical approaches and carry varied prognoses. Finally, patients who declined or were unwilling to provide written informed consent for surgical intervention were excluded from participation. This careful selection ensured a homogeneous study population suitable for evaluating the surgical outcomes in acute AC joint dislocation cases.

Upon admission, all patients underwent a detailed clinical assessment, including local shoulder examination and imaging studies such as plain radiographs and MRI (where required). Preoperative baseline scores were recorded using the Disabilities of the Arm, Shoulder, and Hand (DASH) score and the Constant-Murley score.

All participants underwent open reduction and internal fixation using the Double Endobutton technique with fiber wire under general anesthesia. Postoperatively, patients were immobilized in an arm sling for a short duration, followed by a structured rehabilitation protocol under physiotherapist supervision.

Functional and radiological outcomes were assessed at 6, 12, and 24 weeks postoperatively. The primary outcome variables were DASH and Constant scores, while secondary variables included age, gender, side of injury, time to surgery, and complication rates. Radiological follow-up was done using standard shoulder X-rays to evaluate joint alignment and implant stability.

Ethical approval for the present study was obtained from the Institutional Ethics Committee of Narayana Medical College and Hospital, Nellore, Andhra Pradesh (Ref No: NMCH/2024/IEC/74216). A detailed Participant Information Sheet was provided to all participants, and written informed consent was obtained prior to their participation in the study.

Statistical Analysis: All data were compiled using Microsoft Excel and analyzed using IBM SPSS version 17. Continuous variables were expressed as mean ± standard deviation (SD), and comparisons between time intervals were performed using paired t-tests. A *p*-value < 0.05 was considered statistically significant.

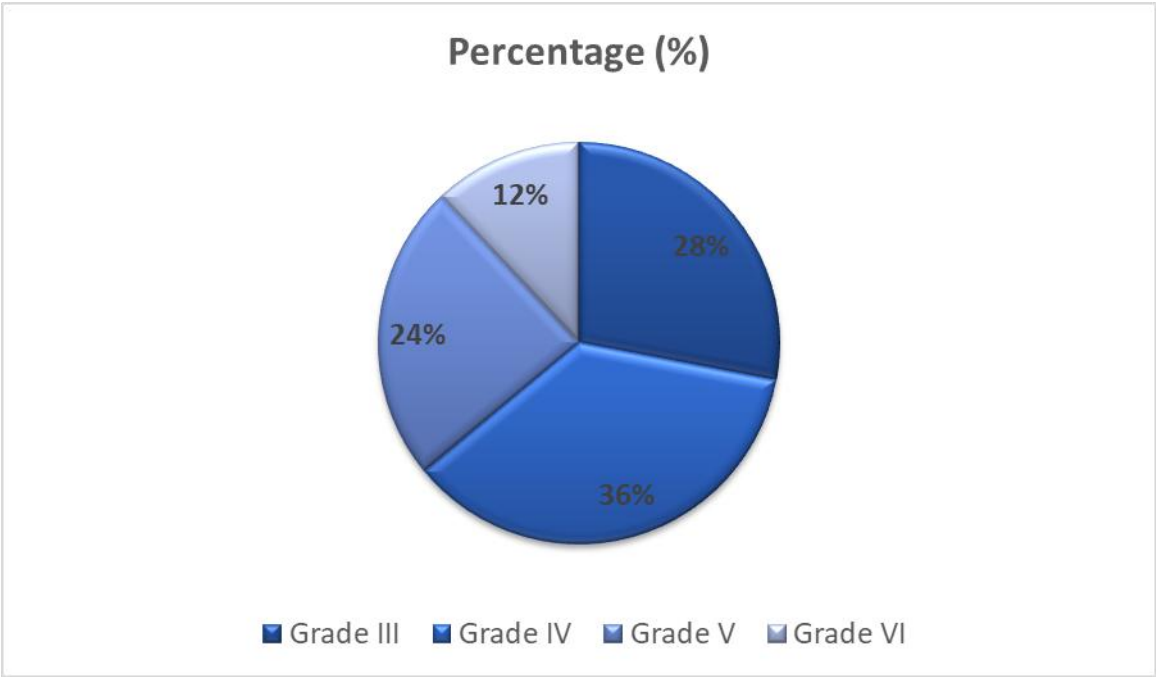
Results

Table 1: Demographic Profile of Study Participants (n = 50)

Variable	Category	Frequency	Percentage (%)
Age Group (years)	18–30	17	34%
	31–45	22	44%
	46–60	11	22%
Gender	Male	38	76%
	Female	12	24%
Side of Injury	Right	29	58%
	Left	21	42%

The majority of patients were male (76%) and within the age group of 31–45 years (44%), indicating that middle-aged working males are more prone to AC joint dislocation, likely due to active occupational or recreational activities. The right side was more commonly affected.

Figure 1: Distribution of Rockwood Classification of AC Joint Dislocation



The majority of patients presented with Grade IV dislocations (36%), followed by Grade III (28%). Grade VI injuries were relatively rare, comprising 12%, which aligns with the natural incidence of increasing severity being less common.

Table 2: Mode of Injury

Cause of Injury	Frequency	Percentage (%)
Fall from height	21	42%
Road traffic accident	17	34%
Sports injury	9	18%
Others	3	6%

Falls and road traffic accidents were the primary causes of injury. Falls (42%) were slightly more common, indicating the need for fall prevention programs, especially in occupational settings.

Table 3: Functional Outcome Based on DASH Score Over Time

Time Point	Mean DASH Score $\pm$ SD	Range
Preoperative	72.4 $\pm$ 5.6	65–85
6 Weeks	38.1 $\pm$ 4.9	30–47
12 Weeks	21.5 $\pm$ 3.8	16–30
24 Weeks	13.3 $\pm$ 2.6	10–18

The DASH score showed a consistent and statistically significant improvement from the preoperative period to 24 weeks. This reflects a steady recovery in the arm, shoulder, and hand function following the double Endobutton repair.

Table 4: Functional Outcome Based on Constant Score Over Time

Time Point	Mean Constant Score $\pm$ SD	Range
Preoperative	32.5 $\pm$ 5.2	25–42
6 Weeks	56.2 $\pm$ 6.1	45–65
12 Weeks	71.8 $\pm$ 5.3	62–82
24 Weeks	83.9 $\pm$ 4.6	76–92

Constant scores increased progressively over time, suggesting improved strength, range of motion, and pain control. By 24 weeks, most patients reached near-normal shoulder function, validating the efficacy of the technique.

Table 5: Postoperative Complications and Radiological Stability

Parameter	Frequency	Percentage (%)
Radiological reduction maintained	49	98%
Hardware failure	1	2%
Surgical site infection	2	4%
Persistent shoulder pain	2	4%
No complications	45	90%

Radiological stability was maintained in 98% of the patients, indicating successful anatomical restoration. Only 1 patient had hardware failure, and 2 developed infections. The overall complication rate was low (10%), reinforcing the safety and efficacy of the technique.

Discussion

Acromioclavicular (AC) joint dislocations, particularly Rockwood types III to VI, remain a significant challenge in orthopedic practice due to the risk of chronic pain, functional limitation, instability, and cosmetic deformity if inadequately managed [1–3]. The primary objective of surgical treatment is to restore both anatomical alignment and biomechanical stability, thereby enabling early functional recovery. Among

the available operative techniques, the double EndoButton construct has gained widespread acceptance because of its minimally invasive nature and strong coracoclavicular fixation properties [6,9,10].

In the present study involving 50 patients with complete AC joint dislocations, surgical repair using the double EndoButton technique resulted in excellent functional and radiological outcomes. There was a marked improvement in functional scores, with the mean DASH score decreasing from 72.4 preoperatively to 13.3 at 24 weeks and the Constant score improving from 32.5 to 83.9 over the same period. These results are comparable to those reported by Singh et al., who demonstrated significant improvements in DASH and Constant scores following double EndoButton fixation in Rockwood type III and V dislocations [14]. Similarly, Li et al. reported favorable early functional recovery with TiRobot-assisted closed-loop double EndoButton fixation, highlighting improved surgical precision and reduced operative time [7].

Our functional outcomes are also consistent with the findings of Struhl and Liu et al., both of whom reported superior clinical results with double EndoButton fixation compared to conventional hook plate techniques [9,10]. The biomechanical advantages of the EndoButton construct include stable coracoclavicular fixation and reduced implant-related discomfort. Struhl and Wolfson demonstrated through biomechanical analysis that double EndoButton fixation closely replicates the strength of the native coracoclavicular ligament complex, thereby minimizing postoperative displacement [5]. In contrast, traditional hook plate fixation has been associated with complications such as subacromial impingement, acromial erosion, and the need for routine implant removal [4,13].

Minimally invasive adaptations of the double EndoButton technique have further enhanced clinical outcomes. El-Sayed and Seleem reported successful reconstruction of the coracoclavicular ligaments using a minimally invasive double EndoButton approach, achieving excellent stability while reducing soft tissue disruption and postoperative pain [11]. These findings support the preference for arthroscopically assisted or percutaneous techniques in managing acute AC joint dislocations.

Radiologically, the present study achieved a 98% success rate in maintaining anatomical reduction at 24 weeks, with only one case (2%) of loss of fixation. This high rate of maintained reduction is comparable to the outcomes reported by Milewski et al., who observed durable anatomical restoration and high patient satisfaction at a minimum of five-year follow-up using dual EndoButton devices [12]. The sustained radiological stability observed in both studies underscores the mechanical reliability of the double EndoButton construct.

Postoperative complications in our study were minimal, with 4% superficial infection and 2% hardware failure, none of which required major revision surgery. These findings are in agreement with Kim et al., who reported a low complication rate with percutaneous EndoButton fixation in acute AC joint dislocations [8]. In contrast, Choi et al. documented significantly higher rates of implant irritation, acromial erosion, and secondary surgery in patients treated with hook plate fixation [4]. A recent systematic review and meta-analysis by Xue et al. further confirmed that double-button techniques are associated with fewer complications and better functional outcomes compared to hook plate fixation [13].

The demographic pattern observed in our cohort, with 76% male predominance, reflects the established epidemiology of AC joint injuries, which are more common in males due to higher participation in contact sports and manual labor [1,2,12]. Mazzocca et al. and Beitzel et al. have emphasized that anatomical reconstructions, such as the double EndoButton and two-button techniques, provide superior functional and cosmetic outcomes compared to older methods like transacromial Kirschner wires and the Weaver-Dunn procedure [1,2,6]. Huang et al. also demonstrated better clinical outcomes with double EndoButton fixation compared to single-button techniques, highlighting the importance of restoring both the conoid and

trapezoid components of the coracoclavicular ligament complex [15].

Overall, the present study reinforces the growing body of evidence supporting the double EndoButton technique as a reliable, biomechanically stable, and minimally invasive option for the management of complete AC joint dislocations. It provides excellent functional recovery, high radiological stability, and a low complication rate when compared with conventional fixation methods [1,6,9,14]. However, larger prospective studies with longer follow-up are required to further validate these findings and to assess the long-term durability and potential late complications associated with this technique.

Conclusion

The present study demonstrates that the double Endobutton technique is a safe, effective, and functionally rewarding surgical method for the management of complete acromioclavicular (AC) joint dislocations. Over a 24-week follow-up, patients showed significant improvements in both DASH and Constant scores, indicating substantial recovery of shoulder function, pain reduction, and range of motion. Radiological outcomes confirmed stable joint reduction in the vast majority of patients, and the complication rate remained minimal. Given the favorable clinical outcomes, high patient satisfaction, and early return to function, the double Endobutton technique can be considered a reliable alternative to traditional fixation methods such as hook plates or K-wires, especially in young, active individuals. Its minimally invasive nature, biomechanical stability, and low incidence of hardware-related issues make it a valuable approach in contemporary orthopedic practice.

Future studies with larger sample sizes and longer follow-up periods are recommended to further validate these findings and assess long-term outcomes such as degenerative changes or late-onset complications.

Conflict of Interest: Nil

Reference

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