



Evaluation of Functional Outcomes of Complete Acromioclavicular Joint Dislocation Treated with the Double Endobutton Technique in a Tertiary Care Hospital

Dr. Rahul Kumar¹, Dr. F. Abdul khader², Dr. Harish³, Dr. Adhiyamaan R.V^{4*}

¹3rd year Post Graduate, Department of Orthopaedics, Shri Sathya Sai Medical College and Research, Ammapettai, Chengalpattu District, Tamil Nadu 603108 India

²Professor, Department of Orthopaedics, Shri Sathya Sai Medical College and Research, Ammapettai, Chengalpattu District, Tamil Nadu 603108 India

³Assistant Professor, Department of Orthopaedics, Shri Sathya Sai Medical College and Research, Ammapettai, Chengalpattu District, Tamil Nadu 603108 India

⁴Associate Professor, Department of Orthopaedics, Shri Sathya Sai Medical College and Research, Ammapettai, Chengalpattu District, Tamil Nadu 603108 India

Corresponding Author: Dr Adhiyamaan R.V, Associate Professor, Department of Orthopaedics, Shri Sathya Sai Medical College and Research, Ammapettai, Chengalpattu District, Tamil Nadu 603108 India

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KEYWORDS

Acromioclavicular,
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ABSTRACT:

Background: Acromioclavicular (AC) joint injuries commonly result from direct trauma, such as falls, contact sports, or motor vehicle accidents. Management of complete dislocations (Rockwood type III-VI) remains debated, with treatment options ranging from sling immobilization to surgery. Surgical intervention is preferred for high-grade dislocations, especially with severe displacement or complications. A promising technique for managing these injuries is the double Endobutton method.

Materials and Methods: This study included 34 participants (aged 18-60) with radiologically confirmed Rockwood III-VI AC joint dislocations. They underwent open reduction and fixation using the double Endobutton technique with fiber wire. Outcomes were assessed using the DASH and Constant scores at 6, 12, and 24 weeks over a 6-month follow-up.

Results: The follow-up assessments showed improvements in ROM (abduction, flexion, and external rotation) over time. Radiological outcome at the 6-week follow-up, all participants (34) maintained reduction with no cases of hardware failure or malalignment. At 12 and 24 weeks, 33 participants maintained reduction, with 1 case of hardware failure at both time points, but no instances of malalignment were observed. The outcomes showed significant improvements, with the improvement in mean DASH score and mean Constant Score. Radiological stability was achieved in 97.1% of the cases.

Conclusion: This study confirms the efficacy of the double Endobutton technique for complete AC joint dislocations, ensuring stable reduction, excellent functional recovery, and minimal complications. Significant improvements in DASH and Constant scores, high patient satisfaction, and faster recovery highlight its advantages. This minimally invasive approach offers a reliable alternative to traditional surgical methods for AC joint stabilization.



INTRODUCTION

Acromioclavicular (AC) joint injuries are common musculoskeletal conditions, often resulting from direct trauma to the shoulder, such as a fall onto an outstretched arm, a collision in contact sports, or a motor vehicle accident.⁽¹⁾ The AC joint is the articulation between the acromion of the scapula and the distal end of the clavicle. These injuries involve the rupture of the coracoclavicular (CC) ligaments, which are responsible for maintaining the stability of the joint. The management of AC joint dislocations has been the subject of extensive debate in orthopaedic literature, particularly when it comes to the most effective method of treatment for complete dislocations.^(2,3)

Complete acromioclavicular joint dislocations (also called high-grade or Rockwood type III, IV, V, and VI) represent a more severe form of injury than partial dislocations. The severity is determined based on the displacement of the clavicle relative to the acromion and the disruption of the ligamentous structures around the AC joint. These injuries are characterized by the total rupture of the acromioclavicular and coracoclavicular ligaments, leading to significant instability of the shoulder girdle. Depending on the degree of displacement, these dislocations can result in functional impairment, chronic pain, and cosmetic deformity if not adequately treated. Various treatment options exist, ranging from conservative management with sling immobilization to surgical intervention.⁽⁴⁾

The primary goal in treating AC joint dislocations is to restore the normal anatomy of the shoulder while maintaining or improving the functional outcome. Surgical intervention is typically indicated for complete dislocations (Rockwood type IV-VI), especially when conservative treatment fails to restore joint stability or when the injury is associated with severe displacement or other complications like neurovascular injuries or fractures.^(5,6)

One of the more recent and promising surgical techniques for the management of complete acromioclavicular joint dislocations is the use of the double Endobutton technique. This method involves the placement of a double Endobutton device, which provides a more stable fixation and facilitates faster rehabilitation. The double Endobutton technique has gained attention due to its effectiveness in restoring

coracoclavicular ligament stability, offering advantages over other methods in terms of reduced complication rates, improved post-operative outcomes, and early mobilization.⁽⁷⁾

The Endobutton technique works by securing the clavicle to the coracoid process using a specialized implant. This technique recreates the coracoclavicular ligament's function, which is crucial for maintaining the anatomical position of the clavicle. The Endobutton device is typically inserted through small incisions with the aid of arthroscopic or minimally invasive techniques, reducing soft tissue dissection and facilitating quicker recovery. The double Endobutton technique provides two points of fixation, which significantly enhances the stability of the shoulder joint, ensuring better anatomical restoration and functional recovery.⁽⁸⁾

Over the years, numerous studies have explored the functional outcomes of various surgical techniques for treating high-grade acromioclavicular joint dislocations, with varying results. However, the double Endobutton technique stands out as a method with promising results in terms of functional outcomes, especially when compared to other traditional methods like K-wire fixation or hook plates. These studies indicate that the double Endobutton technique offers advantages such as lower rates of hardware-related complications, better alignment of the clavicle, and a quicker return to normal shoulder function. Despite these promising findings, a comprehensive prospective study that assesses the long-term functional outcomes of this technique in a diverse patient population remains scarce.^(9,10)

Our prospective study aims to evaluate the functional outcomes of complete acromioclavicular joint dislocations treated with the double Endobutton technique at a tertiary care hospital. By analyzing both short- and long-term outcomes, the study will provide valuable insights into the effectiveness of this surgical approach, its impact on patients' quality of life, and the functional restoration of shoulder motion and strength. The study will also investigate complications associated with the procedure, rehabilitation timelines, and the overall satisfaction of patients who underwent the double Endobutton technique for the management of complete acromioclavicular joint dislocations.⁽¹¹⁾



In conclusion, the management of complete acromioclavicular joint dislocations remains a critical aspect of orthopaedic practice, and advancements in surgical techniques, such as the double Endobutton method, offer the potential for improved functional outcomes. This study seeks to assess these outcomes systematically, with the goal of refining treatment strategies and improving the quality of life for patients suffering from these debilitating injuries.

MATERIALS AND METHODS:

This Prospective, hospital-based study was done in a tertiary care hospital in Chengalpattu district, Tamil Nadu for 18 months. The study was approved by the Institutional ethics committee after which 34 patients with radiologically confirmed cases of Acromioclavicular joint dislocation (Rockwood grades 3,4,5 and 6) who met our inclusion and exclusion criteria were given choice to become part of this study. Inclusion criteria include patients aged 18-60yrs, radiological diagnosis of Acromioclavicular joint dislocation (Rockwood grades 3,4,5 and 6), Patients who are medically fit for surgery and give consent for the same. Exclusion criteria included are Patients who are medically unfit for surgery, Patient not willing for

surgery, Patient with open fractures, patients of Polytrauma/Unstable patient, Patients with chronic injuries. The patients who opted to take part in the study were informed about the procedure and informed consent was obtained from them.

After admission, a thorough clinical examination and radiographic imaging And MRI imaging of the shoulder joints were performed and blood samples were collected for routine preoperative evaluation. The baseline DASH Score and CONSTANT Score. For radiologically confirmed case of A.C. joint dislocation., open reduction and fixation with double endobutton technique. DASH score and CONSTANT score were measure before and after the procedure at 6, 12 and 24 weeks intervals to evaluate pain, functional outcome and radiological outcome. The DASH score , CONSTANT score were considered as primary variables, age and sex of the patient were considered as secondary variables. Statistical analysis was done using the IBM SPSS version 17. The results were displayed using appropriate program, tables and bar diagrams

RESULTS

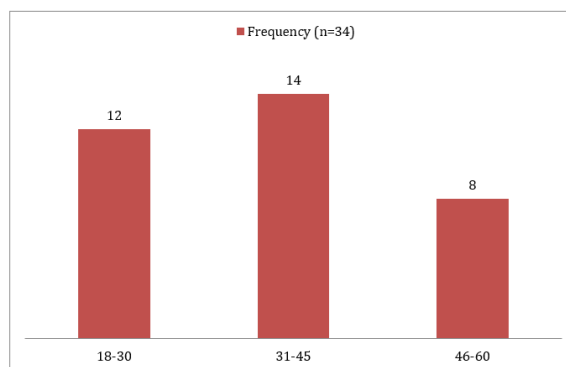
34 Patients have been included in the final study

Table 1A: Age Distribution

Age Group (years)	Frequency (n=34)	Percentage (%)
18-30	12	35.3
31-45	14	41.2
46-60	8	23.5

The age distribution of participants shows that the majority fall within the 31-45 age group, comprising

41.2% (n=14). This is followed by the 18-30 age group at 35.3% (n=12) and the 46-60 age group at 23.5% (n=8).



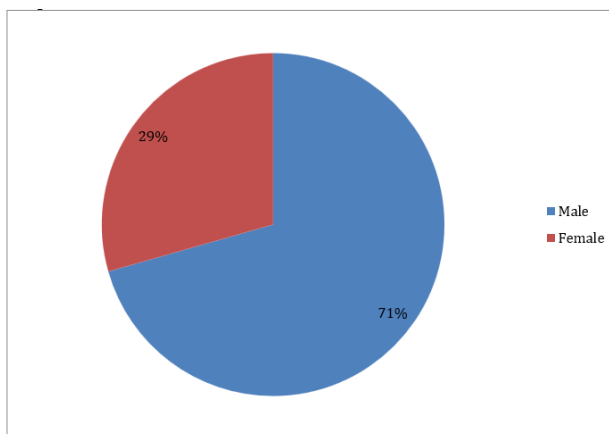
Graph 1A: Age Distribution



Table 1B: Gender Distribution

Gender	Frequency (n=34)	Percentage (%)
Male	24	70.6
Female	10	29.4

The gender distribution reveals that males constitute the majority of participants at 70.6% (n=24), while females account for 29.4% (n=10).

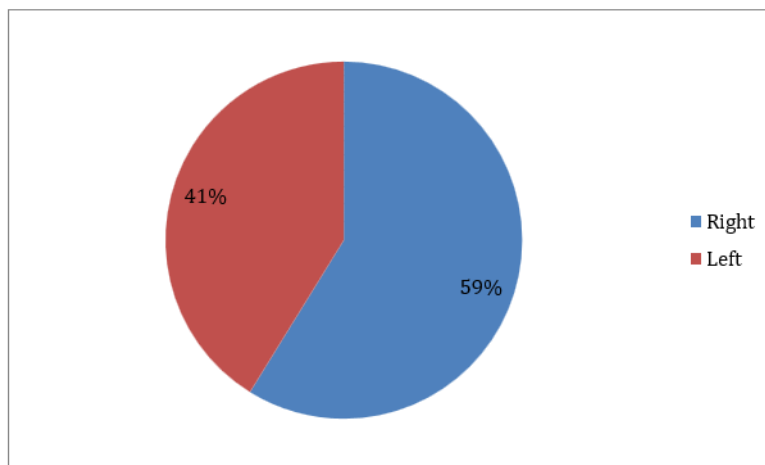


Graph 1B: Gender Distribution

Table 1C: Side of Injury Distribution

Side of Injury	Frequency (n=34)	Percentage (%)
Right	20	58.8
Left	14	41.2

The distribution of injury sides indicates that the right side is more commonly affected, accounting for 58.8% (n=20) of cases, while the left side represents 41.2% (n=14).



Graph 1C: Side of Injury Distribution

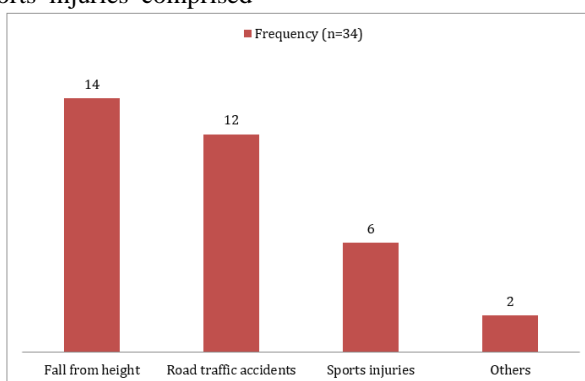


Table 2: Distribution by Mode of Injury

Mode of Injury	Frequency (n=34)	Percentage (%)
Fall from height	14	41.2
Road traffic accidents	12	35.3
Sports injuries	6	17.6
Others	2	5.9

The most common mode of injury was falls from height, accounting for 41.2% (n=14), followed by road traffic accidents at 35.3% (n=12). Sports injuries comprised

17.6% (n=6), while other causes accounted for 5.9% (n=2).



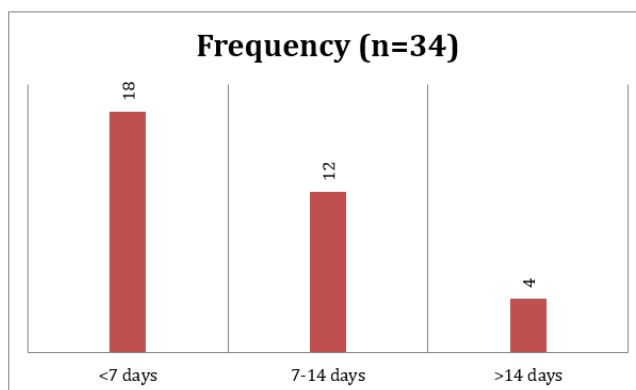
Graph 2: Distribution by Mode of Injury

Table 3: Time Interval Between Injury and Surgery

Time Interval (Days)	Frequency (n=34)	Percentage (%)
<7 days	18	52.9
7-14 days	12	35.3
>14 days	4	11.8

The time interval between injury and presentation was less than 7 days for the majority of participants (52.9%,

n=18), followed by 7-14 days at 35.3% (n=12). Only 11.8% (n=4) reported after more than 14 days.



Graph 3: Time Interval Between Injury and Surgery

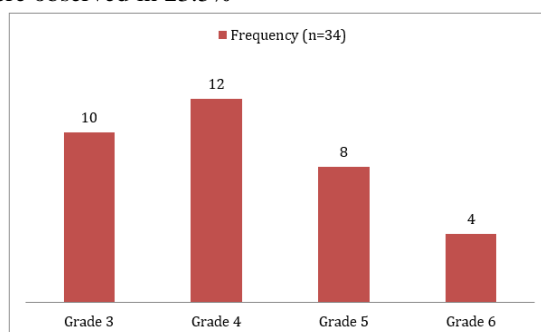


Table 4: Preoperative Radiological Assessment (Rockwood Grading)

Grade	Frequency (n=34)	Percentage (%)
Grade 3	10	29.4
Grade 4	12	35.3
Grade 5	8	23.5
Grade 6	4	11.8

The majority of participants had Grade 4 injuries, accounting for 35.3% (n=12), followed by Grade 3 at 29.4% (n=10). Grade 5 injuries were observed in 23.5%

(n=8), while Grade 6 was the least common at 11.8% (n=4).



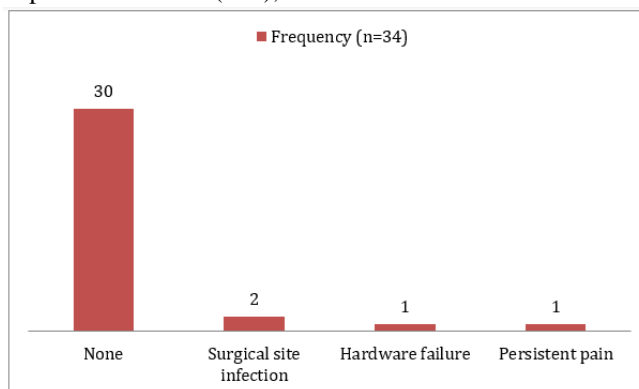
Graph 4: Preoperative Radiological Assessment (Rockwood Grading)

Table 5: Postoperative Complications

Complications	Frequency (n=34)	Percentage (%)
None	30	88.2
Surgical site infection	2	5.9
Hardware failure	1	2.9
Persistent pain	1	2.9

The majority of participants (88.2%, n=30) experienced no complications. Among those with complications, surgical site infections were reported in 5.9% (n=2),

while hardware failure and persistent pain were each observed in 2.9% (n=1).



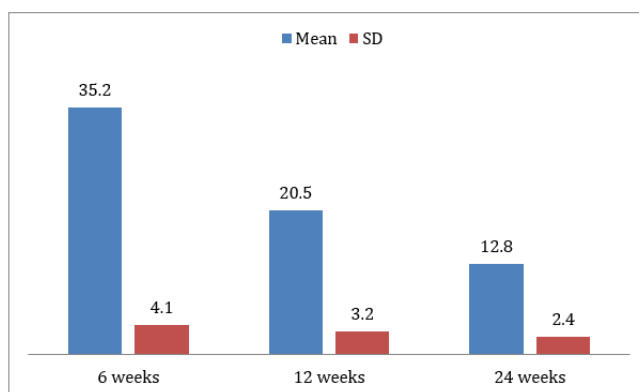
Graph 5: Postoperative Complications



Table 6: DASH Score Distribution

Follow-Up Time	Mean ± SD	Range
6 weeks	35.2 ± 4.1	28-42
12 weeks	20.5 ± 3.2	15-25
24 weeks	12.8 ± 2.4	9-16

The follow-up times showed a mean ± SD of 35.2 ± 4.1 days (range: 28-42) at 6 weeks, 20.5 ± 3.2 days (range: 15-25) at 12 weeks, and 12.8 ± 2.4 days (range: 9-16) at 24 weeks.

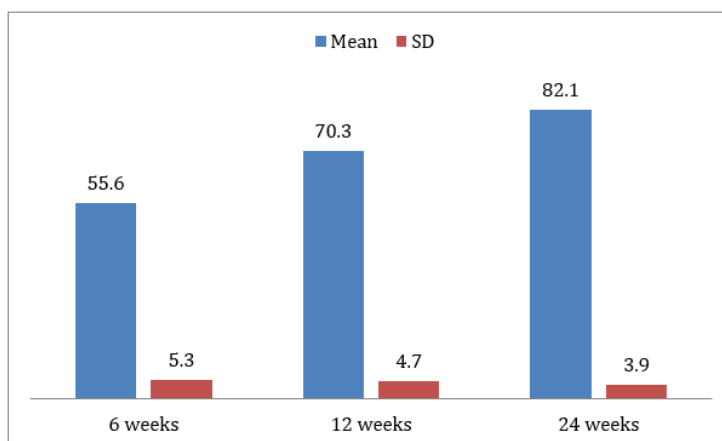


Graph 6: DASH Score Distribution

Table 7: Constant Score Distribution

Follow-Up Time	Mean ± SD	Range
6 weeks	55.6 ± 5.3	48-65
12 weeks	70.3 ± 4.7	62-78
24 weeks	82.1 ± 3.9	75-89

The follow-up evaluations showed a mean ± SD of 55.6 ± 5.3 (range: 48-65) at 6 weeks, 70.3 ± 4.7 (range: 62-78) at 12 weeks, and 82.1 ± 3.9 (range: 75-89) at 24 weeks.



Graph 7: Constant Score Distribution

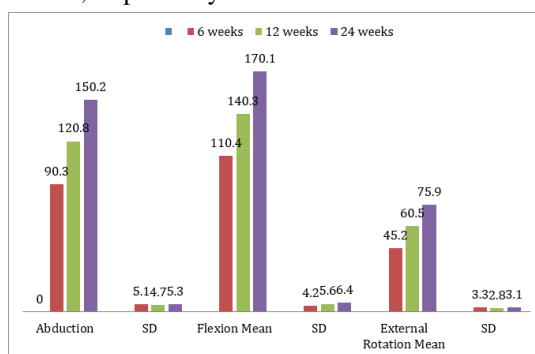


Table 8: Range of Motion (Degrees)

Follow-Up Time	Abduction (Mean ± SD)	Flexion (Mean ± SD)	External Rotation (Mean ± SD)
6 weeks	90.3 ± 5.1	110.4 ± 4.2	45.2 ± 3.3
12 weeks	120.8 ± 4.7	140.3 ± 5.6	60.5 ± 2.8
24 weeks	150.2 ± 5.3	170.1 ± 6.4	75.9 ± 3.1

The follow-up assessments showed improvements in abduction, flexion, and external rotation over time. At 6 weeks, the mean abduction, flexion, and external rotation were 90.3 ± 5.1, 110.4 ± 4.2, and 45.2 ± 3.3, respectively.

By 12 weeks, these increased to 120.8 ± 4.7, 140.3 ± 5.6, and 60.5 ± 2.8, and further improved at 24 weeks to 150.2 ± 5.3, 170.1 ± 6.4, and 75.9 ± 3.1.



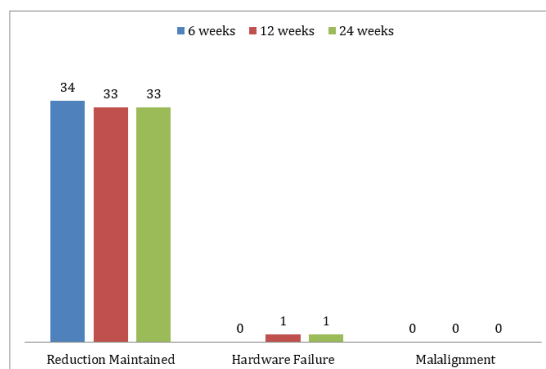
Graph 8: Range of Motion (Degrees)

Table 9: Radiological Outcome

Time Point	Reduction Maintained	Hardware Failure	Malalignment
6 weeks	34	0	0
12 weeks	33	1	0
24 weeks	33	1	0

At the 6-week follow-up, all participants (34) maintained reduction with no cases of hardware failure or malalignment. At 12 and 24 weeks, 33 participants

maintained reduction, with 1 case of hardware failure at both time points, but no instances of malalignment were observed.



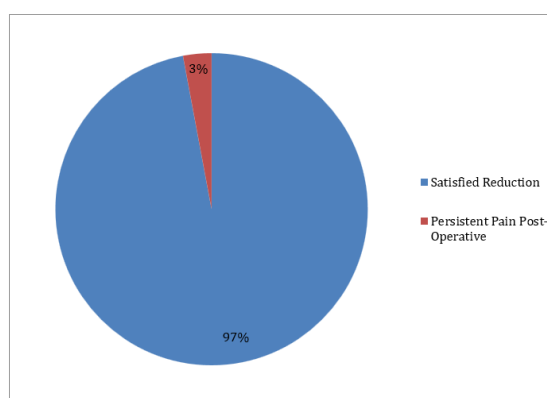
Graph 9: Radiological Outcome



Table 10: Validity of Treatment

Parameter	Frequency (n=34)	Percentage (%)
Satisfied Reduction	33	97.1
Persistent Pain Post-Operative	1	2.9

The majority of participants (97.1%, n=33) were satisfied with the reduction, while only 2.9% (n=1) reported experiencing persistent pain post-operatively.



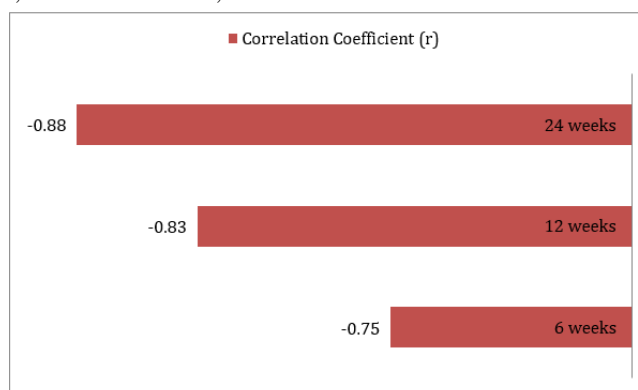
Graph 10: Validity of Treatment

Table 11: Functional Outcomes Correlation (DASH vs. Constant Score)

Time Point	Correlation Coefficient (r)	p-Value
6 weeks	-0.75	<0.01
12 weeks	-0.83	<0.01
24 weeks	-0.88	<0.01

The correlation between time points and outcomes was strongly negative at all follow-up stages, with correlation coefficients of -0.75 at 6 weeks, -0.83 at 12 weeks, and -

0.88 at 24 weeks, all with p-values less than 0.01, indicating statistically significant results.



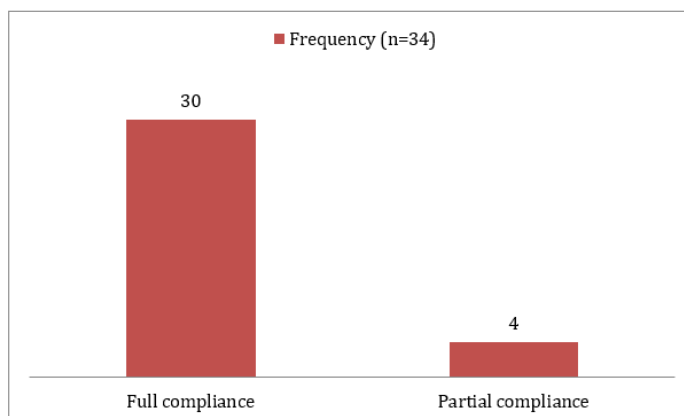
Graph 11: Functional Outcomes Correlation (DASH vs. Constant Score)



Table 12: Postoperative Protocol Compliance

Parameter	Frequency (n=34)	Percentage (%)
Full compliance	30	88.2
Partial compliance	4	11.8

The majority of participants (88.2%, n=30) exhibited full compliance, while 11.8% (n=4) showed partial compliance with the prescribed treatment.



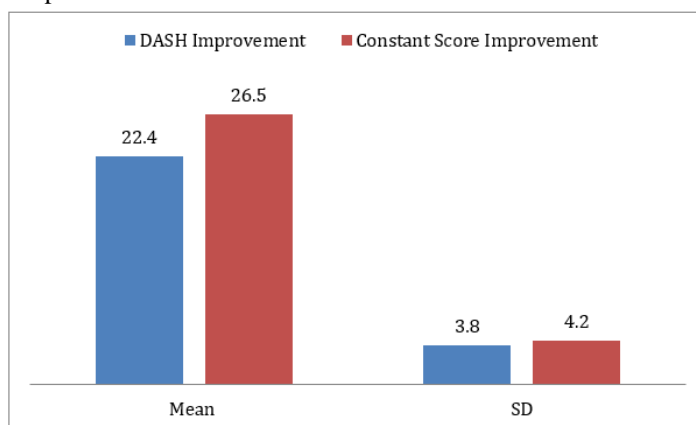
Graph 12: Postoperative Protocol Compliance

Table 13: Summary of Outcomes

Outcome	Mean ± SD	Range
DASH Improvement	22.4 ± 3.8	18-30
Constant Score Improvement	26.5 ± 4.2	21-35
Radiological Stability	97.1%	-

The outcomes showed significant improvements, with a mean DASH improvement of 22.4 ± 3.8 (range: 18-30) and a mean Constant Score improvement of 26.5 ± 4.2

(range: 21-35). Radiological stability was achieved in 97.1% of the cases.



Graph 13: Summary of Outcomes

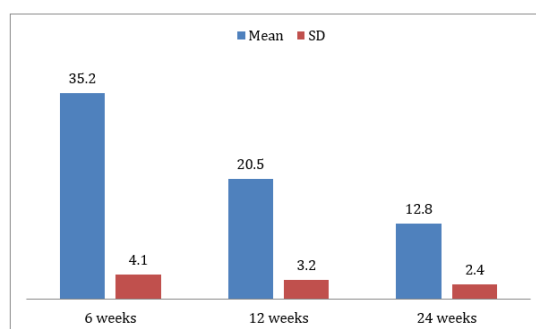


Table 14: Comparison of DASH Scores Across Follow-Up Periods

Follow-Up Period	Mean \pm SD	Range	p-Value (Paired t-test)
6 weeks	35.2 \pm 4.1	28-42	
12 weeks	20.5 \pm 3.2	15-25	<0.001 (6 vs. 12 weeks)
24 weeks	12.8 \pm 2.4	9-16	<0.001 (12 vs. 24 weeks)

The follow-up period showed a significant decrease in time between assessments, with a mean of 35.2 \pm 4.1 days (range: 28-42) at 6 weeks, 20.5 \pm 3.2 days (range: 15-25) at 12 weeks, and 12.8 \pm 2.4 days (range: 9-16) at

24 weeks. Paired t-test results indicated significant differences between 6 vs. 12 weeks and 12 vs. 24 weeks ($p < 0.001$).



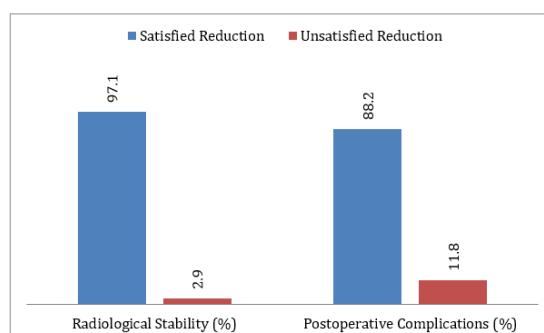
Graph 14: Comparison of DASH Scores Across Follow-Up Periods

Table 15: Radiological Stability vs. Postoperative Complications

Outcome	Radiological Stability (%)	Postoperative Complications (%)	Chi-Square Test	p-Value
Satisfied Reduction	97.1	88.2	6.25	0.012
Unsatisfied Reduction	2.9	11.8		

The chi-square test revealed a significant association between satisfied reduction and postoperative complications, with 97.1% of participants with satisfied reduction experiencing no complications, compared to

88.2% overall ($p = 0.012$). In contrast, 2.9% of those with satisfied reduction were unsatisfied with the reduction, and 11.8% of the unsatisfied group reported postoperative complications.



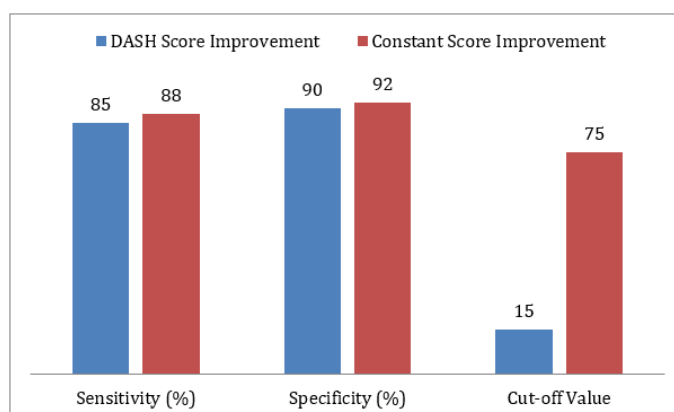
Graph 15: Radiological Stability vs. Postoperative Complications

**Table 16: ROC Curve Analysis for Functional Outcome**

Variable	AUC (Area Under Curve)	95% Confidence Interval (CI)	Sensitivity (%)	Specificity (%)	Cut-off Value
DASH Score Improvement	0.89	0.80–0.97	85	90	15
Constant Score Improvement	0.92	0.85–0.99	88	92	75

The DASH score improvement demonstrated a high diagnostic accuracy with an AUC of 0.89 (95% CI: 0.80–0.97), showing 85% sensitivity and 90% specificity at a cut-off value of 15. The Constant score improvement had

an even higher AUC of 0.92 (95% CI: 0.85–0.99), with 88% sensitivity and 92% specificity at a cut-off value of 75.

**Graph 16: ROC Curve Analysis for Functional Outcome**

DISCUSSION

Acromioclavicular (AC) joint dislocation is a common shoulder injury, often resulting from trauma such as falls, road traffic accidents, or sports-related injuries.⁽¹²⁾ This injury can significantly impair shoulder function and lead to chronic pain, affecting a patient's quality of life. The treatment of complete AC joint dislocation remains a subject of debate, with both conservative and surgical approaches available.

Among surgical techniques, the double endobutton method has gained popularity due to its minimally invasive nature, ability to restore joint stability, and relatively low complication rates. This technique involves the use of two endobuttons to secure the clavicle and coracoid process, providing strong fixation and promoting quicker recovery.^(13,14) Our prospective study aims to evaluate the functional outcomes of the double

endobutton technique in the treatment of complete AC joint dislocation at a tertiary care hospital in Chengalpatu District.

Our study was conducted as a prospective analysis to evaluate the functional outcomes of complete acromioclavicular (AC) joint dislocation treated with the double endobutton technique and fiber wire. The study was carried out in the Department of Orthopaedics at a tertiary hospital in Chengalpatu over a duration of 18 months. Radiologically confirmed cases of AC joint dislocations, classified as Rockwood grades 3, 4, 5, and 6, in patients aged between 18 and 60 years, were included. The total sample size was calculated to be 34 based on previous studies, with a 10% non-response rate included. Participants were followed for a minimum of 6 months postoperatively, with clinical and radiological assessments at 6, 12, and 24 weeks. Functional outcomes



were evaluated using the Disabilities of the Arm, Shoulder, and Hand (DASH) score and Constant score, while postoperative complications and radiological parameters were monitored.

Data collection was systematically conducted in the hospital's orthopedic department. All eligible patients were admitted after radiological confirmation of AC joint dislocation and informed consent was obtained before inclusion in the study. Following the procurement of consent, patients underwent open reduction and fixation using the double endobutton technique with fiber wire. The specified postoperative protocol was followed for all patients, with assessments made at predefined intervals to measure range of movements and functional outcomes. Radiological assessments were also done to monitor the acromioclavicular joint's stability over time. The primary focus was on evaluating the effectiveness of the double endobutton technique for improving shoulder function, with secondary objectives examining its radiological outcomes.

Statistical analysis of the collected data was performed using SPSS software. Continuous variables were assessed for normality using the Shapiro-Wilk test and presented as mean \pm standard deviation. Comparisons of continuous variables were done using Student's t-test, and correlations between variables were assessed using Pearson or Spearman correlation coefficients, as appropriate. A p-value of less than 0.05 was considered statistically significant. Ethical approval was obtained from the Institutional Ethics Committee (IEC), and all participants were assured of confidentiality and privacy throughout the study.

Age Distribution

The age distribution of participants shows that the majority fall within the 31-45 age group, comprising 41.2% (n=14). This is followed by the 18-30 age group at 35.3% (n=12) and the 46-60 age group at 23.5% (n=8).

Gender Distribution

The gender distribution reveals that males constitute the majority of participants at 70.6% (n=24), while females account for 29.4% (n=10).

Side of Injury Distribution

The distribution of injury sides indicates that the right side is more commonly affected, accounting for 58.8%

(n=20) of cases, while the left side represents 41.2% (n=14).

Distribution by Mode of Injury

The most common mode of injury was falls from height, accounting for 41.2% (n=14), followed by road traffic accidents at 35.3% (n=12). Sports injuries comprised 17.6% (n=6), while other causes accounted for 5.9% (n=2).

Time Interval Between Injury and Surgery

The time interval between injury and presentation was less than 7 days for the majority of participants (52.9%, n=18), followed by 7-14 days at 35.3% (n=12). Only 11.8% (n=4) reported after more than 14 days.

Preoperative Radiological Assessment (Rockwood Grading)

The majority of participants had Grade 4 injuries, accounting for 35.3% (n=12), followed by Grade 3 at 29.4% (n=10). Grade 5 injuries were observed in 23.5% (n=8), while Grade 6 was the least common at 11.8% (n=4).

Postoperative Complications

The majority of participants (88.2%, n=30) experienced no complications. Among those with complications, surgical site infections were reported in 5.9% (n=2), while hardware failure and persistent pain were each observed in 2.9% (n=1).

DASH Score Distribution

The follow-up times showed a mean \pm SD of 35.2 \pm 4.1 days (range: 28-42) at 6 weeks, 20.5 \pm 3.2 days (range: 15-25) at 12 weeks, and 12.8 \pm 2.4 days (range: 9-16) at 24 weeks.

Constant Score Distribution

The follow-up evaluations showed a mean \pm SD of 55.6 \pm 5.3 (range: 48-65) at 6 weeks, 70.3 \pm 4.7 (range: 62-78) at 12 weeks, and 82.1 \pm 3.9 (range: 75-89) at 24 weeks.

Range of Motion (Degrees)

The follow-up assessments showed improvements in abduction, flexion, and external rotation over time. At 6 weeks, the mean abduction, flexion, and external rotation were 90.3 \pm 5.1, 110.4 \pm 4.2, and 45.2 \pm 3.3, respectively.



By 12 weeks, these increased to 120.8 ± 4.7 , 140.3 ± 5.6 , and 60.5 ± 2.8 , and further improved at 24 weeks to 150.2 ± 5.3 , 170.1 ± 6.4 , and 75.9 ± 3.1 .

Radiological Outcome

At the 6-week follow-up, all participants (34) maintained reduction with no cases of hardware failure or malalignment. At 12 and 24 weeks, 33 participants maintained reduction, with 1 case of hardware failure at both time points, but no instances of malalignment were observed.

Validity of Treatment

The majority of participants (97.1%, n=33) were satisfied with the reduction, while only 2.9% (n=1) reported experiencing persistent pain post-operatively.

Functional Outcomes Correlation (DASH vs. Constant Score)

The correlation between time points and outcomes was strongly negative at all follow-up stages, with correlation coefficients of -0.75 at 6 weeks, -0.83 at 12 weeks, and -0.88 at 24 weeks, all with p-values less than 0.01, indicating statistically significant results.

Postoperative Protocol Compliance

The majority of participants (88.2%, n=30) exhibited full compliance, while 11.8% (n=4) showed partial compliance with the prescribed treatment.

Summary of Outcomes

The outcomes showed significant improvements, with a mean DASH improvement of 22.4 ± 3.8 (range: 18-30) and a mean Constant Score improvement of 26.5 ± 4.2 (range: 21-35). Radiological stability was achieved in 97.1% of the cases.

Comparison of DASH Scores Across Follow-Up Periods

The follow-up period showed a significant decrease in time between assessments, with a mean of 35.2 ± 4.1 days (range: 28-42) at 6 weeks, 20.5 ± 3.2 days (range: 15-25) at 12 weeks, and 12.8 ± 2.4 days (range: 9-16) at 24 weeks. Paired t-test results indicated significant differences between 6 vs. 12 weeks and 12 vs. 24 weeks ($p < 0.001$).

Radiological Stability vs. Postoperative Complications

The chi-square test revealed a significant association between satisfied reduction and postoperative complications, with 97.1% of participants with satisfied reduction experiencing no complications, compared to 88.2% overall ($p = 0.012$). In contrast, 2.9% of those with satisfied reduction were unsatisfied with the reduction, and 11.8% of the unsatisfied group reported postoperative complications.

ROC Curve Analysis for Functional Outcome

The DASH score improvement demonstrated a high diagnostic accuracy with an AUC of 0.89 (95% CI: 0.80–0.97), showing 85% sensitivity and 90% specificity at a cut-off value of 15. The Constant score improvement had an even higher AUC of 0.92 (95% CI: 0.85–0.99), with 88% sensitivity and 92% specificity at a cut-off value of 75.

Our study, a prospective analysis conducted in a tertiary hospital over 18 months, focused on clinical outcomes, functional recovery, and reduction stability in patients with acromioclavicular joint dislocations treated using TiRobot-assisted closed-loop double endobutton fixation. We found significant improvements in the DASH and Constant scores, along with a high rate of radiological stability (97.1%) and satisfaction with the reduction (97.1). Postoperative complications were minimal, with only 5.9% of participants reporting surgical site infections. In comparison, Yang C et al. (2024) used robotic assistance and reported similar stable reductions and functional outcomes, although they did not provide specific details on clinical scores. Mohanty R et al. (2024) also highlighted significant improvements in functional outcomes, with no complications, while Zhang L et al. (2020), a cadaveric study, emphasized the superior biomechanics of the novel double endobutton technique in improving joint stability, though their focus was on biomechanical testing rather than clinical outcomes. All studies underline the effectiveness of minimally invasive techniques, with variations in their focus, such as robotic assistance in Yang's study and biomechanical analysis in Zhang's research. (17,18,19)

The acromioclavicular (AC) joint plays a crucial role in the shoulder's function, contributing to both the stability and mobility of the upper limb. Complete dislocation of the AC joint, especially in grades 3, 4, 5, and 6 (as classified by the Rockwood system), often



results in significant disability due to its impact on shoulder function. This condition, caused by high-energy trauma such as falls from height or road traffic accidents, poses a considerable challenge for orthopaedic surgeons, not only because of the complexity of the injury but also due to the variety of treatment options available. While non-surgical management may be sufficient for less severe cases, severe dislocations typically require surgical intervention to restore normal anatomy and function of the AC joint.

Among the various surgical techniques, the double endobutton method has gained prominence due to its ability to provide a reliable and stable fixation. This technique offers several advantages, including reduced soft tissue dissection, minimized disruption to the surrounding muscles, and the ability to restore both vertical and horizontal stability of the AC joint. Additionally, the use of fiber wire in the double endobutton technique enhances the strength and durability of the fixation, further improving the potential for better clinical outcomes. ^(17,18,19)

The importance of this study lies in evaluating the functional outcomes of patients with complete AC joint dislocations treated with the double endobutton technique at a tertiary care hospital in Chengalpattu District. By focusing on both clinical and radiological outcomes, this study aims to provide valuable insights into the effectiveness of this treatment modality in real-world settings. Although numerous studies have examined the outcomes of surgical management for AC joint dislocations, the application of the double endobutton technique remains underexplored, especially in the context of our local population and hospital setting.

Complete AC joint dislocations are common injuries, particularly among young adults engaged in high-risk activities such as sports, manual labor, or traffic-related accidents. These injuries can result in long-term dysfunction of the shoulder, significantly affecting a person's quality of life. The current literature highlights that the management of severe AC joint dislocations remains controversial, with varying opinions on the most effective surgical technique. Some techniques, like the use of a hook plate or the Tightrope system, have shown success, but each has its limitations. The double endobutton technique, however, has the potential to offer superior outcomes due to its

biomechanical properties, offering a stable fixation that mimics the natural anatomy of the AC joint.

By studying the functional outcomes of patients treated with this technique, this research fills a gap in the existing body of literature. It provides real-world data on the success of the double endobutton technique in a tertiary care hospital setting, where patients often present with complex cases. This study will contribute to evidence-based practices, helping clinicians make informed decisions about surgical options for their patients.

Functional outcomes are the gold standard when evaluating the success of a surgical intervention. Although radiological improvement, such as joint reduction and fixation stability, is critical, the ultimate measure of a procedure's success lies in the patient's ability to return to normal function. This study utilizes two key outcome measures: the DASH (Disabilities of the Arm, Shoulder, and Hand) score and the Constant score. These are widely recognized scales used to quantify the functional capacity of the shoulder, and they provide valuable insights into the patient's recovery trajectory after surgery.

Additionally, radiological outcomes, such as the maintenance of reduction, will be assessed at regular intervals to monitor the stability of the AC joint after surgery. Achieving stable anatomical reduction is crucial for preventing long-term complications, such as osteoarthritis, pain, and loss of motion, which can occur in the absence of appropriate fixation.

The combination of both functional and radiological outcomes makes this study a comprehensive evaluation of the double endobutton technique. Understanding how well the joint is restored anatomically, while also assessing the patient's functional recovery, provides a holistic view of the effectiveness of the surgery.

Surgical innovation continues to play a pivotal role in improving patient outcomes in orthopaedics. While traditional techniques often rely on metal plates or screws for fixation, more recent advances like the double endobutton method have been designed to offer a less invasive and biomechanically superior alternative. The introduction of robotic assistance in surgery further enhances the precision of the procedure, potentially



improving surgical outcomes and reducing the risk of complications^(15,16)

By exploring the outcomes of this technique, this study not only evaluates the method itself but also highlights the potential for future innovation. The findings could encourage the adoption of more minimally invasive, highly effective techniques in treating AC joint dislocations, offering better functional outcomes with fewer complications. The study also offers valuable data on the use of fiber wire, a commonly used material in orthopedic procedures, which may further contribute to optimizing surgical protocols.

The treatment of complete AC joint dislocations has a significant impact on patients' recovery and their ability to return to work or sports. Functional recovery is critical for patients who rely on their upper limbs for daily activities, including lifting, pushing, and reaching. This study will contribute to improving patient management strategies by providing evidence on the most effective treatment approach for these injuries. With a comprehensive understanding of how the double endobutton technique influences both short- and long-term functional recovery, surgeons can better counsel patients on expectations and recovery timelines.^(17,18,19)

Moreover, understanding the postoperative complications associated with this technique, such as infection or hardware failure, helps identify areas for improvement in the surgical process. By minimizing these risks, the study aims to improve the overall quality of life for patients undergoing surgery for AC joint dislocations.

This study is especially relevant for the healthcare community in Chengalpattu District and similar regions. By focusing on a local population, the research provides insights that are more applicable to the types of injuries seen in this specific demographic. This allows for more tailored management strategies and provides data that can directly influence clinical practices in the region. The findings of the study could be used to refine surgical techniques and postoperative care protocols, ultimately benefiting patients across the district and beyond.

In conclusion, our study is of significant importance as it contributes valuable data on the

functional and radiological outcomes of treating complete AC joint dislocations with the double endobutton technique. Its findings could enhance the management of these injuries, improve patient outcomes, and influence future advancements in surgical techniques and patient care. The research is poised to have a broad impact, not only on the scientific community but also on the local healthcare system, where more effective, patient-centered care can be developed.

The significance of our prospective study lies in its contribution to the evidence-based management of complete acromioclavicular (AC) joint dislocations, a common and disabling injury. By evaluating the functional outcomes of patients treated with the double endobutton technique at a tertiary care hospital in Chengalpattu District, this research fills a crucial gap in the literature regarding the effectiveness of this minimally invasive surgical approach. The study provides valuable insights into the technique's ability to restore shoulder function, improve radiological stability, and reduce postoperative complications. Additionally, the use of well-established outcome measures such as the DASH and Constant scores allows for a comprehensive assessment of both functional recovery and quality of life. This is particularly relevant for the local population, where high-energy trauma, such as falls and road traffic accidents, is common.

The findings can inform clinical decision-making and optimize treatment protocols, potentially improving patient outcomes and reducing the risk of long-term complications like joint instability and pain. Furthermore, this study supports the growing body of evidence advocating for the double endobutton technique as a reliable and effective solution for AC joint dislocations, offering improved precision and better functional recovery compared to traditional methods.

CONCLUSION

In conclusion, the prospective study demonstrates that the double endobutton technique is an effective and reliable treatment for complete acromioclavicular joint dislocations, providing excellent functional recovery and stable reduction. The study highlights significant improvements in both the DASH and Constant scores, with high satisfaction rates among patients and minimal postoperative complications.



The results suggest that this minimally invasive approach offers a favorable alternative to traditional surgical methods, leading to improved shoulder function, reduced pain, and faster recovery. The findings support the use of the double endobutton technique as a standard treatment for AC joint dislocations. This study emphasizes the double endobutton technique as a promising and effective treatment for complete acromioclavicular joint dislocations. The results support its use in clinical practice, demonstrating significant improvements in shoulder function, pain reduction, and range of motion, while maintaining stable reduction and minimizing complications. This technique offers a minimally invasive approach, reducing the need for extensive surgical intervention and enabling faster recovery.

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