

PROSPECTIVE STUDY OF COMPLETE ACROMIOCLAVICULAR JOINT DISLOCATION REPAIR BY DOUBLE ENDOBUTTON METHOD

RASHMIRANJAN MOHANTY^{1*}, ARPITA JENA²

¹Department of Orthopaedics, PRM Medical College, Baripada, Odisha, India. ²Department of Anaesthesiology, SCB Medical College, Cuttack, Odisha, India.

*Corresponding author: Rashmiranjan Mohanty; Email: mohantyrashmi11@gmail.com

Received: 25 October 2023, Revised and Accepted: 07 December 2023

ABSTRACT

Objectives: Double-endobutton technique offers a better treatment for dislocation when compared to conventional method for the acromioclavicular (AC) joint disturbance treatment. Hence, we have planned to assess the experimental outcomes of complete AC joint dislocation through double endobutton method.

Methods: Thirty subjects among 20–68 years with a complete AC joint dislocation were studied. Diagnosis has been made by radiograph of both clavicle anteroposterior stress view and all subjects were subjected to Double Endobutton practice. Outcome was assessed using visual analog score, disabilities of the arm, shoulder, and hand, coracoclavicular, and constant shoulder score.

Results: Among 30 subjects, male subjects were found to be 18 subjects with 34.43±7.65 years as the mean age between them. There was a substantial decrease in VAS score and DASH score from pre-operative to post-operative. A substantial development in the subjective shoulder value (28.4% vs. 98.12%; p=0.001) and Constant–Murley score (32.43% vs. 96.76%; p=0.005) from pre-operative to post-operative was observed with the subjects. At final follow-up, 28 patients showed excellent outcome and fair outcome in two patients. Further, no subjects were reported with any additional difficulties.

Conclusion: This practice offers a modest, affordable, single-stretch surgical procedure that re-establishes coraco-clavicular interval and sustains until the native ligaments rebuild. This technique also demonstrates to be an outstanding alternate modal in rectifying whole AC joint dislocation.

Keywords: AC joint injury, Coracoacromial ligament, Double endobutton technique, Prospective study.

© 2024 The Authors. Published by Innovare Academic Sciences Pvt Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>) DOI: <http://dx.doi.org/10.22159/ajpcr.2024v17i1.50066>. Journal homepage: <https://innovareacademics.in/journals/index.php/ajpcr>

INTRODUCTION

An acromioclavicular (AC) joint injury occurs in 9% of subjects having shoulder girdle injuries. This injury seems to be more prevalent among male amid the age group between 20 and 40 years [1,2]. People who are actively involved in sports and athletes were more prone to this injury and these active persons were most commonly infected with this condition [3,4]. Types of I and II Rockwood wounds can be managed without surgery whereas Types IV–VI need to be managed only with surgery and also required the therapy for satisfactory decline and maintenance of AC joint. Nevertheless, the managing of Rockwood Type III AC displacement seems to be quiet provocative [5,6]. Numerous categories of operating procedures are available to manage AC joint displacement, and there is still waiting for the gold standard method [7-9]. Endobutton procedure seems to be more convenient technique for managing whole AC-joint displacement [10]. This procedure permits restructuring the coracoclavicular (CC) ligament in its bodily site and also for chronic AC-joint displacement to accomplish genetic refurbishment of CC and coracoacromial (CA) ligament [11]. This procedure offers an outstanding result which is authenticated for biomechanical research with no threat of knot slip and additional operation of implantation elimination [12]. Literature analysis revealed that lots of surgical procedures were available to manage AC joint displacement. Lately, endobutton procedure has been illuminated in managing the AC-joint displacement. Therefore, we used this technique in this present study and investigated its consequence.

METHODS

This research has been performed at Orthopaedics Department, PRM Medical College, Baripada, Odisha during 2022 (January–July)

subsequently after getting ethical clearance. Thirty subjects with AC joint damages have been encompassed into the research subsequently procurement of informed and written consents from all the subjects. Subjects aged below 18 years, subjects having chronic dislocations, degenerative ailment of the similar shoulder have been omitted commencing the research. All the subjects have been identified with anteroposterior radiographs and scientific investigations. This research has been followed up for the period of about 1 year. For all the subjects, surgery was performed in beach chair position after initiation of general anesthesia with padding of all the bony prominences. To inhibit protraction of scapula, a small towel has been kept below the medial scapula border. A 2–2.5 cm horizontal opening has been done above adjacent clavicle end, 2–2.5 cm medial to AC joint.

On piercing the deltotrapezoidal fascia, from the coracoid tip, a vertical cut of approximately about 2.5 cm was done. Soft tissue above the coracoid tip and inferior surface was released. The PCL zig was positioned at coracoid base and clavicle taking care not to disturb the soft tissue. A beath pin was drilled and resistance felt over clavicle and then coracoid. 4.5 mm sized drilling was made above Beath pin subsequently examining by C-arm. Then a Beath pin with polyester no. 5 in its eye was driven through clavicle to coracoid in opposite direction. Subsequently, double endobutton and polyester no. 5 suture assemblage was dragged by pulling polyester no. 5. AC joint was reduced physically by giving digital pressure and when decrease was accomplished, the endobutton was stiffened. Closure was done in layers monitored by sterile aseptic bandage.

Mostly all the subjects have been followed up for 1 year and it is assessed by 2nd week, 6th week, 3rd month, 6th month, and 1 year

correspondingly. Subsequently after 2nd week, sutures were removed. Sling was advised to use for the subjects after 6th week post-operatively. During this period, pendulum exercises were advised for all the subjects. From 6 weeks onward, forward flexion, abduction, internal, and external rotation along with shoulder shrugging exercises were also recommended. Complete routine work was recommenced after 6 months. Subjective shoulder value, Constant–Murley score along with VAS for pain measurement have been clinically assessed to find the outcome of the treatment [13,14].

Statistical analysis

Statistical analysis was executed by SPSS software and the variables have been represented in mean value with standard deviation and categorical data were represented in percentage.

RESULTS

The study was conducted on 30 subjects (Table 1) visiting our Department of orthopaedics, Department of Orthopaedics, PRM Medical College. Mainstream of the subjects was in the age range 20–30 years encompassing 15 (50%), followed by 31–40 years 8 (26.7%), 41–50 years 5 (16.7%), and 51–60 years 2 (6.6%), respectively. Mean age of the subjects was found to be 34.43±7.65 years. Male preponderance was observed with 18 (60%) and 12 (40%) were females. Regarding mode of injury, majority of the cases were due to road traffic accidents (RTA) 20 (66.7%) and fall injury in 10 cases (33.3%). Right-side involvement was seen in most of the cases 22 (73.3%) and left side in 8 cases (26.7%). The mean injured time to surgery was 3.23±0.56 days. About 19 (63.3%) patients had Rockwood Type III grade and 11 (36.7%) patients had Type V grade.

VAS and DASH score of pre, also 3-month post-operative, is shown in Table 2. There was a substantial reduction in VAS score and DASH score from pre-operative to post-operative, and it was significant (VAS score; 7.34±0.87 vs. 1.23±0.09; p=0.001) and (DASH score 23.41±3.12 vs. 4.12±0.32; p=0.002).

The functional outcome was assessed by subjective shoulder value and Constant–Murley score. There was a substantial improvement in the shoulder value (28.4% vs. 98.12%; p=0.0001) and Constant–Murley score (32.43% vs. 96.76%; p=0.0005) from pre-operative to post-operative, and it was significant. The results are shown in Table 3.

The CC was markedly widened preoperatively with a mean value of 26.87±1.65 mm and the immediate post-operative was reduced to 13.12±0.98 mm, and it was significant (p=0.02). The range of motion was normal in all the patients and no restriction was observed. There were two complications, stitch granuloma and superficial infections.

The final outcome is shown in Table 4. Out of 30 patients, 28 patients showed excellent outcome and fair outcome in two patients.

DISCUSSION

AC joint capsule, CA ligament, conoid, and trapezoid ligaments form the major components of the AC connections which permit to transmission of weight from axial to appendicular skeleton [15]. There is no gold standard method available today for this AC joint displacement among numerous surgical procedures documented in the literature for the management of AC joint disruption. Major suspensory ligaments of the AC joint are CC ligaments. Every CC ligament functions unique activity against AC joint strength in reaction to numerous loading circumstances [9]. The conoid seems to be the chief restraint toward superior stuffing and the trapezoid toward posterior stuffing [16].

In this research, a synthetic ligament reconstruction method with two endobutton and fiber wire was used. Two titanium buttons, one over the clavicle and one under the coracoids practice, are followed to permit homogeneous scattering of loads on bone surfaces and therefore circumvent the sawing consequence of the sutures connected

Table 1: Clinical characteristic of the study participants

Parameters	Study participants (n=30), n (%)
Age (years)	
20–30	15 (50)
31–40	8 (26.7)
41–50	5 (16.7)
51–60	2 (6.6)
Mean age (years)	34.43±7.65
Gender	
Male	18 (60)
Female	12 (40)
Mode of injury	
Road traffic accidents	20 (66.7)
Fall injury	10 (33.3)
Side of involvement	
Right side	22 (73.3)
Left side	8 (26.7)
Mean time to injury to surgery (days)	3.23±0.56
Rockwood type	
Grade III	19 (63.3)
Grade V	11 (36.7)

Table 2: Assessment of outcome at pre- and post-operative periods

Parameters (mean±SD)	Preoperative	Postoperative	p (Paired Student's t-test)
VAS score	7.34±0.87	1.23±0.09	0.001*
DASH score	23.41±3.12	4.12±0.32	0.002*

*Denotes significant p<0.05. SD: Standard deviation

Table 3: Assessment of functional outcome at pre- and post-operative periods

Parameters (%)	Preoperative	Postoperative	p (Paired Student's t-test)
Subjective shoulder value	28.4	98.12	0.0001*
Constant-Murley score	32.43	96.76	0.0005*

*Denotes significant p<0.05

Table 4: Final outcome of the patients

Final outcome	Pre-operative, n (%)
Excellent	28 (93.3)
Fair	2 (6.7)

with disappointment in other anchor and suture methods. In the present study, male preponderance is observed encompassing 60%, and it might be because of further pre-dispositions to trauma for travel and workplace grievances. Correspondingly in another research documented by Sharma *et al.* [17], AC joint dislocation was higher in males as compared to females (82.6% vs. 17.4%). In our study, majority of the injuries are due to RTA in 66.7% of the cases and right-side involvement in 73.3% of the subjects. Likewise, Hu *et al.* study reported the majority of AC joint injuries are a result of RTA in 56.25% of the patients and 62.5% of the injuries are present in the right side [18].

In the present study, patients managed with double endobutton procedure displayed a significant reduction in VAS score and DASH score from pre-operative to post-operative. Likewise in Avinash *et al.* [19] study mean DASH score considerably reduced from 32

preoperatively to 2.87 at the preceding follow-up. In another research done by Torkaman *et al.* [20] reported, the substantial decrease in mean pre- and post-operative DASH scores from 20.79 and 1.43. In their study, also substantial decrease in VAS scores from pre- to post-operative was significant was documented (6.82 and 1.85).

The current research showed a substantial improvement in subjective shoulder value from 28.4% to 98.12% and Constant–Murley score from 32.43% and 96.76% at pre- and post-operative periods. Similarly in Torkaman *et al.* [21] study, there was a substantial enhancement in constant score during post-operative from 33.54 to 89.36. Further, there was a significant reduction in CC distance postoperatively 13.12 ± 0.98 , and it is in corroboration with the study done by Yapici *et al.* [21] 20.43 ± 3.8 to 8.05 ± 1.4 mm post-operative. As per the observations of the current research, the double-button fixation structure offers negligible injury to the soft tissues adjoining CC ligaments and an appropriate method for AC joint displacement therapy with fewer impediments.

CONCLUSION

Established outcomes of the present research, it concluded that the double endobutton method was found to be extremely efficient management modality for AC joint displacements treatment offering great consequences with negligible impediments if implemented by conscientious operating practice.

ACKNOWLEDGMENTS

Nil.

AUTHORSHIP CONTRIBUTIONS

All the authors equally contributed for the manuscript.

CONFLICTS OF INTEREST

Nil.

FUNDING

Nil.

REFERENCES

- Mazzocca AD, Arciero RA, Bicos J. Evaluation and treatment of acromioclavicular joint injuries. *Am J Sports Med* 2007;35:316-29. doi: 10.1177/0363546506298022, PMID 17251175
- Chillemi C, Franceschini V, Dei Giudici L, Alibardi A, Salate Santone F, Ramos Alday LJ, *et al.* Epidemiology of isolated acromioclavicular joint dislocation. *Emerg Med Int* 2013;2013:171609. doi: 10.1155/2013/171609, PMID 23431452
- Gstettner C, Tauber M, Hitzl W, Resch H. Rockwood type III acromioclavicular dislocation: Surgical versus conservative treatment. *J Shoulder Elbow Surg* 2008;17:220-5. doi: 10.1016/j.jse.2007.07.017, PMID 18249565
- Abrams GD, McGarry MH, Jain NS, Freehill MT, Shin SJ, Cheung EV, *et al.* Biomechanical evaluation of a coracoclavicular and acromioclavicular ligament reconstruction technique utilizing a single continuous intramedullary free tendon graft. *J Shoulder Elbow Surg* 2013;22:979-85. doi: 10.1016/j.jse.2012.09.013, PMID 23313367
- Wei HF, Chen YF, Zeng BF, Zhang CQ, Chai YM, Wang HM, *et al.* Triple endobutton technique for the treatment of acute complete acromioclavicular joint dislocations: Preliminary results. *Int Orthop* 2011;35:555-9. doi: 10.1007/s00264-010-1057-x, PMID 20517694
- Arirachakaran A, Boonard M, Piyapittayanun P, Phiphobmongkol V, Chaijenkij K, Kongtharvonskul J. Comparison of surgical outcomes between fixation with hook plate and loop suspensory fixation for acute unstable acromioclavicular joint dislocation: A systematic review and meta-analysis. *Eur J Orthop Surg Traumatol* 2016;26:565-74. doi: 10.1007/s00590-016-1797-4, PMID 27334621
- Pan Z, Zhang H, Sun C, Qu L, Cui Y. Arthroscopy-assisted reconstruction of coracoclavicular ligament by Endobutton fixation for treatment of acromioclavicular joint dislocation. *Arch Orthop Trauma Surg* 2015;135:9-16. doi: 10.1007/s00402-014-2117-2, PMID 25421528
- Di Francesco A, Zoccali C, Colafarina O, Pizzoferrato R, Flamini S. The use of hook plate in type III and V acromio-clavicular Rockwood dislocations: Clinical and radiological midterm results and MRI evaluation in 42 patients. *Injury* 2012;43:147-52. doi: 10.1016/j.injury.2011.04.002, PMID 21592473
- Wellmann M, Zantop T, Petersen W. Minimally invasive coracoclavicular ligament augmentation with a flip button/polydioxanone repair for treatment of total acromioclavicular joint dislocation. *Arthroscopy* 2007;23:1132.e1-5. doi: 10.1016/j.arthro.2006.12.015, PMID 17916485
- Lu D, Wang T, Chen H, Sun LJ. A comparison of double Endobutton and triple Endobutton techniques for acute acromioclavicular joint dislocation. *Orthop Traumatol Surg Res* 2016;102:891-5. doi: 10.1016/j.otsr.2016.07.003, PMID 27496662
- Wirth MA, Rockwood CA. Acute and chronic traumatic injuries of the sternoclavicular joint. *J Am Acad Orthop Surg* 1996;4:268-78.
- Gilbart MK, Gerber C. Comparison of the subjective shoulder value and the constant score. *J Shoulder Elbow Surg* 2007;16:717-21. doi: 10.1016/j.jse.2007.02.123, PMID 18061114
- Constant CR, Murley AH. A clinical method of functional assessment of the shoulder. *Clin Orthop Relat Res* 1987;1:160-4.
- Fukuda K, Craig EV, An KN, Cofield RH, Chao EY. Biomechanical study of the ligamentous system of the acromioclavicular joint. *J Bone Joint Surg Am* 1986;68:434-40. doi: 10.2106/00004623-198668030-00019, PMID 3949839
- Lee KW, Debski RE, Chen CH, Woo SL, Fu FH. Functional evaluation of the ligaments at the acromioclavicular joint during anteroposterior and superoinferior translation. *Am J Sports Med* 1997;25:858-62. doi: 10.1177/036354659702500622, PMID 9397278
- Debski RE, Parsons IM, Fenwick J, Vangura A. Ligament mechanics during three degree-of-freedom motion at the acromioclavicular joint. *Ann Biomed Eng* 2000;28:612-8. doi: 10.1114/1.1304848, PMID 10983707
- Sharma DB, Tiwari DA, Joshi DS, Parmar DR, Sharma DR, Kumawat DC. Mini invasive double endobutton in patients with acute AC joint dislocation grade III and V: functional outcome and complication. *Nat J Clin Orthop* 2019;3:41-7. doi: 10.33545/orthor.2019.v3.i4a.179
- Hu F, Han S, Liu F, Wang Z, Jia H, Wang F, *et al.* A modified single-endobutton technique combined with nice knot for treatment of Rockwood type III or V acromioclavicular joint dislocation. *BMC Musculoskelet Disord* 2022;23:15. doi: 10.1186/s12891-021-04915-0, PMID 34980065
- Avinash GC, Bharath M, Yogananda GH, Hariprasad KA. A study of functional outcome of acromioclavicular joint reconstruction with double button fixation system. *Int J Pharm Clin Res* 2023;15:946-51.
- Torkaman A, Bagherifard A, Mokhatir T, Haghighi MH, Monshizadeh S, Taraz H, *et al.* Double-button fixation system for management of acute acromioclavicular joint dislocation. *Arch Bone Jt Surg* 2016;4:41-6.
- Yapici F, Üçpınar H, Gür V, Sevencan A, Kizilay YO, Karaköse R, *et al.* Open double-button technique is superior to hook plate in the treatment of acute rockwood type III/V acromioclavicular dislocations. *Ulus Travma Acil Cerrahi Derg* 2022;28:839-848.