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Original Article

Evaluation and Management of Distal Clavicle Fracture in a Tertiary Care Hospital LRH, Peshawar

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ABSTRACT

Background: Background: Distal clavicle fractures, constituting 10–30% of all clavicle fractures, present a significant challenge in orthopedic surgery due to their high propensity for displacement and subsequent complications such as nonunion and malunion. The Revised NEER classification system guides the management approach, distinguishing between stable and unstable fracture types, with varying recommendations for surgical and non-operative treatments.

Objective: This study aims to elucidate the patterns of distal clavicle fractures based on the NEER classification and to evaluate the outcomes of different management strategies in a tertiary care setting.

Methods: Conducted at the Department of Orthopedics, Lady Reading Hospital, Peshawar, this cross-sectional study spanned four months, from September to December 2023, following ethical approval. It employed a non-probability convenience sampling technique, including patients aged 20 to 60 years with radiographically confirmed lateral third clavicle fractures. Exclusion criteria encompassed patients without fractures or with healed fractures. Data on demographics, injury mechanism, comorbidities, and treatment were collected. The statistical analysis was performed using IBM SPSS version 25, focusing on frequencies, percentages, means, and standard deviations, with a p-value of ≤ 0.05 considered significant.

Results: Out of 70 participants, the mean age was 34.39 years (SD = 9.42), with 75.7% males. The majority of injuries were due to road traffic accidents (60%), followed by falls (17.1%), sports injuries (14.3%), and physical assaults (8.6%). Regarding comorbidities, 10% were smokers, 2.9% had hypertension, 1.4% diabetes, and 84.3% had no comorbidities. NEER classification revealed Type 2A fractures as the most common (28.6%), followed by Types 1 and 2B (18.6% each). Surgical management was predominant, with plating (58.6%) and conservative treatment (28.6%) being the most utilized methods.

Conclusion: The study highlights the prevalence of surgical intervention, particularly plating, in managing distal clavicle fractures, predominantly caused by road traffic accidents. These findings suggest a need for specific surgical protocols tailored to the fracture type to optimize patient outcomes and minimize complications.

Keywords: Distal Clavicle Fracture, NEER Classification, Orthopedic Surgery, Plating, Conservative Management, Road Traffic Accidents, Surgical Outcomes.

INTRODUCTION

Distal clavicle fractures represent a significant proportion of clavicular injuries, comprising 10–30% of all cases, with a notable fraction, approximately 50%, presenting as displaced and necessitating surgical intervention to mitigate the risks of symptomatic malunion or nonunion, which occurs in 10–44% of instances (1-4). The management of these fractures is guided by the Revised NEER classification system, which categorizes the fractures based on their relationship to the coracoclavicular (CC) ligament, delineating the approach towards their treatment. Historically, the treatment protocol for clavicular fractures, irrespective of the extent of displacement, predominantly favored non-operative measures. However, contemporary practices advocate a more stratified approach, identifying Types 1 and 3 fractures as stable, thereby suitable for conservative management, whereas Types 2 and 5 fractures are deemed unstable, frequently requiring surgical intervention such as open reduction and internal fixation (1,5,6).

Journal of Health and Rehabilitation Research 2791-156X JHRR

The instability induced by injury to the CC ligament, particularly affecting the vertical stability of the medial fragment, significantly elevates the risk of complications (7-9).

The landscape of surgical techniques for the fixation of distal clavicle fractures is diverse, encompassing methods ranging from the employment of Kirschner wire (K-wire) and hook plates for direct osteosynthesis, to the use of various suture materials, tendon grafts for indirect stabilization of the coracoclavicular ligament, traditional pinning methods like intramedullary pin or the CC screw, and even arthroscopic approaches. Despite the array of techniques available, each comes with its set of complications, including pin migration, nonunion, osteomyelitis, osteoarthritic changes, and ankylosis. This has rendered plate fixation, particularly challenging for the small distal segment, often deemed impractical (10-12). Consequently, despite the plethora of fixation techniques described in the literature, none has been universally acknowledged as the "gold standard" (13). This ambiguity underscores the management of distal clavicle fractures as a persistently challenging dilemma for shoulder surgeons, igniting ongoing debate within the scholarly community (14-16).

The objective of this study, conducted within the context of a tertiary care hospital in Peshawar, LRH, seeks to elucidate the diverse patterns of distal clavicle fractures alongside their respective management strategies. This endeavor aims not only to contribute to the existing body of knowledge but also to potentially guide future therapeutic approaches in addressing this complex orthopedic challenge.

MATERIAL AND METHODS

This cross-sectional study was conducted at the Department of Orthopedics, Lady Reading Hospital, Peshawar, following the receipt of ethical approval from the Institutional Review Board. The research spanned a period of four months, commencing on September 1, 2023, and concluding on December 31, 2023. The sampling method employed was non-probability convenience sampling, through which participants were selected based on their availability and willingness to partake in the study. Prior to their inclusion, all study participants were informed about the nature and objectives of the research, and informed consent was obtained, assuring them of confidentiality and informing them of the absence of any associated risks.

The collected baseline data encompassed a range of demographic and clinical variables including age, sex, Body Mass Index (BMI), laterality of the affected limb, duration since surgery, and the presence of any co-morbidities. Each participant underwent a comprehensive medical history review and physical examination to gather relevant data for the study. For the analysis of the collected data, IBM SPSS version 25 was utilized. This statistical software facilitated the computation of frequencies and percentages for qualitative variables such as gender, BMI, limb laterality, and treatment outcomes, while means and standard deviations were calculated for quantitative variables, including age and the number of co-morbidities. A p-value of 0.05 or less was predetermined as the threshold for statistical significance. The findings of the study were systematically presented in the form of tables and graphs to facilitate a clear and concise interpretation of the results.

The inclusion criteria for the study were specifically defined to ensure a focused and relevant participant pool. Individuals aged between 20 and 60 years of both genders, presenting with X-rays indicative of a fracture of the lateral third of the clavicle, were eligible for participation. Conversely, the study excluded individuals without a fracture or with a healed fracture, to maintain the specificity of the research towards active cases of distal clavicle fractures.

The study adhered to the ethical principles outlined in the Declaration of Helsinki, ensuring the protection of the rights, safety, and well-being of all participants. This commitment to ethical standards was reflected in the thorough process of obtaining informed consent and the meticulous consideration given to the confidentiality and risk minimization for participants. The methodological design of the study, including data collection, participant selection, and data analysis using IBM SPSS version 25, was crafted to ensure the reliability and validity of the findings.

RESULTS

In the cross-sectional study conducted, a total of 70 patients were analyzed to understand the patterns and management of distal clavicle fractures. The participants predominantly comprised males, representing 75.7% (53 individuals) of the study population, while females accounted for 24.3% (17 individuals). The mean age of those included in the study was 34.39 years, displaying a variance in age with a standard deviation of 9.42 years. When examining the mechanisms leading to the fractures, road traffic accidents (RTA) emerged as the most common cause, implicated in 60.0% (42 cases) of the incidents. This was followed by falls, contributing to 17.1% (12 cases) of the injuries, sports-related injuries at 14.3% (10 cases), and physical assaults accounting for 8.6% (6 cases). The comorbidity profile within the patient cohort revealed smoking as the most prevalent condition, observed in 10.0% (7 cases), with hypertension present in 2.9% (2 cases), diabetes in 1.4% (1 case), and other comorbidities also in 1.4% (1 case). Notably, a significant majority, 84.3% (59 cases), reported no comorbidities. Regarding the management approaches adopted, operative

Journal of Health and Rehabilitation Research JHRR 2791-156X

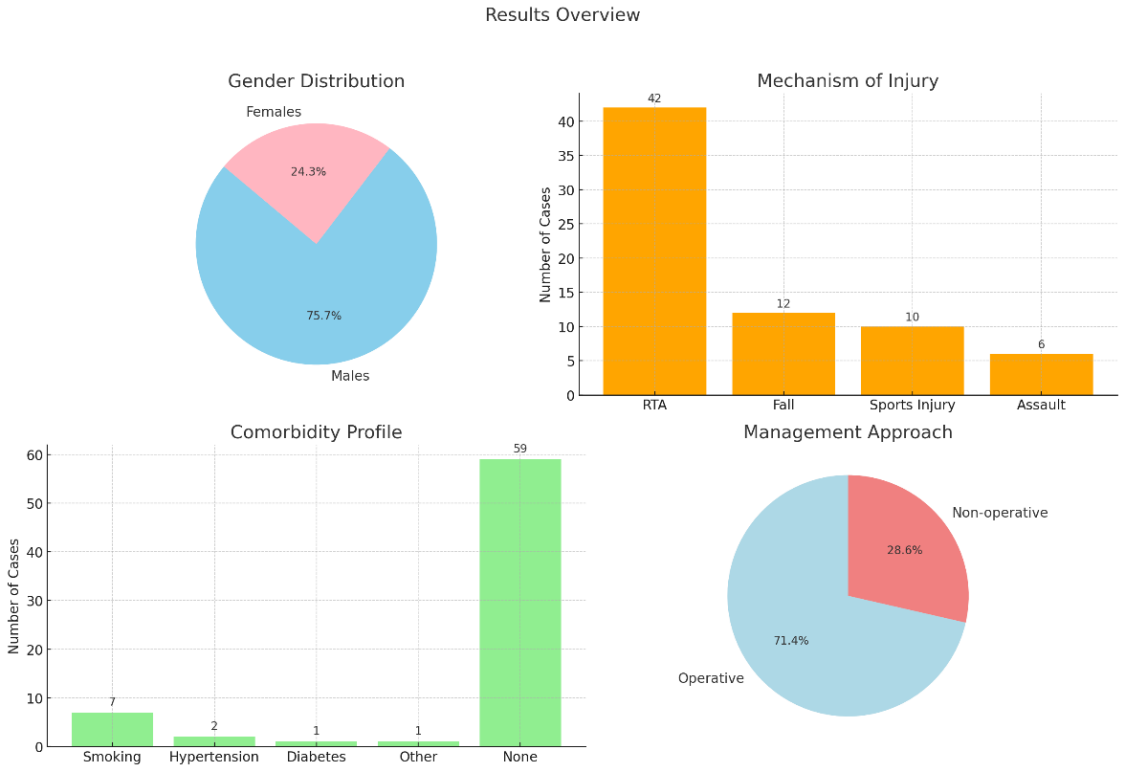

Figure 1 Demographic and Study Characteristics

management was the predominant strategy, utilized in 71.4% (50 cases) of instances, while non-operative management was applied in 28.6% (20 cases) of the cases. This distribution of management strategies underscores the complexity and varied nature of distal clavicle fracture treatment, reflecting a diverse approach to patient care within the study's context.

Table 1: NEER's Classification and Management Approaches

Classification/Management	Frequency	Percent
Type 1	13	18.60%
Type 2A	20	28.60%
Type 2B	13	18.60%
Type 3	9	12.90%
Type 4	4	5.70%
Type 5	11	15.70%
K-wires	7	10.00%
Plating	41	58.60%
Tension Bend Wiring	2	2.90%
Conservative	20	28.60%

In the comprehensive analysis presented in Table 1, the distribution of NEER's classification for distal clavicle fractures among the study participants is meticulously detailed alongside the management approaches employed. The classification reveals a varied distribution, where Type 2A fractures predominate, accounting for 28.6% of cases, signifying their relative frequency within the cohort. This is closely followed by Type 1 and Type 2B fractures, each constituting 18.6% of the total, highlighting a significant incidence of these classifications as well. Type 5 fractures were also notable, representing 15.7% of cases, whereas Type 3 and Type 4 fractures were less common, observed in 12.9% and 5.7% of the population, respectively.

The management strategies adopted for these fractures are equally telling, with plating emerging as the most frequently utilized technique, employed in a substantial 58.6% of cases. This preference underscores the technique's prominence in the surgical treatment of distal clavicle fractures. Conservative management was opted for in 28.6% of cases, reflecting a significant proportion of patients for whom non-operative treatment was deemed appropriate. The use of K-wires, although less prevalent at 10.0%, still played a vital role in the management of specific fracture types. Tension bend wiring was the least utilized method, applied in only 2.9% of cases, indicating its selective application in this cohort.

Journal of Health and Rehabilitation Research 2791-156X JHRR

DISCUSSION

In the conducted study, a significant majority of patients underwent surgical management rather than non-operative treatments, reflecting a trend towards operative intervention for distal clavicle fractures, particularly for NEER type 2 fractures which predominantly necessitated surgical intervention, with plating being the most commonly employed surgical technique. This preference for surgical management, especially plating, aligns with the study's findings that road traffic accidents (RTA) were the most frequent cause of these injuries. This observation is slightly divergent from other studies where the causes of fractures were more evenly distributed between RTA and falls (1), suggesting a potential variance in the etiological factors influencing the incidence of distal clavicle fractures in different populations.

Notably, the distribution of NEER's classification in our cohort, with Type 2A fractures being the most prevalent at 28.6%, followed by Types 1 and 2B at 18.6%, presents a contrast to other research findings. In particular, the proportion of Type 2A fractures in our study was higher than in another study which reported a relative percentage of 22% for Type 2A and 10% for Type 2B fractures (17), indicating potential variations in the incidence or reporting of fracture types across different studies or geographical areas.

The conservative management approach, applied to 28.6% of cases in our study, is noteworthy. Although conservative treatment for certain types of fractures is associated with higher complication rates such as nonunion and acromioclavicular (AC) joint arthritis, as indicated by a complication rate of 34.65% in one study (6,19), our findings underscore the complexity and need for careful selection of treatment modalities based on individual patient conditions and fracture types.

The efficacy of plating, as evidenced by its application in 58.6% of patients in our study, is supported by literature indicating excellent functional outcomes and minimal complications. One study reported a 100% functional outcome with no complications (20), while another observed a 96.8% functional score without complications (6,19), reinforcing the validity of plating as a preferred surgical technique for managing NEER type 2 fractures.

Conversely, K-Wire fixation, utilized in 10% of our cases, showed satisfactory results in alignment with previous findings; however, the risk of complications such as nonunion, K-Wire breakage, and K-Wire migration remains a concern (20-22). The use of tension band wiring in a small fraction of patients (2.9%) also mirrored the complication profile associated with K-Wiring, suggesting a need for cautious application of these techniques (6).

The study concludes that road traffic accidents are a leading cause of distal clavicle fractures, with a significant portion falling under NEER's type 2 classification, necessitating surgical intervention for optimal outcomes. This aligns with the broader consensus in orthopedic research advocating for operative management to enhance functional recovery and minimize long-term complications.

However, the study's limitations, including its focus on a specific hospital population and the relatively short research timeframe, restrict the generalizability of the findings and the ability to assess late complications associated with different surgical approaches. Additionally, potential selection bias and confounding factors might have influenced the outcomes.

Recommendations for future research include expanding the study duration to capture late postoperative complications and broadening the demographic scope to enhance the generalizability of the findings. Further investigations comparing the efficacy of different surgical techniques and their long-term outcomes are essential for refining treatment protocols for distal clavicle fractures.

CONCLUSION

The study's findings underscore the predominance of surgical management, particularly plating, in treating distal clavicle fractures, chiefly attributed to road traffic accidents. The emphasis on operative intervention, especially for NEER type 2 fractures, suggests a critical pathway for enhancing patient outcomes, reducing complications, and facilitating quicker functional recovery. These insights bear significant implications for healthcare practices, highlighting the need for tailored surgical approaches to address the specificities of distal clavicle fractures. By informing surgical decision-making and treatment protocols, the study contributes to the broader goal of optimizing patient care and outcomes in orthopedic surgery, emphasizing the importance of context-specific strategies in the management of clavicle fractures.

REFERENCES

1. Zhang C, Huang J, Luo Y, Sun H. Comparison of the efficacy of a distal clavicular locking plate versus a clavicular hook plate in the treatment of unstable distal clavicle fractures and a systematic literature review. International orthopaedics. 2014 Jul;38:1461-8.

2. Panagopoulos A, Solou K, Tatani I, Triantafyllopoulos IK, Lakoumentas J, Kouzelis A, Athanasiou V, Kokkalis ZT. What is the optimal surgical treatment for Neer type IIB (IIC) distal clavicle fractures? A systematic review and meta-analysis. Journal of Orthopaedic Surgery and Research. 2022 Apr 7;17(1):215.

3. Li L, Li TY, Jiang P, Lin G, Wu H, Han X, Yu X. Clavicle hook plate versus distal clavicle locking plate for Neer type II distal clavicle fractures. Journal of Orthopaedic Surgery and Research. 2019 Dec;14(1):1-1.

4. Nie S, Li HB, Hua L, Tang ZM, Lan M. Comparative analysis of arthroscopic-assisted Tight-rope technique and clavicular hook plate fixation in the treatment of Neer type IIB distal clavicle fractures. BMC Musculoskeletal Disorders. 2022 Dec;23(1):1-7.

5. Andersen JR, Willis MP, Nelson R, Mighell MA. Precontoured superior locked plating of distal clavicle fractures: a new strategy. Clinical Orthopaedics and Related Research®. 2011 Dec;469:3344-50.

6. Kim DW, Kim DH, Kim BS, Cho CH. Current concepts for classification and treatment of distal clavicle fractures. Clinics in orthopedic surgery. 2020 Jun;12(2):135.

7. Wang J, Guan J, Liu M, Cui Y, Zhang Y. Treatment of distal clavicle fracture of Neer type II with locking plate in combination with titanium cable under the guide. Scientific Reports. 2021 Mar 2;11(1):4949.

8. Yagnik GP, Jordan CJ, Narvel RR, Hassan RJ, Porter DA. Distal clavicle fracture repair: clinical outcomes of a surgical technique utilizing a combination of cortical button fixation and coracoclavicular ligament reconstruction. Orthopaedic journal of sports medicine. 2019 Sep 23;7(9).

9. Seo JB, Kwak KY, Yoo JS. Comparative analysis of a locking plate with an all-suture anchor versus hook plate fixation of Neer IIb distal clavicle fractures. Journal of Orthopaedic Surgery. 2020 Oct 28;28(3)

10. Kao FC, Chao EK, Chen CH, Yu SW, Chen CY, Yen CY. Treatment of distal clavicle fracture using Kirschner wires and tension-band wires. Journal of Trauma and Acute Care Surgery. 2001 Sep 1;51(3):522-5.

11. Pujol N, Philippeau JM, Richou J, Lespagnol F, Graveleau N, Hardy P. Arthroscopic treatment of distal clavicle fractures: a technical note. Knee Surgery, Sports Traumatology, Arthroscopy. 2008 Sep;16:884-6.

12. Xie Z, Song M, Zhou J, Yin G, Lin H. Precontoured locking compression plate with titanium alloy cable system: in treatment of Neer type IIb distal clavicle fracture. Orthopaedic Surgery. 2021 Apr;13(2):451-7.

13. Stegeman SA, Nacak H, Huvenaars KH, Stijnen T, Krijnen P, Schipper IB. Surgical treatment of Neer type-II fractures of the distal clavicle: a meta-analysis. Acta Orthopaedica. 2013 Jan 1;84(2):184-90.

14. Sharma V, Modi A, Armstrong A, Pandey R, Sharma D, Singh H, Padney R. The Management of Distal Clavicle Fractures–A Survey of UK Shoulder and Elbow Surgeons. Cureus. 2021 Aug 19;13(8).

15. Bisbinas I, Mikalef P, Gigis I, Beslikas T, Panou N, Christoforidis I. Management of distal clavicle fractures. Acta Orthop Belg. 2010 Apr 1;76(2):145-9.

16. Yagnik GP, Seiler JR, Vargas LA, Saxena A, Narvel RI, Hassan R. Outcomes of arthroscopic fixation of unstable distal clavicle fractures: a systematic review. Orthopaedic Journal of Sports Medicine. 2021 Apr 28;9(5).

17. Raval P, See A, Singh HP. Distal third clavicle fractures: a nationwide trainee-led collaborative review of current practice. Bone & Joint Open. 2022 Dec 23;3(12):953-9.

18. Andersen K, Jensen PØ, Lauritzen J. Treatment of clavicular fractures: Figure-of-elght bandage versus a slmple sling. Acta Orthopaedica Scandinavica. 1987 Jan 1;58(1):71-4.

19. Vaishya R, Vijay V, Khanna V. Outcome of distal end clavicle fractures treated with locking plates. Chinese Journal of Traumatology. 2017 Feb 1;20(1):45-8.

20. Regel JP, Pospiech J, Aalders TA, Ruchholtz S. Intraspinal migration of a Kirschner wire 3 months after clavicular fracture fixation. Neurosurgical review. 2002 Mar;25:110-2.

21. Leppilahti J, Jalovaara P. Migration of Kirschner wires following fixation of the clavicle-a report of 2 cases. Acta Orthopaedica Scandinavica. 1999 Jan 1;70(5):517-9.

22. Lyons FA, Rockwood Jr CA. Migration of pins used in operations on the shoulder. JBJS. 1990 Sep 1;72(8):1262-7.https://doi.org/10.1016/j.cjtee.2016.05.003.