e-ISSN: 0975-5160, p-ISSN: 2820-2651

Available online on www.ijtpr.com

International Journal of Toxicological and Pharmacological Research 2024; 14(11); 240-243

Original Research Article

Comparison between Intra-Medullary Nailing Versus Plating for Displaced Mid-Shaft Clavicle Fracture

Samarth Singh[1], Saurabh Ponde[2]

[1]Assistant Professor, Department of Orthopaedic, Vedanta Institute of Medical Sciences, Dhundalwadi, Dahanu, Distt. Palghar, Maharashtra

[2]Associate Professor, Department of Orthopaedics, Vedanta Institute of Medical Sciences, Dhundalwadi, Dahanu, Distt. Palghar, Maharashtra

Received: 18-08-2024 / Revised: 21-09-2024 / Accepted: 26-10-2024

Corresponding author: Dr. Saurabh Ponde

Conflict of interest: Nil

Abstract:

Background: Clavicle fracture is common fracture in orthopaedics practice because of its subcutaneous and relatively its anterior position. Clavicle fracture constitutes approximately 40-44% of injury to shoulder. Displaced mid-shaft clavicle fractures are most common. But the optimal fixation strategy is still controversial. With this background, we decided to conduct a study in which we compare the two most common type of fixation strategies (Plate fixation versus Intra-medullary nailing) in displaced mid-shaft clavicle fracture, to evaluate their efficacy & safety. However, both methods have their advantages and disadvantages.

Methods: 60 cases were selected on the basis of inclusion criteria & divided into two groups of 30 each. Plate fixation was used in group A and Intra-medullary TENS nailing in group B .The duration of study was one year. The primary outcome measurements included post-operative VAS score, post-operative DASH score, Union time, delayed union, Mal-union, Hospital stay, and any other side effects.

Results: Both Plate fixation & Intra-medullary TENS nailing is safe and effective procedure for displaced mid-shaft clavicle fracture. But both have certain limitations. Post-operatively VAS score, DASH score & fracture union was quite similar in both the groups but duration of hospital stay was less in group B. Rare complications were seen in both the groups.

Conclusion: We concluded that on comparing to plate fixation, Intra-medullary TENS nailing provide good functional outcome and allow early return to occupational activities, with very less chance of any complications.

Keywords: Displaced mid-shaft clavicle fractures, Plating fixation, Intramedullary nailing.

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0) and the Budapest Open Access Initiative (http://www.budapestopenaccessinitiative.org/read), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

Clavicle is one of the common fractured bones which account for 6-8% of all fractures.[1] Among clavicle fractures, mid shaft fractures are the commonest (and mostly displaced) with a reported incidence of 80%-90% as it is the thinnest segment of clavicle and is not stabilized by ligaments. Distal third fractures have incidence of 5% to 15% while medial third fractures are least common with incidence of 5%.A direct blow on the point of shoulder is the commonest reported mechanism of injury that produces a fracture of the mid shaft clavicle.[2]

Earlier, mid-shaft clavicular fractures had been treated non-surgically, as the evidence suggested that clavicular non-unions and mal-unions were rare & clinically irrelevant.[3] Decreased shoulder abduction and flexion was the main cause of patient dis-satisfaction despite bony union when treated non-operatively. Now, recent evidence suggested that higher non-union rates and increased functional deficits after non-operative management of displaced mid shaft clavicular fracture gradually shift non-surgical management towards internal fixation as an alternative treatment for mid-shaft clavicular fracture.[4]Various modalities of fixations are available which include elastic stable intra-medullary nailing, intramedullary K-wires and plate fixation.

Nowadays, Plating and intramedullary nail fixation devices have been used for faster recovery and early return to work after mid-shaft clavicular fracture. But still the optimal method of fixation for mid shaft clavicular fracture remains a matter of debate.[5] Both Plate fixation and intra-medullary nailing have their own advantages and dis-advantages. Plate provides rapid rigid fixation with rotational stability, while its dis-advantage can be hypertrophic scarring, skin irritation because of

implant prominence, infections.[6] Advantages of intra-medullary nail fixation is less invasive with comparatively reduced implant prominence & superior cosmetic results, while its disadvantages can be injury to neurovascular structures and implant migration.[7]

With this background, we decided to conduct a study in which we directly compare the outcomes of operative intervention by Plating with screw fixation and Intra-medullary nail fixation for mid shaft clavicle fractures, in terms of time for consolidated union, Pain score, complications of both surgical modality, and Functional outcome.

Methodology

Our study design was Prospective, Observational and Comparative study, which was done in Department of Orthopaedics, Vedanta Institute of Medical Sciences, Dhundalwadi, Dahanu, Distt. Palghar, (Maharashtra) during the period of 1 year i.e.between July 2023 to June 2024 in 60 patients of both the gender. Study was approved by IEC (Institutional Ethical Committee) &, a written as well as Verbal informed consent were taken from all the patients who participated in our study. A detailed history, thorough clinical examination and necessary investigations were performed in each case according to planned proforma. All patients were investigated for routine investigations including CBC, BT, CT, Blood Sugar, S-urea, Serum creatinine, HIV, HBsAg, Urine complete, X-Ray clavicle with shoulder (AP view) & Chest, and ECG.

All patients with 18-60 years of age, having displaced mid-shaft clavicular fracture of less than 14 days, without any co-morbidity were included. Patients above the age of 60 years, patients having any trauma in upper limb, patients having any co-morbidity, patients unfit for general anaesthesia were excluded. These 60 patients were equally divided into two groups, Group A and Group B by coin method. Group A underwent Plate fixation for displaced mid-shaft clavicular fracture and Group B underwent Intra-medullary nailing for displaced mid shaft clavicle fracture. Pre-operatively patients were kept nil per oral overnight as well as explained about the procedure and received a Phosphate enema in the morning of day of Surgery. All operations were performed in supine position under General anaesthesia. General anaesthesia was given by same experienced Anaesthesiologist on each patient. All surgeries were performed by 2 experienced orthopaedic trauma surgeons. The fixation device was chosen according to surgeon preference. Both surgeons performed both surgery types. Plate fixation was done by an oblique 8–10 cm incision, made just superiorly over the fracture site. Subcutaneous flaps were created & clavi-pectoral fascia was incised to expose the fracture site. After reduction of fractures, 3.5 mm locking compression plate (Recon) was fixed on the superior surface of the clavicle. Lag screws were used for plate fixation. TEN fixation was done by a small incision of 1–2 cm in length was made 1cm lateral to sterno-clavicular joint anteriorly. After obtaining the entry point using a 2.5 mm drill bit, closed reduction was done. Under fluoroscopy, using pointed reduction clamps either per-cutaneous or through small stab incision, TEN nail was inserted. TEN nail diameter depends on the width of Intra-medullary canal. The tip of the nail was advanced without perforating the lateral cortex. The protruding medial end of the nail was cut off at the site of insertion and bent into a hook like shape to avoid soft tissue injury.

Wound dressings were done at 3rd post-operative day in routine or when needed for proper care. Stitches were removed on 10th Post-operative day. The limb was kept in a sling post-operatively for 1 week. All patients received Intravenous ceftriaxone at the time of hospital presentation and pre, intra as well as post operatively. In group A, implant removal was not routinely performed except post union, in the presence of infection or on patient's request. While in group B, Implant removal was performed in all patients after union. Post-operatively, pain was assessed using VAS score. A follow-up visit was scheduled at 4 weeks, 8 weeks, 12 weeks and 24 weeks after the surgery. Surgical outcome in both the groups was assessed in terms of time taken for union, Functional outcome each visit, VAS scores and any complications. Functional outcome was assessed using Disabilities of the Arm, Shoulder and Hand (DASH) score. Duration of surgery, duration of hospital stay, intra-operative bleeding along with any incidence of post-operative surgical site infection, itching, sepsis, bleeding from surgical site were recorded.

Results

In our study, we compared the two different type of surgeries (Plate fixation versus Intra-medullary TENS nailing) for displaced mid-shaft clavicle fracture in total 60 patients. The average age of patients in our study was 37.1 years & ratio of Male: Female is 68%:32%. The average duration of surgical procedure was 106 minutes in group A & 78 minutes in group B.

Out of total 60 patients, most common mechanism of injury was fall on an out-stretched hand during walking/Running, which accounts for 68% in group A & 72% in group B. Other cause of injury was fall on shoulder or sports injuries. Bladder &Bowel movement appears normal in both the groups. Immediate post-operative complications (like Retention of urine, Incontinence, bleeding, pain etc.) were seen rarely in any group. All 60 patient in both the groups came for the follow-ups. Follow-

up was done on 6th week, 12th week, 18th week & 24th week. There was a statistical significant difference between Pre-operative as well as Post-operative VAS score (p-value <0.01) in both the groups. Pre-operative VAS score in both the group was 8-9 which was decreased to 2-3 during post-operative period in both the group. But there was no statistically significant difference in two groups as pain decreases significantly in both groups. The functional DASH scoring pre-operatively in both the group was 89.2% & 90.6% respectively. There was a Statistically Significant decrease in DASH scoring post-operatively in both groups, i.e. 9.1% & 9.5% respectively (p-value <0.01). But there was no statistically significant difference in two groups as DASH scoring decreases significantly in both groups. The time taken for union in both the group was also not statistically significant as it was 12.2 weeks & 12.5 weeks respectively in both the groups. There was a statistically significant difference in hospital stay if we are comparing the two group, it was 10.1 days in group A & 6.9 days in group B. Complications was rarely seen in both the groups like Restriction of shoulder movements, Implant loosening, Skin irritation or infection, mal-union, implant failure or migration etc.

Discussion

In our study, we evaluate and compare the efficacy & safety of Plating Fixation and Intra-medullary Nailing in the treatment of displaced mid-shaft clavicle fractures. The most commonly accepted protocol worldwide, for managing displaced mid-shaft clavicle fractures include fracture stabilization, good functional output & avoidance of mal-union. However, there is no consensus on the best method of bony stabilization, still Plating and Intra-medullary nailing are two well-accepted techniques. One of the basic goals in the treatment of displaced mid shaft clavicle fracture is to prevent mal-union & provide better functional outcome.

In our study, we had taken 60 patients which is divided in two equal groups & compared the two different types of surgeries (Plate fixation versus Intra-medullary TENS nailing) for displaced mid-shaft clavicle fracture in total 60 patients. The average age of patients in our study was 37.1 years, which was similar with the findings of Dhoju D et al [8], Partha Saha et al[9]. Ratio of Male: Female is 68%:32% i.e. male are more prominent for these kind of fractures, our study was relevant with several studies.[10-13] The average duration of surgical procedure was 106 minutes in group A & 78 minutes in group B. Out of total 60 patients, most common mechanism of injury was fall on an out-stretched hand during walking/Running, which accounts for 68 % in group A & 72% in group B. Other cause of injury was fall on shoulder or sports injuries. Bladder &Bowel movement appears normal in both the groups. Immediate post-operative complications (like Retention of urine, Incontinence, bleeding, pain etc.) were seen rarely in any group. All 60 patient in both the groups came for the follow-ups. Follow-up was done on 6th week, 12th week, 18th week & 24th week. There was a statistical significant difference between Pre-operative and Post-operative VAS score (p-value <0.01) in both the group. Pre-operative VAS score in both the group was 8-9 which was decreased to 2-3 during post-operative period in both the group. But there was no statistically significant difference in two groups as pain decreases significantly in both groups, which was similar with the findings of Silva. et. Al [14] The functional DASH scoring pre-operatively in both the group was 89.2% & 90.6% respectively. There was a Statistically Significant decrease in DASH scoring post-operatively in both groups, i.e. 9.1% & 9.5% respectively (p-value <0.01). But there was no statistically significant difference in two groups as DASH scoring decreases significantly in both groups, which was similar with the conclusion of Silva. et. al [14] & Meijden. et.al [15]

The time taken for union (means fracture line was not visible radio-logically, tenderness was zero, functional outcome becomes normal) in both the group was also not statistically significant as it was 12.2 weeks & 12.5 weeks respectively in both the groups. These times were quit similar in both the groups, i.e. none of the procedure was superior with other one, which was comparable with the studies of Zehir.et.al[16] There was a statistically significant difference in hospital stay if we are comparing the two group, it was 10.1 days in group A & 6.9 days in group B, (lesser in Group B because of lesser operating time & faster healing), which was similar with the findings of other studies.[14-16] Complications was rarely seen in both the groups (total 4 complications, out of 60 patients) like Restriction of shoulder movements, Implant loosening, Skin irritation or infection, mal-union, implant failure or migration etc. These complications were also seen in previous studies.[14-15] In their studies, these complications were also rarely seen. According to current literature, the optimal method for clavicle fixation whether plating or TENS nail is still a matter of debate. The loosening of implants can be seen in plating group which delayed the mobilisation of shoulder joint which led to restriction of shoulder movements. The probable reasons for implant loosening in the plating could be early lifting of weights, latent infection, and improper technique of fixation. If we talk about intra-medullary TENS nailing, implant failure could be seen, which probably suggests that opting for nailing in clavicle fracture was not a right choice of fixation. The disadvantage of nailing was the irritation caused at the skin on the medial point of entry. Literature

also shown rotational mal-alignment of fractures happening when nailing was used. There was a chance of catastrophic neurovascular complications in plating fixation. Intramedullary nail fixation had good functional outcome during the first six months after surgery with early functional recovery, and lesser duration of stay in the hospital. Intramedullary nail fixation group has the advantage of being less invasive surgery as it is performed with a small incision.

Conclusion

We concluded that Plate fixation and Intra-medullary TENS nail fixation provide good anatomic fracture reduction, stable fixation, early return to daily activities and satisfying functional results. There was no significant difference in functional result, time for union and complications in both groups. Only difference in decrease in hospital stay in case of intra-medullary TENS nail fixation.

References

1. Nordqvist A, Petersson C. The incidence of fractures of the clavicle. ClinOrthop 1994; March, 300:127–32.
2. Stanley D, Trowbridge EA, Norris SH. The mechanism of clavicular fracture. A clinical and biomechanical analysis. J Bone Joint Surg Br. 1988; 70(3):461–464.
3. CS NEER II: Nonunion of the clavicle. J Am Med Assoc 172: 1006-1011, 1960.
4. Smekal V, Irenberger A, Struve P, Wambacher M, Krappinger D and Kralinger FS: Elastic stable intramedullary nailing versus nonoperative treatment of displaced midshaft clavicular fractures-a randomized, controlled, clinical trial. J Orthop Trauma 23: 106-112, 2009.
5. Xu B, Lin Y, Wang Z, Cao J, Yang Y, Xia H and Zhang Y: Is intramedullary fixation of displaced midshaft clavicle fracture superior to plate fixation? Evidence from a systematic review of discordant meta-analyses. Int J Surg 43: 155-162, 2017.
6. Wijdicks F-JG, Van der Meijden OAJ, Millett PJ, Verleisdonk EJMM and Houwert RM: Systematic review of the complications of plate fixation of clavicle fractures. Arch Orthop Trauma Surg 132: 617-625, 2012.
7. Wijdicks FJ, Houwert RM, Millett PJ, Verleisdonk EJ and Van der Meijden OA: Systematic review of complications after intramedullary fixation for displaced midshaft clavicle fractures. Can J Surg 56: 58-64, 2013.
8. Dhoju D, Shrestha D, Parajuli N, Shrestha R, Sharma V. Operative Fixation of Displaced Middle Third Clavicle (Edinburg Type 2) Fracture with Superior Reconstruction Plate Osteosynthesis. Kathmandu Univ Med J. 2011; 36(4):286-91.
9. Partha Saha, Prasenjit Datta, Saankritya Ayan, Anant Kumar Garg, Utpal Bandyopadhyay, Srikanta Kundu. Plate versus titanium elastic nail in treatment of displaced midshaft clavicle fractures: A comparative study. Indian J Orthop. 2014 Nov-Dec; 48(6): 587–593.
10. Andrade-Silva FB, Kojima KE, Joeris A, Santos Silva J, Mattar R Jr. Single, superiorly placed reconstruction plate compared with flexible intramedullary nailing for midshaft clavicular fractures: a prospective, randomized controlled trial. J Bone Joint Surg Am. 2015; 97(8): 620-6. doi:.
11. van der Meijden OA, Houwert RM, Hulsmans M, Wijdicks FJ, Dijkgraaf MG, Meylaerts SA, et al. Operative treatment of dislocated midshaft clavicular fractures: plate or intramedullary nail fixation? A randomized controlled trial. J Bone Joint Surg Am. 2015; 97(8): 613-9.
12. Frigg A, Rillmann P, Perren T, Gerber M, Ryf C. Intramedullary nailing of clavicular midshaft fractures with the titanium elastic nail: problems and complications. Am J Sports Med. 2009; 37(2): 352-9.
13. Smekal V, Oberladstaetter J, Struve P, Krappinger D. Shaft fractures of the clavicle: current concepts. Arch Orthop Trauma Surg. 2009; 129(6): 807-15.
14. Andrade-Silva FB, Kojima KE, Joeris A, Santos Silva J, Mattar R Jr. Single, superiorly placed reconstruction plate compared with flexible intramedullary nailing for midshaft clavicular fractures: a prospective, randomized controlled trial. J Bone Joint Surg Am. 2015; 97(8): 620-6.
15. van der Meijden OA, Houwert RM, Hulsmans M, Wijdicks FJ, Dijkgraaf MG, Meylaerts SA, et al. Operative treatment of dislocated midshaft clavicular fractures: plate or intramedullary nail fixation? A randomized controlled trial. J Bone Joint Surg Am. 2015; 97(8): 613-9.
16. Tarng YW, Yang SW, Fang YP, Hsu CJ. Surgical management of uncomplicated midshaft clavicle fractures: A comparison between titanium elastic nails and small reconstruction plates. J Shoulder Elbow Surg. 2012; 21:732–40.