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Dr. Arun Viswanath N
Assistant Professor, Department of Orthopaedics, Panimalar Medical College Hospital and Research Institute, Chennai, Tamil Nadu, India

Dr. Prem Kumar K
Assistant Professor, Department of Orthopaedics, Chettinad Hospital and Research Institute, Kelambakkam, Tamil Nadu, India

Dr. F Abdul Khader
Professor, Department of Orthopaedics, Shri Sathya Sai Medical College and Research Institute, Ammapettai, Chengalpattu, Tamil Nadu, India

Corresponding Author:
Dr. Prem Kumar K
Assistant Professor, Department of Orthopaedics, Chettinad Hospital and Research Institute, Kelambakkam, Tamil Nadu, India

Functional results of superior anterior locking plate in treatment of unstable distal clavicle fractures (type 2)

Dr. Arun Viswanath N, Dr. Prem Kumar K and Dr. F Abdul Khader

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Abstract
Background: Clavicle fractures is the most common upper body fractures, as it is superficially placed [1, 2]. Clavicle fractures presents about 10–15% in children and 3–5% in adults [1, 2]. Depending on the lateral end fractures of clavicle which are classified into 3 types, based on their relation to coraco-clavicular ligaments by Neer [3]. In this study we wanted to evaluate the functional results of superior anterior locking plates use in the surgical management of unstable distal clavicle fractures (type II). The functional outcome were assessed by Quick DASH score, [12] we also analysed: union rates, earliest duration for the patients got back to their routine and regular activities and its complications.
Methods: An observational, retrospective and prospective study of 84 patients, where 73 patients had unstable unilateral fractures where 52- right sided and 21 - left sided and 11 patients had bilateral fracture and all the patients were treated with superior anterior locking plate from January 2018 to December 2020 in our tertiary hospital. Patients were followed up at 3 weeks, 6 weeks, 3 months, 6 months and 1 year after surgery. Quick DASH score was used to evaluate the functional outcome [13]. X-rays were taken regularly to look for migration of implants, rate of union and any acromioclavicular pathology. The duration to get back to their routine and regular activities from range of 6 – 8 weeks from surgery were also assessed.
Results: At each follow up both clinically and radiologically evaluation showed gradually improvement. All the patients at the 1 year follow up showed full range of movement and with good union. The Quick DASH score range of 0-13.5 with average score of 4.6 which shows good satisfactory outcome (13). There was superficial wound infection in one patient and that was treated by antibiotics. All the patients got back to their routine and regular activities within 7 weeks of surgery, from a range of 6 - 8 weeks of surgery.
Conclusion: The unstable distal end of clavicle fractures type II needs a particular surgical intervention with superior anterior locking plates which have specially designed pre-contoured locking plate which provides a good fitting and stable fixation, which gives an amazing results in terms of clinical and functional outcome and without any surgical intervention related complications.

Keywords: Unstable distal clavicle fractures, clavicle fracture, superior anterior locking plates

Introduction
Clavicle fractures is the most common upper body fractures, as it is superficially placed [1, 2]. Clavicle fractures presents about 10-15% in children and 3-5% in adults [1, 2]. Depending on the lateral end fractures of clavicle which are classified into 3 types, based on their relation to coraco-clavicular ligaments by Neer [3]. Type II clavicle fractures which are managed conservatively has more chance of non-union (22-50%) [3,4]. Displacement of 2 fragments occurs by restricting powers following up on them, mainly by trapezius where the proximal fragment gets superiorly displaced and the distal fragment gets inferiorly displaced due to weight of arm [5]. Conservative management for longer duration leads to resorption of bone and prominent scar [6]. Tension band fixation, K-Wire, coraco-clavicular screw fixation, osteosynthesis with hook plate or else locking plate fixation are different methods for fixing clavicle fractures, each having its individual pros and cons [7-11] In this study In this study we wanted to evaluate the functional results of superior anterior locking plates use in the surgical management of unstable distal clavicle fractures (type II). The functional outcome were assessed by Quick DASH score, [12] we also analysed: union rates, earliest duration for the patients got back to their routine and regular activities and its complications.

Materials and Methods

An observational, retrospective and prospective study of 84 patients, where 73 patients had unstable unilateral fractures where 52- right sided and 21 - left sided and 11 patients had bilateral fracture who was treated from January 2018 to December 2020 in our tertiary hospital.

Mode of injury: 1) caused by road traffic accidents - 68 patients 2) caused by fall - 16 patients.

All the patients in this study were selected according to

- **Inclusion Criteria**

1. Type II clavicle fractures
2. Age between 20 to 60 years
3. Closed fractures

- **Exclusion Criteria**

1. Clavicle fractures type 1 and Type III clavicle fractures
2. Open fractures
3. Nonunion

- **Pre-op evaluations include**

1. X-ray of clavicle both AP view and Zanca view
2. All the required blood investigation should be done
3. Should clear anaesthesia fitness
4. Both informed and written consent should be obtained before surgery.

Surgical Technique

All the patients were given prophylactic antibiotics before the surgery. All the procedures were carried out under RB / GA. The patients were placed in "beach chair" position and the incision were made antero-superior to the clavicle. The fracture site was exposed along with distal end. Fracture fragments were reduced anatomically and fixed with distal locking plate insitu. If necessary, coraco-clavicular ligament are sutured. In cases of bilateral clavicle fractures both the sides surgery were done in same sitting. After through wash with normal saline, wound were closed in layers. Sterile dressing done.

Post operative care protocol

Postoperatively all the patients were under appropriate antibiotics and analgesics. Once in 3 days dressing were done for all the patients. After 10th post operative day sutures were removed. The patient were kept in broad arm sling for six weeks. After 3 weeks mild shoulder exercises were started. Patients were followed up at 3 weeks, 6 weeks, 3 months, 6 months and 1 year after surgery. Quick DASH score [12] was used to evaluate the functional outcome [12]. X-rays were taken regularly to look for migration of implants, rate of union and any acromioclavicular pathology. All the patients were allowed to get back to their routine and regular activities after 10-12 weeks of surgery.

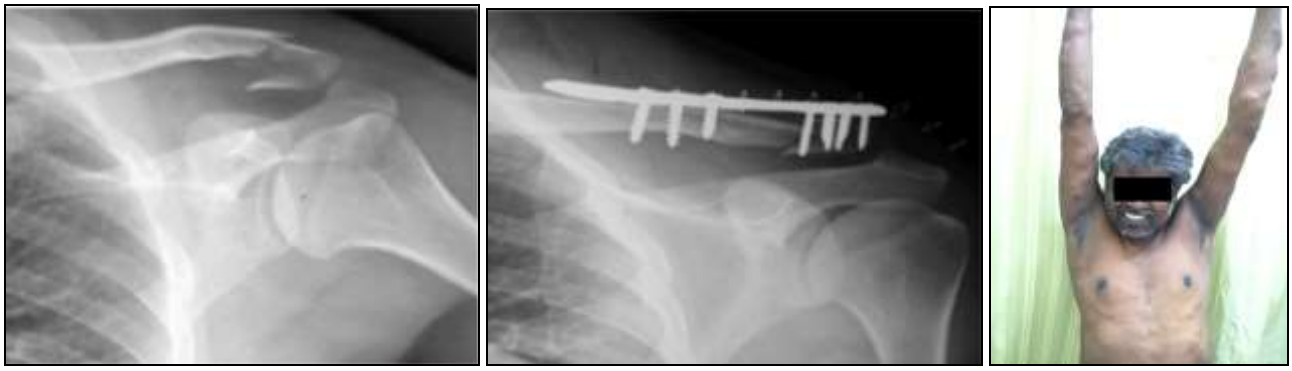

Fig 1: A 50 years old male with left lateral end clavicle fracture, preoperative x-ray and immediate post operative x-ray.

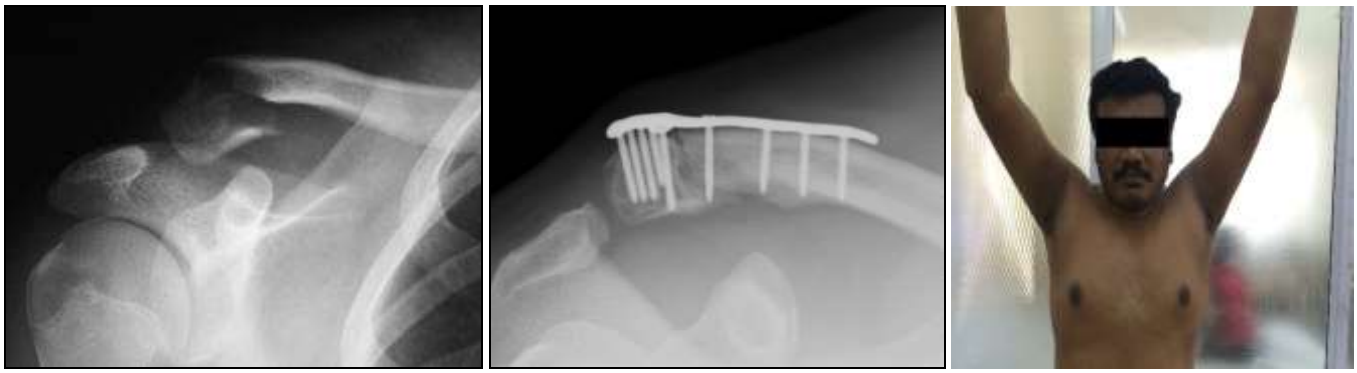

Fig 2: A 32 years old male with right lateral end clavicle fracture, preoperative x-ray and post operative x-ray taken on the 4 weeks follow up.

Results

An observational, retrospective and prospective study of 84 patients, where 73 patients had unstable unilateral fractures where 52- right sided and 21 - left sided and 11 patients had bilateral fracture who was treated from January 2018 to December 2020 in our tertiary hospital. The study group ages ranged from 20 – 50 years with a mean age of 38 years. All patients came for all the followed up. At each follow up both clinically and radiologically evaluation showed gradually improvement. The time duration taken for union of the fracture range from 5 - 7 weeks with a mean duration of 6.2 weeks in all cases. All the patients at the 1 year follow up showed full range of movement and with good union. The Quick DASH score range of 0-13.5 with average score of 4.6 which shows good satisfactory outcome [12]. There were superficial wound infection in one patient and that was treated

by antibiotics. All the patients got back to their routine and regular activities within 7 weeks of surgery, from a range of 6 – 8 weeks of surgery. During follow up, no patients had any implant related complications. Implant removal was done in 4 patients after 1 year of surgery due to prominence of hardware.

Discussion

The unstable distal end of clavicle fractures type II needs a particular surgical [13-16].

The surgical intervention of the distal end of clavicle fractures most of the time gives unfavorable results due to its small fragments. Recent studies recommend surgical intervention of clavicle fractures with superior anterior locking plate [17-19] and has shown favorable results after surgery. As locking plates improves the osteosynthesis to the distal end [10, 11] and provides a stable fixation of the lateral clavicle fractures and the implants mostly need not be removed after recovery [17-19] Superior anterior locking plate due to proper fixed angled screws which provides a maximum pull out strength to the small size distal segment as its weak in nature. This locking plates eliminates the need of across bridge and secure the action at the acromioclavicular joint [20]. Surgical intervention with superior anterior locking plates have exhibit an amazing results in functional outcome [20, 21] In our study, all the 84 patients had surgical intervention with superior anterior locking plates and have achieved 100% bone union. Only one patient had superficial infection which was treated by antibiotics. In our study we observed better functional outcomes, good stability fixation, good clinical outcomes and 100% bone union with minimal complication after surgery similar finding was noted in other similar studies [22-27] All the patients got back to their routine and regular activities within an average duration of 7 weeks from a range of 6 – 8 weeks of surgery.

Conclusion

The unstable distal end of clavicle fractures type II needs a particular surgical intervention with superior anterior locking plates which have specially designed pre-contoured locking plate which provides a good fitting and stable fixation and gives an amazing results in terms of clinical and functional outcome and without any surgical intervention related complications.

Pre-op

Post-op

Pre-op

Post-op

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