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SIMPLE FIXATION OF DISPLACED LATERAL END CLAVICLE FRACTURE BY TBW

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ABSTRACT: BACKGROUND: Displaced lateral end clavicle fractures have high incidence of delayed union or non-union, hence several authors suggested operative management for these fracture. Many surgical techniques are available. But adequate reduction and minimal soft tissue dissection during implant placement and early removal is ideal for these fractures. **METHODS:** 15 patients with displaced lateral end clavicle fractures were included in our study in Rajah Muthiah Medical College & Hospital, Chidambaram. The fracture were reduced by open reduction and fixed with 2 transacromial K-wires and additional TBW with SS wire. Implant removal was done at an average of six weeks. **RESULTS:** All 15 fractures united. The mean average age was 27.5 years ranging from 20 years to 55 years. The mean average time of union was 8.6 weeks ranging from 6 weeks to 14 weeks. All patients regained near normal range of motion and 10 patients had excellent constant murley score, 3 had good and 2 had fair results. In our study two patients had K-wire back out without loss of reduction. **CONCLUSION:** The clinico-radiological outcome of displaced lateral end clavicle fractures treated by transacromial K-wires with TBW is encouraging and comparable with earlier studies. **KEYWORDS:** Lateral end clavicle fractures, transacromian, K-wires, tension band wiring (TBW), Stainless Steel wire (SS wire).

INTRODUCTION: Clavicle fractures are one of the most common fractures encountered in orthopaedic practice. Previous epidemiologic studies suggest that clavicle fractures represent up to 5% of all adult fractures and up to 44% of all shoulder girdle fractures.^[2-4]

The incidence of injury also is characterized by bimodal age distribution with peak under age 40yrs. With respect to the incidence of different fracture types, fractures of middle third of the clavicle are most common accounting for 69% to 81%. The second most common type is fracture of lateral or distal third of clavicle, accounting for 16% to 30%. Less than 3% of all clavicle fractures are fractures of medial or proximal third of the clavicle.^[2-4]

Neer in 1968 classified distal clavicle fractures according to the location in relation to the coraco-clavicular ligaments.

Type 1 fractures are stable fractures are stable fractures located lateral to coraco-clavicular ligaments.

Type 2 fractures are complex unstable fracture dis location which leaves the distal end of clavicle and the AC joint untouched, separating the clavicle from the underlying coraco-clavicular ligament complex through a vertical or oblique fracture line.

Type 3 fractures are intra-articular fractures of AC joint

The deforming forces acting in the lateral end clavicle makes the lateral end mobile and prone for non-union.

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There are studies which shows high rate of delayed union and non-union in displaced lateral end clavicle (Neer's Type 2 fractures).^[1,7,15]

Several authors recommended operative treatment for displaced lateral end clavicle fractures and reported good clinical and radiological outcomes with few complications.

Many surgical methods have been introduced for treatment of displaced lateral end clavicle fractures like K-wire fixation, TBW, hook plate, Bosworth coracoclavicular screw, knowels pin etc. But still there is no gold standard treatment for displaced lateral end clavicle fractures.

In view of these considerations, the present study is of Surgical Management of Displaced Lateral End Clavicle Fractures with minimal soft tissue dissection using Transacromial K-wires and Tension band wiring.

MATERIALS AND METHODS: This study was conducted in RAJAH MUTHIAH MEDICAL COLLEGE AND HOSPITAL from May 2012 to June 2014. During this period 15 cases of adult patients with displaced lateral end clavicle fractures were included.

Pre-operative assessment was made by X-ray AP view for all patients. All the patients were operated in supine position. A small incision of about 3cms was made antero-superiorly centering over the fracture site and exposing the acromian process. Cautery dissection was carried out to minimize bleeding from the subcutaneous plane onwards. Every care was taken not to disturb acromioclavicular ligaments.

The fracture site was visualized and the hematoma was curetted and washed. The fracture was reduced and fixed with two 2.0mm trans-acromial Krischner wires and the reduction was checked with an image intensifier. An anteroposterior drill hole was made with 2mm drill bit on proximal part of the fracture. A stainless steel wire was passed through the hole. The SS wire was tied in a figure of eight manner keeping the knot superiorly around the K-wires. The K-wires were bent and buried inside the skin. The wound was irrigated with saline and closed in layers over drain.

RESULTS: All 15 fractures united. The mean average age was 27.5 years ranging from 20 years to 55 years. The mean average time of union was 8.6 weeks ranging from 11 weeks to 14 weeks. All patients regained near normal range of motion and 10 patients had excellent constant murley score, 3 had good and 2 had fair results. In our study two patients had K-wire back out without loss of reduction, which is managed by early implant removal. No wound related complications like infection was noted.

DISCUSSION: Clavicle fractures are one of the most common fractures encountered in orthopaedic practice.

Previous epidemiologic studies suggest that clavicle fractures represent up to 5% of all adult fractures and up to 44% of all shoulder girdle fractures.^[2-4]

The incidence of injury also is characterized by bimodal age distribution with peak under age 40yrs.

With respect to the incidence of different fracture types, fractures of middle third of the clavicle are most common accounting for 69% to 81%. The second most common type is fracture of lateral or distal third of clavicle, accounting for 16% to 30%. Less than 3% of all clavicle fractures are fractures of medial or proximal third of the clavicle.^[2-4]

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Neer in 1968 classified distal clavicle fractures according to the location in relation to the coraco-clavicular ligaments.^[7]

Neer original series of clavicle fractures observed unusually high rate of non-union or delayed union in displaced lateral third clavicle.^[1]

The deforming forces and the rotational movements acting in the clavicle is the reason for the displacement of the fragments which is the reason for delayed or non-union.

So Neer suggested operative stabilization for displaced lateral end clavicle. He showed successful results with K-wire fixation with few complications.^[7]

Consequently, various surgical modalities have been advocated with various techniques of fixation with better outcomes. But still there is no gold standard method of fixation for displaced lateral end clavicle. Gaining control over such rotational movement with some sort of semi rigid to rigid fixation would prevent non-union.

Coracoclavicular reconstruction is generally not required as the ligaments are intact and attached to the distal clavicle.

Anatomical alignment and prevention of rotation will suffice for such fractures to unite. In view of these consideration our method is a minimally invasive with 2 transacromial K-wires and tension band wiring with SS wire, where tensile force is converted into compressive force.^[30]

We routinely remove Krischner wires before full active mobilization of the shoulder around six weeks by the time fracture become sticky and due to its intramembranous nature of ossification, union takes place if a conductive environment is provided. So early implant removal eliminates the complications like wire breakage which is compared to Laxman Rijal et al.^[30]

With our method, minimal dissection is required to reduce the fracture. Transacromial K-wires are passed under image intensifier guidance to hold the fracture in an anatomical position and compression at fracture site is given by tension band wiring. We keep the limb supported in an arm pouch for six weeks to make the patient aware that their shoulder needs protection and secondly, the stress exerted by hanging the limb is guarded. Both these facts minimize undue stress at the healing bone. Results of our method of fixation are encouraging with this small cohort study of 15 patients and comparable with other studies.

Neer reported 100% union with Krischner wire fixation and suggested displaced fractures should be stabilized for better results.^[7]

Kona et al reported 52.6% success rate with Krischner wires and reported complications like loosening of K-wires, migration, undue stress during active mobilization, back out, and breakage.^[11] Stabilization with a clavicular hook plate has yielded a success rate of up to 88% and 12% nonunion in a series of 18 patients by Tambe et al.^[37]

Acromian osteolysis has also been reported in a 30% with hook plates. However, Lee et al^[38] described the advantageous role of hook plate fixation in comparative study between role of hook plate and tension band. Anderson et al^[40] reported 94% union rate with pre contoured superior locking plate for displaced distal clavicle fractures. Peri-implant fracture has been reported in one case and infected non-union in the other.

Levy^[22] described single figure eight suture fixation with PDS suture with a success rate of 100%. Though alignment is secured, rotational stress during mobilization may awaken suture fixation. Their technique has been modified by Badhe et al,^[27] that consists of two figure-eight sutures with non- absorbable polyester.

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Our method of fixation allows stable fixation with two transacromial Krishner wires and figure of eight suturing with SS wire which provides compression at the fracture site. Early removal of implant allows active mobilization without the fear of implant related complications. Though we encountered two cases of K-wire back out around 12 weeks without the loss of reduction, we removed the K-wires at 12th week and supported the limb in arm pouch and the union occurred around 14th week for that two cases.

In our study males are more commonly affected (87%) than female which is compared to Laxman Rijal et al^[30] and Chi- Chuan Wu.^[31]

In our study 4 cases had associated rib fracture (27%) which is compared to Faisal Qureshi et al who showed 10% associated rib fractures.^[40]

In our study most common mode of injury is fall with an out stretched hand (53%), RTA (27%) which is compared to Robinson who showed simple fall (25%), RTA (29%).^[41]

In our study we achieved 95% union in all cases which is compared to Neer who reported 100% union with K-wires,^[7] Kona et al showed 52.6% union^[11] and Yih-Shiunn Lee et al showed 95% union with tension band wires.^[28]

Age	No. of cases	Percentage
0-20	1	7
21-40	11	73
41-60	3	20
Age distribution		

Nature	No. of cases	Percentage
Fall on an outstretched hand	8	53
RTA	4	27
Fall on shoulder	3	20
Mode of injury		

RESULTS	No. of cases	Percentage
Excellent	10	66
Good	3	20
Fair	2	14
Poor	nil	Nil
Constant murley score		

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CASE ILLUSTRATIONS:

Case 1: Pre- op x-ray 3weeks follow up

6 weeks follow up

Case 2: Pre- op x-ray 3weeks post- op

8 weeks post-op

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CONCLUSION: Lateral end clavicle fractures are the second most common clavicle fractures encountered in orthopaedics practice which accounts 16%to 30%.The deforming forces and the rotational movements acting in the clavicle is the reason for the displacement of the fragments which is the reason for delayed or non-union. Hence the displaced lateral end clavicle fractures necessitate fixation. Anatomical alignment and prevention of rotation will suffice for such fractures to unite.

Our method is a minimally invasive with 2 transacromial K-wires and tension band wiring with SS wire, where tensile force is converted into compressive force which helps in fracture union. Full active mobilization is not allowed with the implants. Early implant removal as soon as there is a radiological signs of union may minimize implant related complications.

To conclude the clinical and radiological outcome with two Transacromial K-wires and Tension band wiring with SS wire for displaced Neer Type 2 lateral end clavicle fractures were encouraging.

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