

Prospective Outcome Evaluation of Fractures of Lateral end of Clavicle using different Modalities of Management

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Abstract

Aim: To evaluate outcomes of fractures of lateral end of clavicle using different modalities of management.

Methodology: This is a type of prospective study including patients having fracture of lateral end of clavicle treated either conservatively or operatively in Department of Orthopedics, Darbhanga Medical College and Hospital, Laheriasarai, Darbhanga, Bihar, India. Data was based on medical records of patients in the form of case sheets, discharge cards, X-rays, etc. Medical records of patients were assessed with respect to site of fracture, distribution according to age, occupation, mode of injury, closed/open, degree of comminution, treatment modalities, fixation techniques, etc. The type of fracture was determined by Neer's classification [6]. Then according to the nature of the fracture, patient was either treated conservatively or surgically. Patients were given information sheet informing the procedure and informed written consent was obtained prior to surgical intervention. Patients were assessed at admission, 12 days, 1 month, 3 months and 6 months post admission.

Results: Out of the 50 patients having fracture of lateral end of clavicle, majority of the patients in our study were males (62%) and 38% were females. 42% of patients were below the age of 35, 34% of the patients were between 35-50 yrs old, and 24% of the patients were more than 50 years old. Mode of injury of 56% patients in our study was fall from height and 44% patients had road traffic accident. Right side was affected in 70% of cases and left side was affected in 30% of cases. In our study, 22% patients were Neer's type I fracture pattern, 12% patients were Neer's type III, and the remaining 66% patients had Neer's type II fractures. 22 patients were managed non-operatively and 28 were operated using different modalities. In operative modalities, 13 (46.4%) cases were operated in the form of tension band wiring, 9 (32.1%) patients using plates and screws, 6 (21.5%) using coraco-clavicular screw fixation.

Conclusion: Non-surgical treatment should be considered as the first line of treatment in Neer's type I and III and few stable cases of type II fractures of lateral end of clavicle. But operative treatment is preferred over conservative management for unstable, displaced type II fractures in terms of functional outcome. If surgical treatment of a distal clavicle fracture is indicated, then the fixation method with the least complication rate and the maximum union rate should be selected.

Keywords: Clavicle, fixation, tension band wiring, plates and screws.

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Introduction

Clavicle fracture is a common traumatic injury around shoulder girdle due to its subcutaneous position. Fractures of the clavicle are common injuries of adults, accounting for about 3% of all injuries [1]. They are often caused by either a direct blow to the anterior chest wall or by a fall on the outstretched hand. The commonest site of fracture in clavicle is the midshaft followed by the lateral end, which accounts for about 25% of all the clavicle fractures [2, 3]. Clavicle fractures constitute 44% of all shoulder girdle injuries. The fractures of the clavicle reportedly represent 2.6% of all fractures [4, 5]. Twenty-five percent of these fractures are unstable due to the displacing forces acting on the fracture fragments: an inferior force on the lateral clavicle fracture fragment and an anterosuperior force on the medial clavicle fragment.

These fractures can be classified using the Neer's Classification [6]. Neer in 1968 suggested a new classification and proposed general treatment guidelines for fractures of lateral end of clavicle. Due to the unstable nature of Neer's type II fractures, the risk of fracture non-union is high with an average of 30%. The high rate of nonunion is secondary to excessive motion at the fracture site. Neer's classification of lateral end clavicle fractures: a. Type I – coracoclavicular ligaments intact. b. Type II – coracoclavicular ligaments detached from the medial segment but trapezoid intact to distal segment. c. Type III – intra-articular extension into the acromio-clavicular joint.

Many treatment modalities have been used for the management of such fractures. The conservative treatment includes pain medication, ice and compressive dressing to relieve pain and reduce swelling. Use of a shoulder immobilizer, figure of four strapping with arm sling is usually

recommended. Nonoperative methods are associated with high rates of nonunion (22%–50%) [7, 8], out of which 14% cases [8] were symptomatic. Many operative treatment modalities have been tried for the management of lateral clavicle fracture including coracoclavicular screws [9], Kirschner wires [10], tension bands [11], hook plates [12], non locked [13] and locked plates [12, 14].

Clavicle fractures are categorized into proximal, mid-shaft and distal fractures. Most of them are mid-shaft fractures that unite satisfactorily with non-operative treatment. In contrary, fractures of the distal one third of clavicle are an exception that carries a high non-union rate. Therefore, it is important to recognize this distinct clavicle fracture as different entity and treat it properly.

Materials and Methods

This is a type of prospective study including patients having fracture of lateral end of clavicle treated either conservatively or operatively in Department of Orthopedics, Darbhanga Medical College and Hospital, Laheriasarai, Darbhanga, Bihar, India for 2 years.

Methodology

Data was based on medical records of patients in the form of case sheets, discharge cards, X-rays, etc. Medical records of patients were assessed with respect to site of fracture, distribution according to age, occupation, mode of injury, closed/open, degree of comminution, treatment modalities, fixation techniques, etc.

The type of fracture was determined by Neer's classification [6]. Then according to the nature of the fracture, patient was either treated conservatively or surgically. Patients were given information sheet informing the procedure and informed

written consent was obtained prior to surgical intervention. Patients were assessed at admission, 12 days, 1 month, 3 months and 6 months post admission.

Final outcome was judged in terms of union, range of movement, duration for union of fracture, neurological status and ability to perform activities of daily life. The constant shoulder score was used to assess overall functional outcome.

Results:

Out of the 50 patients having fracture of lateral end of clavicle, majority of the patients in our study were males (62%) and 38% were females. 42% of patients were below the age of 35, 34% of the patients were between 35-50 yrs old, and 24% of the patients were more than 50 years old. Mode of injury of 56% patients in our study was fall from height and 44% patients had road traffic accident. Right side was affected in 70% of cases and left side was affected in 30% of cases.

Table 1: Demographic details, mode of injury, affected side, and treatment modality in patients.

Variables		Number	%
Gender	Males	31	62
	Females	19	38
Age (in years)	<35	21	42
	35-50	17	34
	>50	12	24
Causes of injury	Fall from height	28	56
	RTA	22	44
Affected side	Right	35	70
	Left	15	30
Treatment Modality	Non-operatively	22	44
	Operatively	28	56
Operative modality	Using tension band wiring	13	46.4
	Using plates and screws	9	32.1
	Using coraco-clavicular screw fixation	6	21.5

22 patients were managed non-operatively and 28 were operated using different modalities. In operative modalities, 13 (46.4%) cases were operated in the form of tension band wiring, 9 (32.1%) patients using plates and screws, 6 (21.5%) using coraco-clavicular screw fixation.

Table 2: Neer's classification of fractures

Neer's Classification	Number	%
Type I	11	22
Type II	33	66
Type III	6	12

In our study, 22% patients were Neer's type I fracture pattern, 12% patients were Neer's type III, and the remaining 66% patients had Neer's type II fractures.

Discussion:

Clavicle fractures are one of the most common injuries in an adult population. Clavicle fractures are being encountered increasingly due to increase in high-velocity trauma as seen in the young population. The incidence of clavicle fractures in adolescent and adult population is suggested to be between 29 and 64 per 100,000 persons [4, 15]. In adults, more than two-thirds of these injuries occur at the diaphysis of the clavicle, and these injuries are more likely to be displaced as compared with medial and lateral third fractures. Due to more soft tissue injuries associated with these accidental injuries, the fracture fragments are displaced and require adequate reduction and fixation. Moreover, the functional demands in younger patients are high, and hence there has been a recent increase in the operative fixation of these fractures. In our study also, mode of injury of 56% patients was fall from height and 44% patients had road traffic accident.

Various surgical procedures for lateral clavicle fractures have been used like K-wire fixation, screw fixation, tension band wiring, hook plates, non-locking and locking plates. We have used anterior locking compression plate with lateral extension, which provided a stable fixation of the fractured fragments and allowed early mobilization of the shoulder. This plate is anatomical and fits well to the contour of the lateral end of the clavicle. It also allows screw fixation in different planes in the lateral end of the clavicle and hence provides a multi-planar fixation of the distal fragment of the fracture and greater stability to the small unstable fragment. This implant not only neutralizes the forces acting upon the fracture fragments but also gives better hold in

osteoporotic bones. We believe that all these factors contribute to a successful union of the clavicle fracture along with good functional outcomes.

In a small case series of Sajid et al [16], 4 cases of lateral clavicle fractures were treated with the help of different modalities of treatment including lateral clavicle locking with bone grafting, lateral clavicle locking plate alone, lateral clavicle locking compression plate system and Small Fragment Locking Compression Plate System (Synthes™) and they recommended that the locking plate should be augmented with the coracoclavicular sling which is in direct contradiction to the biomechanical study by Rieser et al [17] and on contemplating we decided not to augment the locking plates with coracoclavicular sling and our clinical results were excellent with no instability clinically or radiologically, postoperatively or at 6 months of follow-up and even though we had 1 case of radiological malunion none of them were symptomatic and hence did not require secondary surgery.

Rieser et al [17] analyzed the biomechanical analysis of the lateral clavicle fracture treated with the help of various treatment modalities and reported that locking plate fixation provided a stable fixation biomechanically and the clinical outcome was also satisfactory. Kalamaras et al [18] were the first to report the concept of locking plate in distal clavicle fracture in their study where distal radius locking plate was used and finally concluded that the use of the locking plate gave good results and was promising for the management of the lateral clavicle fracture as it showed to have a better control on the distal fracture fragment.

Closed or open reduction should be performed to reduce the displaced fragment in an emergent fashion. [19, 20]. When open reduction is necessary, several

techniques have been described for internal fixation of fracture fragments. These include wire or plate fixation and interosseous sutures [19-21]. In general, Kirschner wire fixation has proven unsafe because of breakage and migration. By contrast, use of interosseous wires or suture and modified hooked Bessler plate fixation appears more successful but requires a second operation for hardware removal [19-21].

Conclusion:

Non-surgical treatment should be considered as the first line of treatment in Neer's type I and III and few stable cases of type II fractures of lateral end of clavicle. But operative treatment is preferred over conservative management for unstable, displaced type II fractures in terms of functional outcome. If surgical treatment of a distal clavicle fracture is indicated, then the fixation method with the least complication rate and the maximum union rate should be selected.

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