

Intramedullary Nailing for Middle Clavicular Fractur

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Abstract

Gross displacement of midclavicular fracture fragments, as well as non-unions, are seen as relative indications for surgical fixation. Plate osteosynthesis is the standard operative treatment, but higher complication rates have been described with this technique. In this study, intramedullary fixation is used which, is a minimally invasive procedure that provide a three-point fixation within the S-shaped clavicle. Methods: This study was carried out on ten patients with displaced fractures of the middle third of the clavicle presented to Benha University Hospital and treated by intramedullary fixation . All patients were followed up clinically and radiologically for at least six months. Results were assessed at the end of this period according to Constant and Murley Score. Results: The final Constant score was 95.70 ± 13.55 . Excellent results in 9 patients [90%], and poor in one patient [10%]. There was statistically significant relationship between the final score and the patients' age and associated medical conditions. Complications encountered were medial skin irritation in two patients [20%], dorsolateral migration in two patients [20%], and hypertrophic non-union in one patient [10%]. Conclusion: EIN is a safe, minimally invasive surgical technique with a lower complication rate, faster return to daily activities, excellent cosmetic and comparable functional results, and can be used as an equally effective alternative to plate fixation in displaced non comminuted midshaft clavicle fractures.

1.Introduction

The clavicle, is the primary association between the pivotal [by means of the sternoclavicular joint]. and the attached [by means of the acromioclavicular joint]. skeleton. Any power consumed by the furthest point is sent to the chest through the clavicle. This reality, notwithstanding its shallow area, clarifies why it is powerless against injury [1].

The frequency of cracks of the clavicle in grown-ups has all the earmarks of being expanding a direct result of a few components, including high-speed vehicular mishaps and the expansion of notoriety of contact sports [2].

Clavicular cracks represent 5% to 10% everything being equal and 35% to 45% of shoulder support wounds. Most regular mid-shaft cracks represent about 80% of all clavicular breaks, trailed by sidelong third cracks [12% to 15%]. and in conclusion average third cracks [5% to 6%] [3].

Undisplaced midclavicular cracks are for the most part overseen minimalistically, for example with a wide arm sling. Approaching puncturing of the skin, looming or existing neurovascular bargain and the gliding shoulder speak to total signs for usable treatment. Net relocation of break parts, just as non-associations, are viewed as relative signs for careful obsession. Plate osteosynthesis is the standard usable treatment, however higher complexity rates have been depicted with this technique [4].

In this investigation, intramedullary obsession is utilized which, is a negligibly intrusive methodology that give a three-point obsession inside the S-molded clavicle and focuses on precise rebuilding of the clavicular length with early come back to full action, with a decent restorative outcome due to a littler

cut, less delicate tissue analyzation and relative steadiness that empowers callus formation [5].

The point of this work was to survey the consequences of treatment of dislodged breaks of the center third of the clavicle utilizing intramedullary obsession.

2. Patient and method

This investigation was completed on ten patients with dislodged breaks of the center third of the clavicle introduced to Benha University Hospital and treated by intramedullary obsession.

An antero-back radiograph of the shoulder was acquired for all patients to survey the break type as per ROBINSON classification [6].

All patients were dealt with utilizing intramedullary obsession. The medullary depression of the clavicle was opened utilizing a drill about 1cm horizontal to the sternoclavicular joint. The drill was pointed horizontally in-accordance with the clavicle and calculated at about 30% to the coronal plane. Care was taken not to puncture the dorsal cortex so as to dodge significant confusions

When the medullary depression was opened, a preselected TEN was painstakingly embedded [The size of the nail was estimated utilizing this equation = $0.4 \times$ waterway breadth in mm. In clinical practice, we contrast the nail size and the channel distance across and pick it not exactly a large portion of the width. The embedded nails had distances across somewhere in the range of 2.0 and 3.0 mm as per the patient's measurements. The nail was fixed in a widespread throw with a T handle and progressed with wavering developments till arrived at the break site

When the Ti nail arrived at the crack site shut decrease by direct weight on the parts joined with control of the arm was performed. Generally decrease was encouraged when a little pointed decrease forceps was applied percutaneously to the horizontal piece

Now and again shut decrease may not be practiced. In these cases a short cut straightforwardly over the break site [2 cm]. with insignificant dismemberment [to maintain a strategic distance from injury of the supraclavicular nerve]. is proposed to lessen the crack

The nail was then driven into the distal piece of the clavicle near its furthest point. Care was taken to maintain a strategic distance from puncturing of the dorsolateral cortex of the horizontal clavicle, especially when a mallet was utilized

The distending average finish of the nail was kept separate from the cortex and abbreviated near its entrance point into the bone followed by wound conclusion

Conclusion of skin was performed by single basic intruded on stitch utilizing 3-0 prolene or utilizing steri-strips, if there should arise an occurrence of open decrease a standard conclusion of the other injury was then acted in layers utilizing 2-0 absorbable stitches for the myofascia and subcutaneous tissue then subcuticular fasten for the skin. After the medical procedure the patient was put in a sling.

All patients were followed up clinically and radiologically for at any rate a half year.

Patients were released with their arm immobilized in a sling. Early delicate preparation when agony permits, with no overhead kidnapping for initial a month and a half. The shoulder sling was disposed of at about fourteen days and dynamic helped practices were begun, however the patients were exhorted not to lift any overwhelming item for about a month and a half. Around then, uninvolved and fortifying activities were begun. The stitches were evacuated following fourteen days. The nail was evacuated after complete radiological association to maintain a strategic distance from any further skin bothering.

Results were evaluated toward the finish of this period as per Constant and Murley Score [CMS] [59].

3. Results

60% of patients were found between 20-35 years. The age of the studied sample ranged from 19 – 52 years with a mean of 30.9 ± 8.91 years . 80% of the patients were males [8 patients]. and 20% of the patients were females [2 patients]. . 50% of the patients were hard

duty workers [5 patients]., while 50% [5 patients] were light workers.

All the patients were right handed, the right side [dominant]. was affected in 8 patients [80%], while the left side [non-dominant]. was affected in 2 patients [20%]. One patient [10%]. had associated ipsilateral fracture distal end radius and another one [10%]. had associated ipsilateral fracture humerus and scapula, while the others [80%].were free .

Three patients [30%]. had associated medical conditions, the first had hypertension and the second had diabetes mellitus and the third was mentally retarded [Table VII & Figure 15].

The time lapse before surgery in the studied patients ranged from 1 day to 10 days with a mean 4.60 ± 2.93 days. The commonest mechanism of injury was road traffic accidents [RTA]. in 6 patients [60%]., followed by falling down in 3 patients [30%]., and lastly direct trauma in 1 patients [10%].

According to Robinson classification 8 cases [80%]. were type 2b1, one case [10%]. were type 2b2 and one case [10%]. type 2a1 . Open reduction was done in 3 cases [30%]. out of 10 cases after failed closed reduction of fracture

At the end of the follow up period, the mean final constant score for pain was 14 ± 3.16 ranging from 5 to 15

At the end of the follow up period, the mean final Constant score for active forward flexion was 9.60 ± 1.39 [145-174°]. ranging from 4 to 10

At the end of the follow up period, the mean final Constant score for active abduction was 9.60 ± 1.39 [145-174°]. ranging from 4 to 10

At the end of the follow up period, the mean final Constant score for active external rotation was 9.60 ± 1.23 ranging from 6 to 10

At the end of the follow up period, the mean final Constant score for active internal rotation was 9.60 ± 1.23 ranging from 6 to 10

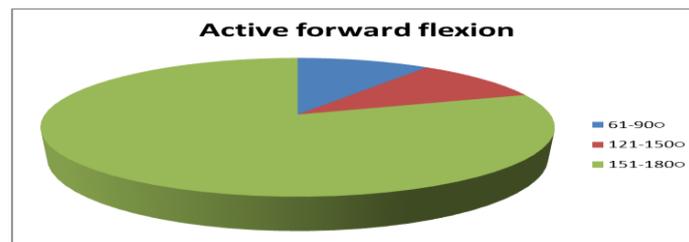
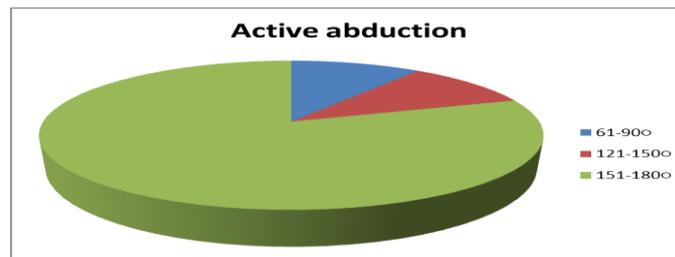
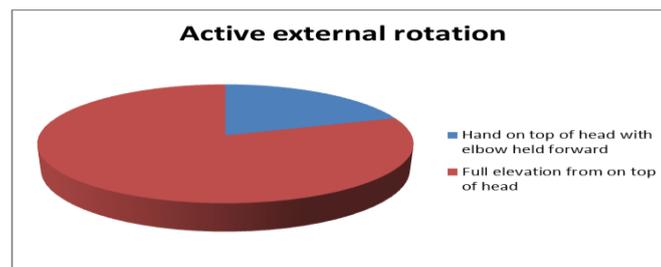
At the end of the follow up period, the mean final constant score for strength was 24.0 ± 3.08 ranging from 15 to 25.

Time of union in the studied patients ranged from 8 weeks to 12 weeks with a mean 10.0 ± 1.33 weeks with an exception of one case which, presented with hypertrophic non-union

2 patients [20%]. developed medial end skin irritation, one patient had to remove the nail while the other resolved within 2 weeks of medical treatment, 2 patients [20%]. presented with dorsolateral migration of the nail which was followed up until removal of the nail and one patient [10%]. presented with non-union.

Table (1) Distribution of the studied patients regarding the final score according to Constant and Murley score.

Final score	No.	%
Excellent [91 – 100].	9	90.0
Good [81 - 90].	0	0.0
Fair [71 – 80].	0	0.0
Adequate [61 - 70].	0	0.0
Poor [< 60].	1	10.0
Min. – Max.	55.0 – 100.0	
Mean \pm SD.	95.50 \pm 14.23	
Median	100.0	

**Fig (1)** Distribution of the studied patients regarding Activity level.**Fig (2)** Distribution of the studied patients regarding active forward flexion.**Fig (3)** Distribution of the studied patients regarding active abduction.**Fig (4)** Distribution of the studied patients regarding active external rotation.

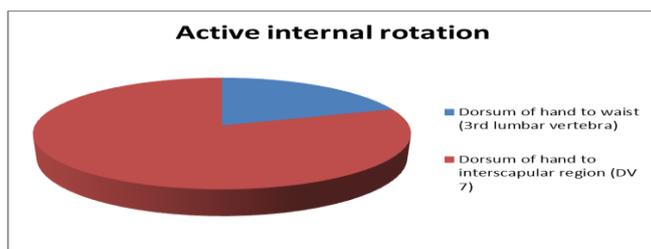


Fig (5) Distribution of the studied patients regarding active internal rotation.

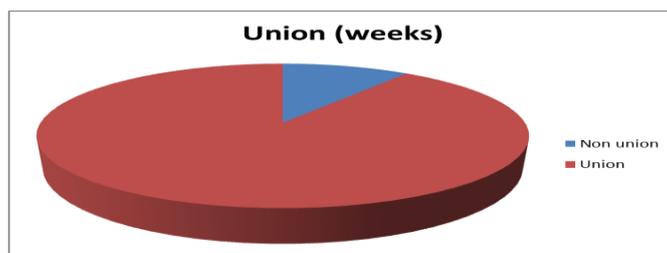


Fig (6) Distribution of the studied patients regarding union.

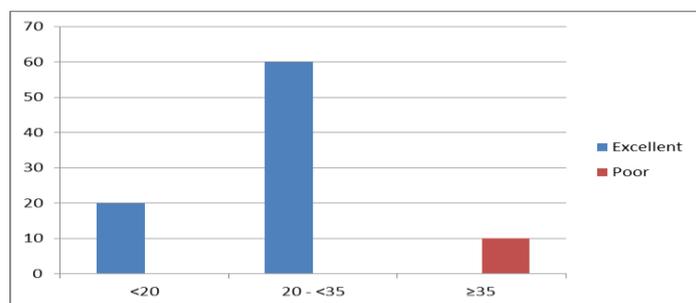


Fig (7) Relation between final score and age of the patients.

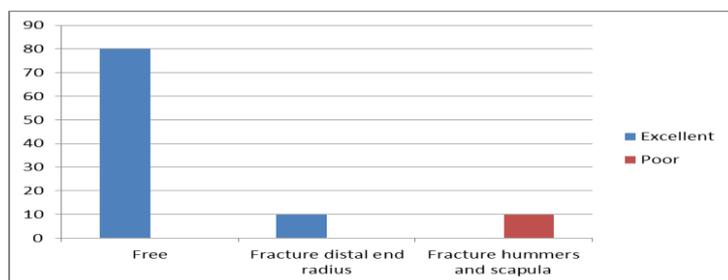


Fig (8) Relation between final score and associated injuries

Table (2) Relation between final score and fracture pattern.

Fracture pattern	Final score						χ ²	MCp
	Excellent [n = 8].		Adequate [n = 1].		Poor [n = 1].			
	No.	%	No.	%	No.	%		
2a1	1	10	0	0.0	0	0.0	9.426	0.253
2b1	8	80.0	0	0.0	0	0.0		
2b2	0	0.0	0	0.0	1	10.0		

χ²: value for chi square test
MC: Monte Carlo

Case 1

A 24 years old male employee. Mechanism of injury was falling down. Total score was 100 [ADL: 20, no pain, full range

forward elevation and abduction, full external rotation and internal rotation].. Union occurred after 10 weeks. The patient was graded as excellent.

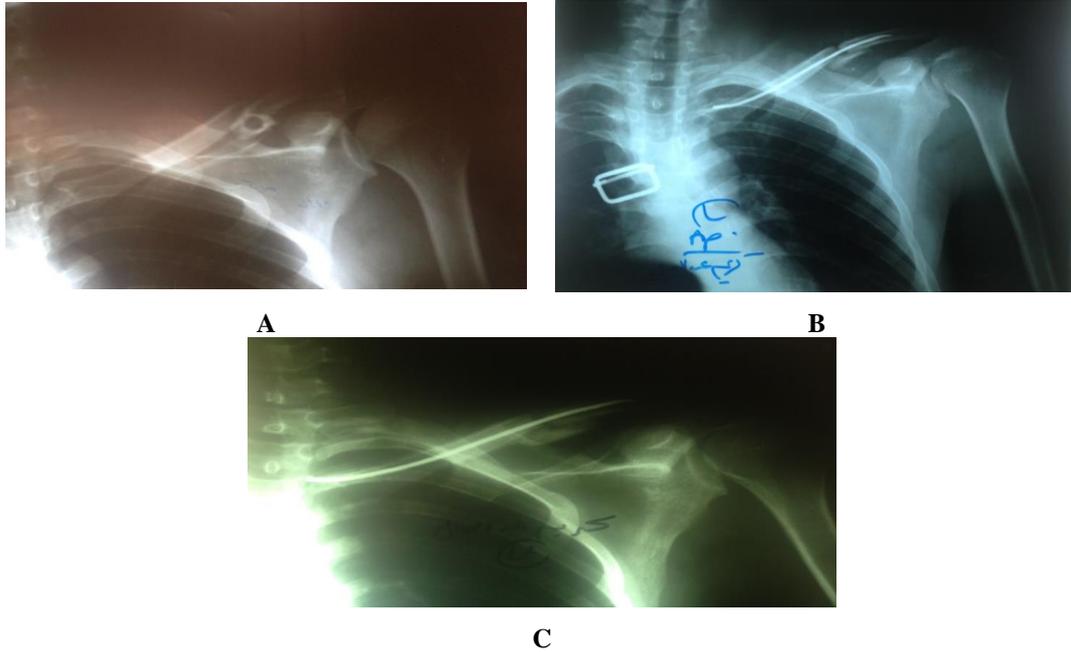


Fig (9) Case 4.A: preoperative X-ray. B: Immediate post-operative. C: X-ray after six months

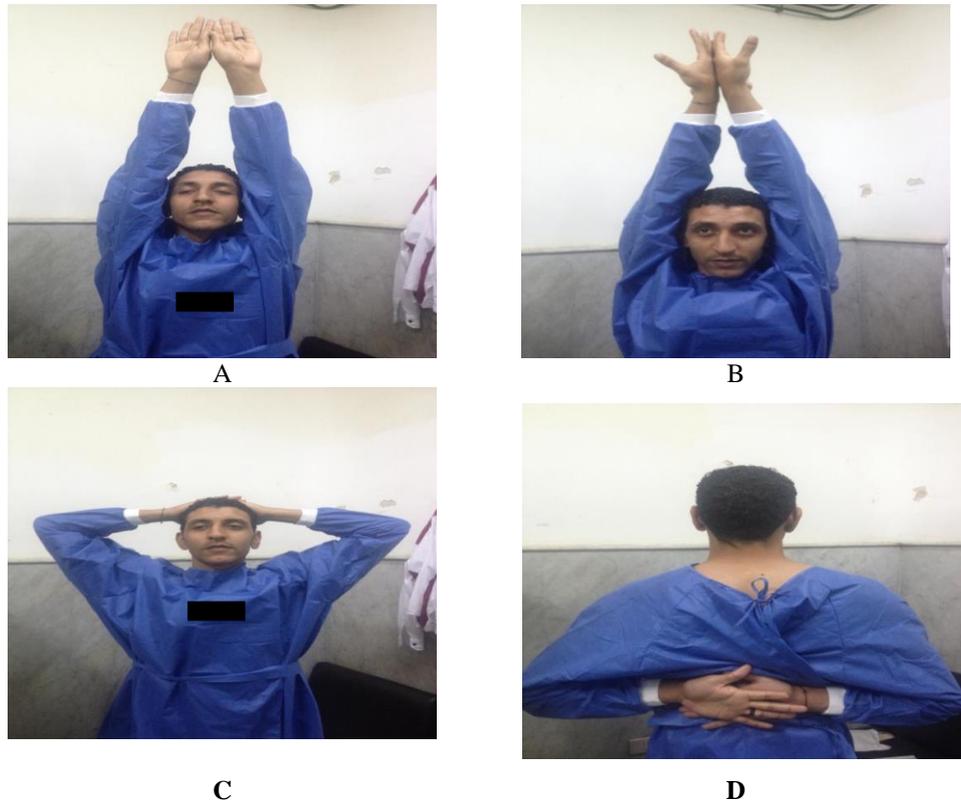


Fig (10) Case 4. A: full active forward elevation. B: full active abduction. C: full elevation of the hand above the head[full external rotation]. D: dorsum of the hand reached interscapular region [full internal rotation].

Case 2

A 30year old male manual worker. Mechanism of injury was road traffic accident. Total score was 100 [ADL: 20, no pain, full

range forward elevation and abduction, full external rotation and internal rotation].. Union occurred after 11 weeks. The patient was graded as excellent.

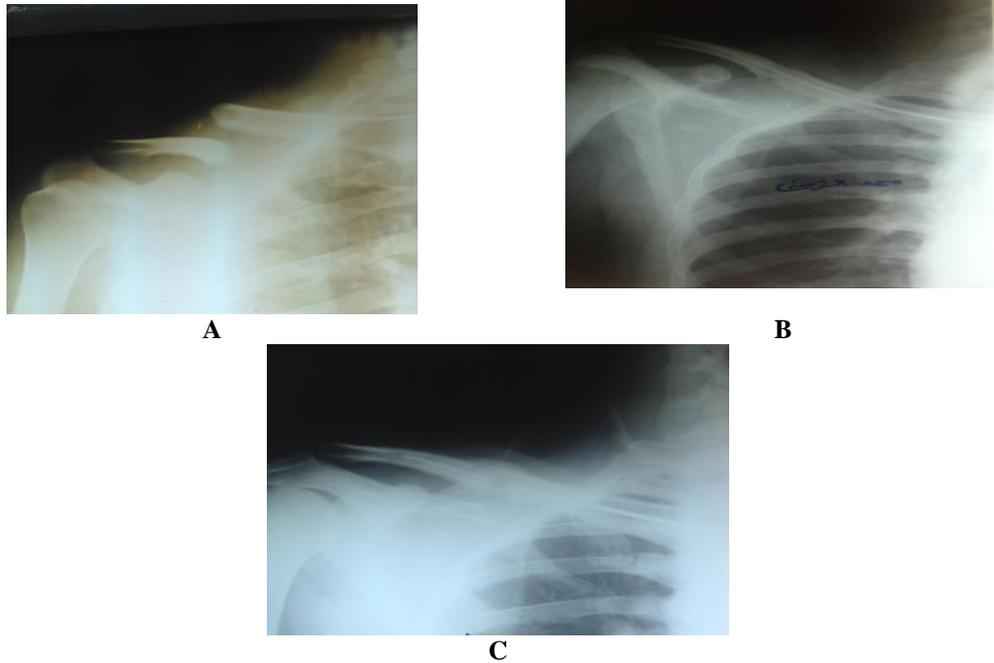


Fig (11) Case 5.A: preoperative X-ray. B: Immediate post-operative. C: X-ray after six months.



Fig (12) Case 5. A: full active forward elevation. B: full active abduction. C: full elevation of the hand above the head[full external rotation].. D: dorsum of the hand reached interscapular region [full internal rotation].

4. Discussion

A clavicle crack may be regular traumatic damage that comprises regarding 45% about shoulder support damages and 5% of the sum skeletal wounds [3]. A regulate ruin on the purpose of the shoulder may be those. The majority basic news person instrument about damage [7]. An assortment for intramedullary gadgets including Knowles pins, Kirschner wires, Hagie pins. What's more Rockwood pins have been utilized. [35]. Implant relocation for deadly mishap complications, insert disappointment and mal- and non-unions need been specified. Concerning illustration difficulties [8]. Christophmeier et al., [5]. Case arrangement might have been completed will assess indications, specialized foul pitfalls. What's more practical Conclusion from claiming versatile stable intramedullary nailing from claiming displaced midclavicular fractures done 14 players. Consistent score and radiographs were assessed after 1. What's more 6 weeks, 3 months. What's more 6 months done 13 patients. Intend agdistis might have been 28. A long time. The Normal catch up might have been 17 months. Mean operation chance might have been 62 minutes. Open decrease through a extra little entry point might have been vital to 7 fractures. Intend healing facility sit tight might have been 1. 2 times. Optional crack uprooting might have been watched for 1 tolerant. The steady score averaged 81 following 1 week, 96 following 6 weeks. Furthermore 98 following 6 months. The point when those operation might have been Postponed for more than 7 times shut decrease might have been never attained suggesting that patients profit starting with a right on time mediation with exceptional possibilities for fruitful shut diminishment. In one case those dorsolateral cortex might have been punctured. At those ten might have been propelled of the parallel conclusion of the clavicle utilizing An hammer with energy. Concerning illustration this issue might have been understood. Throughout the system those ti nail might have been withdrawn a couple centimeters. Furthermore repositioned. On unnoticed it Might prompt insert relocation with skin puncturing. What's more auxiliary crack relocation. They don't suggest utilizing a hammer any longer. An littler insert ought a chance to be decided. Assuming that it will be not could reasonably be expected to propel those ti nail by swaying developments main.

Previously, our ponder 10 patients were incorporated with An mean agdistis from claiming 30. 9 ± 8. 91 years, 8 patients [80%]. were guys. Also 2 patients [20%]. were females. Three patients [30%]. needed

cohorted restorative conditions, the to start with needed hypertension, the second required diabetes mellitus and the third might have been rationally impeded. Those run through slip preceding surgery in the concentrated on patients went from 1 day should 10 days for a mean 4. 60 ± 2. 93 day. Open diminishment might have been carried to 3 situations [30%]. crazy of 10 cases after neglected shut decrease about crack. Time of union in the contemplated patients went starting with 8 weeks should 12 weeks for An intend 10. 0 ± 1. 33 weeks for an special case for particular case the event which exhibited with hypertrophic non-union. Those last consistent score after 6 months might have been 95. 70 ± 13. 55. 8 patients needed phenomenal result, Furthermore 1 tolerant needed poor effects.

In regards those age, there might have been statistically huge association between agdistis and the last score. In examination to Jubel and Christoph investigations were every last bit their patients need aid adolescent athletes, the intend agdistis clinched alongside our investigation to the fantastic effects might have been 24. 44 a considerable length of time, same time that to poor people effects might have been 52. This finishes up that the result about adolescent may be superior to elderly patients [9,5]. Also, those cohorted therapeutic condition demonstrated statistically critical association with the last score. In examination of the other investigations were the patients were physical with no specified restorative morbidity, patients for our contemplate demonstrated connected therapeutic conditions; the tolerant with poor effect might have been uncontrolled diabetic. As An result, those restorative condition need an impact ahead last score from claiming patients.

There were 5 patients with difficulties. On our study; 2 patients [20%]. produced average limit skin irritation, a standout amongst them needed to uproot those nail, same time alternate moved forward inside 2 weeks about medicinal treatment, 2 patients [20%]. introduced with dorsolateral relocation of the nail which might have been trailed up until evacuation of the nail. What's more Ultimately particular case tolerant [10%]. introduced for hypertrophic non-union.

Jubel's consider demonstrated no complications [9]., same time Christoph's contemplate [59]. Showed numerous complications, those dorsolateral cortex might have been punctured in one case when those nail might have been propelled of the parallel wind of the clavicle utilizing An hammer with energy. Over different patient, optional crack relocation with clavicular shortening formed

since those parallel part might have been missed Eventually Tom's perusing the ti nail. For an alternate patient, the nail required to make uprooted prematurely [11 weeks]. after skin puncturing of the distending average wind because of a immediate hit Throughout a soccer diversion. Different two patients complained of skin aggravation over the ipsilateral sternoclavicular joint, those distending average limit of the nail might have been abbreviated under neighborhood anesthesia and the skin aggravation disappeared inside days.

Lastly, Hartmann's contemplate [10]. indicated 5 patients for complications, four patients endured from skin aggravation Also agony In the sternal conclusion of the clavicle I should 4 months then afterward the operation. Clinched alongside three cases the unmistakable average end of the ten might have been shortened, in one case the ten might have been uprooted promptly [5 months after those agent treatment].. In one case the insertion of the ten might have been went with Toward An complete acromioclavicular division sort iii. This tolerant exhibited preoperatively with An halfway acromioclavicular separation, sort ii. The weight connected of the joint Throughout insertion of the insert conceivably prompted An break of the remaining ligamentous structures. On a second procedure, those acromioclavicular ligaments were sutured and the clavicle might have been settled of the coracoid for a polydioxanon suture [PDS-banding]..

Will summarize, intramedullary nailing may be a picture indigent methodology shown best to youthful therapeutically nothing patients with intense straightforward 2 Some piece working third clavicle crack as auxiliary shortening or "telescoping" of clavicle happens to comminuted fractures for a middle of the road zone for precariousness. Delay to surgery might require open diminishment. Pounding is not recommended to evade dorsolateral cortex puncturing. The mossycup oak as a relatable point muddling will be average skin aggravation which might conclusion done skin puncturing Furthermore this is due to the subcutaneous position of the clavicle and the sharp limit of the reduction nail. Evacuation of the nail will be required after complete radiological union.

Principle preference from claiming our method is that it gives that's only the tip of the iceberg fast free development of the shoulder

What's more a sooner exchange with Every day exercises over those preservationist medication. In examination for plate fixation, the system may be lesquerella obtrusive and obliges more diminutive incisions for unrivaled cosmesis.

However, this contemplate needed exactly limitations:. The examine might have been directed just for 10 cases.

It might have been An randomized prospective examine with no control assembly.

Short span about catch up.

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