

Research Article

Fracture union and complication following internal fixation of clavicle by plate and screw

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ABSTRACT

Background: Among all long bones clavicle is the only bone placed horizontally and has membranous ossification. Clavicle fractures accounting for about 2.6% of total body fractures and 34% to 45% of total shoulder girdle injuries in adults. Most fractures occur in middle third of clavicle and common in young male patients. It has wide range of management from conservative to variant internal fixation. Each procedure has its own outcome and complications. We tried to find out the outcome and complications following internal fixation of clavicle with plate and screws.

Methods: In a prospective study 50 patients of fracture mid shaft clavicle who were treated with plate and screw were followed for a period of two years. Only adults more than 18 years were included in the study. All patients were followed at 2nd post-operative day 5th post-operative day 14th post-operative day and at 1, 2, 6, 12 and 24 months. Only two parameters were observed i.e. union of fracture and post-operative complications.

Results: Of all patients operated with plate and screw 48 patients had good radiological union by six months. Only two patients had non-union and one with implant failure at 12 months. Of complications one had stitch abscess and seven had hardware discomfort.

Conclusions: Clavicle fracture in adults has multimodal treatment option. Though conservative management has good results it has high chance of mal-union and non-union. Operative fixation should be opted for adult individuals where chance of non-union is high. Plate and screw fixation has good results in terms of union with least complication.

Keywords: Fracture, Clavicle, Complication, Plate and Screw

INTRODUCTION

Clavicle is the only bone that is most neglected in a poly-trauma patient. But its importance was more convincing after dealing floating shoulder injuries. When there was both clavicle and scapular fracture more attention was given to clavicle fracture to maintain the leverage action of shoulder. Clavicle fracture amounts to 2.6% of all fractures and accounts for 34% to 45% of shoulder girdle injuries in adults.¹⁻³ Of all clavicle fractures it is most common in middle one third i.e. about 69% to 81%, lateral one-third 17% and medial one-third 2%.^{4,6} Most of the clavicles fractures are treated nonoperatively, results

vary from good union, mal-union to non-union. Even united or not most patients have good functional outcomes and a high level of patient satisfaction except few where there is functional disability following non-union.^{2,7-11}

As nonoperative treatment are not as favourable as once thought, there is increase trend for internal fixation.¹²⁻¹³ Besides non-union was lower in operated group as compared to conservative group, pooled data showed that 14% of 452 patients in the nonoperative group developed non-union, which is significantly higher ($p=0.00001$) than the 1.7% rate of non-union in the 507 patients of the

operative group. Symptomatic mal-union was also significantly more common in the nonoperative group (20% in the nonoperative group versus 1.8% in the operative group. The most common complications in the operative group were hardware related (including plate irritation, pin protrusion and removal.¹⁴ With these available results we thought of finding the complication or union rate in internal plate fixation of mid shaft clavicle fracture in our scenario.

METHODS

Total 50 patients with midshaft clavicle fracture treated with plate and screw were enrolled in this study between Jan 2012 to Dec 2013 at IMS and SUM hospital, Bhubaneswar. Only adult patients i.e. 18 to 60 years with midshaft fracture were included in our study. Medial end and lateral end clavicle fractures, compound fracture or old fractures i.e. more than 3 weeks were not included in our study. All the patients were operated by two surgeons by routine anterior approach. Fracture fixed with plate and screw, minimum three screws in each fragment. Stitches removed at 14th postoperative day. All patients advised to use an arm sling for three weeks post

operation. Physiotherapy as tolerated started on second post-operative day. All patients were followed at 2nd post-operative day, 5th post-operative day, 14th post-operative day and at 1, 2, 6, 12 and 24 months. Out of 50 patients, 2 female patients lost to follow up, so rest 48 patients; 36 males and 12 females were included in the study. Only two parameters were observed i.e. union of fracture and post-operative complications. Radiological evaluation; done at 2nd post-operative day, at one month, at two month, at 6 month, at 12 month and at 24 months if required. Fracture union accessed at each follow up as mentioned. Complication or patient dissatisfaction recorded at each follow up. For the follow up evaluation a chart with definite parameters were recorded as found or said by patient. Patient selection was purely on fracture pattern, all patients with mid shaft clavicle fracture fixed with plate and screw were included in study in chronology. Study did not affect the treatment pattern or there was any selection of patient. It was a prospective study during routine course of treatment of clavicle fractures to know the outcome of clavicle plating and complications of the procedure.

RESULTS

Table 1: Results and complications.

	2 nd Post-operative day	5 th Post-operative day	14 th Post-operative day	1 Month post-operative	2 Months post-operative	6 Months post-operative	12 Months post-operative	24 Months post-operative
Pain at operative site	50/50	36/50	14/50	26/48	7/48	2/48	2/48	1/47
Shoulder pain	36/50	34/50	11/50	28/48	7/48	2/48	4/48	4/48
Soakage at Operative site	28/50	11/50	2/50	--	--	--	--	--
Haematoma at fracture site	2/50	2/50	--	--	--	--	--	--
Delayed wound healing	--	--	2/50	1/48	--	--	--	--
Palpable hardware	--	--	--	36/48	36/48	36/48	41/48	36/40
Disturbing hardware	--	--	--	--	--	7/48	10/48	4/40
Hardware failure	--	--	--	--	--	1/48	1/48	--
Union / Callus/ fracture line obliteration	--	--	--	11/48	26/48	46/48	46/48	47/47
Reoperation	--	--	--	--	--	--	1/48	--
Implant removed voluntarily	--	--	--	--	--	--	--	7/47

Results were recorded on a format at each specified follow ups as observed or as said by the patient (Table 1). For follow ups at 1, 2, 6, 12 and 24 months; deviation of 15 days on either side was accepted. Parameters such as; Pain at operative site, Shoulder Pain, Soakage at Operative site, Haematoma at fracture site, Delayed wound healing, Palpable hardware, Disturbing hardware, Hardware failure, Union/Callus/ fracture line obliteration, reoperation and implant removed voluntarily were recorded. Out of 50 patients two left to follow up since stitch removal. All the parameters as observed mentioned in the table 1. Pain at operative site was seen in all patients which decreased gradually. Shoulder pain was more marked during first month of operation. Soakage of dressing at operated site maximum at 2nd post-operative day, seen in all patients and was not seen at one month post operation. Haematoma was seen in two patients which subsided with due course of time. Wound healing was delayed in two patients, there was no other complication relating to wound healing in other patients. Most important was the plate and screw, which has visible markings on skin though there was no wound and palpable in almost 70 to 80 percent of patients. Of these hardware was disturbing in 7-10 patients. After union of fracture⁷ patients had removed the implants after 18 months of surgery, among them five removed because of hardware discomfort. Two patients had non-union till 12 months of surgery; one united by 24 months and other had implant failure. Patient with implant failure and non-union was operated with plating and bone grafting.

DISCUSSION

Clavicle fracture is a very common fracture accounts for 2.6 % of all fractures. Clavicle fracture is the most fracture, with treatment varying from quack to surgical intervention. Fortunately it has a good outcome in each method, even though there is lot of mal-union and non-union, functionally it hardly troubles the patient in many. Looking at the finer results it has been reported that conservative management has more chance of mal-union and non-union.^{2,7-11} A pooled data revealed that non-union was lower in operated group as compared to conservative group, Also showed that 14% of 452 patients in the Non-operative group developed a non-union, which is Significantly higher ($p=0.00001$) than the 1.7% rate of Non-union in the 507 patients of the operative group. Symptomatic mal-union was also significantly more common in the nonoperative group (20% in the nonoperative group versus 1.8% in the operative group.¹⁴ The present trend is to get best alignment and function to the extent of 100%, that is best possible with operative fixation. In one study it was found that nonoperative group had a higher likelihood of neurological symptoms compared with the operative group. A significantly higher risk of complications was found in patients treated conservatively than in those who underwent operative fixation. They have concluded that operative treatment is superior to nonoperative treatment in the management of displaced midshaft clavicle

fractures.¹⁶ In our study we did not encounter any neurological complication, which may support their finding.

In another study it was found that, Constant shoulder scores and DASH scores were significantly improved in the operative fixation group at all time-points ($p = 0.001$ and $p < 0.01$, respectively). The mean time to radiographic union was 28.4 weeks in the non-operative group compared with 16.4 weeks in the operative group ($p = 0.001$). There were two non-unions in the operative group compared with seven in the non-operative group ($p = 0.042$). Symptomatic mal-union developed in nine patients in the non-operative group and none in the operative group ($p = 0.001$). Most complications in the operative group were hardware-related (five patients had local irritation and/or prominence of the hardware, three had a wound infection, and one had mechanical failure.¹⁵ We found a similar finding with callus in 95% by 6 months and non-union in two patients by one year, of which one got united later and one ended with implant failure. Most important was palpable hardware found in more than 85% patients of which 20% had hardware related disturbance or irritation. Our finding is also similar to a study where implant prominence and skin irritation has resulted in implant removal rates of 9% to 64%.¹⁹⁻²² In a study with plate and screw author had encountered non-union in 5.3%, infection in 5.3%, refracture in 5.3% and 15.8% had prominent implants under the skin.²³ Besides there were other findings such as haematoma seen in two patients, pain at operative site, pain shoulder etc. These symptoms didn't last long, besides 4 patients had constant shoulder pain even at two years follow up. Shoulder pain was due to clavicle fracture or other shoulder pathology was not evaluated as patients managed at their end and refused further investigation. Basically our aim was to evaluate the efficacy of operative fixation of clavicle fracture and look out for major complications. There was lot in literature saying high about operative fixation over conservative management. We were operating clavicle fractures, but without our own statistical records. We found that our data of operative fixation are close to data in literature. In indirect correlation compiling our study and literature; operative fixation is a safe procedure with good union and minimal complications compared to conservative management.

CONCLUSION

Our study on clavicle plating revealed good outcome in terms of fracture union and minimal complications. Out of 50 patients one had non-union and implant failure requiring reoperation, which is a satisfactory result compared to conservative management. Besides, there was no neurological complication and other significant complication. Most important was palpable implants and disturbing implants. Complications like wound infection, haematoma, mal-union was negligible in present operation theatre standards and spread of knowledge by

various workshop, seminar and conferences. I agree with previous authors who claimed that plate and screw fixation is a dependable procedure for fracture midshaft clavicle. With all these we must not forget the demerits of any operation under general anaesthesia. I presume operative fixation of clavicle fracture with plate and screw should be preferred choice of treatment for adults, functionally demanding patients and comminuted fractures.

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