Complications associated with open reduction and internal fixation procedure in the treatment of clavicle fracture: A cross sectional study

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Abstract

Aim: To assess the complications associated with open reduction and internal fixation procedure in the treatment of clavicle fracture

Study Design: Cross sectional study

Place and duration: This study was conducted in SMBBIT/Dow University of Medical and Health Sciences Karachi, Pakistan. from June 2019 to June 2020

Methodology: This study was conducted on 55 patients having clavicle fractures who were under the treatments of plate internal fixation and open reduction method. Constant shoulder score was evaluated to assess the union and motion range of shoulder depending upon radiography, shoulder pain, and strength of shoulder.

Results: In this study, 15 (27.27%) individuals were female whereas 40 (72.72%) individuals were male. The mean constant shoulder score value was 85±4 with a 95% confidence interval. It was identified that treatment with the hook plates were used in 20 (36.36%) patients. Similarly, it was also identified that major number of individuals (almost 98%) had troubles because of poor cosmetics.

Conclusion: It was concluded that the complications associated with internal fixation were poor cosmesis, moderate pain and skin numbness at the site of surgery.

Keywords: Internal fixation, open reduction, clavicle fracture

Introduction

Clavicle is a curved 'S' shaped bony structure which is responsible for connecting the shoulder girdle to the axial skeleton laterally via acromioclavicular, and medially via sternoclavicular joints.[1] It is present in mammals who have prehensile forelimbs but absent in sea mammals. Humans have two clavicles present on both sides of the anterior base of neck. Clavicle is also called as the collar bone.[2] This bone plays an important part in maintaining the cosmetic sense,

stability and movement of shoulder girdle. There is a very close relationship between the shape, ligaments, and muscles of clavicle which form a platform to manage shoulder movement. This clavicle could either be congenitally absent or reduced in structure.[3] Its steadiness depends upon the degree and extent to which the muscles are developed.

Clavicle is quite prone to fracture particularly from a trauma or a fall, and results in a crack or fracture at midsection of bone. In children, 90% clavicle fractures occur at the mid-shaft, while in adults two third fractures or more than that occur at the clavicle's diaphysis.[4] These injuries at diaphysis have a higher chance to get displaced in comparison with the lateral third or medial fractures. Out of all clavicle fractures, almost 25% fractures account for lateral-third fractures, 2-3% fractures are medial-third, and the remaining clavicle fractures occur at the mid-shaft.[5] The mid-shaft clavicle fractures occur upon the implication of a direct force on any shoulder's point during an accidental fall, intense exercise or any sports activity. These fractures commonly happen during cycling or equestrian sports when the bicycle or horse suddenly stops throwing the rider forward, due to which the rider often lands on the unprotected shoulder or the extended arm.[6] While, in elderly females, these fractures are usually due to the low energy domestic falls because of osteoporosis.

Depending upon the severity and intensity of the fractures, the treatment is opted. Non-displaced clavicle fractures are usually managed without any kind of surgical procedures, and in most cases they are healed without any treatment or simply by using an arm sling or figure of eight strap bandaging, which is a proven method for the treatment of such fractures. For treating the malposition of scapula, more than three piece fractures, open fractures, and the displacements of more than two centimeters.[7] Similarly, to treat distal clavicle, clavicle hook plate is also a method of choice. Generally, hook plate method is used to treat the displaced distal clavicle which extends

to the acromioclavicular joint or the fractures which occur in the close proximity of acromioclavicular joint.[8] In a study of similar sort the malunion and nonunion cases were observed in less than 10% participants. It was concluded that most complications were due to errors in the plate stability.[9] Different studies on adults have suggested that managing the clavicle fractures by surgical procedures often lead to complications such as malunion and nonunion. Generally surgeries are helpful in treating the fractures of young adults in particular, but less helpful and less recommended in children and the old individuals.[10]

Considering the fact that very few studies are available on this topic, high rate of complications related to the fractures of clavicle, the surgical and non-surgical treatment controversies, and the difficulties associated with choosing the surgical treatment for clavicle fracture, this current study is designed to assess the complication caused by the internal fixation of a plate to manage clavicle fracture. Not only this, but this study has also conducted to evaluate the infection incidence, occurrence of malunion and nonunion, and the surgical site dissatisfaction in the patients.

Methodology:

It was a cross-sectional study conducted on a sample size of 55 patients having fractures of clavicle. The patients were selected by random sampling method, and the patients who either had neurovascular diseases, previous fractures, some underlying diseases, were using any particular medicines which might increase the nonunion possibility or have previous fractures were excluded from the study. Permission was taken from the ethical review committee of the institute. After obtaining the written consent from the patients, they were asked different questions, and on the

basis of their answers the questionnaires were filled. To analyze the shoulder strength; shoulder pain, and motion range constant shoulder score (CSS) was used. To determine the union; radiography was performed. In CSS, the score between 0-100 was assigned to different sections such as for shoulder strength; it was 25, for daily activities; it was 20, for motion range; it was 40 and for pain it was 15. For data analysis, SPSS version 22 was used to identify the mean, standard deviation and, frequency in order to analyze the rate of incidence of complications related to clavicle fractures. The p-value < 0.05 was considered significant.

Results

In the current study, 15 (27.27%) individuals were female whereas 40 (72.72%) individuals were male. The mean constant shoulder score value was 85±4 with a 95% confidence interval. It was identified that treatment with the hook plates were used in 20 (36.36%) patients. Similarly, it was also identified that major number of individuals (almost 98%) had troubles because of poor cosmesis. Some patients also reported the feeling of numbness and pain at the surgical site till almost four weeks after surgery. Although, the range of motion and daily activities were normal and no disability or disfigurement was observed in the participants as reported in Table 1.

Table 1: List of complications observed in individuals with or without hooks

Complaints	Without hook (n=35)	With hook (n=20)	Total (n=55)
Discharge and wound infection	3	5	8

history at the site of surgery			
Poor cosmesis (%)	98	96	97
Numbness (%)	74	87	80.5
Pain (%)	97	100	98.5
Scar discomfort (%)	24	27	25.5
Union after 6 months (%)	100	87	93.5
Pain after first four weeks of surgery (%)	Low 35	Low 9	22
	Moderate 70	Moderate 87	78
	Severe 0	6	1

Discussion

This current study was conducted to assess the prevalence of complications associated with fractures of clavicle after the process of internal fixation. Also, this study was conducted to identify the rate of infection incidence, malunion and nonunion, and the dissatisfaction at the surgical site after the surgery. Generally, clavicle fractures are classified into interior-third, middle-third, and exterior-third fractures depending upon their locations. Among which the most common type of fracture is the middle-third type which is considered in this study. In the present study, the mean constant shoulder score value was 85±4 with a 95% confidence interval which coincided with a study conducted of similar sort researchers observed a constant shoulder score value 89 with a 95% confidence interval after six weeks of surgery.[11]

In our study it was also identified that the union in all the patients had been achieved after six months of the surgery with the exception of 7 patients in the group of non-hook. Similarly, the malunion and nonunion were not observed which was another study identical to the previous ones. Using the hook plates is very common to treat distal fractures of clavicle. We used hook plates in this study because the clavicle fracture had extended into the acromioclavicular joint in our patients. A study conducted by Coupe et al., had reported that nonunion was observed in only one patient in a group of 89 patients during the follow-up of 9 years. It was also observed in the same study conducted by Coupe et al., that the most cases of nonunion were of malunion because patients experienced weakness and fatigue during daily activities.[12] Another study conducted by Charles et al., reported that the incidence of nonunion was quite higher in patients who were having fixation surgery for their fracture when compared with the patients for whom surgery was not required.

In this study it was observed that the incidence of post-surgery infections was quite low which coincided with the earlier studies conducted on the similar topics. The study conducted by Coupe reported that the only one patient had developed postoperative infection.[12] Although such infections are superficial and heal on their own. Generally, pain is a feeling of discomfort which is developed after the surgery, and pain in the body emerges from the site where bone is located, so feeling pain is quite normal. In our study 78.5% individuals experienced moderate pain which also coincided with previous studies where pain is commonly experienced.

In our study 97% patients complained about poor comesis which is also similar to previous studies. Similarly, 80.5% patients reported numbness at the site of surgery which differs from other studies of similar sort. With this study it is suggested that the nonsurgical treatments have a higher prevalence of developing postsurgical complications in comparison with the surgical treatments. The plate fixation method for clavicle fracture is an effective option for surgical treatment which is responsible for accelerating the process of shoulder recovery, decreasing the possibility of postoperative complications, and increasing the union possibility. For future recommendations, other techniques for scoring should be used and then the scores should be compared on a larger sample size to have better research analysis.

Conclusion

It was concluded at the end of this study that the clavicle fractures' treatment by internal fixation and open reduction can have positive outcomes. In this study, the mean constant shoulder score was high, incidence rate of postsurgical infections was low and the union is observed within a span of 6 months. Although, cosmesis, numbness and moderate pain is observed in majority of patients.

Permission:

It was taken from the ethical review committee of the institute

Declaration:

None

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