

# Cancellous Screw with Tension Band Wiring for Fractures of the Olecranon

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## ABSTRACT

**Background:** Olecranon fractures are one of the most commonly seen orthopaedic injuries in the emergency room. The K-wire which is used in the AO Tension Band Wiring (TBW) technique resists the shear better than the figure of eight wire alone, but, it does not add compression to the fixation strength. But, the cancellous screw plus the tension band wire, in combination, provides the strength of fixation i.e., by converting the tensile force to a compressive force at the fracture site, with additional resistance to the displacement due to the lag screw compression.

### Objective:

- To clinically evaluate the result of the cancellous screw with tension band wiring for fractures of the olecranon.

- To assess the elbow joint motion and stability after the procedure.

**Material and Methods:** Twenty five cases of fractures of the olecranon which were treated by using 6.5mm AO cancellous screws with a screw length of 80-105mm with a 16 gauge TBW, were evaluated. All the cases were followed up and the results were analyzed by using a 19 point scale.

**Results:** The results which were obtained in our series were excellent in 15(60%) patients, good in 3(12%) patients and fair in 7(28%) patients and there were no poor results.

**Conclusion:** The technique of open reduction and internal fixation with a 6.5mm AO cancellous screw and TBW, is a simple and effective means of treating fractures of the olecranon and it is based on the biomechanical principle of sound.

**Key Words:** Olecranon fractures, Cancellous screw, Tension band wiring

## INTRODUCTION

Olecranon fractures are one of the most commonly seen orthopaedic injuries in the emergency room. When they are displaced, open reduction and internal fixation are usually required to obtain an anatomical realignment or the articular surface and to restore the normal elbow function. The fixation should be stable, it should allow an active elbow flexion and extension and it should promote union of the fracture.

In the past, closed reduction and a plaster cast application was the treatment for fractures of the olecranon. But, a prolonged immobilization, with its own complications, increased the morbidity and the mortality of the patients. So, considering this, it has become important to intervene surgically. The active mobilization after surgery will restore the patient to normal functions as early as possible. The early and active movement not only prevents the tissue from fracture disease, but it greatly influences the quality and the rapidity of the fracture union.

Many methods which have been described are tension band wiring, intrafragmentary screws with or without wires, wires alone, plates, rush pin with tension band wiring, intramedullary screws with or without tension bands and bone fragment excision with reattachment triceps [1]. AO tension band wiring is the most common method which is used; it involves the use of a tension band and two K wires [2]. But it is not free of complications, the most common being hardware prominence which requires removal, loss of motion and loss of fixation. The K-wire which is used in the AO tension band technique, resists the shear better than the figure of eight wire alone, but, it does not add compression to the fixation strength. But, a cancellous screw plus a Ten-

sion Band Wire (TBW) in combination, provides the strength of fixation i.e., by converting the tensile force to a compressive force at the fracture site, with additional resistance to the displacement due to the lag screw compression.

## MATERIALS AND METHODS

The present study consisted of 25 cases of fractures of the olecranon which were treated with 6.5mm AO cancellous screws with a screw length of 80-105mm with a 16 gauge TBW, which were treated at the KVG Medical College during the period from April 2008 to March 2010, after taking ethical committee clearance from the hospital authorities.

Immediately, on the arrival of the patients, if he/she was in shock, the level of the shock was noted and it was managed accordingly. An X-ray of the part was taken and the elbow was immobilized in whatever position the patients presented, in a A/E POP posterior slab. The affected limb was kept elevated. Analgesics and antibiotics were given if necessary. The necessary investigations were carried out. All the patients were informed regarding the procedure and their informed consents were taken. The patients were then prepared for surgery and anaesthesia after their pre anaesthetic check ups.

### Selection of the Cases for the Cancellous Screw with Tension Band Wiring:

The following points were considered

- Age of the patient
- The extent of damage to the articular surface
- The degree of comminution

The patients of extreme ages and the patients in whom the operative risk was great, were not taken up for surgery. The severely comminuted fractures with larger articular surface damages, where restoration of the normal anatomy was not possible, were not taken up for the cancellous screw and TBW.

**The Surgical Procedure:** Twenty five cases of fractures of the olecranon were treated by using 6.5mm cancellous screws with a screw length of 80-105mm with a 16 gauge TBW under general anaesthesia or a brachial block. The exposure of the olecranon was achieved by using Campbell's posterolateral approach.

The accuracy of the reduction was checked and its stability was tested by moving the joint.

## POSTOPERATIVELY

- Liberal analgesia and antibiotics were given.
- The affected limb was elevated and the patient was asked to perform finger movements on day one. Elbow movements were advised from the 3<sup>rd</sup> postoperative day.
- For the minimal comminuted fractures and the unstable fixations, the limb was immobilized in A/E POP posterior slab with the elbow in 90° flexion for 2 weeks. For other fractures, the limb was mobilized by about the 3<sup>rd</sup> postoperative day.

## FOLLOW UP

This part of the study should be done very carefully and meticulously. In our study, the patients who were to be discharged were advised to report for follow up after 6 weeks and 12 weeks and thereafter, every 3 months. The result was assessed 12 months after the procedure. At follow up, a detailed clinical examination was done and the patients were assessed subjectively for symptoms like pain, swelling and restriction of the joint motion. On clinical examination, the swelling of the joint, its tenderness, the movements of the elbow joint, prominence of the head of the cancellous screw, nutrition and power of the muscles which were acting on the joint, were noted. The patients were instructed to carry out physiotherapy in the form of active flexion-extension and pronation-supination without loading. Check X-rays were taken and when the final X-rays showed union, the implants were removed. In all the patients, the durations after which they returned to their jobs were noted.

## RESULTS

Although there are many methods of evaluation of the results, which are given by many authors, for the sake of simplicity and ease, the results of all the fractures of the olecranon which were treated by using a cancellous screw with TBW, were evaluated in our study by keeping the following criteria in view, as shown in the 19 point scale Table [3,4] (according to Daniel F. Murphy et al., 1987).

- In the present study, the maximum number of patients were found to be in the age group between 21-30yrs. (10 patients i.e., 40%).
- There was a significant male predominance in the present study (18 patients-72%).
- Right side olecranon fractures were common 20 (80%) than left side fractures 5(20%) in the present study.
- In the present study, direct injuries were more common 17(68%) than indirect injuries.
- In the present study, 17(68%) patients had transverse fractures and 8(32%) had oblique fractures.

6. All the patients were operated between 2-10 days, with an average period of 3.48 days after the injury. All the cases were followed up and the findings were recorded regularly. The results were analyzed according to a 19 point scale. Excellent results were achieved in 60% patients, good results were achieved in 12% patients and fair results were achieved in 28% patients. There were no poor results. The complications like superficial infections and a symptomatic metal prominence were noticed in 2 cases each, which were treated accordingly.

Series	Male	Female
1) Jiang Xieyan (2000) [5]	10(66.6%)	5(33.33%)
2) Hume & Wiss (1992) [6]	30(73.17%)	11(26.82%)
3) Wolfgang G. et al (1987) [7]	27(60%)	18(40%)
4) Present Study	18(72%)	7(28%)

**[Table/Fig-1]:** Sex Incidence

Series	Right	Left
1) Wolfgang G., et al (1987)	25(55.55%)	20(44.44%)
2) Hume and Wiss (1992)	16(39.2%)	25(60.9%)
3) Present study	20(80%)	5(20%)

**[Table/Fig-2]:** Side Incidence

Series	No. of cases	Percentage
1) Jiang Xieyuan (2000) Traffic accident Fall from height	9 6	60% 40%
2) Wolfgang G., et al., (1987) Fall Motor vehicle accident Direct blow	22 20 3	48.88% 44.44% 6.66%
3) Present study Direct injury Indirect injury	17 8	68% 32%

**[Table/Fig-3]:** Mechanism of Injury

1) Jiang Xieyuan (2000) • Oblique fracture • Comminuted fracture	1 14	6.67% 93.34%
2) Murphy et al., (1987) • Transverse fracture • Oblique fracture • Comminuted fracture	26 12 7	57.5% 26.7% 15.6%
3) Present study • Transverse fracture • Oblique fracture	17 8	68% 32%

**[Table/Fig-4]:** Type of Fracture

Complications	Present study	Murphy et al
1) Superficial infection	2(8%)	20(44.44%)
2) Symptomatic metal prominence	2(8%)	3(6.6%)

**[Table/Fig-5]:** Post Operative Complications or Demerits of This Procedure

Study	Results in percentage			
	Excellent	Good	Fair	Poor
Murphy et al.,	60	10	30	—
Jiang Xieyuan	53.3	40	40	—
Present study	60	12	28	—

**[Table/Fig-6]:** Results of the procedure

## DISCUSSION

The main aim behind the treatment of fractures is not only achieving a joint union but also preserving the optimum function of the adjacent soft tissues and joints. In the management of intraarticular fractures like fractures of the olecranon, a perfect anatomical reduction of the fragments, for obtaining articular congruity and rigid fixation of the fragments, is of utmost importance, if early movements are to be instituted to prevent complications like traumatic arthritis and joint stiffness. 6.5mm AO cancellous screws plus TBW in combination, provides the strength of fixation, that is, by converting the tensile force to a compressive force at the fracture site, with additional resistance to the displacement due to the lag screw compression.

In our study, 25 cases of fractures of the olecranon were treated with 6.5mm AO cancellous screws with tension band wiring. Our experience with this method of fixation has given favourable results. The findings, the end results and various other data will be analyzed and compared in the following discussion [Table/Fig-1, 2, 3, 4 & 5].

Most of the studies including ours, have shown excellent results in around 60% of the cases. Another recent study of Ahmed AR et al., has concluded that an intramedullary screw which is combined with a tension band in the treatment of displaced transverse and oblique olecranon fractures gives better clinical results and that it has a much less re-operation rate for the removal of the hardware as compared to the AO tension band wire fixation, in avoiding the costs, work time loss and the possible complications which occur due to the hardware removal [8] [Table/Fig-6].

## CONCLUSIONS

From the present study, it was concluded that the technique of open reduction and internal fixation with a 6.5mm AO cancellous screw and TBW was a simple and effective means of treating fractures of the olecranon and that it was based on the sound biomechanical principle.

The 6.5mm AO cancellous screw with TBW for fractures of the olecranon has the following distinct advantages, provided the

surgery is performed as early as possible, giving due care to all the technical details.

- 1) In this method, the post-operative immobilization in the POP is greatly minimized, thereby avoiding fracture disease.
- 2) Because of the rigid fixation (a combined tension band effect with additional resistance to the displacement due to the lag screw compression) between the fracture fragments, early active and functional movements can be achieved at the involved joints during the phase of the fracture healing. This reduces the chances of joint stiffness.
- 3) The early active movement at the involved joint induces compression between the fragments. This compression hastens the fracture healing. Because of the early union of the fracture, the patient can get back to work earlier. This aspect is very important, both from the psychological and the economical points of view.

Considering all the distinct advantages, 6.5mm AO cancellous screws with TBW is the choice of treatment for fractures of the olecranon.

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