

# TRANSOSSEOUS FIXATION OF INTERCONDYLAR FRACTURE OF LOWER END HUMERUS BY TENSION BAND WIRING TECHNIQUE

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## ABSTRACT

**Background:** Intercondylar fractures of lower end of humerus is a challenge for orthopedic surgeon to fix rigidly for early mobilization. We hereby have devised a novel technique of fixing an intercondylar fracture of lower end of humerus by transosseous route utilizing the Tension band wiring. We successfully obtained a rigid, stable reconstruct without affecting the anatomy of the region.

**Aims & Objective:** To study the effect of transosseous fixation of intercondylar fracture of lower end humerus by tension band wiring technique.

**Materials and Methods:** We have followed a novel technique for treating intercondylar fracture of lower end of humerus. Till date we have treated 10 patients of supracondylar fracture of humerus with intercondylar extension. All patients were selected randomly the only criteria was a supracondylar fracture of lower end of humerus with intercondylar extension. This method gave us four cortices fixation in the lower intercondylar region which was not possible till date by other methods of fixation. So now T-Y elbow type of fracture is converted into a supracondylar fracture. Rest fixation of supracondylar fracture was done with perpendicular plating and k wire TBW in case of osteoporotic bones.

**Results:** Out of 10 treated cases with this method all get rigid fixation and radiological union at average of 8 weeks. Average ROM was 5-100. One case had postoperative stitch infection, one had k wire impinging on skin and two patients lost follow up after 3 months.

**Conclusion:** Complicated fractures of intercondylar region of distal humerus can be successfully managed by interosseous TBW technique. We recommend such technique and further research regarding it.

**Key Words:** Intercondylar Fracture; Intra-Articular; Tension Band Wiring; Compression; Novel Technique

## Introduction

The treatment of intra-articular fractures of lower end of humerus in the intercondylar region poses a great challenge to fix it securely and rigidly in anatomical alignment so as to mobilize it early, to obtain ultimate post-operative results.<sup>[1]</sup> The intercondylar area being intra articular completely provides very little space for the use of various rigid implants. Till date the fixation modality for intercondylar region was either single screw or a k wire. Now with the advent of the anatomical plates we try to fix the intercondylar fractures by more than one screw in the intercondylar region<sup>[2]</sup>, but none of these screws has a purchase on opposite cortex. There by making fixation not very rigid. We have devised a simple useful and rigid method of fixing the fractures of intercondylar region and maintaining the anatomy as normal as possible and also getting four cortices fixation which till date was not possible with the any of the implant used. This method converts a very unstable fracture of humerus into a very rigid reconstruct even in cases of very osteoporotic and open infected cases, for early mobilization. In this technique we have utilized the principle of tension band wiring over a cannulated cancellous screw by transosseous route with full restoration of intra articular anatomy.

## Materials and Methods

Till date we have treated 10 patients of supracondylar fracture of humerus with intercondylar extension at in Shree Harilal Bhagwati Municipal General Hospital, Borivali (w), Mumbai. In all 10 cases we got rigid and stable anatomical reduction on table itself which we confirmed by direct visualization under fluoroscopy. All patients were selected randomly the only criteria was a supracondylar fracture of lower end of humerus with intercondylar extension. We included all fresh fractures, non-union, compound fractures, and osteoporotic fractures. All patients were operated in prone position under region block or general anesthesia. We used posterior approach of elbow with olecronon chevron osteotomy. Intercondylar portion of fracture was first reduced and held with AO reduction clamp as anatomical as possible. Then we passed a guide wire for cannulated cancellous screw from medial side to lateral aspect in intercondylar area crossing fracture perpendicularly. A second guide wire was passed through intercondylar area parallel to first one just distal to it without breaching the articular margin. A cannulated cancellous drill bit was used to drill the first guide wire from medial to lateral side. One proper size 4mm cannulated cancellous screw was passed over a guide wire and screw was placed in position. A

cannulated drill bit was used to drill the second guide wire from lateral to medial side. Now the second guide wire was removed from drill bit. A pre-tensioned stainless steel wire was passed through the cannulated drill bit from lateral aspect to medial side. A medial end of same stainless steel wire now turned and passed through the medial side of cannulated screw head .so that it came out from the cannulated cancellous screw from lateral side. Now the cannulated cancellous drill bit was removed. Now the stainless steel wire is ultimately passing through transosseous canal into the lower intercondylar region and back again through cannulated cancellous screw in the upper part of the intercondylar region. Now tension was applied by twisting the two free ends of the stainless steel wire on the lateral side the intercondylar region. While tension was being applied we could feel the compression being achieved at the intercondylar region and also the rigidity was experienced as he tension was applied. This could be appreciated on fluoroscopy also. Added to these wires are passed from common extensor origin at lateral condyle and from common flexor origin at medial condyle. As both muscle group contracts, the distraction forces created by them are converted into compression forces by this interosseous tension bend wiring. This method gave us four cortices fixation in the lower intercondylar region which was not possible till date by other methods of fixation. In osteoporotic fractures we used washer over the stainless steel wire to achieve compression at intercondylar region. In cases of non-union we did not used any graft in the intercondylar region, only freshening and compression was the modality of fixation. In cases of open fractures we constructed two transosseous canal instead of one and did not used cannulated cancellous screw as we intended to use very minimal implants. So now T-Y elbow type of fracture is converted into a supracondylar fracture. Rest fixation of supracondylar fracture was done with perpendicular plating and k wire TBW in case of osteoporotic bones.

Out of 10 treated cases with this method all get rigid fixation and radiological union at average of 8 weeks. The maximum period for union was 12 weeks and the minimum time duration was 7 weeks. Average ROM was 5-100 with maximum range of motion (ROM) 0-110. One case had postoperative infection which was treated successfully by local debridement and antibiotics, one had k wire impinging on skin which was removed after radiological union and two patients lost follow up after 3 months.

## Discussion

Distal humerus fractures remain a challenging reconstructive problem for orthopedic surgeons. Much of the difficulty encountered in treating distal humerus fractures lies in the complex anatomy of the elbow joint.<sup>[1]</sup> The highly constrained nature of the elbow joint causes it to absorb energy following direct trauma.<sup>[3]</sup> Consequently, articular comminution may occur. The distal humerus has a narrow supracondylar isthmus with a sparsity of adequate subchondral metaphyseal supporting bone, especially within the olecranon fossa.<sup>[4]</sup> The osteopenia observed in elderly patients adds to the complexity. Hastings and Engles have described a "spillover effect," in which inadequate restoration of a singularly injured joint can lead to abnormal wear and degenerative changes in an adjacent articulation. This effect can apply to the elbow.<sup>[5-7]</sup> However, Early mobilization , anatomical reduction and rigid fixation is required to prevent future problems.<sup>[8]</sup> We here described such one method which allow good compression at fracture site, rigid fixation and less hardware which is best for condylar area of elbow . Early mobilization is possible because of rigid fixation and good compression. In our method of intercondylar fixation rigid fixation and compression is achieved by transosseous route utilizing the principle of tension band wiring. Tension bend principle is applied here by the common extensor origin at lateral condyle and common flexor origin at medial condyle. As both muscle group contracts, the distraction forces created by them are converted into compression

## Results

**Table-1: Management and follow up of patients**

Sr. No	Age	Sex	Mode of Injury	Management	Radiological Union	Functional Outcome (ROM*)	Complications
1	55 years	F	Fall from height	Interosseous TBW** + Perpendicular plating	10 weeks	0°-115°	K wire impingement on skin
2	38 years	M	Road traffic Accident	Interosseous TBW + Perpendicular plating	7 weeks	5°-115°	No major complications
3	65 years	F	Fall on Ground	Interosseous TBW + Perpendicular plating	10 weeks	5°-110°	No major complications
4	47 years	M	Road traffic Accident	Interosseous TBW + Perpendicular plating	9 weeks	10°-110°	No major complications
5	85 years	F	Fall on Ground	Interosseous TBW + K wire TBW for both columns	12 weeks	10°-95°	Superficial infection (lost follow up after 3 months)
6	46 Years	M	Road traffic accident	Interosseous TBW + Perpendicular plating	8 weeks	10°-100°	No major complications
7	53 Years	F	Road Traffic Accident	Interosseous TBW + Perpendicular plating	10 weeks	10°-95°	No major complications
8	28 Years	M	Road Traffic Accident	Interosseous TBW + Perpendicular plating	7 weeks	0°-115°	Lost follow up after 2.5 months (10 weeks)
9	42 years	M	Road Traffic Accident	Interosseous TBW + Perpendicular plating	8 weeks	5°-100°	No major complications
10	47 years	M	Road Traffic Accident	Interosseous TBW + Perpendicular plating	9 weeks	5°-110°	No major complications

\* ROM = Range Of Motion; \*\* TBW = Tension Band Wiring; M= Male; F = Female

forces by this interosseous tension bend wiring. We hereby achieved four cortices fixation which is not described by any implant. Because of immense rigidity and stability we can mobilize the patient very early and the tension bend wiring technique acts in dynamic mode when muscles contracts.



Figure-1: Pre-operative x-ray



Figure-2: Post-operative x-ray

The added advantage of this modality is that it allows other implants for fixation of both supracondylar and intercondylar fracture over and does not interfere with instrumentation or implants. We propose that this method of fixation can have wide applications like: In fresh and old intercondylar fractures. In comminuted fractures were screw hold is not good, and this technique gives four cortices fixation with good compression and can hold comminuted fragments as well. In fractures in osteoporotic bone were large implants can have shattering effect and screw may loose out, this stainless steel compression gives

good hold without fear of loosening and gives good hold without much implants. In non-union cases were good compression and rigid fixation is required which is definitely provided by this technique and the chances of healing would increase. In case of infected fracture as the implant used in very less and we can apply antibiotic beads along with it on both sides, and we can do only interosseous TBW without cannulated screw. This method can also be applied to other intercondylar areas like upper end of tibia, femoral conylar area, distal radius. We can apply in more than one plane also like in upper end tibia it can be passed in medial to lateral plane and anterior to posterior direction, so we can take care of posterior fragment as well. Future technology may hold many solutions. With the advent of newer, stronger biocompatible materials, diverse hardware options allow improved reduction and fixation of distal humerus fractures. Lower profile plates and smaller screws are showing some results. This method of transosseous intercondylar tension band wiring can be useful technique in such situations that allow the surgeon to maintain the original articular congruity needed to prevent posttraumatic arthrosis, which allows for faster and progressive postoperative rehabilitation.

## Conclusion

Complicated fractures of intercondylar region of distal humerus can be successfully managed by interosseous TBW technique. We recommend such technique and further research regarding it.

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