International Journal of Orthopaedics Research
www.orthopaedicsjournal.in
E-ISSN: 2663-0923, P-ISSN: 2663-0915
Received: 13-05-2019, Accepted: 13-06-2019; Published: 13-07-2019
Volume 1; Issue 2; 2019; Page No. 04-06

Bimalleolar ankle fracture: Comparative study between TBW (tension band wiring) and CCS (cannulated cancellous screw) for medial malleolus (MM)

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Abstract
Objectives: This study was conducted to compare the results of tension band wiring (TBW) and Cannulated Cancellous screw (CCS) fixation for the medial malleolus (MM) fracture in bimalleolar fracture in terms of functional outcomes and range of motion of ankle.
Materials and methods: This study was conducted in our tertiary care centre from june 2017 to Dec 2018 which comprised of 30 patients of which 10 were females and 20 were males. They were divided into two equal groups, group 1 in which TBW was done for MM fracture and for the other group 2, CC screw fixation was done for MM fracture. In both the conditions, lateral malleolus fracture was treated with rush nailing. The functional outcome was measured after 6 months and 1 year using the modified ankle scoring system of Olerud and Molander and Range of motion of ankle noted.
Results: we used the modified ankle scoring system of Olerud and Molander for functional outcome and according to that, excellent results were achieved in 60 % and good results were achieved in 20 % in group1 patients and excellent results were achieved in 40 % and good results were achieved in 40 % in group2 patients. the mean range of motion was 20 ^{0} dorsiflexion and 35 ^{0} plantar flexion in TBW group and 15 ^{0} dorsiflexion and 30 ^{0} plantar flexion in CC Screw group.
Conclusions: when compared to CC screw fixation, TBW had shown better functional outcome and range of movements in ankle making it a preferable choice for medial malleolus fracture.

Keywords: tension band wiring, Cancellous cannulated screw, Ankle fracture

Introduction

Being one of the most congruous joint in the lower extremity, the ankle bears upto five times the body weight [1]. They are common fractures treated by orthopaedic surgeons. In last two decades, the prevelance of such fractures have increased both in young, active patients and in elderly [2]. Pain, instability, and early degenerative arthritis are some of the potential complications of ankle fracture, if not treated well [3].So, keeping this in mind, open reduction and internal fixation has been superior over closed method of treatment [4]. For ORIF, various implants are available, including CC screws, k-wires, TBW (tension band wires) etc. which are excellent to restore the normal anatomy of the ankle joint.

This study was performed to compare the functional outcome of medial malleolar fractures treated with tension band wiring and 4 mm cannulated cancellous screws.

Materials and methods

This study was performd in our tertiary care centre with 30 patients, of which 20 were males and 10 females. All had the age group of 25-45 years. 20 had the history of road traffic accident and 10 had history of fall from height. when the patients were brought in our casualty, x-rays were done and initially, below knee plaster was applied. 22 were operated within 24 hours and 8 patients were operated after a gap of 10 days for subsidence of swelling. Patients were divided into two equal groups. Group 1 with 15 patients were treated with TBW and group 2 with other 15 patients with CC screw. Post-operative plaster was applied in neutral position.

All the patients were reviewed at 14th day, two months, six months and one year after operation. On 14th day, the stitches were removed, plaster was replaced with a removable splint and

range of motion exercises were started. Patient was kept non Weight-bearing for 6 weeks after which partial weight bearing started. After 12 weeks full weight bearing was allowed. Functional Evaluation was done by modified Olerud and Molander score [5].

It consist of question are and clinical findings. The scoring scale has a maximum of 100 points (>91 excellent results, 81-90 good results, 71-80 fair results, <70 poor results).

Fig 1: Post -Operative TBW Mm

Fig 2: Post-Operative Ccs Mm

Results

The mean duration of operation for tension band wiring was 45 minute and cannulated screw fixation was 30 minute. Mean age for group 1 (TBW) was 35 years and for group 2 (CCS) was 40. In both the groups 66.66% were male and 33.3% were female. According to the modified ankle scoring system of Olerud and Molander, 9(60%) patients in group 1 and 6(40%) patients in group 2 were excellent and good outcome was seen in 3(20%) patients in group1 and 6 (40%) in group2, fair in 3(20%) patients in group 1 and none in group2: No poor outcome in group1 and 3(20%) poor outcome in group2 patients. Excellent and good results were achieved in 80% in both group1 patients and group2 patients.

Table 1: Follow up assessment using modified Olerud and Molander scoring system

Outcome	Group 1 (TBW)	Group 2(CCS)
Excellent	9 (60%)	6 (40%)
Good	3 (20%)	6 (40%)
Fair	3 (20%)	0 (0%)
Poor	0 (0%)	3 (20%)

At the end of 1 year, the mean range of dorsiflexion in group1 (TBW) was 20 degrees as compared to 15 degrees in group 2(ccs). The mean range of plantar flexion in TBW group was 35 degrees as compared to 30 degrees range of plantar flexion in ccs group.

Fig 3: Dorsi Flexion – TBW - After 1 Year

Fig 4: Plantar Flexion – TBW - After 1 Year

Fig 5: Dorsi Flexion – Ccs Mm - After 1 Year

Fig 6: Plantar Flexion – Ccs Mm - After 1 Year

Discussion

Ankle joint is the most common joint involved of all the intra-articular fractures occurring in weight-bearing joints and when it comes to treatment, Burwell and Charnley showed that anatomical reduction and rigid fixation led to early return to function [6]. In our study the mean age was 40 years. In study by

Roberts RS the mean age was 40 years and in that of Beris *et al*. the mean age was 43.8 years [7, 8]. In our study out of 30 patients, 20(66.66%) were male and 10(33.33%) were females. In his study of 30 patients, Nabeel Shams *et al*. had 22 male and 8 female patients [9]. Dr. Maruthi CV *et al*. had 28 males and 12 females in their study of 40 cases [10].

Our study showed that excellent results were achieved in 60% and good results were achieved in 20 % in group1 patients (treated with TBW) and in group2 patients (treated with ccs) excellent results were achieved in 40% and good results were achieved in 40 %. The results of Sang-Hanko and Young-Jun Park were similar to us, who achieved excellent and good results in about 89 % of cases treated with TBW and 78 % of cases treated with CCS [11].

As compared with CCS group, better range of motion was noticed in TBW group which could be attributed to more rigid fixation with the use of tension-band with the principal that the distracting tensile forces are converted in to compressive forces [12].

Conclusion

This study concludes that TBW has better functional outcome when compared to CCS in terms of functions of Ankle joint after medial malleolus fixation in bimalleolar fracture, with added advantage of good range of movements as than those treated with CCS. TBW can be preferably used for medial malleolus fractures in Bimalleolar fractures.

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