



# UNICOMPARTMENTAL OSTEOARTHRITIS OF KNEE; OUTCOME OF HIGH TIBIAL OSTEOTOMY IN UNICOMPARTMENTAL OSTEOARTHRITIS OF KNEE

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**ABSTRACT... Background:** Osteoarthritis is more common in females because in postmenopausal state, it is linked with high body weight, higher subcutaneous fat, deficiency of calcium and weakness of muscles associated with changes in hormones. **Objectives:** To assess the outcome of high tibial osteotomy in unicompartmental osteoarthritis of knee in terms of pain and improvement in function. **Study Design:** Prospective study. **Setting:** King Abdullah Teaching Hospital, Mansehra. **Period:** 1<sup>st</sup> January 2016 to 31<sup>st</sup> December 2017. **Materials and Methods:** Two hundred and forty eight cases were included in which twenty cases were operated by the use of modified coventry technique, twenty cases were operated by open wedge osteotomy with non locking plates as well as bone graft and remaining 208 cases were operated by medial open wedge osteotomy and iliac graft secured by locking plate. In all cases at eight weeks, six weeks and third post operative day respectively allowed full weight bearing. Post-operative changes in tibio femoral angle included in radiographical analysis. 2 years mean follow-up of all these cases. **Results:** Function score and pain of knee improved considerably as the p value <0.001 in our study. Maximum pain score is 50, pre-operatively average pain score was 18±7 and 44±5 was postoperatively. There was a significant improvement at two years in the function of cases 244 (98.38%) according to grading used for judgment of function in knee score. Pre-operatively mean functional knee score in 110 cases (88.70%) cases were 28.86, (100 is the maximum functional knee score) and 70.45 was post-operatively. In tibiofemoral angle there was a correction of 5.2±1.5 degree varus preoperatively and postoperatively as well as valgus 5.8±1.3 degree respectively. **Conclusion:** In function and pain of the knee, there was significant improvement after the deformity correction (p value <0.001). In 88.23% outcomes of high tibial osteotomy in knees rated as excellent. Due to associated comorbidity and excessive over correction, there were poor outcomes in two cases. There is significant association between the obtained postoperative valgus and relief in pain.

**Key words:** High Tibial Osteotomy, Osteoarthritis Knee, Locking and Non Locking Plates, Bone Graft.

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## INTRODUCTION

In female, osteoarthritis is much frequent and more common because in postmenopausal female is linked with high weight of body, higher subcutaneous fat, deficiency of calcium and weaker muscles associated with changes in hormones. The outcomes of our study also show that only females are more prone to osteoarthritis as compared to males. High tibial osteotomy is effective, well established and safe surgical technique for treatment of unicompartmental osteoarthritis of knee. Koshino reported in 2004, the incidence of osteoarthritis in male as 20% and

females as 80%. Similarly in 2001, Chol<sup>2</sup> reported an incidence of male 30.77% and female 62.23%. Further in 2009, Zaki<sup>3</sup> in his study included 100% male patients.

## MATERIALS AND METHODS

This prospective study was conducted at King Abdullah Teaching Hospital, Mansehra from 1<sup>st</sup> January 2016 to 31<sup>st</sup> December 2017. Selection criteria of patients based on varus/valgus deformity, of unicompartmental involvement, restriction in daily activities due to pain. Apart from usual investigations and examination (i)

possibility of walking long distance, (ii) with two sticks ability to walk a few yards, (iii) walking with a limp but without aids and (iv) walking without aids.

Knee mobility: graded 0 to 5 (flexion actual range divided by 25). Femorotibial angle (FT angle)-1 is a radiological assessment in which along the center of long axis of femur and tibia a longitudinal line was drawn. Angle subtended by tibia on femur calculated in degrees and expressed as valgus or varus. Tibio perpendicular angle (TP angle) is also a radiological assessment. The index of osteoarthritis of Western Ontario and McMaster Universities (WOMAC) is used to evaluate patients using twenty four (24) parameters with knee osteoarthritis. It can be used to check the disease course and to determine anti-rheumatic medications effectiveness. There were two types of surgical techniques used, of which first one is modified Coventry technique and second is open wedge high tibial osteotomy protected with internal plating with bone grafty. All patients at sixth week, third month and at sixth month were examined after operation in OPD.

**RESULTS**

In following table majority of cases in which high tibial osteotomy was done fall under the age group of 50-59 years (53.23%) and constituted >60 years age group (33.87%). No patient belonged to the age group of 40 years or below showing that high tibial osteotomy (HTO) is infrequently executed in such group of age for osteoarthritis of knee joint. In our study the average age of patients was 55±8.68 years (Table-I).

Age	Cases	%
≥60	84	33.87
50-59	132	53.23
40-49	32	12.90
<40	0	-

**Table-I. Distribution of age**

High tibial osteotomy (HTO) was performed on female patients consisting of 55.65% of total cases. It represents that females are more prone to evolve osteoarthritis changes and required HTO. In females indications were much noticeable

/ clear and acute as compared to radiological changes seen. (Table-II).

Sex	Cases	%
Female	138	55.65
Male	110	44.35

**Table-II. Distribution of sex**

In 41.94 percent cases, right knee high tibial osteotomy was done. Approximately in 10.48% cases HTO was performed in both knees. In 47.58% cases, left knee HTO was performed (Table-III).

Side	Patients	%
Left	118	47.58
Right	104	41.94
Bilateral	26	10.48

**Table-III. High tibial osteotomy performed on knee sides**

20.16% cases took >5 years to be operated from the beginning of signs. Between 4 to 5 years about 33.06%, 21.77% and 16.12% cases took, 3 to 4 years and 2 to 3 years respectively (Table-IV).

Interval (years)	Cases	%
>5	50	20.16
4-5	82	33.06
3-4	54	21.77
2-3	40	16.12
1-2	22	8.87

**Table-IV. Interval of time between beginning of signs and operations**

Open wedge osteotomy fixed with non-locking plate and bone grafting technique used in 20 cases (8.06%). 120 (48.38% ) cases by open wedge osteotomy fixed with small LCP and in remaining 88 cases (35.48%) open wedge osteotomy fixed with TOMOFIX technique was used. Close wedge technique was used in 20 cases (8.06%) for operation. Out of these 20 cases, two cases operated by using oblique wedge osteotomy technique (Table-V).

Technique	Cases	%
Open wedge osteotomy with non locking plate	20	8.06
lateral close wedge osteotomy	20	8.06
MOWHTO with small LCP	120	48.38
OMWHT with Tomofix	88	35.48

Table-V. Operation Methods/Technique

In cases of open wedge with non locking plate and closed wedge technique, average of thirty four days hospital stay was founded and Patients were discharged with POP cast after removing the stitches, whereas, patients were discharged after dressing postoperatively on third-fifth post operative day in case of open wedge osteotomy fixed with locking plate (Table-VI).

Kept in view the classification of Lawrence, knees were graded from 0-4. In our study 160 (64.51%) knees have grade-III, 36 (14.52%) knees having grade-II changes and remaining 52 (20.97%) knees with advance osteoarthritis were operated (Table-VII.).

In our study at 2 years, average correction loss for closed wedge osteotomy was  $3.2 \pm 1.02$ ,  $6 \pm 3.12$  for MOWHTO with non locking plate and  $0.22 \pm 0.46$  for MOWHTO. On applying student; T test, the difference between non locking plate group and remaining 2 groups was found statistically significant  $p < 0.001$  (Table-VIII).

Reduction in pain with valgus alignment of femoro tibial angle correlated shown in Table-IX.

Technique	Cases	Preoperative Stay	Postoperative Stay	Avg. Total stay
Open wedge with non locking plate	20	4	26	$30 \pm 5.34$
Close wedge technique	20	4	26	$30 \pm 6.40$
Open wedge with small LCP	120	4	6	$10 \pm 7.20$
Open wedge with TOMOFIX	88	4	6	$10 \pm 13.4$

Table-VI. Hospital stay

Grade	Cases	%
Grade-I	0	-
Grade-II	36	14.52
Grade-III	160	64.51
Grade-IV	52	20.97

Table-VII. Radiological grading (preoperative)

Group	Mean postoperative FT angle(°)	Mean postoperative FT angle in degree 9 (at 2 years)	Average loss of correction (°)
Closed wedge osteotomy	$11.8 \pm 2.38$	$8.6 \pm 2.3$	$3.2 \pm 1.02$
MOWHTO with non locking plate	$18.2 \pm 3.58$	$12.2 \pm 2.22$	$6 \pm 3.12$
MOWHTO with LCP	$12.34 \pm 2.52$	$12.12 \pm 2.52$	$0.22 \pm 0.46$

Table-VIII. Femoro tibial angle (postoperative)

Postoperative FT angle	Cases	%	Mean improvement in pain score
0 to 4 valgus	20	8.06	$16.67 \pm 7.63$
5 to 7 valgus	188	75.81	$23.41 \pm 6.70$
>7 valgus	40	16.13	$13.20 \pm 5.83$
Valgus not achieve	-	-	-

Table-IX. Postoperative FT angle

## DISCUSSION

The present study was carried out on 248 knees of 222 patients. In this study 55.65% were female and 44.35% were male patients. In our study maximum age of seventy five years and minimum was forty years. The majority patients 53.23% were in the age group of 50-59 years followed by age group of >60 years (33.87%). In female osteoarthritis is more common because in postmenopausal female are linked with higher body weight, higher subcutaneous fat, deficiency of calcium and weaker muscles associated with changes in hormones. The outcome of our study also shows that female are more prone to evolve osteoarthritis than male. High tibial osteotomy is effective, well recognized and safe surgical procedure/technique for treatment of unicompartmental osteoarthritis of knee.<sup>4,5</sup> In our study, the mean age of patients at the time of surgery was 55.97 years, compared to a mean age of 59 years in the study by Choi et al<sup>2</sup> in 2001, 59.6 years by Koshino et al<sup>1</sup> in 2004 and 45.2 years by Dehouk et al<sup>6</sup> in 2005, 69 years by Takeuchi et al<sup>7</sup> in 2008 and 39.5 years by Zaki and Rae<sup>3</sup> in 2009. In case of open wedge high tibial osteotomy with non locking plate and technique of close wedge, the hospital stay in case of MOWHTO with locking plate was observed.

On the basis of OPD, the fitness for surgery was done and two day before surgery patients were admitted in hospital. In LCP, hospital stay was considerably reduced because of minor exposure and lack of their plaster cast need. Further, pain was major cause of morbidity and there was maximum affected knee with pain score  $p < 0.001$  and it was the basic reason for which the HTO was performed. In accordance with acuteness of radiological changes, Lawrence classification used for roentgenograms graded from 0-4. Thirty six (36) cases (14.52%) had grade-II and 160 (64.51%) cases had grade-III and remaining 52 (20.97%) cases had grade-IV changes in our study. The femoro tibial angle was in varus alignment in all these cases. 154 cases (62.09%) had femorotibial angle between 0-5 degree varus. 94 cases (37.90%) between 6 degree to 10 degree varus. Three techniques were used to perform high tibial osteotomy. We disrupt the

proximal tibio fibular syndesmosis by osteotomy by using modified Coventry technique in 20 cases (8.06%). It allows the fibula to proximally migrate on closure. There was no need of revealing the common peroneal nerve therefore, no way of its injury. Osteotomy was protected with Coventry staples directed from lateral to medial. By open wedge osteotomy with non locking plate and bone grafting, 20 cases were operated. Gap was filled by auto graft taken from iliac crest in 16 cases and artificial bone substitute in 4 cases (G bone & G grant). Spacer plate was used in four cases. By using medial open wedge osteotomy 208 cases were operated and iliac bone graft protected by locking plate in which small LCP in 120 cases and 88 cases by Tomofix.

A long leg plaster cast was applied in six cases operated by modified Coventry technique. Patients were diffident to sustained weight due to heavy for early weight bearing. In open wedge osteotomy with locking plate were give POP cast. Except for these six cases no patient with open wedge osteotomy fixed with LCP which had lateral cortex breach during wedge opening. Staubli et al<sup>8</sup>, Stoffel et al<sup>9</sup>, Horacek et al<sup>10</sup>, Niemeyer et al<sup>11</sup>, Brinkman et al<sup>12</sup> and Staubli<sup>13</sup> also used Tomofix plate for high tibial osteotomy fixation and got good results.

A definite improvement in pain was observed in all cases. Overall in this study excellent results were obtained as well compare to other like Pfahler et al<sup>14</sup> in 2003 with 90% good and 10% deprived outcomes. Polyzois et al<sup>15</sup> reported that outcomes were excellent in 71.50% cases and fair in 10.70% and deprived in 17.80% cases.

The outcomes of Wu et al<sup>16</sup> in 2004, Zhou et al<sup>17</sup> in 2003 and Parvizi et al<sup>18</sup> in 2004 studies were excellent in 97.30%, 88% and 91.30% cases. With the passage of time these outcomes were decline. This study needs follow-up to comment on deterioration.

## CONCLUSION

In short, we found in this study close wedge high tibial osteotomy as well as open wedge high tibial osteotomy to be a fruitful and long-running

procedure for unicompartmental illness linked with varus in active patients. In function and pain of the knee, there was significant improvement after the deformity correction (p value <0.001). In 88.23% outcomes of high tibial osteotomy in knees rated as excellent. Due to associated comorbidities and excessive over correction, there were poor outcomes in two cases. There is significant association between the obtained postoperative valgus and relief in pain. In our series, both techniques endurance is comparable and linked with low pain score, high activity levels and high satisfaction of the survivors.

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*Use your eyes to see the needs,  
and use your talents to meet them.*

– Unknown –

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### AUTHORSHIP AND CONTRIBUTION DECLARATION

Sr. #	Author-s Full Name	Contribution to the paper	Author=s Signature
1	Assad Mehmood	Data collection, compiling of results & writing of manuscript.	
2	Mohammad Ishaq	Collection of materials.	
3	Muhammad Shafique	Review the article and guidanec in writing the manuscript.	