

## Evaluation of the Role of Medial Open Wedge Osteotomy with Use of External Ring Fixator in Osteoarthritis of the Knee in Rural Population

Dr. Charudatta V. Shinde, M.S. MCh ( Orthopaedics )

Additional Civil Surgeon District Dhule Maharashtra. India 424001.

---

**Abstract:** In this era of increasing life expectancy and change in the lifestyle, osteoarthritis of weight bearing joints, particularly the knee joint has become the most common Orthopaedic problem of enormous magnitude. Medial opened wedge tibial osteotomy fixed with standard ring fixator will be very useful for them as being of low cost and giving them immediate pain free mobilization, so that they can carry out their routine activities freely and as early as possible.

**Aim and Objectives:** To study clinicoradiological findings in cases of Medial compartment osteoarthritis of knee joint. To evaluate the role of Medial opened wedge tibial osteotomy aiming to relieve pain, correct deformity and improve function. To study Biomechanics of knee joint with special reference to knee in osteoarthritis. To study the relevant literature. To compare the results with other available series.

**Results:** 23 cases of medial compartmental osteoarthritis of knee joint, who were subjected to Medial open wedge high tibial osteotomy, were studied. Osteoarthritis of knee joint was found to be common in patients between 45 to 65 years of age [82.60%] Most of the patients had right sided involvement [65.22%]. In some patients, patello-femoral arthritis became less severe. In the present study 52.81 % patients had 5 to 8 degree varus angulation and one patient had 2 degree of valgus angulation pre-operatively. Excellent relief of pain in knee can be achieved in patients who presented earlier i.e. whose complaints were of less than 1 year duration. 30 to 50 of over correction are essential to unload the medial compartment of the joint. The knee which maintains 5° to 14° of Valgus angulation post-operatively ended with radiologically satisfactory results [78%]. 82.58% patients obtained clinically worthwhile relief of pain following Medial opened wedge tibial osteotomy.

---

### I. Introduction

Osteoarthritis or osteoarthritis is not a disease by itself. It is the effect of degenerative processes. Osteoarthritis is a well-known entity even before the understanding of biomechanics of joint and its effect on articular cartilage. This disease leaves a long lasting impact on the personality due to the loss of confidence, depression and social isolation. Hence the need for the treatment of osteoarthritis has become essential. Thus in such a fast moving world it has become absolute mandatory to offer some solution to the problems produced by osteoarthritis.

Osteoarthritis can involve any population irrespective of geographical location or climate [1]. After the age of 60 years large population suffer from osteoarthritis of the knee joint [2]. This is one of the major causes for morbidity at that age, which increases with age.

Pathological studies have shown that the knee joint is the most commonly affected joint by osteoarthritis as compared to other joint in the body. [HEINE, 1926] [3] This is the result of aging.

It is now well proved fact that out of total body weight, 60% of weight is transmitted by muscles and 40% by bones [4].

This study has been carried out in rural population where patient are from a low socioeconomic status as they are many a times the bread earners of the family. Medial opened wedge tibial osteotomy fixed with standard ring fixator will be very useful for them as being of low cost and giving them immediate pain free mobilization, so that they can carry out their routine activities freely and as early as possible.

### II. Aims And Objectives

To study clinicoradiological findings in cases of Medial compartment osteoarthritis of knee joint.

To evaluate the role of Medial opened wedge tibial osteotomy aiming to relieve pain, correct deformity and improve function.

To study Biomechanics of knee joint with special reference to knee in osteoarthritis.

To study the relevant literature.

To compare the results with other available series.

### III. Materials And Method

The patients for the present study of A clinical study of role of Medial opened wedge tibial osteotomy in medial compartment osteoarthritis of knee were selected from cases of osteoarthritis of knees attending Orthopaedic O.P.O. of Pravara Rural Hospital, Loni between the period form July 2001 to June 2003. Uniform surgical technique and post - operative regimen were followed in all cases. After confirmation of diagnosis, most of our patients were given a conservative trial of treatment. Finally surgery was advised to the patients for the following indications:

- 1) Patients complaining of knee joint pain while walking squatting or at rest, or leading to disability that interfere significantly with employment or recreation which is unrelieved by conservative treatment.
- 2) The presence of osteoarthritis changes on weight bearing roentgenograms mainly of the medial compartment, symptoms. With symptoms.
- 3) Loss of normal valgus angulation or varus deformity up to 12° to 150°.
- 4) Absence of gross instability of the knee joint.
- 5) Fixed flexion deformity of 100 or less and a range of flexion at knee of 700 or more with evidence of medial compartment osteoarthritis.
- 6) Patient should be physical fit to carry out rehabilitation post operatively [able to use crutches and to do simple exercises].
- 7) Vascular status of the extremity should be compitent in every patient.
- 8) Patient should not be over weight.

### ASSESSMENT OF RESULTS

The operative results are graded according to subjective and objective findings with particular emphasis on

1. Relief of pain
2. Restoration of movement
3. Correction of deformity

### GRADING OF RESULTS

EXCELLENT	-	1. Completely pain free 2. Improved free range of flexion as compared to its pre-operative status. OR 2. Free range of flexion more than 90°
GOOD	-	1. Grade I pain (mild pain) 2. Free range of flexion same as pre-operative. OR 2. Free range of flexion more than 90°
FAIR	-	1. Grade II pain (moderate pain) 2. Pain free or mild pain without flexion possible Up to 90°.
POOR	-	1. Grade III pain (severe pain) 2. Pain with flexion less than 90°.

### RADIOLOGICAL ASSESSMENT

The radiological assessment was also carried out to study the relation between the post-operative Tibio - femoral angle and the results using the criteria employed by **Coventry** (1965) [5].

5° - 13° valgus alignment is ideal and has satisfactory results.

**Grade I** - The knee that maintained 5° - 13° of valgus as shown by **Coventry** (1965) [5] **Insall** (1974) [6] **Maquet** (1976)[7].

**Grade II** - The knee in which the alignment was not ideal with less than 5° or more than 14° of valgus alignment.

### IV. Observation Tables

In the present series, 23 patients were subjected to Medial opened wedge tibial osteotomy stabilized with external ring fixator for medial compartment osteoarthritis of knee joint.

### AGE AND SEX DISTRIBUTION

In the present series, 56.52% patients were between 45 to 50 yrs of age. The average age was 54 yrs.

**TABLE -1 AGE AND SEX DISTRIBUTION**

AGE IN YRS.	SEX		TOTAL	PERCENTAGE
	MALE	FEMALE		
Below 45 yrs.	0	2	2	8.70%
44-55 yrs.	3	10	13	56.52%
55-65 yrs.	3	3	6	26.08%
Above 65 yrs.	1	1	2	8.70%
<b>TOTAL</b>	<b>7</b>	<b>16</b>	<b>23</b>	<b>100%</b>
<b>Percentage</b>	<b>30.43%</b>	<b>69.57%</b>		<b>100%</b>

In the present series, out of 23 patients 16 patients were female i.e. 69.57% and 7 patients were male i.e. 30.43%

**WEIGHT OF THE PATIENT**

Majority of patients in this series had weight between 50-70 kg (73.92%)

**TABLE-II WEIGHT OF THE PATIENT**

WEIGHT OF PATIENT	NO. OF CASES			PERCENTAGE
	MALE	FEMALE	TOTAL	
Below 50 kg	0	3	3	13.04%
50-70 kg	5	12	17	73.92%
Above 70 kg	2	1	3	13.04 %
<b>TOTAL</b>	<b>7</b>	<b>16</b>	<b>23</b>	<b>100%</b>

**SIDE OF INVOLVEMENT**

Majority of patients in this present study had Right sided involvement (65.22%).

**TABLE – III SIDE OF INVOLVEMENT**

	RIGHT	LEFT	TOTAL
No. OF CASES	15	8	23
PERCENTAGE	65.22%	34.78%	100%
<b>TOTAL</b>	<b>7</b>	<b>16</b>	<b>23</b>

**PREOPERATIVE DURATION OF OSTEOARTHRISIS OF KNEE**

Most of the patients in this series had complaints of osteoarthritis (mostly pain) of more than 1 yr. of duration.

**TABLE - IV PREOPERATIVE DURATION OF OSTEOARTHRISIS OF KNEE**

DURATION IN YRS.	NO. OF PATIENTS	PERCENTAGE
Below 1 yrs.	7	30.43 %
Above 1 yrs	16	69.57%
<b>TOTAL</b>	<b>23</b>	<b>100%</b>

**ASSOCIATION WITH PATELLO-FEMORAL ARTHRITIS**

43.48 % patients in this series were associated with mild to moderate patellofemoral arthritis.

**TABLE V - ASSOCIATION WITH PATELLO-FEMORAL ARTHRITIS**

PATELLO-FEMORAL ARTHRITIS	NO. OF PATIENTS PERCENTAGE		
PRESENT	MILD - 4 MODERATE - 6 SEVERE-0	10	43.48%
ABSENT		13	56.52%
TOTAL		23	100%

**GRADING OF PAIN**

Pre-operatively 60.87% of knees gave continuous severe pain i.e. grade III in this present study.

**TABLE VI - GRADING OF PAIN**

GRADE	NO. OF PATIENTS	PERCENTAGE
II	1	4.35%
II	8	34.78%
II	14	60.87%
TOTAL	23	100%

**DEFORMITY**

In the present study 12 patients i.e. 52.18 % had 50\_80 varus angulation pre-operatively. One patient had 2° valgus angulation showing medial compartment osteoarthritis radiologically along with significant clinical findings.

**TABLE VII - DEFORMITY**

VARUS ANGULATION IN DEGREES	NO. OF PATIENTS	PERCENT
0-4	7	30.43%
0-8	12	52.18%
9 and above	3	13.03%
ONE PATIENT HAD VALGUS ANGULATION	1	4.35%
TOTAL	23	100%

**RANGE OF MOVEMENT PRE-OPERATIVELY**

73.90% patients had 1260 and more free flexion range of movement pre-operatively.

**TABLE VIII - RANGE OF MOVEMENT PRE-OPERATIVELY**

FLEXION IN DEGREES	NO. OF PATIENTS	PERCENTAGE
85 – 95	0	0
96 - 105	1	4.35%
106-115	1	4.35%
116 – 125	4	17.40%
126 and above	17	73.90%
<b>TOTAL</b>	<b>23</b>	<b>100%</b>

**RADIOLOGICAL GRADINGS OF OSTEOARTHRISIS OF KNEE**

60.87% of patient was grouped in IV i.e. osteoarthritic changes showing joint space 2mm or less [given in material and method].

**TABLE - IX RADIOLOGICAL GRADINGS OF OSTEOARTHRISIS OF KNEE**

GRADE	NO. OF PATIENTS	PERCENTAGE
I	0	0
II	0	0
III	3	13.03%
IV	14	60.87%
V	6	26.10%
VI	0	0
<b>TOTAL</b>	<b>23</b>	<b>100%</b>

**POST - OSTEOTOMY RADIOLOGICAL GRADINGS OF OSTEOARTHRISIS OF KNEE**

In our present series not much of radiological changes occurred [degeneration or regeneration] post-operatively as compared to preoperative, except for the opening of joint space.

**TABLE X POST - OSTEOTOMY RADIOLOGICAL GRADINGS OF OSTEOARTHRISIS OF KNEE**

GRADE	NO. OF PATIENTS	PERCENTAGE
I	0	0
II	0	0
III	13	56.52%
IV	8	34.78%
V	2	8.70%
VI	0	0
<b>TOTAL</b>	<b>23</b>	<b>100%</b>

**GRADING OF PAIN - POST - OPERATIVE COMPARE WITH PRE - OPERATIVE**

When comparison was made in between pre-operative and postoperative grading of pain, it showed almost reversal of polarity. At follow up 56.12% patients were completely free of pain.

**TABLE XI GRADING OF PAIN - POST – OPERATIVE COMPARED WITH PRE - OPERATIVE**

GRADING OF PAIN	PRE OPERATIVE		POST OPERATIVE	
NO PAIN	0	(0%)	13	(56.52%)
I	1	(4.35%)	7	(30.43%)
II	8	(34.78%)	3	(13.5%)
III	14	(60.87%)	0	(0%)
<b>TOTAL</b>	<b>23</b>	<b>(100%)</b>	<b>23</b>	<b>(100%)</b>

**RANGE OF MOVEMENT POST - OPERATIVELY.**

73.90% patients had 126 and more free range of flexion postoperatively. In 17.40% patients, range of movement was improved while in 8.70% patients range of movement was worsened post operatively.

**TABLE – XII RANGE OF MOVEMENT - POST - OPERATIVELY.**

DEGREES	NO. OF PATIENTS	PERCENTAGE
85-95	1	4.35%
96-105	0	0%
106-115	1	4.35%
116-125	4	17.40%
126 and above	17	73.90%
<b>TOTAL</b>	<b>23</b>	<b>100%</b>

**TABLE XIII RANGE OF MOVEMENT**

MOVEMENT	95 -105	106-115	116-125	126 and Above	TOTAL
IMPROVEMENT	1	1	2	0	4
SAME	0	0	2	15	17
WORSE	0	0	0	2	2
<b>TOTAL</b>	<b>1</b>	<b>1</b>	<b>4</b>	<b>17</b>	<b>23</b>

**POST-OPERATIVE VALGUS ANGULATION**

In the present study we had patients having 5° to 14° valgus angulation in 78% patients post operatively.

**TABLE XIV POST-OPERATIVE VALGUS ANGULATION**

VALGUS ANGULATION (Degrees)	NO. OF PATIENTS	PERCENTAGE
Less than 5°	5	22
5° to 14°	18	78
More than 14°	0	0

### WEIGHT BEARING

In the present study partial weight bearing with support was started at 4th week (avg.) and full weight bearing without support was started at 10th week (avg.).

**TABLE XV WEIGHT BEARING PERIOD**

WEIGHT BEARING	AVERAGE DURATION
Partial weight bearing With support	8 to 10 days
Full weight bearing without Support	3 months

### DURATION OF Follow - UP

82.60% patients had more than 1 year follow up in this present study. The minimum post-op. follow-up (6 months. - 12 months) was in 17.39% patients.

**TABLE XVI DURATION OF Follow - UP**

DURATION IN MTH	NO. OF PATIENTS	PERCENTAGE
6 MTH - 12 MTH	4	17.39%
13 MTH - 18 MTH	10	43.48%
18 MTH - 24 MTH	9	39.23%
<b>TOTAL</b>	<b>23</b>	<b>100%</b>

### COMPLICATIONS

The complications seen in this series were as follows:

**TABLE XVII COMPLICATIONS**

COMPLICATIONS	NO. OF CASES	PERCENTAGE
<b>INTRAOPERATIVE</b>		
Intraarticular Fracture	0	0
Neurovascular Complications	0	0
<b>POST - OPERATIVE</b>		
Infection:		
Superficial	2	8.6%
Deep	1	4.35%
Weakness of ankle Dorsiflexors	2	8.6%
Delayed union	1	4.35%
Non union	0	0%
Deep Venous Thrombosis	0	0%
Death	0	0%

**RESULTS: CLINICAL**

In the present study, 56.50% patients showed excellent results and 26.08% patients showed good results.

**TABLE XVIII RESULTS**

GRADE	NO. OF PATIENTS	PERCENTAGE
EXCELLENT	13	56.50%
GOOD	6	26.08%
FAIR	4	17.40%
POOR	0	0%

**RESULTS: RADIOLOGICAL**

In the present study, 78% patients had valgus alignment between 5° to 13° post-operatively.

**TABLE XIX RESULTS**

GROUP	TOTAL KNEE	VALGUS ANGULATION	%	RESULT
I	18	5°-13°	78%	SATISFACTORY
II	5	< 5° ->14°	22%	UNSATISFACT.

**V. Summary And Conclusions**

- In the present series, 23 cases of medial compartmental osteoarthritis of knee joint, who were subjected to Medial open wedge high tibial osteotomy, were studied between July 2001 to July 2003.
- Osteoarthritis of knee joint we found to be common in patients between 45 to 65 years of age [82.60%], in over weighted patients it was earlier and was more severe.
- Majority Le. 69.57% patients were females and 31.43% were males.
- Most of the patients had right sided involvement [65.22%].
- In Medial compartment osteoarthritis varus deformity of varying degree was commonly found.
- Most of the patients had complaints about osteoarthritis of more than 1 year duration [69.57%].
- Many of the patients of present study had patella femoral arthritis [43.48%] and could be responsible, at least to some extent, for the persistent or recurrence of pain following osteotomy. In some patients, patello-femoral arthritis became less severe.
- In the present study 52.81 % patients had 5 to 8degree varus angulation and one patient had 2degree of valgus angulation pre-operatively.
- External ring fixator serves as an adequate fixation, which allow early mobilization and was enough to maintain correction.
- As the bone was externally fixed, and the site of osteotomy was at the cortical bone region bone grafting is done to reduce chances of delayed or nonunion.
- In 91.30% patients, range of movement remained same or increased as compared to that pre-operatively.
- When comparison was made between pre-operative and post operative grading of pain, it showed almost reversal of polarity.
- Marked radiological improvement is uncommon following osteotomy although joint space had increased and subchondral sclerosis decreased.
- Partial weight bearing was started after an average period of 8 to 10 days, and full weight bearing was started on 3 months.
- Patients were followed up for 6-24 monthb.82.60% patients were followed up for more than 1 year.
- Minor complications occurred in 6 out of 23 patients. Complications seen were in the form of infection, delayed union, weakness of ankle dorsiflexors.
- Advanced age did not seem to be a contraindication for the osteotomy and showed good results.



- Excellent relief of pain in knee can be achieved in patients who presented earlier i.e. whose complaints were of less than 1 year duration.
- 3° to 5° of over correction are essential to unload the medial compartment of the joint. The knee which maintains 5° to 14° of Valgus angulation post-operatively ended with radiologically satisfactory results [78%].
- 82.58% patients obtained clinically worthwhile relief of pain following Medial opened wedge tibial osteotomy.
- Follow up of all cases that were in good results category, showed continued relief of pain and good range of movement.
- Results of the present series are comparable to other published series of high tibial osteotomies.

## **VI. Conclusions**

- In properly selected cases and with proper technique, medial open wedge high tibial osteotomy is a reliable surgical procedure. It is a surgical treatment of choice in young and active patients with over 80% good results, where other recent modalities of treatment are not easily available to every patient. A long lasting relief of pain and a good range of movement can be assured post-operatively.
- To get good results and to avoid complications, pre-operative assessment and planning is essential.
- The social conditions in our area for e.g. sitting cross legs, squatting for daily activities, hence we have thought of this procedure.
- Our series confined itself to a low socio-economic status, which made patient, refuse for total knee arthroplasty. Which, if at all required in future, can also be done after Medial open wedge tibial osteotomy.
- This procedure is technically simple, safe without any potential hazard, and can be done in remote places. Good amount of correction is possible by this procedure.
- Medial opened wedge tibial osteotomy fixed with standard ring fixator will be very useful for them as being of low cost and giving them immediate pain free mobilization, so that they can carry out their routine activities freely and as early as possible.
- The procedure is simple, safe and effective method. It is a small operation with negligible blood loss and no blood transfusion is required. No anesthesia is necessary to remove the apparatus.
- The fact that all of the patients requiring bilateral osteotomy return for the operation to be performed on the opposite side speaks for itself.

## **BIBLIOGRAPHY**

- [1]. Lawrence and Sebo; "Geography of osteoarthritis" in the Aetiopathogenesis of Osteoarthritis, edited by Nuki - 1980 [London-Pitman] Page No. 155
- [2]. Koshino Tomihisa - Clinical, findings and aetiology of osteoarthrosis of the knee Asian Medical Journal Vol. -10 No. 11 Nov. 1987
- [3]. Jackson J.P., Waugh W., Green J.P.; "High Tibial Osteotomy for Osteoarthritis of the Knee" JBJS 51-B, P 88, 1969
- [4]. Gibson P.J., Good fellow J. - stress radiography in degenerative arthritis of the knee JBJS Vol. 68 - B No.4 Aug. 1986. P. -608
- [5]. Coventry M.B; "Osteotomy of the Tibia for Osteoarthritis of the knee" JBJS 47 - A, P 984-90, 1965
- [6]. Insall J.N., Shoji H, Mayer V; "High Tibial Osteotomy - 5 year evaluation" JBJS 56-A, P 1397, 1974
- [7]. Maquet P.G.J; CORR - No. 120, P143, 1976

**CASE photos:**

PRE- OPERATIVE



IMMEDIATE POST- OPERATIVE



ON DISCHARGE [12<sup>th</sup> Day]



FOLLOW UP [AFTER 2 MONTHS]



FOLLOW UP [AFTER 2 MONTHS]

