



STUDY OF MEDIAL OPEN WEDGE OSTEOTOMY FOR
OSTEOARTHRITIS KNEE

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ABSTRACT

INTRODUCTION:

Osteoarthritis of the knee in relatively younger patients is a major disabling condition. If the axis of the varus angle is realigned in young and active patients having arthritic process limited to medial compartment with open wedge HTO to unload the medial compartment, patients get significant pain relief and surgery adds life to the knees. In our institute we use Dr Patwa's lock step plate. The new Dr. Patwa's medial open wedge lock step plate has been designed to achieve optimal stability without the interference of bone healing. The principle of the locking compression plate system (LCP) meets our requirements. The locking-head screws provide a stable fixation without compression between plate and bone.

AIMS & OBJECTIVES:

To critically evaluate the clinical outcome of the medial open wedge osteotomy done at our institute. To compare both the clinical and functional outcomes of medial open wedge osteotomy performed at our setup with similar data else where. To analyse the complications, if any and assess the causes and solutions for it, at our constrained setup.

MATERIALS AND METHODS:

The study consists of 35 knees of medial open wedge osteotomy with the use of Dr. Patwa's lock step plate for medial compartment. Result: In our series of medial open wedge osteotomy we could get 91% excellent result and 6% good result and 3% fair result.

CONCLUSION:

Medial open wedge osteotomy using our step plate is an answer to medial compartment arthrosis.

KEYWORDS : osteoarthritis, Dr. Patwa's lock step plate, Medial open wedge osteotomy.

INTRODUCTION:

Osteoarthritis is 'a heterogeneous group of conditions that lead to joint symptoms and signs which are associated with defective integrity of cartilage, in addition to the related changes in underlying bone and at the joint margin¹.

Historically, evidence of bone hypertrophy accompanying focal cartilage damage lead to radiographic findings in patients with osteoarthritis include medial tibiofemoral and patellofemoral joint space narrowing, as well as subchondral new bone formation^{2,3}. Any event that changes the environment of the chondrocyte has the potential to cause osteoarthritis. Although usually occurring as a primary disorder, osteoarthritis can occur secondary to other processes. Risk Factors for Osteoarthritis⁴.

- Age older than 50
- High bone mineral density
- History of immobilization
- Injury to the joint Joint hyper mobility or instability Obesity (weight-bearing joints) Prolonged occupational or sports stress

Osteoarthritis of the knee in relatively younger patients is a major disabling condition⁵. Joint Replacement for OA is the ultimate treatment option but only for those who are above 60 and not very physically demanding⁶. If the axis of the varus angle is realigned in young and active patients having arthritic process limited to medial compartment⁷. With open wedge HTO to unload the medial compartment, patients get significant pain relief and surgery adds life to the knees⁸. The classic technique is the lateral closed wedge osteotomy popularised by Coventry⁹. Potential complications of this method include neurovascular injury, compartment syndrome, intra-articular fracture, infection, delayed union or non-union,

Instability, recurrent varus deformity and valgus overcorrection. In addition, major corrections cause an offset of the proximal tibia that may compromise placement of the tibial component of a total knee arthroplasty. Medial opening wedge osteotomy has the advantages of maintaining the bone stock and correcting the deformity Close to its origin, which may facilitate subsequent arthroplasty? Fibular osteotomy is not required and the osteotomy is technically easier. It is a realignment procedure to transfer a weight-bearing load from an affected medial compartment to a relatively intact lateral compartment of the knee. It promotes symptom relief and potential healing of damaged cartilage and it slows the progression of arthrosis in a knee with varus alignment¹⁰.

The new Dr. Patwa's medial open wedge lock step plate has been designed to achieve optimal stability without the interference of bone healing. The principle of the locking compression plate system (LCP) meets our requirements¹¹. The locking-head screws provide a stable fixation without compression between plate and bone.

AIMS AND OBJECTIVES:

To critically evaluate the clinical outcome of the medial open wedge osteotomy done at our institute. The study was performed at tertiary institute. The study was prospective as well as retrospective and observational in nature. The study included 35 knees who underwent medial open wedge osteotomy for osteoarthritis knee at the Department of Orthopaedics, from May 2010 to September 2014.

Inclusion Criteria:

Patients willing to participate in the study All cases of medial open wedge osteotomy and all cases of medial compartment

osteoarthritis irrespective of age and medical condition of the patient. Quality of bone should be good.

Exclusion Criteria:

Patients not willing to participate in the study. Tricompartment Syndrome (medial -lateral patellofemoral arthritis) like rheumatoid arthritis , gouty arthritis , etc. Excessive varus >15 degree Flexion contracture>10 degree or over all motion <90 degree.

CLINICAL EVALUATION (KNEE SOCIETY SCORE)

(A) CINICAL KNEE SCORE

1. PAIN POINTS

pain	Score
none	50
Mild or occasional	45
Stairs only	40
Walking and stairs	30
Moderate occasional	20
Continuous severe	0

2. RANGE OF MOTION (Flexion)

range	Points
5 degree	1
maximum	25

3. STABILITY (Maximum movements in any position)

	stability	Score
1	anteroposterior	
	<5mm	10
	5-10mm	5
	10mm	0
2	Mediolateral	
	<5	15
	6-9	10
	10-14	5
	>15	0
	subtotal	

4. DEDUCTIONS

DEDUCTIONS	
1. FLEXION CONTRACTURE (degree)	POINTS
5-10	2
11-15	5
16-20	10
>20	15
2.EXTENSOR LAG (DEGREE)	
<10	5
10-20	10
>20	15
MALALIGNMENT (degree)	
0-4	0
5-10	3 points for each degree
11-15	3 points for each degree
others	20
Total deduction	

5.FINAL CLINICAL KNEE SCORE

FUNCTION	Points
1.WALKING	
UNLIMITED	50
10 BLOCKS	40
5-10 BLOCKS	30
<5 BLOCKS	20
HOUSEBOUND	10
UNABLE	0

2. STAIRS	
Normal up and down	50
Normal up and down with rails	40
Up and down with rail	30
Up with rail, unable down	15
unable	0
subtotal	

6.DEDUCTION

deductions	Points
cans	5
Two cans	10
Crutches or walker	15
Total deduction	

7.KNEE SOCIETY SCORE

(If total is minus number, score is Zero) RESULTS (TOTAL SCORE IS CLINICAL +FUNCTIONAL DIVIDED BY 2)

Result	Score
Excellent	80-100
Good	70-79
Fair	60-69
Poor	<60

OBSERVATIONS AND RESULTS:

The following observations were made from the data collected during this study of total 35 knees of medial compartment osteoarthritis treated by medial open wedge osteotomy.

In our study criteria of results are Mechanical axis should pass through fujisawa point Union of osteotomy (radio logically) Holding of osteotomy with implant Able to squat and sit cross legged Knee society score.

AGE:

To study the age distribution, all the patients included in our study were divided into groups with 10 years interval. In our study the major group of patients belong to 41-50 yrs (44%). The mean age of patients of our study is 51.57 year.

TABLE NO. - 1 : AGE DISTRIBUTION

AGE	No. of patients	%
31-40	4	13
41-50	14	44
51-60	10	25
61-70	2	6
71-80	2	6
>80	0	0

SEX:

In our study of medial open wedge osteotomy we had 24 females (75%) and 8 males (25%). In high tibial osteotomy, females outnumbered males.

TABLE NO. - 2 : SEX DISTRIBUTION

Sex	No. of patients	%
Female	24	75
Male	8	25

LATERALITY:

In medial compartment osteotomy done in 32 patients, 29 were unilateral and 3 were bilateral.

TABLE NO. - 3 : LATERALITY DISTRIBUTION

Side	No. of patients	%
Bilateral	3	0.09
Unilateral	29	90.62

SIDES OF HIGHTIBIAL OSTEOTOMY:

Out of 35 medial open wedge high tibial osteotomy done in our study 18 were on right side and 17 on left side..

TABLE NO. - 4 : SIDE DISTRIBUTION

Side	No. of patients	%
Right	18	56.25
Left	17	43.75

POST OPERATIVE:
FOLLOW UP:

All patients who underwent medial open wedge osteotomy during May 2010 to May 2014 were followed up till September 2014. Their minimum follow up period was 6 months and maximum follow up period was 2 years. The average follow up of patients with medial open wedge osteotomy surgeries was 12.68 months.

TABLE NO. - 5 : FOLLOW UP PERIOD

Duration in months	No of patients
6-9	19
10-12	8
13-15	0
16-18	0
19-21	0
22-24	8

WEIGHT BEARING

Out of 35 knees in our study 33 knees all had started partial weight bearing with walker at 4th day, stick walking by 4th week and full weight bearing by 6th week following surgery. 2 knees had intraarticular extension of osteotomy following which their weight bearing was partial weight bearing at 12th week, stick walking by 16th week and full weight bearing by 20th week following surgery.

TABLE 6

T i m e (days)	Partial weight bearing with walker	T i m e (weeks)	(S t i c k walking)	T i m e (weeks)	F u l l weight bearing
4	33	4	33	6	33
>4	2	>4	2	>6	2
total	35		35		35

BONE GRAFTING

In our study ofBONE GRAFTING: medial open wedge osteotomy, bone grafting at the site of osteotomy is done when the correction is more than 10 degree. Out of 35 osteotomies we did bone grafting in 10 osteotomies.

TABLE NO. - 7 : BONE GRAFTING

Bone grafting	Number of osteotomy
Yes	10
No	25
Total	35

BONE GRAFTING WITH FINAL RESULT:

There is no change in result associated with bone grafting. Both the categories of with bone grafting and without bone grafting patients showing excellent results in 90% and 92% respectively.

RANGE OF MOTION:
FLEXION:

In our study average flexion is 120.86 degree.

TABLE NO. – 8 RANGE OF MOTION FLEXION (DEGREE) NO. OF HIGH TIBIAL OSTEOTOMY PRE OPERATIVELY POST OPERATIVELY

Flexion	Number of high tibial osteotomy	
	preoperatively	Postoperatively
0-110	2	2
0-115	3	3
0-120	17	17
0-125	13	13
Total	35	35

CLINICAL UNION:

In our study we got clinical union by 2-4 months of time. The mean time of clinical union is 2.22 month.

TABLE NO. - 9: CLINICAL UNION

TIME (months)	Number of osteotomy
2	21
2.5	12
3	0
3.5	0
4	2
Total	35

RADIOLOGICAL UNION:

In our study we got radiological union by 3-5 months of time. The mean time of radiological union is 3.45 months.

TABLE NO. – 10 RADIOLOGICAL UNION

Time (month)	Number of osteotomy
3	21
4	12
5	2
Total	35

MEDIAL PROXIMAL TIBIAL ANGLE:

In our study pre mean value of medial proximal tibial angle was 84.74 degree pre operatively and post operatively it was became 94.82 degree.

TABLE NO. - 11 : MEDIAL PROXIMAL TIBIAL ANGLE

ANGLE (DEGREE)	preoperatively	Postoperatively
78-80	0	0
81-83	10	0
84-86	17	0
87-89	8	2
90-92	0	1
93-95	0	19
96-98	0	12
99-101	0	1
Total	35	35

TABLE NO. - 12 : PRE OPERATIVE VARUS ANGLE

In our study 34 knees were having 0-5 degree of varus deformity. After the operation we got average 6-8 degree correction and we got the average 94.82 medial proximal tibial angle post operatively.

Preoperative varus angle	Number of knees
0-5	34
6-10	1
11-16	0
Total	35

IMPLANT REMOVAL:

In our study implant removal was done in only 3 patients. That was because of local irritation. These were done only after getting radiological union.

TABLE NO. - 13 : IMPLANT REMOVAL

Removal of implant	Number of knees
Yes	3
No	32
Total	35

COMPLICATION:

As far as complications are concerned, in our series there were 2 cases of superficial infection which recovered at the end of two weeks. None of the cases had infection at final follow up. One patient was having over correction. 2 cases were having intra articular extension of osteotomy which was united by the time of 5 months and these patients were having good range of knee motion at the final follow up.

TABLE NO. - 14: COMPLICATION

Complication	Number of medial open wedge osteotomy
Superficial infection	2
Over correction	1
Intra articular extension of osteotomy	2
Loosening of implant	0

KNEE SOCIETY SCORE:

TABLE NO. - 15 KNEE SOCIETY SCORE (CLINICAL)

Clinical score	preop	Post op
0-10	0	0
11-20	0	0
21-30	0	0
31-40	0	0
41-50	5	0
51-60	16	0
61-70	11	1
71-80	3	2
81-90	0	2
91-100	0	30
Total	35	35

FUNCTIONAL:

The average knee functional score was 72.43 preoperatively which increased to average score 91.71 postoperatively.

TABLE NO. - 16 : KNEE SOCIETY SCORE (FUNCTIONAL)

functional score	preop	Post op
0-10	0	0
11-20	0	0
21-30	0	0
31-40	0	0
41-50	1	0
51-60	1	0
61-70	21	1
71-80	7	5
81-90	5	15
91-100	0	14
Total	35	35

RESULTS OF TOTAL MEDIAL OPEN WEDGE OSTEOTOMY

TABLE NO. - 17 : KNEE SOCIETY SCORE (FINAL RESULT) RESULTS

Results	Total medial wedge osteotomy
Excellent	32
Good	2
Fair	1
Poor	00
Total	35

STATISTICAL ANALYSIS AND DISCUSSION:

Unicompartmental medial knee arthritis is a very common condition due to ground sitting, squatting and cross leg sitting in Asian community and can represent a challenge for the orthopaedic surgeon, mostly in young and active patients. In these patients, high tibial osteotomy (HTO) is a widely accepted procedure that can rely on good outcomes with correct indications[115]. High tibial osteotomy (HTO) is a widely performed procedure to treat medial knee arthrosis. The correctly done HTO not only leads to correction of mechanical axis but helps to regenerate the articular cartilage, thereby delaying the need for total knee arthroplasty.

Patient's age ranging from thirty five to eighty years under went medial open wedge high tibial osteotomy. In our study of 32 patients, 14 (44%) cases fall into the age group of 41-50 years. The mean age of our study group is 51.57 year. When compared to other series by Chaturong Pornrattanamaneewong, Rapeepat Narkbunnam, and Keerati Chareancholvanich the mean age was 54.4 years (range 40-67 years)².

In this study of 32 patients of medial open wedge high tibial osteotomy, 8 (25%) were males whereas 24 (75%) were females. Thus there was female preponderance in knee osteoarthritis due to their traditional working in Kitchen with squatting and cross leg sitting.

In our medial open wedge high tibial osteotomy series, 3 patients were operated bilaterally and 29 unilateral with 17 on right side and 19 on left side. We have operated bilateral cases in which the results were very good with very good range of motion.

In our study, average flexion of knee is 120.86 degree without any extension lag. Out of 35 knees in our study 33 knees all had started partial weight bearing with walker at 4th day, stick walking by 4th week and full weight bearing by 6th week following surgery. 2 knees had intraarticular extension of osteotomy following which their partial weight bearing was started at 12th week, stick walking by 16th week and full weight bearing by 20th week following surgery. In our study average time for full weight bearing is 6.8 weeks. when compared to other study of T. Brosset, G. Pasquier, H. Migaud, F. Gougeon¹² the full weight bearing was on average of 3 months where Forty-seven patients (92%) were fully weight-bearing after 2 months. In our study clinical union was observed with average time of 2.22 month while radiological union was observed with average time of 3.45 month. When compared to other study of T. Brosset, G. Pasquier, H. Migaud, F. Gougeon¹² where Radiological union occurred on average after 4.5 months.

In our study the average medial proximal tibial angle was 84.65 degree pre operatively and 94.82 degree postoperatively with use of Dr. Patwa's lock step plate. When compared to other series by Chaturong Pornrattanamaneewong, Rapeepat Narkbunnam, and Keerati Chareancholvanich¹³ the overall preoperative and twelve month postoperative medial proximal tibial angle values were 83.4 degree and 96.3 degree, respectively in which internal fixation was performed using fixed angle plates (Tomofix or Locking Compression Plate, Synthes, Switzerland). In our study 34 knees were having 0-5 degree of varus deformity. After the operation we got average 6-8 degree correction and we got the average 94.82 medial proximal tibial angle post operatively.

In our series we did bone grafting at the site of osteotomy in 10 osteotomies. We did bone grafting in those osteotomies where we planned correction more than 10 degrees.

As far as complications are concerned, in our series there were 2 cases of superficial infection which recovered at the end of two weeks. None of the cases had infection at final follow up. One patient was having over correction and involvement of lateral compartment. 2 cases were having intra articular extension of osteotomy which were united by the time of 5 months and these patients were having good range of knee motion at the final follow up.

In our series of medial open wedge osteotomy we did implant removal in 3 cases. That was because of local irritation. We did it after getting radiological union. Where compare to other series of Chaturong Pornrattanamaneewong, Surin Numkanisorn, Keerati Chareancholvanich, Thossart Hamroongroj¹⁴ one knee had screw penetration into the knee joint and two knees had local irritation that required the removal of the hardware. In our plate the screws and drill sleeve are made in such a way that our screws are having 10 degree of down ward inclination from articular surface.

In our study there was significant improvement of Knee Clinical Score and Knee Functional Score following medial open wedge osteotomy by using Dr. Patwa's lock step plate.

In our study of medial open wedge osteotomy for medial compartment osteoarthritis the average knee clinical score preoperatively was 59.34 and the average post-operative clinical score was 94.17. The average knee functional score was 72.43 preoperatively which increased to average score of 91.71

postoperatively... This is comparable to other series by T. Brosset, G. Pasquier, H. Migaud, F. Gougeon¹² where the clinical score increased from 69 to 90 and the functional score increased 84 to 95.

CONCLUSION:

Dr. Patwa's lock step plate used to allow transmission of the axial forces in a direct line and thus it protects the screw from loading by the step and that is why early mobilization by partial weight bearing is possible on 4th day.

Medial open wedge osteotomy using our step plate is an answer to medial compartment arthrosis if patient selection is proper. One might delay or obviate the need of replacement. (Unicondylar or total knee arthroplasty).

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