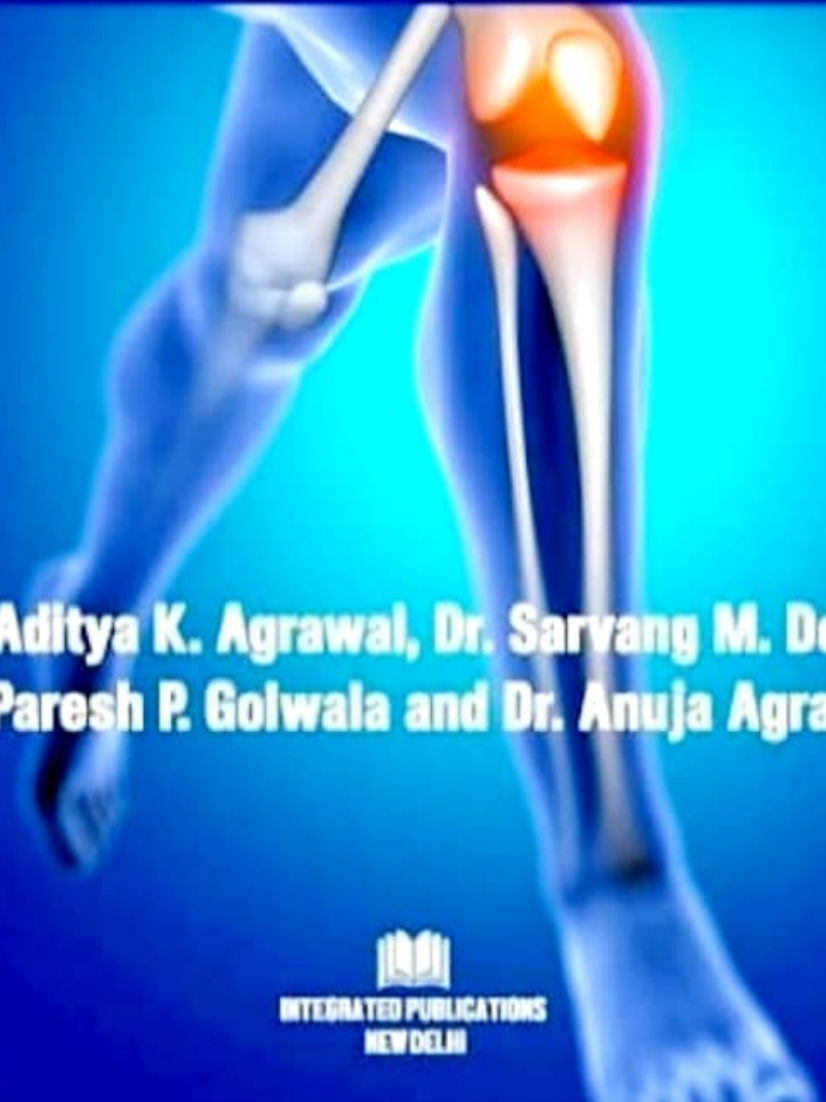


Textbook of
ORTHOPAEDICS
trauma and
Emergency



**Dr. Aditya K. Agrawal, Dr. Sarvang M. Desai,
Dr. Paresh P. Golwala and Dr. Anuja Agrawal**


INTEGRATED PUBLICATIONS
NEW DELHI

Textbook of
ORTHOPAEDICS
trauma and
Emergency

(Volume - 1)

Authors

Dr. Aditya K. Agrawal

Professor & Head of Unit II, Dept. of Orthopaedics, Dhiraj Hospital, Smt. BK Shah Medical Institute & Research Centre, Sumandeep Vidyapeeth Deemed to be University, Piparia, Vadodara, Gujarat, India

Dr. Sarvang M. Desai

Professor & HoD, Dept. of Orthopaedics, Dhiraj Hospital, Smt. BK Shah Medical Institute & Research Centre, Sumandeep Vidyapeeth Deemed to be University, Piparia, Vadodara, Gujarat, India

Dr. Paresh P. Golwala

Medical Director, Smt. BK Shah Medical Institute & Research Centre, Sumandeep Vidyapeeth Deemed to be University, Piparia, Vadodara, Gujarat, India

Dr. Anuja Agrawal

Professor & HoD, Dept. of Emergency Medicine, Dhiraj Hospital, Smt. BK Shah Medical Institute & Research Centre,

Director, Labdhi Simulation Centre, Sumandeep Vidyapeeth Deemed to be University, Piparia, Vadodara, Gujarat, India

Integrated Publications
New Delhi



Contents

S. No.	Chapters	Page No.
	Section I: Basic Sciences	01-40
1.	Calcium Homeostasis	01-11
2.	Rickets	12-21
3.	Osteomalacia	22-29
4.	Osteoporosis Etiology & Clinical Features	30-34
5.	Drugs for Osteoporosis and Osteomalacia	35-40
	Section II: Trauma	41-112
6.	Fractures of Distal Humerus	41-43
7.	Fractures of Forearm	44-55
8.	Scaphoid Fractures	56-58
9.	Finger Tip Injuries and its Management	59-65
10.	Hip Dislocation	66-79
11.	Acetabulum Fractures (Anterior Column Fixation)	80-89
12.	Classification & management of Pertrochanteric Femur Fractures	90-112
	Section III: Congenital	113-126
13.	Developmental Dysplasia of Hip	113-119
14.	Congenital Pseudoarthrosis of Tibia	120-126
	Section IV: Tumours	127-163
15.	Fibrous Dysplasia	127-131
16.	Other Benign Tumours	132-150
17.	Ewing's Sarcoma	151-155
18.	Chondrosarcoma	156-163
	Section V: Clinical Examination & Surgical Approaches	164-186
19.	Approach to a Patient for Clinical Examination	164-167
20.	Ravines of Back Pain	168-174
21.	Ilio Femoral Approach	175-179
22.	The Ilioinguinal approach	180-186
	Section VI: Arthroscopy	187-191
23.	Use of Peroneus Longus Tendon Graft for Arthroscopic Anterior Cruciate Ligament Reconstruction	187-191
	Section VII: Osteoarthritis hip & Knee	192-256
24.	Avascular Necrosis of the Femoral Head	192-216
25.	Non-replacement Management of OA Knee	217-226
26.	Recent Trends in Management of Degenerative Arthritis of Knee	227-246
27.	TKA With or Without Resurfacing Patella	247-256

Considering drawbacks of all procedures of osteoarthritis surgery of knee, we decided to do restoknee surgery for medial compartment osteoarthritis of knee. The procedure is mainly based on the principle of very old and established technique of closed wedge osteoclasia, where we are not using any implants internally.

In this procedure, we do closed wedge osteoclasia through cancellous bone between one cm below the articular surface through the subchondral bone and tibial tuberosity underneath the ligamentum patellae with base of wedge on lateral side above tip of fibular head and then gap is closed down by valgus stress and disruption of superior Tibiofibular syndesmosis. Then decompression of medullary canal of femur by lateral to medial side linear cutting between two cortices above the intercondylar notch crossing midline and opening out the medullary canal which reduces the intramedullary pressure. Because of osteoclasia of the posterior cortex, the position of both the fragments is maintained with long leg brace after closure. Now whole position is confirmed under IITV. Then wound is closed and long fixed brace is applied which is followed by short brace. Patient is allowed to walk with walker from next day of surgery. Thus, desired valgus is maintained. We have operated cases from 1997 to 2017, many patients from 1 year to 8 years with average follow up of 3.5 years, out of which 12 are males and 56 are females with average age of 58 years, out of which, 32 right and 36 left knees were treated.

Considering all criteria and important points, we got 52 (76.47%) excellent and 16 (23.53%) good, while 0% poor result. Considering many findings and all criterias with short to long follow up, we got best result of medial compartment osteoarthritis of knee. Almost all patients are happy and even in longest 21 years followed up case is also absolutely happy with the result and doesn't require replacement surgery.

Recent trend of eating junk food or fast food leading to obesity, diabetes etc. obesity leads to restricted motion again it increases body weight, leads to arthritis of knee joint. Thus reach people also leads to OA knees. Because of fast life and struggle even a normal average person has to use the joint more than requirement which leads to OA knee. So it suggests that underused and overweight patient also get OA while, underweight patient with overused joint will also lead to OA knee.

This OA knee can be tackled by osteotomies either open or closed wedge with implant or without implant or replacement. Whenever the medial proximal tibial condylar angle is having more than 16° deformity, then it is to be corrected by Ilizarov or rail fixator by gradual correction. The drawback of external fixator is quite cumbersome, that creates some difficulty while walking and pin track infection is most common complication. At times (some time) patient may get lateral popliteal nerve palsy. God has provided 3° of varus to all tibia which leads to passing of mechanical axis through the medial compartment and that is the reason why osteoarthritis starts from medial compartment. But the appearance of medial compartment syndrome depends on over loading or under loading, under used or over used of joint and that is why medial compartment syndrome appears at different age in different person. It suggests that everybody will going to get medial compartment syndrome but at different ages.

Disadvantages of replacement are as follows

1. After all implant is a foreign body for the patient.
2. Because of implant, chances of infection are more.
3. Patient is likely to get metallic reaction.
4. Splinted bone with long stem and unsplinted bone junction is a stress riser leads to fracture even with trivial trauma.
5. Implant stem tip fracture even with trivial trauma and periprosthetic fractures are common.
6. In spite of proper replacement surgery, even with robot, patients are not able to flex the knee fully.
7. Patient is unable to sit crosslegged or squatt or do "namaz".
8. After replacement, patient is unable to play any outdoor games.
9. Subclinical infection leads to loosening as well as aseptic loosening as also common complication.
10. Once replaces joint, if infected it requires removal of implants and arthrodesis. Patient is not able to flex the knee and there will be severe pain and patient is very uncomfortable.
11. All patients are not painfree, complaining of stiffness, heaviness and fullness with pain at different places.

12. Cost factor is also to be kept in mind.

13. As far as Indian custom is concerned, crossleg sitting, squatting etc. are very important, to seat on the ground is required which is not possible after replacement.

How unicondylar replacement came in picture?

When arthroplasty surgeon realized the unicompartment involvement, but literature says the result of unicompartment replacement are poor and it is loosened out within short time leading to total knee replacement and the total cost of treatment becoming double.

Osteotomies are having its own complications like, implant failure, reaction, loss of correction re-pain after some time, translation of fragment etc. Pseudopatella baja, true patella baja, patella alta etc leads to restricted flexion.

Considering all the drawbacks, we have decided to do restoknee surgical technique for medial compartment osteoarthritis of knee joint.

This process was initially started by Dr. Sharad Oza and femoral lateral condyle decompression was invented by him for relieving pain due to increased intramedullary pressure which is relieved by femoral condyle cutting of subchondral bone between two cortices.

Considering drawbacks of all procedures, we have decided to do restoknee surgery for medial compartment osteoarthritis of knee. In this, we are not using any implants internally and it is mainly based on principle of closed wedge osteoclasia through cancellous bone between subchondral bone and tibial tuberosity underneath the ligamentum patellae and just above tip of the head of fibula, wedge is removed which is followed by decompression of lateral condyle of femur. After removal of wedge valgus, strain applied and gap is closed down and confirmed on IITV. We are making custom made brace from groin to heel with required valgus at the level of knee joint without any joint single piece to maintain the position. This brace patient has to wear for one month and then short customised brace with knee joint is given for another few weeks till bone is healed completely. Then patient is allowed to walk without support. Our all patients are able to sit on the ground without pain and are able to sit crosslegged, squat and do namaz with their original knee. Patients are able to walk more than two kilometers without pain.

Thus, this procedure gives excellent result. Total number of patients followed up 68. We have operated 12 males and 56 females. Average age of patients was 58 years, with 52 cases got excellent result, while 16 cases got good result. Long leg brace kept for four weeks and short brace was kept for six to eight weeks. Post operatively patient was allowed to bear full weight with brace and walker/stick and none of our case had loss of correction.

Chances of infection is virtually nil as we are not using any implant because of cancellous bone involved healing is faster and solid and with brace position is maintained properly that is why we allow patient to walk with brace and walker/stick with full weight bearing. So recommend this procedure in ideal cases. Custom made brace can be corrected even in post-operative period as per our wish.

Inclusion criteria

1. Pure medial compartment syndrome
2. Other compartments of knee are virtually normal or nearly normal.
3. There is no more than 15° FFD, which is passively correctible.
4. On x-ray articular surfaces are normal or nearly normal.
5. Patient is having waddling gait.
6. Patient is having tibia vara.
7. There is no instability of knee joint in any direction or subluxation.
8. No other bony deformity or relative muscle power is good.

Dr. Sharad Oza had operated from 1997 to 2017 several cases by restoknee technique, out of which 68 cases are with regular follow up. Out of these 68 cases there are 12 male and 56 females of average age of 58 years. Out of these 52 cases got excellent results and 16 cases got good results.

How to measure wedge for correction

A. By weight bearing x-ray of knee joint: (rough measurement)

- Draw mechanical axis of tibia, then draw joint congruent line of tibial articular surface.
- Measure medial proximal tibial angle (Average 87° if tibial diameter is 57mm)
- As for example, in below given x-ray, medial proximal tibial angle is 83°
- Medial Proximal Tibial Angle (MPTA) is 83° and average MPTA is 87°. So, 87° - 83° = 4° Deformity.

- For correction, removal of wedge is 4° deformity + 8° over correction (valgus) is necessary, so total wedge to be removed is 12° .

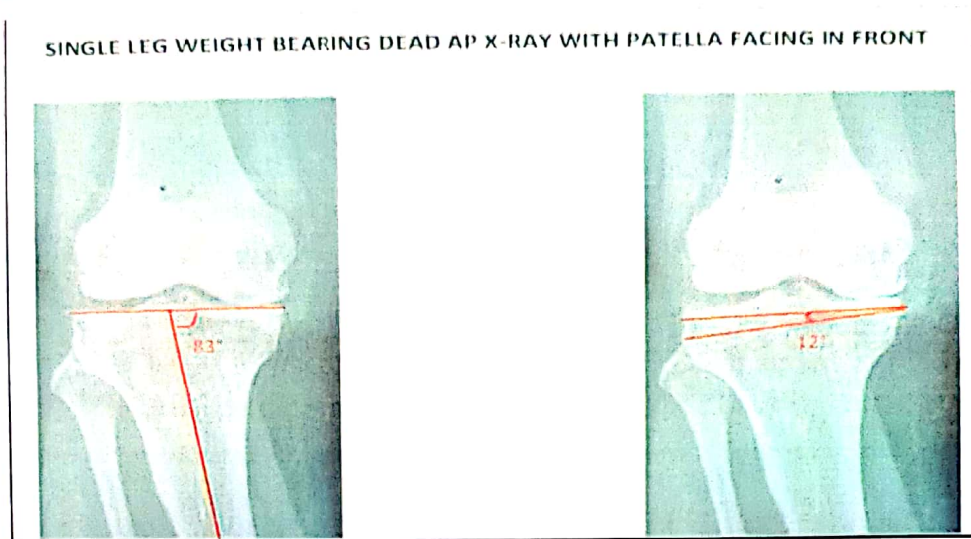


Fig 25.1: MPTA (Medial Proximal Tibial Angle)

With the help of long leg X-ray

Draw following points

- Draw mechanical axis
- Corrected mechanical axis
- Connect the center of head to post-operative corrected center of ankle.
- Connect the center of femur to Fugisawa point and extend it down upto expected center of the post-operative center of the ankle.
- Mediolateral diameter of osteotomy.
- Mark hinge.
- Line connecting hinge and pre-operative center of ankle joint
- Line connecting hinge and expected post-operative center of ankle joint.
- Angle of correction.

Main Method

Main method was started by Dr. Sharad G Oza, not using any implant but using custom made long leg brace and short leg brace post operatively. Second most important procedure to relieve throbbing pain in osteoarthritis of knee is decompressing lateral femoral condyle. Linear cut is made between two cortices ant. and post. without damaging it, which was also invented by Dr. Oza. This technique is also followed by us in restoknee healthcare pvt. ltd., which is giving excellent results.

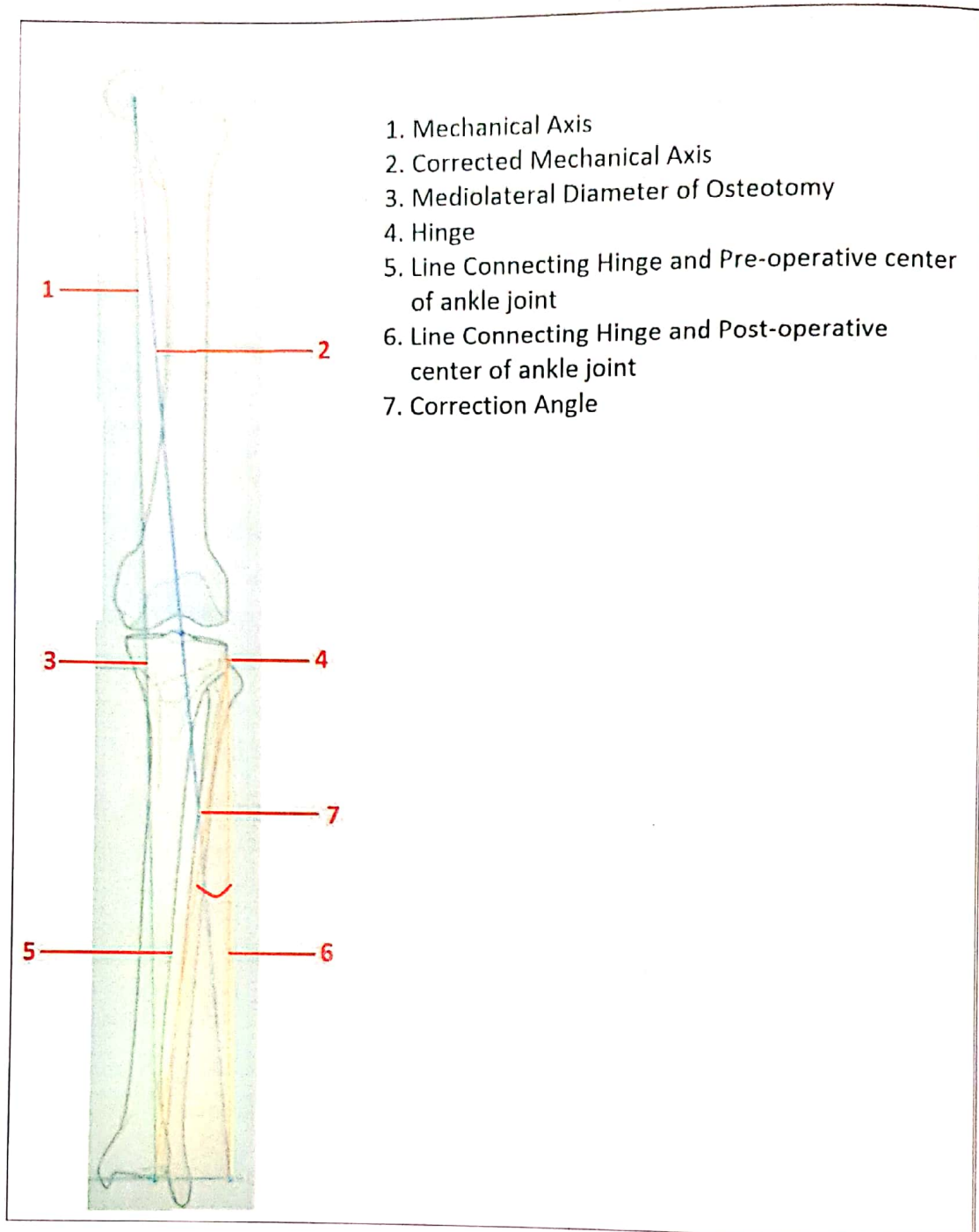


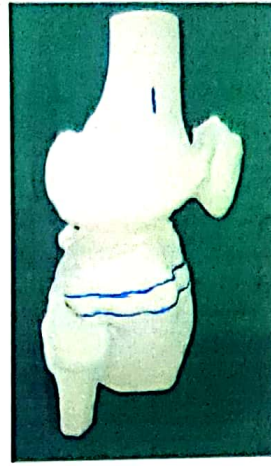
Fig 25.2: Various axis of lower limb

Main Method

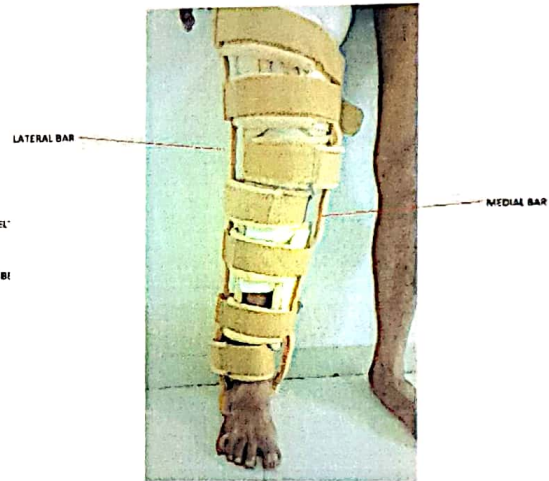
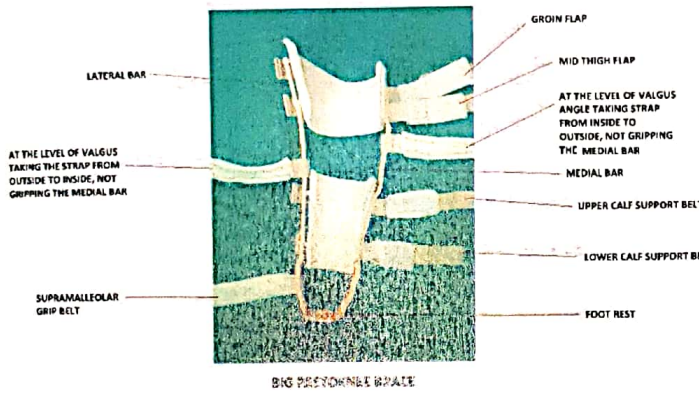
Main method was started by Dr. Sharad G Oza, not using any implant but using custom made long leg brace and short leg brace post operatively. Second most important procedure to relieve throbbing pain in osteoarthritis of knee is decompressing lateral femoral condyle. Linear cut is made between two cortices ant. and post. without damaging it, which was also invented by Dr. Oza. This technique is also followed by us in restoknee healthcare pvt. ltd., which is giving excellent results.



ANTERIOR VIEW OF 3D (CT) MODEL OF KNEE JOINT
WEDGE REMOVED



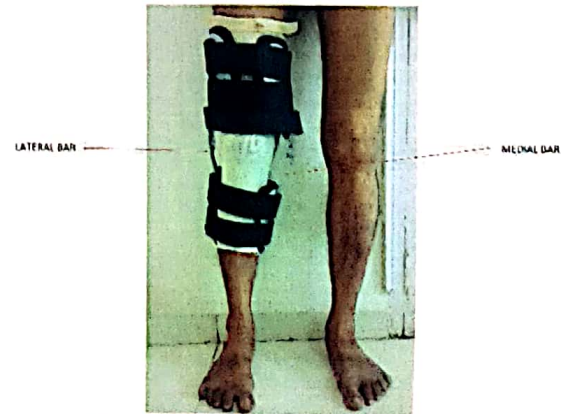
LATERAL VIEW OF 3D (CT) MODEL OF KNEE JOINT
LATERAL CUT SEEN ON LATERAL CONDYLE



APPLICATION OF CUSTOM MADE BRACE ON PATIENT



SHORT RESTOKNEE BRACE



APPLICATION OF SHORT RESTOKNEE BRACE ON PATIENT

Fig 25.3: 3D printing model showing amount of wedge to be resected. Application of restoknee brace in a patient with osteoarthritis of knee joint

Material and Analysis

Till today, many cases have been operated by our team.

1. Total number of cases followed up completely from 1997 to 2017 are 68, M:F= 12:56. As usual female gender is very predominative for osteoarthritis. 82.56% (56).
2. Average age of the patient is 58.39 yrs at the time of surgery. Total right knees involved in 32 cases and total left knees involved in 36 cases.
3. Pre-operatively almost all patients had pain while walking – 85% (58). Another three patients got additional

While post-operatively, 52 cases (76%) had no pain and only 16 cases (23.53%) got occasional pain.

4. All 68 cases had waddling gait which was cured in 57 cases.
5. Two patients were using walker while eleven were using stick pre-operatively. In post-operative follow up, only three were using occasional stick.
6. Out of 68 patients, average F.F.D. was 11.38°, while follow up cases, none has got F.F.D.
7. Post-operative average range of motion was 83.25°, while post-operative follow up, range of motion was 116.23°.
8. In all 68 cases, pre-operative walking distance was ranging from 200-750 metres which was increased to the range of 1000-4000 metres post-operatively.
9. Medial compartment narrowing: Almost in 92.5% cases medial compartment opened up.

Grade	Pre-Operative No.	Post-Operative No.
I	23 (33.82%)	Fully to partial opened up- 63 (92.50%)
II	45 (66.15%)	Normal- 7 (7.5%), One- mild varus (1.45%)

10. Squatting was not possible in all 68 cases, out of which, 28 (41.18%) cases were able to do squat, 21 (30.88%) cases could do squatting with mild pain, while 19 (27.94%) cases were not able to squat.
11. Out of 68 cases- 36 (52.94%) cases had required valgus, 31 (45.59%) had minimal valgus, 1 (1.47%) had mild varus. Except one patient, all got valgus position and that is why mechanical axis passing through the fugisava point or nearby it.

12. In complication:

- 1) Transient physiological lateral popliteal nerve palsy- 1
- 2) Superficial infection in two stitches- 1 (cured with dressing)
- 3) Brace complication of rash- 2 (cured with anti-allergics, anti-fungal powder and anti-biotics)

13. Duration of symptoms to surgery:

Years	patients	Percentage
7-8	4	5.88
5-6	17	25
4-5	16	23.52
3-4	15	22.05
2-3	10	14.70
1-2	6	8.82

Table: Criteria for result and result according to score

Criteria	Criteria of Result		
	Excellent	Good	Poor
walking distance	> 2000 mts	1000-2000 mts	< 1000 mts
knee flexion (in degree)	> 130	120-130	<120
extension (in degree)	full	terminal loss	> 15
lag	No lag	upto 15 lag	
cross leg sitting	Able to do fully	able with difficulty	not able
squatting	Able to do fully	able with difficulty	not able
x-ray medially + space	opened up fully	partial	as it is
OA changes	not present	only at one place	generalised
pain	totally relieved	ocassionally	every time
clinical appearance	required valgus	minimal valgus	neutral/mild varus
of knee			
complication	none	only one	more than one
infection			
lat. Popleteal nerve palsey			
oedema			
brace complication	nil	ocassional rash	permenant discoloration
SCORE	80-100	50-80	Below 50
TOTAL 68 cases	52 cases	16 cases	00 cases
Percentage	76.47%	23.53%	00%

The restoknee surgical technique is mainly based on principle of established lateral base wedge osteoclasts without any internal fixation. Position is maintained with long custom made leg brace without knee joint and necessary valgus in fixed brace at the level of knee joint to keep knee into valgus, which is to be continued for four weeks. On the fourth day of surgery, dressing is changed and again the brace is applied properly. On the 11th day of surgery, sutures are removed and brace is reapplied, which is to be continued for 20 more days. Then short brace with knee joint is given for another 8-10 weeks. Knee movements are gradually started. Full weight bearing is continued and instead of walker, stick is given to patient, which is to be given for 2-3 weeks, then stick is removed and patient is allowed to walk without aid but with short brace on. After 8-10 weeks, when x-ray confirms consolidation, short brace is also discarded. Patient is able to sit cross-legged then squatting with support started.

Our average followup is as follows:

- 20-25 years- 3 cases
- 15-20 years- 2 cases
- 10-15 years- 3 cases
- 5-10 years- 4 cases
- 1-5 years- 56 cases

All are having excellent (52 cases) to good (16 cases) result.

So we strongly recommend restoknee surgical technique because there is no possibility of infection, patient can sit on ground and can sit cross-legged and squat and able to do Namaz. Patient can play outdoor games also and able to walk for prolong distance. Patient is having his/her own knee, so even in future if this procedure fails or pain reappears, re restoknee surgery is also possible and option for TKR remains open which can be done easily without any trouble.

Throbbing pain at rest, another seven patients got shooting pain also. While post-operatively, 52 cases (76%) had no pain and only 16 cases (23.53%) got occasional pain.

10) All 68 cases had waddling gait which was cured in 57 cases.

11) Two patients were using walker while eleven were using stick pre-operatively. In post-operative follow up, only three were using occasional stick.

12) Out of 68 patients, average F.F.D. was 11.38°, while follow up cases, none has got F.F.D.

13) Post-operative average range of motion was 83.25°, while post-operative follow up, range of motion was 116.23°.

14) In all 68 cases, pre-operative walking distance was ranging from 200-750 metres which was increased to the range of 1000-4000 metres post-operatively.

15) Medial compartment narrowing: Almost in 92.5% cases medial compartment opened up.

Grade	Pre-Operative No.	Post-Operative No.
I	23 (33.82%)	Fully to partial opened up- 63 (92.50%)
II	45 (66.15%)	Normal- 7 (7.5%), One- mild varus (1.45%)

2. Squatting was not possible in all 68 cases, out of which, 28 (41.18%) cases were able to do squat, 21 (30.88%) cases could do squatting with mild pain, while 19 (27.94%) cases were not able to squat.

3. Out of 68 cases- 36 (52.94%) cases had required valgus, 31 (45.59%) had minimal valgus, 1 (1.47%) had mild varus. Except one patient, all got valgus position and that is why mechanical axis passing through the fugisava point or nearby it.

4. In complication:

1. Transient physiological lateral popliteal nerve palsy- 1
2. Superficial infection in two stitches- 1 (cured with dressing)
3. Brace complication of rash- 2 (cured with anti-allergics, anti-fungal powder and anti-biotics)

Duration of symptoms to surgery

Years	patients	Percentage
7-8	4	5.88
5-6	17	25
4-5	16	23.52
3-4	15	22.05
2-3	10	14.70
1-2	6	8.82

Table: Criteria for result and result according to score

Criteria of Result			
Criteria	Excellent	Good	Poor
walking distance	> 2000 mts	1000-2000 mts	< 1000 mts
knee flexion (in degree)	> 130	120-130	< 120
extension (in degree)	full	terminal loss	> 15
lag	No lag		upto 15 lag
cross leg sitting	Able to do fully	able with difficulty	not able
squatting	Able to do fully	able with difficulty	not able
x-ray medially + space	opened up fully	partial	as it is
OA changes	not present	only at one place	generalized
pain	totally relieved	occasionally	every time
clinical appearance	required valgus	minimal valgus	neutral/mild varus
of knee			
complication	none	only one	more than one
infection			
lat. Popleteal nerve palsey			
oedema			
brace complication	nil	occasional rash	permenant discoloration
SCORE	80-100	50-80	Below 50
TOTAL 68 cases	52 cases	16 cases	00 cases
Percentage	76.47%	23.53%	00%

Osteoarthritis of knee joint treated with novel non-prosthetic surgical technique

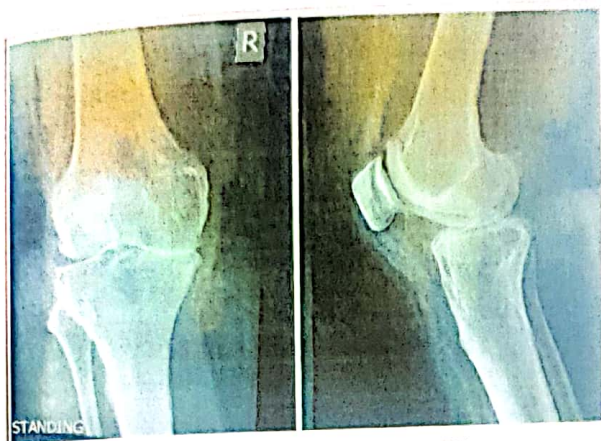
Case

A 39-year old female patient with 5'2" height and 92 kgs weight, presented to clinic with chief complaints of severe pain of the right knee joint which was more marked on medial joint line. She was having pain in left knee but more marked in right side, that's why we have done restoknee surgery on right side before two years and left side before six months.

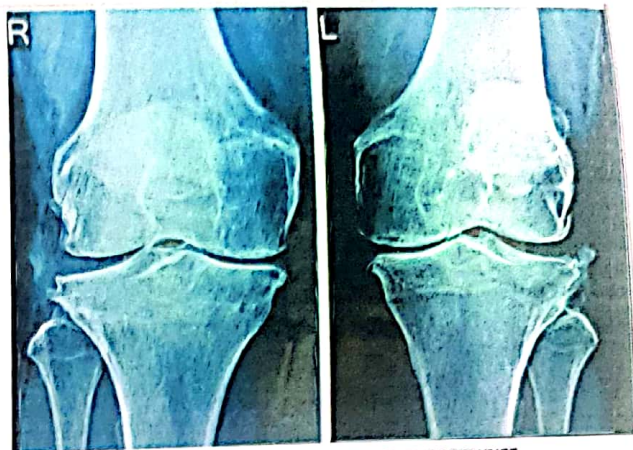
Patient outcome

The patient follow-up was available at 6 month and 18 months postoperatively. The patient became pain free post-operatively. At 18-month follow-up she can climb stairs as well as can walk and ride bicycle up to two kilometers without pain. A post-operative x-ray at 6 months and 18 months showed that patient had restoration of knee joint space in medial compartment.

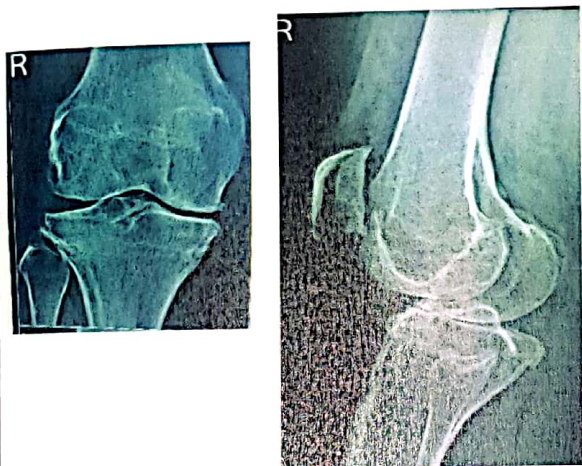
1. Pre-operative x-rays
2. Post operative x-ray at first follow up after 6 months of surgery.
3. Post operative x-ray at second follow up after 2 years of surgery.



PRE-OPERATIVE AP AND LATERAL VIEW OF RIGHT KNEE



POST-OPERATIVE AP VIEW OF RIGHT AND LEFT KNEE AT FIRST FOLLOW UP AFTER SURGERY



POST OPERATIVE FOLLOW UP AFTER TWO YEARS OF SURGERY OF RIGHT KNEE



POST OPERATIVE FOLLOW UP AFTER SIX MONTHS OF SURGERY OF LEFT KNEE

Fig 25.4: Pre-operative and post-operative radiographs of patient with knee osteoarthritis

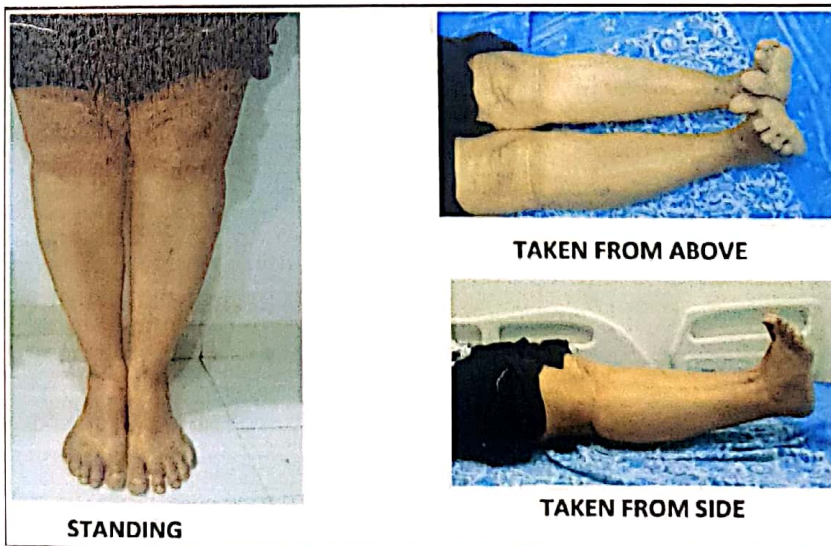


Fig 25.5: Correction of varus deformity in a patient with knee osteoarthritis



FLEXION IN SUPINE POSITION



FLEXION IN PRONE POSITION



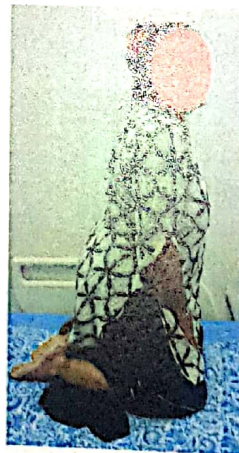
SITTING WITH RIGHT KNEE FULLY FLEXED



SITTING WITH LEFT KNEE FULLY FLEXED



SQUATTING FRONT VIEW



SQUATTING SIDE VIEW

Fig 25.6: Follow up of patient with correction of varus deformity in a patient with knee osteoarthritis