

Role of Ilizarov in Genu varum correction in Osteoarthritic Knee

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Introduction

Osteoarthritis (OA) is one of the most common chronic degenerative condition of joints especially in aging population. The role of inflammation in osteoarthritis has been somewhat controversial. Osteoarthritis is known by various name as degenerative arthritis, gono-arthritis, osteoarthrosis, hypertrophic arthritis or age-related arthritis. The pathological features include loss and erosion of articular cartilage, subchondral sclerosis and bony overgrowth (osteophytes). It may involve soft tissue structure in and around the joints. There is modest inflammatory cell infiltration in the synovial tissue, ligaments get lax and bridging muscle becomes weak. The patient has difficulty in walking and has heavy impact on daily activity and day to day life style and this disease represents an ever-increasing burden on health care. The most prominent symptom that bring the patient to doctor is pain. There might be a group of patients, who do not have any symptoms but might be showing pathological and radiological evidence of OA.¹

The main aim of treatment for OA of the knee is to alleviate pain and improve function in order to mitigate reduction in activity. However, most treatments are not curative as they do not modify the natural history or progression of OA. Guidelines for the medical management of osteoarthritis, as per the American

College of Rheumatology 2012, emphasize the role of both non-pharmacologic and pharmacologic therapies. Initial management involves non-pharmacologic therapies including education, physio-therapies, mild to moderate exercises, various appliances, braces and weight reduction.²

Pain is decreased with mild to moderate exercise and leads to improved functioning in people with OA of knee. Moderate exercise does not accelerate the pathophysiology of knee osteoarthritis, whether or not there is evidence of pre-existing disease. In either case there appears to be improved physical functioning and reduction of pain and disability in those who exercise. Adequate joint motion and elasticity of peri-articular tissues are necessary for cartilage nutrition and health, protection of joint structures from damaging impact loads, function and comfort in daily activities.³

Patients were benefitted with conservative measures such as weight control, appropriate rest, exercise and the use of mechanical support devices. Reduction in weight by 10% improves the function by 28%. Low energy diet is useful in rapid reduction of weight and more significantly loss of body fat.⁴

Pharmacologic modalities recommended for the initial management of patients with knee OA includes acetaminophen, oral and topical NSAIDs, tramadol, intra-

articular corticosteroids injections and intra-articular hyaluronate injections. As first-line pharmacologic therapy acetaminophen is recommended. If pain does not relieved with acetaminophen, analgesic-dose nonsteroidal anti-inflammatory drugs (NSAIDs) may be used (e.g. ibuprofen, naproxen). If symptom response to a lower NSAID dosage is inadequate, higher, anti-inflammatory dose may be used. Analgesic drugs relieve pain and do nothing more. In contrast NSAIDs also suppress inflammation along with reducing pain but are preferred by physicians and patients for short periods of time. However, these drugs have to be used with great care especially in the patients with co-morbidities due to the well known side effects. In addition, NSAIDs have been shown to have a deleterious effect on cartilage metabolism. Topical agents can be used in view to avoid side effects associated with the systemic use of these NSAIDs; but these topical formulations also have only been proven useful for short-term use for mild to moderate pain in mild joint degeneration.^{2,5}

Intra-articular injections of corticosteroids, as indicated by a few studies, are only of short-term benefit for pain and function. Furthermore, some evidence indicates that they are not able to change the natural history of the disease and may also have negative consequences on knee structures. Glucosamine and chondroitin sulfate have not been clearly shown to be effective either, and they cannot be considered ideal agents for the treatment of pain from chronic severe cartilage degeneration or osteoarthritis. Among the available pharmacologic solutions, despite contradictory findings and controversies regarding its effective usefulness, intra-articular hyaluronic acid (HA) is widely applied in clinical practice, with good results reported in many studies. Platelet-rich plasma (PRP) is a simple, low cost, and minimally invasive method that

allows one to obtain from the blood a natural concentrate of autologous growth factors and it would improve symptoms and function, possibly through the release of growth factors and bioactive molecules, in patients affected by knee degeneration in early stages.^{2,5-6,8}

High tibial osteotomy as surgical modality for OA knee attained popularity in the 1960's following work by Jackson and Waugh & Debeyre and Patte in 1961 and is now a well-established procedure. It is a widely performed surgery to treat OA of medial compartment of knee. High Tibial Osteotomy can be performed with various techniques i.e. closing wedge, opening wedge, dome and —en chevronl osteotomies, but opening (medial) and closing (lateral) wedge osteotomies are the most commonly performed.^{9,10}

The medial opening wedge osteotomy was described, in France, by Debeyre and Artigou in 1972. HTO has been documented in literature showing consistently significant pleasing result. The main concept of HTO, as weight bearing axis is shifted to relatively unaffected lateral compartment in varus knees, It reduces knee pain and delays or slows down the destruction of the medial joint compartment, hence delay the need for a knee replacement. HTO avoids the majority of the issues associated with lateral closing wedge osteotomy such as the need to perform a fibula osteotomy, risk of compartment syndrome and injury to common peroneal nerve and malunion of the proximal tibia resulting in more demanding subsequent total joint replacement and bone stock loss etc. For all these reasons, the opening wedge HTO gained popularity and became a widely used alternative option.¹⁰⁻¹¹

Unicompartmental knee arthroplasty (UKA) when compared with high tibial osteotomy (HTO) in terms of functional results was found to be superior, however there

was no difference in specific knee score; HTO got slightly better results of the range of motion. Postoperative rate of revision and complications did not differ significantly between two groups. Unicompartmental/ Total knee replacement is the main stay of treatment in the western world. But the needs and habits of people in Indian sub-continent (squatting for toilet purposes and cross leg sitting/kneeling for prayer purposes) are little different. Hence, joint conserving surgeries suit such patients better than replacements. Moreover, most of these patients are manual laborers.^{12,13}

Medial open wedge high tibial osteotomy could be fixed with: 1) Ilizarov Fixator 2) Simple plate with bone grafting and 3) Locking plate without bone graft. Locking anatomical plate even without bone graft forms structurally stable construct and showed significant results in obese patients, osteotomies requiring large angle of correction and unstable osteotomies following lateral tibial cortex fractures.^{7,14}

Materials and Method

We report prospective longitudinal midterm results of high ilizarov fixation in genu varum patients of osteoarthritis knee . This study included 21 knees , between May 2016 to April 2017 , presented to OPD treated with Ilizarov’s Ring fixator .

Inclusion Criteria

Patient with osteoarthritis of knee joint with

- 1) Predominant involvement of the medial compartment
- 2) Muscle power of at least 4/5 in muscles of the lower limb.
- 3) Functional range of movement around knee joint
- 4) No joint instability

Exclusion Criteria

- 1) Patients with comorbid conditions unfit for surgery
- 2) Patient unwilling to undergo surgery

- 3) Patients with concomitant significant lateral compartment and patellofemoral involvement
- 4) Patients with pre existing genu varum deformity due to other causes.
- 5) Associated ligamentous instability
- 6) Fixed flexion deformity more than 20°

Preoperative planning

- 1. Clinical evaluation
 - Knee Society Clinical Rating System (KSCRS)
- 2. Radiological evaluation
 - Preoperative planning
- 3. Functional evaluation
 - Functional KSCRS

Radiographic assessment

Knee Society Clinical Rating Functional Score

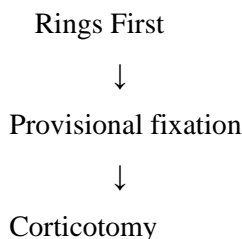
Findings	Description	Score
Walking	Unlimited	50
	>10 blocks	40
	5-10 blocks	30
	<5 blocks	10
	Housebound	0
Stairs	Normal up and down	50
	Normal up and down with rail	40
	Up and down with rail	30
	Up with rail; unable down	15
	Unable	0
Deductions	Cane	-5
	Two Canes	-10
	Crutches or walker	-20
Functional Score	Total	100 (maximum)

Technique

- Fibulectomy
- Ilizarov application and corticotomy

Technique : Fibulectomy

- First step
- Under tourniquet
- Distal third junction



↓
Connecting the two rings with desired correction
↓
On table Radiological confirmation
↓
Closure of wound

Post Op and Follow up

Institutional protocol regarding antibiotics and analgesics

- POD 1 : Ankle and knee exercises
- POD 2: Toe-touch weight bearing with bilateral axillary crutches
- gradually increased as tolerated by the patient.
- Pin site care
- 2weekly follow up

Parameters

Any specific complaints of the patient such as pain, discharge at pin site, tingling or numbness of the foot, etc.

Clinical

- Knee Society Clinical Rating System (KSCRS)
- Improvement in range of movement
- Limp
- Mechanical axis alignment tests
- Complete weight bearing time
- Time of return to normal activities
- Ahlbäck Grade
- Mechanical Axis Deviation
- Mechanical Medial Proximal Tibial Angle
- Mechanical Lateral Distal Femoral Angle
- Tibio Femoral angle
- Hip Knee Ankle angle
- Insall Salvati Ratio



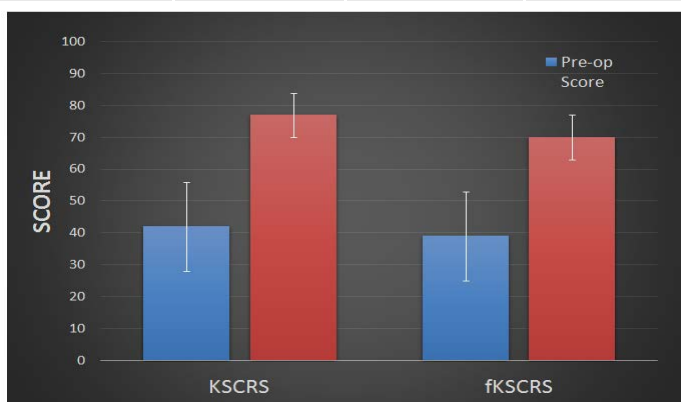
Result and Discussion

- 21 patients
- Mean age - 53.19 ± 5.72 years.
- Females - 85.7%
- Mean follow-up - 40 weeks
- Fixator removal - 75 days

- Complete weight bearing - 124.6 days
- Return to their activities - 138 days.

	Pre-operative	Post-operative	p value
Range of motion	100.71±14.42 degrees	101.19±13.13 degrees	p=0.8033
Fixed flexion deformity	9.76±4.87 degrees	3.57±4.23 degrees	p=0.0001
Limp	17 cases (81%)	11cases (52.4%)	p=0.0495

	Pre-operative	Post-operative	p value
Mechanical Axis Deviation	30.81±4.18mm varus	2.71±4.46mm valgus	p<0.0001 Significant
Mechanical Medial Proximal Tibial Angle	78.81±2.71 degrees	90.38±3.06 degrees	p<0.0001 Significant
Mechanical Lateral Distal Femoral Angle	91.00±2.68 degrees	90.91±2.53 degrees	p=0.09064
Anatomical Tibio Femoral angle	6.48±3.47 degrees varus	3.91±4.56 degrees valgus	p<0.0001 Significant
Hip Knee Ankle angle	12.48±2.98 degrees	2.38±3.68 degrees valgus	p<0.0001 Significant
Insall Salvati Ratio	0.94±0.09	0.93±0.09	p=0.6075



Effect of preoperative range of motion over outcome.

- Fifty percent of patients having range of motion more than 90 were having excellent outcome
- 28% of patients having ROM less than or equals 90 had excellent outcome.

Not significant

Naudie et al

- better outcomes in preoperative range of motion >120 degrees

Effect of Ahlbäck grade over outcome

Ahlbäck Grade	Excellent	Good	Fair	Poor	Total
Grade 1 7 cases	4 (57.1%)	2 (28.6%)	1 (14.3%)	0 (0%)	7
Grade 2 11 cases	3 (27.3%)	8 (72.7%)	0 (0%)	0 (0%)	11
Grade 3 3 cases	0 (0%)	1 (33.3%)	2 (66.7%)	0 (0%)	3
TOTAL	7	11	3	0	21

Complications

- Superficial pin site infection - 10 patients
- Foot drop
- No non union
- Gillooly et al in their study in 2012 demonstrated the efficacy of Ilizarov apparatus in management of non union of high tibial osteotomies following other methods.

Future total knee replacement

No truncation

No alteration of tibial slope and lesser incidence of patella infera

Besides being minimally invasive this method also has advantage in terms of multiplanar stability, early weight bearing and having scope for post operative correction.

Final Overcome

- Of the 21 cases, 33.3% of knees had excellent score, 52.4% had good score and 33.3% of knees had fair score after the surgery.
- In our study cases having lower grade of arthritis showed better outcomes.
- Complications such as deep infection and failure of correction were not seen.
- Ambulation during treatment period

References

1. Felson DT, Lawrence RC, Dieppe PA. Osteoarthritis: new insights—part 1: the disease and its risk factors. *Ann Intern Med* 2000;133:635–46.
2. Gamble R, Wyeth AJ, Johnson EL, Searle WA, Beecham S. Recommendations for the medical management of osteoarthritis of the hip and knee. *Arthritis Rheum* 2000;43:1905–15.
3. Bosomworth NJ. Exercise and knee osteoarthritis: benefit or hazard? *Can Fam Physician* 2009;55:871-8.
4. Christensen R, Astrup A, Bliddal H. Weight loss: the treatment of choice for knee osteoarthritis? A randomised trial. *Osteoarthritis Cartilage* 2005;13:20-7.
5. Kon E, Mandelbaum B, Buda R, Filardo G, Delcogliano M, Timoncini A, et al. Platelet-rich plasma intra-articular injection versus hyaluronic acid visco supplementation as treatments for cartilage pathology: from early degeneration to osteoarthritis. *Arthroscopy* 2011;27:1490-1501.
6. Clegg DO, Reda DJ, Harris CL. Glucosamine, chondroitin sulfate and the two in combination for painful knee osteoarthritis. *N Engl J Med* 2006;354:795-808.
7. Pornattanamanee Wong C, Numkanisorn S, Chareancholvanich K, Harnroongroj T. A retrospective analysis of medial opening wedge high tibial osteotomy

- for varus osteoarthritic knee. *Indian J Orthop* 2012;46:455-61.
8. Felson DT, McAlindon TE, Anderson JJ, Naimark A, Weissman BW, Aliabadi P, et al. Defining radiographic osteoarthritis for the whole knee. *Osteoarthritis Cartilage* 1997;5:241-50.
9. Ivarsson I, Myrnerets R, Gillquist J. High tibial osteotomy for medial osteoarthritis of the knee : a 5 to 7 and 11 to 13 year follow up. *J Bone Joint Surg* 1990;32:238-44.
10. Amendola A, Bonasia DE. Results of high tibial osteotomy: review of the literature. *Int Orthop* 2010;34:155-60.
11. Lee DC, Byun SJ. High tibial osteotomy. *Knee Surg Rel Res* 2013;24:61-9.
12. Kamboj P, Kaushik SK, Kundu ZS, Singh R, Singh R, Tanwar M, et al. Results of open wedge high tibial osteotomy using plate Osteosynthesis (tomofix) without grafting. *Indian J.Sci.Res.* 2017;7(2):63-70.
13. Fu D, Li G. Comparison of high tibial osteotomy and unicompartmental knee arthroplasty in the treatment of unicompartmental osteoarthritis: a meta analysis. *J Arthroplasty* 2013;28:759-65.
14. Mondanelli M, Giron F, Losco M, Buzzi R, Aglietti P. Opening wedge high tibial osteotomy using a monoaxial dynamic external fixator. *Knee Surg Sports Traumatol Arthrosc.* 2015.