



A COMPARITIVE STUDY TO DETERMINE EFFECTIVENESS OF HIGH TIBIAL OSTEOTOMY AND PROXIMAL FIBULECTOMY FOR MEDIAL UNICOMPARTMENTAL KNEE OSTEOARTHRITIS IN MIDDLE AGE PATIENTS

Orthopaedics

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ABSTRACT

This is a comparative study that was conducted over a period of 18 months in Burdwan Medical College and Hospital, to determine the effectiveness of high tibial osteotomy and proximal fibulectomy in management of non-traumatic medial uni-compartmental knee osteoarthritis in middle age group (40-60) years patients of both sexes. There were a total of 20 patients studied during a period of 18 months. It was found that though Pre-Op Femorotibial Angle was significantly high in High Tibial Osteotomy patients compared to Proximal Fibulectomy patients, Post-Op Femorotibial Angle at 6 months and at 9 months was significantly decreased in High Tibial Osteotomy compared to Proximal Fibulectomy patients. Also that Post-Op Medial /Lat Joint Ratio and Post-Op Medial Lat Joint Space at 6 months were significantly decreased in Proximal Fibulectomy compared to High Tibial Osteotomy patients. The present study demonstrates the High tibial osteotomy effectively relieves the pain and improves the joint function in the patients with medial compartment osteoarthritis of knee by shifting the mechanical axis. Z test and Pearson correlation analysis shows Distribution of mean post-Op (6 months) Femorotibial Angle with Group was statistically significant ($p=0.0424$). Distribution of mean post-Op (9 months) Femorotibial Angle with Group was statistically significant ($p=0.0491$). However due to small numbers of sample size in my study, larger study is recommended to attain this conclusion. In conclusion, High tibial osteotomy seems to be a better option as compared to proximal fibulectomy in terms of functional outcome.

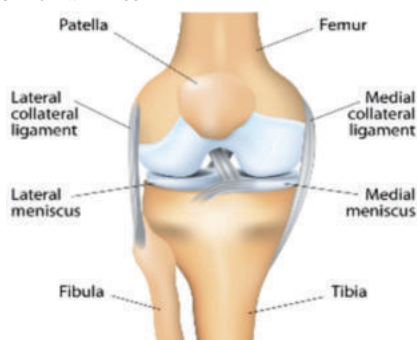
KEYWORDS

High Tibial Osteotomy, Proximal Fibular Osteotomy, Osteoarthritis, WOMAC (Western Ontario And McMaster University Osteoarthritis Index), VAS (Visual Analogue Scale), OKS (Oxford Knee Score)

INTRODUCTION

Abnormal mechanical alignment of the lower limb is a risk factor for progressive joint degeneration. The pathological characteristics of Knee Osteoarthritis include joint structure degradation and cartilage destruction and hyperplasia, with joint pain, dysfunction and joint deformity as the main clinical symptoms. We conducted a pilot study over a period of 3 months to determine the effectiveness of high tibial osteotomy and proximal fibulectomy in management of medial uni-compartmental knee osteoarthritis in middle age patients on the basis of functional, radiologic and clinical outcome in patients with VAS, WOMAC, Oxford knee scoring.

Anatomy of Human Knee



The knee is a hinge joint that is responsible for weight-bearing and movement. The femur (thigh bone), tibia (shin bone), and patella (kneecap) make up the bones of the knee. Menisci, the first of the two variety of cartilages found in knee, are crescent-shaped discs that act as a cushion, or —shock absorber, so that the bones of the knee can move through their range of motion without rubbing directly against each other. The knee has two menisci medial and lateral. On the other hand the second variety, Articular cartilage found on the femur, the top of the tibia, and the back of the patella, is a thin, shiny layer of cartilage. It acts as a shock absorber and helps bones move smoothly over one another. Anterior and posterior cruciate ligaments prevent the femur from sliding on the tibia. Medial and Lateral collateral ligament prevent side to side movement of the femur. The patellar tendon, which covers the kneecap, runs up the thigh, and attaches to the quadriceps, provide stability to the joint. Joint capsule, a membrane bag that surrounds the knee joint, is filled with a liquid called synovial fluid, which lubricates and nourishes the joint. There are approximately 14 small fluid-filled sacs within the knee joint aka Bursa. They reduce friction between the tissues of the knee and prevent inflame.

Etiology

Knee osteoarthritis is classified as either primary or secondary, depending on its cause. Primary knee osteoarthritis is the result of articular cartilage degeneration without any known reason. This is typically thought of as degeneration due to age as well as wear and tear. Secondary knee osteoarthritis is the result of articular cartilage degeneration due to a known reason.

Risk Factors of Knee Osteoarthritis

Modifiable

- Articular trauma
- Occupation – prolonged standing and repetitive knee bending
- Muscle weakness or imbalance
- Weight (BMI>25 Kg/m²)
- Health – metabolic syndrome

Non-modifiable

- Gender - females more common than males
- Age
- Genetics
- Race

Epidemiology

Depending on the source, roughly 13% of women and 10% of men 60 years and older have symptomatic knee osteoarthritis. Among those older than 70 years of age, the prevalence rises to as high as 40%. Only 15% of patients with radiographic findings of knee OA were symptomatic. , the incidence of symptomatic knee osteoarthritis is roughly 240 cases per 100,000 people per year.

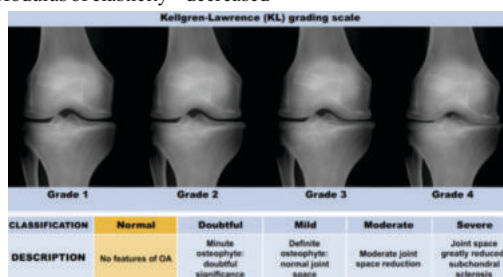
Pathophysiology

Articular cartilage is composed primarily of type II collagen, proteoglycans, chondrocytes, and water. In the process of osteoarthritis, matrix metalloproteinases (MMPs), or degradative enzymes, are overexpressed, disrupting the equilibrium and resulting in an overall loss of collagen and proteoglycans. The loss in equilibrium results in increased water content, the disorganized pattern of collagen, and ultimately loss of articular cartilage elasticity. Macroscopically these changes result in cracking and fissuring of the cartilage and ultimately erosion of the articular surface.

Histopathology

Cartilage Changes In Oa

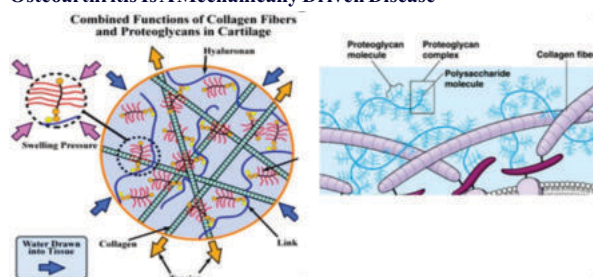
- Water content – increased
- Collagen – disorganized
- Proteoglycan content – decreased
- Proteoglycan synthesis – increased
- Chondrocyte size – same
- Chondrocyte number – same
- Modulus of elasticity – decreased



Radiographic Findings of Knee Osteoarthritis

- Joint space narrowing
- Osteophyte formation
- Subchondral sclerosis
- Subchondral cysts

Osteoarthritis Is A Mechanically Driven Disease



The primary changes with OA typically occur in the articular cartilage, followed by the associated changes in subchondral bone. The unique mechanical properties of articular cartilage depend on the extracellular matrix which consists of tissue fluid and framework of structural molecules. These highly organized molecular structures were

assembled by type II collagen fibers, non-collagenous proteins, proteoglycans and glycoproteins which are produced by chondrocytes and give the cartilage its form and tensile strength.

It is claimed that the failure of chondrocytes to maintain the homeostasis between synthesis and degradation of such extracellular matrix components is one of the key reasons to trigger OA.

Therefore, some surgical interventions may be necessary to correct the alignment of knee joint in the early stage of OA.

Overview of Medial Opening Wedge Hto

HTO is a surgical realignment procedure designed to reduce the load acting on the degenerated medial knee compartment, thereby relieving pain and improving joint function [7]. The realignment reduces the varus moment, which also reduces the compressive loading related to knee pain and self-reported OA symptoms.

HTO has considerable advantages over total knee replacement (TKR) since it well preserves the native bone structure, as well as the durability and degree of functional recovery particularly for young and active patients. Therefore, osteotomy is recommended to younger and more active patients who require high knee function and wish to postpone the need for total knee replacement.

Dynamic Fibular Distal Lization Theory

Qin et al³³ in their prospective study of 67 PFOs found that significant clinical improvement after surgery was proportional to the amount of distalization of the fibula and the inclination angle of the proximal tibio-fibular joint. Muscles attached to the proximal fibula, such as the soleus and peroneus long us, pulled the fibular head in the distal direction, and the tensile force was simultaneously transmitted from the fibular head to the lateral femoral condyle, thereby narrowing the lateral knee-joint space. This theory was supported by the finding that the greater the distal displacement of the fibular head, the better was the correction of the varus deformity and the more significant the improvement in symptoms.

SUBJECTS AND METHODS

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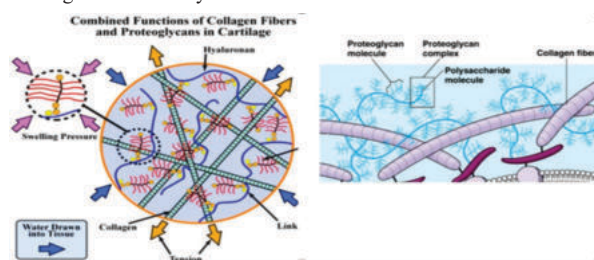
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RESULTS

Distribution of mean Body Mass Index (Kg/m²) with Group was statistically significant (p=0.0233).

Distribution of mean Post-Op VAS (3 months), Post-Op VAS (6 months), Post-Op VAS (9 months) with Group was statistically significant with respective p values of 0.0156, 0.0409, 0.0421. Distribution of mean Pre-OP WOMAC with Group was statistically significant (p=0.0011).

Distribution of mean Post-Op WOMAC (6 months) and Post-Op WOMAC (9 months) with Group was statistically significant with respective p values of 0.0059 and 0.0310. Distribution of mean Pre-OP Oxford Knee Score with Group was statistically significant (p=0.0476). Distribution of mean Post-Op Oxford Knee Score (6 months) and Post-Op Oxford Knee Score (9 months) with Group was statistically significant with respective p values of 0.0495 and 0.0151.

Table: Difference of mean Pre-OP Femorotibial Angle, Post-OP (6 months) Femorotibial Angle and Post-OP (9 months) Femorotibial Angle

		Number	Mean	SD	Minimum	Maximum	Median
Pre-OP Femorotibial Angle	HIGH TIBIAL OSTEOTOMY	10	180.2000	3.0478	176.0000	184.0000	181.0000
Post-OP (6 months) Femorotibial Angle	HIGH TIBIAL OSTEOTOMY	10	167.0000	5.4365	160.0000	174.0000	167.0000
Post-OP (9 months) Femorotibial Angle	HIGH TIBIAL OSTEOTOMY	10	165.4000	4.3256	162.0000	172.0000	163.0000

P=0.0490, Statistically significant.

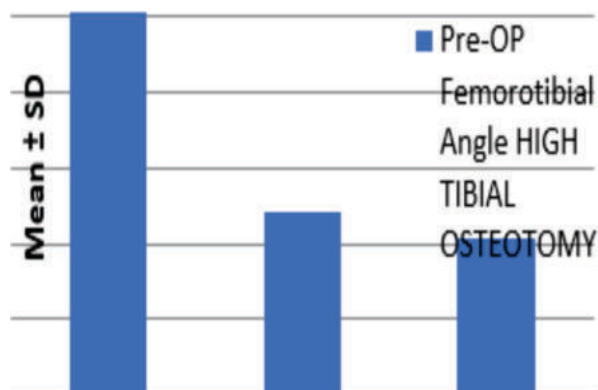


Table: Difference of mean Pre-OP Femorotibial Angle, Post-OP (6 months) Femorotibial Angle and Post-OP (9 months) Femorotibial Angle

		Number	Mean	SD	Minimum	Maximum	Median
Pre-OP Femorotibial Angle	PROXIMAL FIBULECTOMY	10	177.3000	6.0928	165.0000	184.0000	178.0000
Post-OP (6 months) Femorotibial Angle	PROXIMAL FIBULECTOMY	10	169.6000	4.0879	162.0000	174.0000	171.0000
Post-OP (9 months) Femorotibial Angle	PROXIMAL FIBULECTOMY	10	169.9000	5.1737	160.0000	178.0000	171.0000

P=0.0351, Statistically significant

SUMMARY AND CONCLUSION

We found that most of the patients were 46-50 years old which was not statistically significant. It was found that Proximal Fibulectomy was mostly observed in Left Knee and Locking T Plate was significantly used in High Tibial Osteotomy. Complications after Surgery were not significant difference in two groups. Present study showed that Body Mass Index was significantly low in proximal fibulectomy patients compared to high tibial osteotomy patients. It was found that Pre-OP -VAS, Post-Op VAS at 6 months and at 9 months were significantly low in Proximal Fibulectomy patients compared to high tibial osteotomy patients. Our study showed that Pre-OP WOMAC, Post-Op WOMAC at 6 months and Post-Op WOMAC at 9 months were high in High Tibial Osteotomy patients compared to Proximal Fibulectomy patients which were statistically significant and Post-Op Oxford Knee Score at 6 months and at 9 months were significantly increased in High Tibial Osteotomy patients compared to Proximal Fibulectomy patients.

We found that Pre-OP Femorotibial Angle was significantly high in High Tibial Osteotomy patients compared to Proximal Fibulectomy patients. Post-Op Femorotibial Angle at 6 months and at 9 months was significantly decreased in High Tibial Osteotomy compared to Proximal Fibulectomy patients. It was found that Post-Op Medial /Lat Joint Ratio and Post-Op Medial Lat Joint Space at 6 months were significantly decreased in Proximal Fibulectomy compared to High Tibial Osteotomy patients. We concluded that High tibial osteotomy is a better option as compared to proximal fibulectomy in terms of functional outcome and improvement in VAS.

The present study demonstrates the High tibial osteotomy effectively relieves the pain and improves the joint function in the patients with medial compartment osteoarthritis of knee by shifting the mechanical axis. However due to small numbers of sample size in my study, larger study is recommended to attain this conclusion.

Limitations of The Study

In spite of every sincere effort of my study the notable short comings of this study are:

- The sample size was small. Only 20 cases are not sufficient for this study.
- The study was carried out in a single tertiary care hospital, so hospital bias cannot be ruled out.
- On-going COVID 19 pandemic and lockdown has further hampered the study.

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