"ARTHROSCOPIC DEBRIDEMENT IN OSTEOARTHROSIS OF KNEE JOINT – ANALYSIS OF SHORT TERM BENEFITS"

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BY

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LIST OF ABBREVIATIONS USED

OA	Osteoarthrosis
RF	Rhcumatoid Factor
SF OA	Synovial Fluid Signs of OA
ACL	Anterior Cruciate Ligament
MCL	Medial Collateral Ligament
PCL	Posterior Cruciate Ligament
LCL	Lateral Collateral Ligament
ECF	Extracellular Matrix
AGEs	Advanced Glycation End Products

ABSTRACT

TITLE

ARTHROSCOPIC DEBRIDEMENT IN OSTEOARTHROSIS OF KNEE JOINT -ANALYSIS OF SHORT TERM BENEFITS

AIM

To study the outcome of Arthroscopic debridement in Osteoarthrosis of knee joint and to arrive at a consensus regarding the subsets of patients with Osteoarthrosis who will benefit from the procedure.

MATERIALS AND METHODS

This prospective study was done in Department of Orthopaedics at R.L. Jalappa Hospital and Medical Research Center, attached to Sri Devaraj Urs Medical College, Kolar during the period from November 2010 to June 2012. This study consists of 30 cases above the age of 50years with Primary Osteoarthrosis were included in this study.

RESULTS

Results were analysed based on KNEE SOCIETY CLINICAL RATING SYSTEM (1989). At the end of one month 86.6% patients had Excellent to Good results. At the end of six months 60% of patients had Excellent to Good results and 30% had relief of some degree of pain. At the end of one year 37.6% of patients had Excellent to Good results.

CONCLUSION

Patients with mild to moderate degrees of Osteoarthrosis benefitted with excellent to good results from the procedure. Results were good and long lasting particularly, if there was minimal or no malalignment of knee or, there was any associated mechanical restriction of movement due to meniscal tear or loose bodies.

Patients had been benefited in terms of pain, ease of undergoing physiotherapy and reduction of usage of NSAIDS and its side effects.

Keywords : ***Arthroscopic Debridement, Osteoarthrosis, Knee Society Clinical Rating System***

TABLE OF CONTENTS

LIST OF TABLES

LIST OF CHARTS

INTRODUCTION

Osteoarthrosis is a progressive degenerative joint disease. Osteoarthritis was the term originally proposed by John Spender in 1886. Arthritis deformans, as proposed by Heine[1] in 1926, was for many years considered a synonym for osteoarthrosis in the European medical community. The terms osteoarthrosis and degenerative joint disease give no information about the pathologic processes that characterize the disorder.

Traces of degenerative arthritis have been found in the fossil remains of dinosaurs and prehistoric humans. Written accounts of osteoarthrosis date back to ancient times, and its existence is borne out of examination of Egyptian mummies, which clearly show evidence of the disease.

Women are more commonly affected. The Worid Health Organisation estimates that osteoarthrosis is a cause of disability in atleast 10% of population over 60 years of age.[2] Statistics suggest that, 80% of people more than 50 years old have arthritis, with spine, hip, and knees, the most frequently affected joints.

There are basically two types of degenerative arthritis. The primary type, which apparently develops spontaneously but may be associated with some minor or repetitive and subclinical level of traumatic insult to the joint with a possible genetic predisposition, and the secondary type, which results from a recognizable problem, usually

traumatic. Degenerative arthritis is relatively rare before the age of 40 years, except in secondary cases.

CONSENSUS DEFINITION[3]

Over the twentieth century, the definition of Osteoarthritis has evolved from "hypertrophic arthritis" to the most common current consensus definition: "Osteoarthritis disease are a re sult of both mechanical and biological events that destabilize the normal coupling of degradation and synthesis of articular cartilage, chondocytes, extracellular matrix and subchondral bone. Although they may be initiated by multiple factors, including genetic, metabolic, developmental and traumatic, Osteoarthritic diseases involve all of the tissues of the diarthrodial joint. Ultimately, Osteoarthritis disease are manifested by morphological, biochemical, molecular, and biomechanical changes of both cells and matrix which leads to softening, fibrillation, ulceration, los of articular cartilage, sclerosis and eburnation of subchondral bone, osteophytes and subchondral cysts. When clinically evident, osteoarthritis diseases are characterized by joint pain, tenderness, crepitus, limitation of movements, occasional effusion and variable degrees of inflammation without systemic effects".

THE DIAGNOSIS OF OSTEOARTHRITIS

Diagnostic criteria have been developed for osteoarthrosis by Altman et al (1986).[4]

(1986) Criteria for Classification of Osteoarthrosis (OA) of the knee

Clinical and laboratory	Clinical and radiographic	Clinical
Knee pain	Knee pain	Knee pain
+ at least 5 of 9	+ at least 1 of 4	+ at least 3 of 6
- Age > 50 years	- Age > 50 years	- Age > 50 years
- Stiffness < 30 minutes	- Stiffness < 30 minutes	- Stiffness < 30 minutes
- Crepitus	- Crepitus	- Crepitus
- Bony Tenderness	+ Osteophyte	- Bony Tenderness
- Bony enlargement		- Bony enlargement
- No palpable warmth		- No palpable warmth
- ESR < 40 mm / hour		
- RF < 1:40		
- SF OA		
92% sensitive	**91% sensitive**	**95% sensitive**
75% specific	**86% specific**	**69% specific**

*ESR = erythrocyte sedimentation rate (Westergren); RF = rhcumatoid factor; SF OA = synovial fluid signs of OA (clear, viscous, or white blood cell count<2000/mm^3)

AIM OF THE STUDY

To study the outcome of arthroscopic debridement in osteoarthrosis of knee joint and to arrive at a consensus regarding the subsets of osteoarthritic patients who will benefit from the procedure. .

REVIEW OF LITERATURE

Professor Kenji Takagi in Tokyo has traditionally been credited for performing the first arthroscopic examination of the knee joint of a patient in 1919. He used a 7.3 mm cystoscope for his first arthroscopy. Recently it has been discovered that Danish physician **Severin Nordentoft** reported on arthroscopies of the knee joint as early as 1912 at the proceedings of the 41st Congress of the German Society of Surgeons at Berlin.

Pioneering work in the field of arthroscopy began as early as the 1920s with the work of **Eugen Bircher**[5]. Bircher published several papers in the 1920s about his use of arthroscopy of the knee for diagnostic purposes. He was the first to note the effect of lavage. After diagnosing torn tissue through arthroscopy, Bircher used open surgery to remove or repair the damaged tissue.

While Bircher is often considered the inventor of arthroscopy of the knee, the Japanese surgeon **Masaki Watanabe**[6], receives primary credit for using arthroscopy for interventional surgery.

In 1934, study was reported on the use of arthroscopic lavage of the knee in 10 patients with osteoarthrosis showing significant improvement in all patients.[7]

Debridement, described in 1941 as "house-cleaning arthroplasty", was an open procedure in which all accessible synovial membrane, osteophytes, diseased cartilage and normal tissues were removed in an

effort to relieve symptoms of osteoarthrosis. It was found useful for the treatment of possible meniscal damage, removal of free-floating bodies within the joint, and reduction of symptomatic osteophytes.[8]

In 1947, open debridement was performed for osteoarthrosis knee for 20 patients and got good results.[9]

In 1950, good results were reported after joint debridement in 66% of patients .[10]

In 1977, in a review of 120 patients it was found that management of unicompartmental osteoarthrosis of the knee by high tibial osteotomy was enhanced by an associated joint debridement.[11]

In 1978, study was reported on 14 patients treated with Arthroscopic Lavage, 93% patients improved at 1 week and 59% had satisfactory improvement at 4 weeks.[12]

In 1979, "Articular Pumping" was introduced using recirculating lavage of the joint and reported good results.[13]

In 1981, good results were reported following arthroscopic lavage and debridement in 74% patients.[14]

In 1982, study was reported on 275 patients out of which 172 patients were followed up for more than 3 years and 76% patients had good results.[15]

In 1985, preoperative angular deformity was correlated with results of arthroscopic debridement and found that 32% of the knees with residual varus deformity were in fair to good category.[16]

In 1986, study was reported on 207 patients with femoro tibial arthritic disease in either the medial or lateral compartment who had lavage versus arthroscopic debridement with 2 years follow up which showed that lavage alone produced 45% improvement only whereas debridement produced 68% improvement.[17,18,19]

In 1988, a study showed good or excellent results in 52% of the patients treated with arthroscopic debridement.[20]

In 1989, study compared Priedie's procedure with arthroscopic debridement and found that results were better with the latter.[21]

In 1991, a study compared symptomatic relief in patients in two groups. One treated with arthroscopic lavage and physiotherapy and other one with physiotherapy alone. They found that there was better pain relief in lavage group and the effect was long lasting.[22]

In 1991, reported 551 cases with long term follow up upto 8 years and found that 55% of patients had satisfactory results.[23]

In 1991, study on 43 knees following arthroscopic debridement showed 72% good to excellent result.[24]

In 1991, a study stated that arthroscopic joint debridement may help when conservative measures have failed.[25]

In 1992, a study found debridement to be more effective than lavage.[26]

In 1993, a study found arthroscopic debridement to be more effective than conservative treatment for osteoarthrosis of the knee.[27]

In 1994, in a series of 275 cases of arthroscopic surgery for degenerative arthritis of the knee, 75% of the patients were rated excellent to good with a minimum follow-up of two years. Arthroscopic surgery offers a good alternative in the overall management strategy of degenerative arthritis of the knee.[28]

In 1995, a study on 105 knees in patients 60 years or older concluded that with arthroscopic surgery good and excellent results were obtained in 65% of knees.[29]

In 1996, a study compared articular debridement versus washout for tibiofemoral degenerative arthritis and found debridement to be superior to lavage.[30]

In 1999, a study found arthroscopy to be very effective in relieving pain and stated that young patients with normally aligned knees and early arthritis had best results.[31]

In 1999, a study on effect of Intra articular injection of cortisol and joint lavage stated that both alone and in combination, afforded improvement in pain in osteoarthritic knee.[32]

In 2000, a study stated that arthroscopic management of degenerative arthritis of the knee has become an attractive alternative to osteotomy or total knee arthroplasty, at least partly because it is associated with lower costs and lower morbidity.[33]

In 2002, study suggested that arthroscopic debridement may be over utilized in elderly patients and it can delay joint replacements in many patients[34].

In 2002, in a study on 34 patients found that arthroscopic debridement has a favourable outcome in selected patients.[35]

In 2002, a study stated that with proper selection, patients with early degenerative arthritis and mechanical symptoms of locking or catching can benefit from arthroscopic surgery.[36]

In 2002, a study found that 81% of their patients were doing better after arthroscopic surgery for osteoarthrosis of knee.[37]

In 2003, a study on 121 cases recommended that surgeon should be conservative in surgical debridement, removing only the fibrillated and scaling fragments of articular cartilage.[38]

In 2003, a study on the effect of lavage versus lavage plus intra-articular steroid injection for osteoarthrosis knee found that both the groups had similar effects. Effect of intraarticular steroids was of short term, ranging up to 4 weeks.[39]

In 2004, a study performed arthroscopic debridement and lavage in 197 patients under local anaesthesia and found it to be an efficient, simple, safe, painless and cost-effective method of treatment.[40]

In 2005, a study on indications for Arthroscopic Debridement for Osteoarthrosis of the knee stated that the most important factor in determining success is proper patient selection, and many who have osteoarthrosis of the knee will not benefit from arthroscopic debridement.[41]

In 2006, a study on 122 patients concluded that knees with severe arthritis fare poorly whereas with mild arthritis fare well, they could not predict the outcome for moderate arthritic knee.[42]

In 2006, a study on factors affecting the outcome of Arthroscopy in medial-compartment Osteoarthrosis of the knee found that a history of Osteoarthrosis for more than 2 years, obesity, smoking, tibial osteophytes, and joint space narrowing of less than 5 mm were associated with a poor outcome.[43]

In 2006, a study showed arthroscopic debridement is a reliable and effective treatment for knee arthritis in appropriately selected patients.[44]

In 2006, a study stated that arthroscopic lavage plus administration of corticosteroid was more effective than arthroscopic lavage plus administration of placebo or joint aspiration plus injection of corticosteroids.[45,46]

In 2007, a study stated that arthroscopic debridement of meniscal tears and low grade osteoarthrosis may have some utility but it should not be used as a routine treatment for all patients with knee osteoarthrosis.[47]

In 2007, a study suggested that arthroscopic debridement combined with visco supplementation is an effective treatment option for selected patients with knee osteoarthrosis.[48]

In 2008, a study on arthroscopic debridement of the osteoarthritic knee combined with hyaluronic acid treatment concluded that concomitant delivery of high molecular weight hyaluronic acid is safe when given at the time of arthroscopic debridement of the osteoarthritic knee. Furthermore the combination of both procedures showed efficacy in reducing pain.[49]

In 2009, a study showed that it is an extremely beneficial procedure for patient with mild to moderate osteoarthrosis.[50]

ANATOMY

The knee is the largest joint in the body and it is also one of the most complex. The knee joint is made up of four bones, the femur, tibia, fibula and the patella. These are connected by muscles, ligaments, and tendons.

TIBIOFEMORAL JOINT

The tibiofemoral joints is a complex synovial joint. The proximal tibial surface slopes posteriorly and downwards relative to the long axis of the shaft.

The medial articular surface is oval (long axis anteroposterior) and longer than the lateral tibial condyle. Around its anterior, medial, and posterior margins, it is related to the medial meniscus, and the meniscal imprint, wider behind, narrower anteromedially, is often discernible.

The lateral condyle overhangs the shaft posterolaterally above a small circular facet for articulation with the fibula. The articular surface is more circular and coapted to its meniscus. In the sagittal plane the articular surface is fairly flat centrally; anteriorly and posteriorly the articular surfaces fall away inferiorly.

Intercondylar area (Intercondylar eminence)

The rough-surfaced area between the condylar articular surfaces is narrowest centrally where there is an intercondylar eminence, the edges of which project slightly proximally as the lateral and medial

intercondylar tubercles. The intercondylar area widens behind and in front of the eminence as the articular surfaces diverge.

Femoral surface

The femoral condyles, bearing articular cartilage, are almost wholly convex. The shapes of their sagittal profiles are somewhat controversial. One view is that they are spiral with a curvature increasing posteriorly (‘a closing helix’), that of the lateral condyle more rapidly. An alternative view is that the articular surface for contact with the tibia on the medial femoral condyle describes the arcs of two circles. According to this view, the anterior arc makes contact with the tibia near extension and is part of a virtual circle of larger radius than the more posterior arc, which makes contact during flexion. Laterally there may only be a single radius of curvature of a single arc.

Menisci

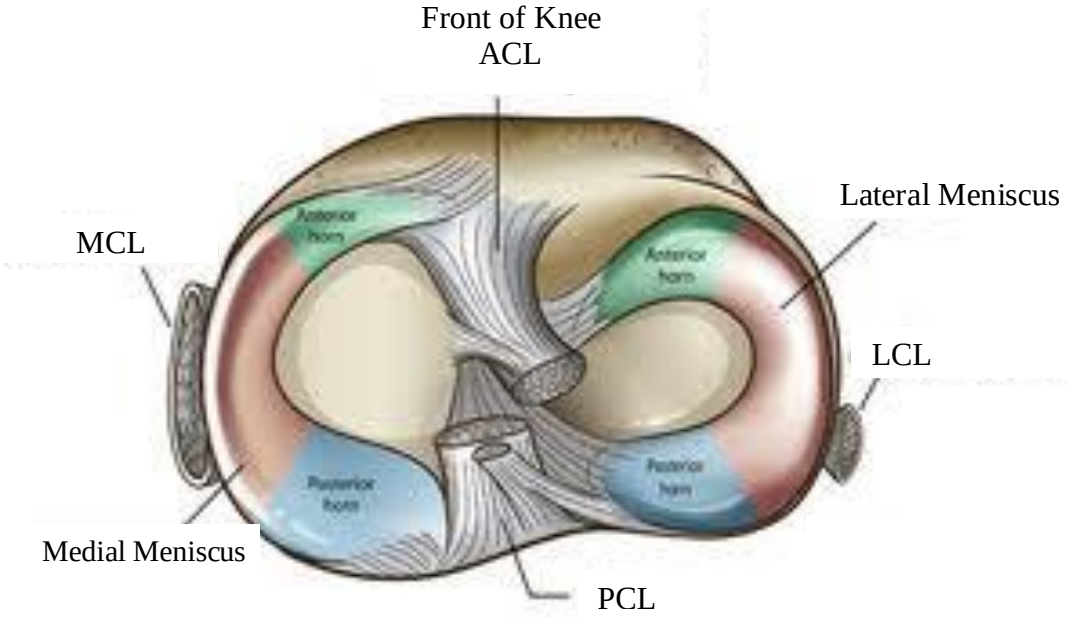
The menisci (semilunar cartilages) are crescentic laminae deepening the articulation of the tibial surfaces that receive the femur. Their peripheral attached borders are thick and convex, their free borders thin and concave. Their peripheral zone is vascularized by capillary loops from the fibrous capsule and synovial membrane, while their inner regions are avascular.

Medial meniscus

The medial meniscus, broader posteriorly, is almost a semicircle in shape. It is attached by its anterior horn to the anterior tibial intercondylar area in front of the anterior cruciate ligament; the posterior fibres of the anterior horn are continuous with the transverse ligament.

Lateral meniscus

The lateral meniscus form approximately four - fifths of a circle, and covers a larger area than the medial meniscus. Its breadth, except that of the short tapering horns, is uniform. It is grooved posterolaterally by the popliteal tendon, which separates it from the fibular collateral ligament.



Soft tissues

Recent advances in knee ligament surgery have contributed to a better understanding of the anatomy of the medial and lateral soft tissues of the knee.

Capsule and retinacula

The capsule is a fibrous membrane of variable thickness. Anteriorly it is replaced by the patellar tendon and elsewhere it lies deep to expansions from vasti medialis and lateralis, separated from them by a

plane of vascularized loose connective tissue. The expansions are attached to the patellar margins and patellar tendon, extending back to the corresponding collateral ligaments and distally to the tibial condyles. They form medial and lateral patellar retinacula, the lateral being reinforced by the iliotibial tract.

Posteriorly, the oblique popliteal ligament is a well-defined thickening across the posteromedial aspect of the capsule, and is essentially an extension from the tendon of insertion of semimembranosus

Synovial membrane, plicae and fat pads

The synovial membrane of knee is the most extensive and complex structure in the body. It forms a large suprapatellar bursa between quadriceps femoris and the lower femoral shaft proximal to the superior patellar border . The bursa is an extension of the joint cavity. The attachment of articularis genu to its proximal aspect prevents the bursa from collapsing into the joint. Distal to the patella, the synovial membrane is separated from the patellar tendon by an infrapatellar fat pad.

LIGAMENTS

Cruciate ligaments

The cruciate ligaments are very strong and are located a little posterior to the articular centre. They are termed cruiciate because they cross: anterior and posterior refer to their tibial attachments. Synovial membrane almost surrounds the ligaments but is reflected posteriorly from the posterior cruiciate to adjoining parts of the capsule. The

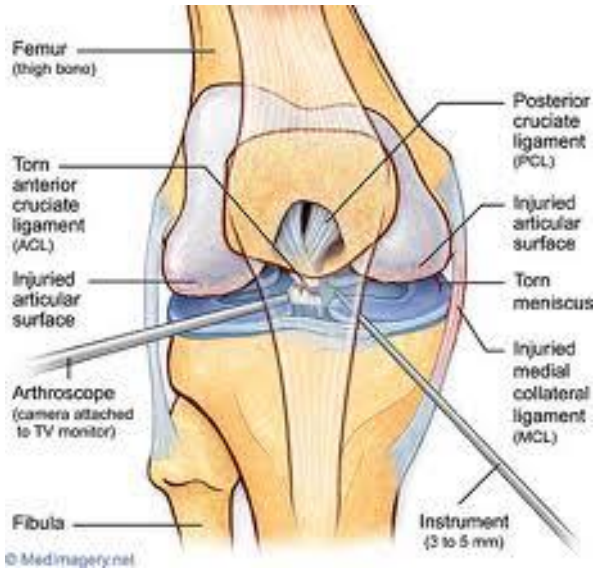
intercondylar part of the posterior region of the fibrous capsule therefore has no synovial covering.

Anterior cruciate ligament

The anterior cruciate ligament is attached to the anterior intercondylar area of the tibia, just anterior and slightly lateral to the medial tibial eminence, partly blending with the anteriror horn of the lateral meniscus. It ascends posterolaterally, twisting on itself and fanning out to attach high on the posteromedial aspect of the lateral femoral condyle.

Posterior cruciate ligament

The posterior cruciate ligament is thicker and stronger than the anterior cruiciate ligament. This is perhaps surprising because its rupture is usually better tolerated than of the anterior cruciate.

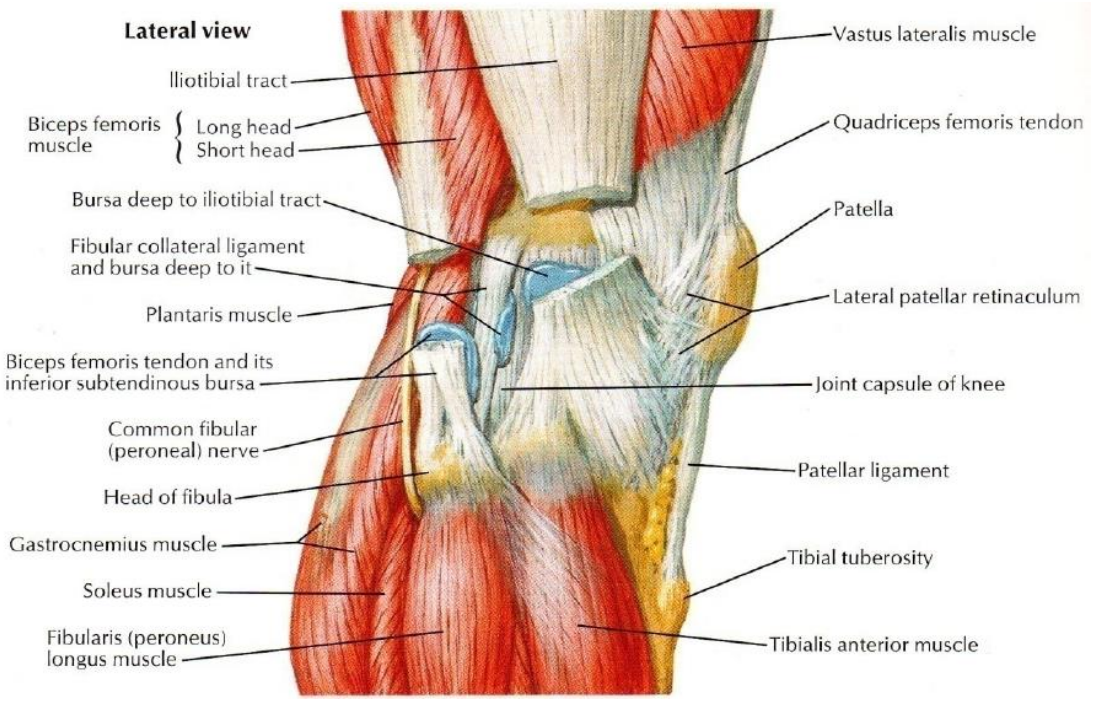


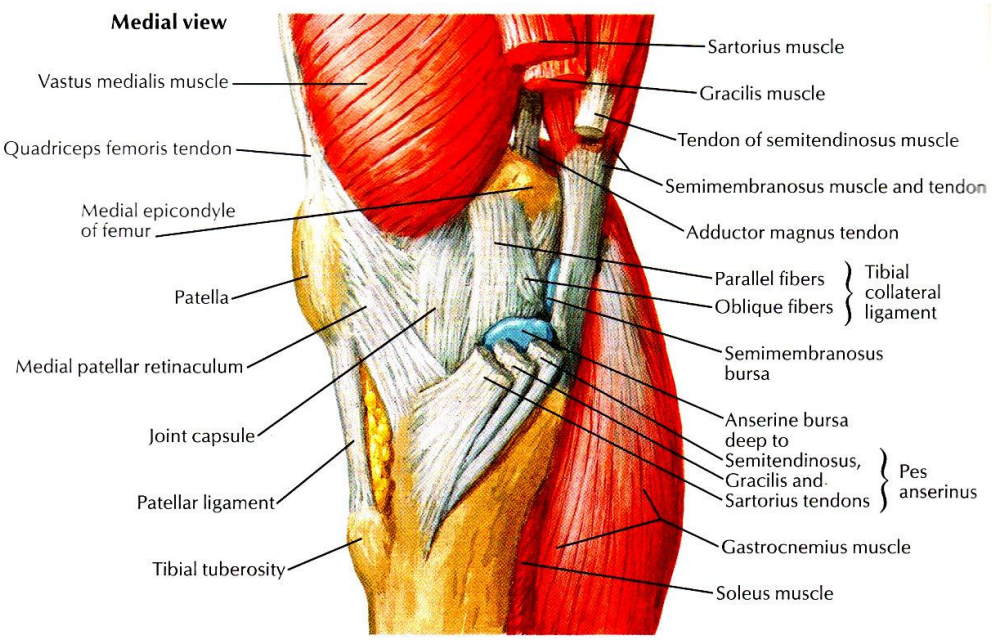
PATELLOFEMORAL JOINT

The patellofemoral joint, which is part of the knee joint, is a synovial joint.

Articulating surfaces

The articular surface of the patella is adapted to that of the femur, which extends onto the anterior surfaces of both condyles like an inverted U. Since the whole area is concave transversely and convex in the sagittal plane, it is an asymmetrical sellar surface. The ‘odd’ facet contacts the lateral anterior end of the medial femoral condyle in full flexion, when the highest lateral patellar facet contact the anterior part of the lateral condyle. As the knee extends, the middle patellar facets contact the lower half of the femoral surface and in full extension only the lowest patellar facets are in contact with the femur. In summary, on flexion the patellofemoral contact point moves proximally. The contact also broadens to cope with the increasing stress that accompanies rising flexion.





BLOOD SUPPLY

There is an intricate arterial anastomosis around the patella and femoral and tibial condyles. A superficial network spreads between the fascia and skin around the patella and in the fat deep to the patellar tendon. A deep network lies on the femur and tibia near the adjoining articular surfaces, and supplies the bone and marrow, the articular capsule, synovial membrane and the cruciate ligaments. The vessels involved are the superior, middle and inferior genicular branches of the popliteal artery, descending genicular branches of the femoral artery, the descending branch of the lateral circumflex femoral artery, the circumflex fibular artery and the anterior and posterior tibial recurrent arteries.

INNERVATIONS OF KNEE JOINT

The knee joint is innervated by branches from the obturator, femoral, tibial and common peroneal nerves. The genicular branch of the obturator nerve is the terminal branch of its posterior division. Muscular branches of the femoral nerve, especially to vastus medialis, supply terminal branches to the joint. Genicular branches from the tibial and common peroneal nerves accompany the genicular arteries: those from the tibial nerve run with the medial and middle genicular arteries, while those from the common peroneal nerve run with the lateral genicular and anterior and posterior tibial recurrent arteries.

PATHOPHYSIOLOGY OF OSTEOARTHROSIS

It has been demonstrated that Osteoarthrosis is not exclusively a disorder of articular cartilage. Multiple components of the joint are adversely affected by Osteoarthrosis, including the peri-articular bone, synovial joint lining and adjacent supporting connective tissue element.

The characteristic structural changes in Osteoarthrosis include

- The progressive loss of articular cartilage.
- Increased subchondral plate thickness.
- Formation of new bone at the joint margins (osteophytes) and
- The development of subchondral bone cysts.

In addition, at the junction of the articular hyaline cartilage and adjacent subchondral bone, in the region of so-called tidemark, there is a remnant of calcified cartilage. It will be multiple and discontinuous in elderly. As Osteoarthrosis progresses, there is evidence of vascular invasion and advancement of this zone of calcified cartilage into the articular cartilage. It further contributes to a decrease in articular cartilage thickness. These structural alterations in the articular cartilage and peri-articular bone may lead to modification of the contours of the adjacent articulating surfaces. These changes, as well as the accompanying alterations in subchondral bone remodelling and modulus, may further contribute to the development of an adverse biomechanical environment and enhance the progression of the articular cartilage deterioration.

Multiple factors have been shown to affect the progression of Osteoarthrosis, including the presence of polyarticular disease, increasing age, associated intra-articular crystal deposition, obesity, joint instability and / or mal alignment, muscle weakness and peripheral neuropathy. These factors can be segregated into categories that include hereditary contributions, mechanical factors and the effects of ageing.

There are several lines of evidence indicating that genetic factors contribute to the risk of Osteoarthrosis.

The articular surface plays an essential role in load transfer across the joint and there is good evidence that conditions that produce increased load transfer and / or altered patterns of load distribution can accelerate the initiation and progression of Osteoarthrosis.

Whereas it is clear that mechanical and genetic factors play major roles in determining the natural history of Osteoarthrosis, the primary risk factor is age. The aging process contributes to Osteoarthrosis pathogenesis in several ways. The first relates to the influence of the ageing process on the structural organization and material properties of the cartilage extracellular matrix (ECM). There is evidence that the major components of the ECM, which consists of type II collagen and proteoglycan, undergo structural changes during the ageing process. For example, aggrecan, which is the major cartilage proteoglycan, decreases in size and structural organization and its content in the ECM diminishes, likely contributing to an alteration in the biomechanical properties of the matrix. In addition, there is evidence of accumulation of advanced

glycation end products (AGEs). This process has been shown to enhance collagen cross-linking and likely is a significant contributing factor to the increase in cartilage stiffness and altered biomechanical properties that has been observed with ageing.

There is evidence that capacity to remodel and repair the cartilage ECM diminishes with age, and this appears to be related primarily to a decreased anabolic capacity. This may in part be related to the diminished capacity of the chondrocyte to respond to anabolic stimuli such as insulin-like growth factor.

Essential to the development of more effective strategies for treating patients with Osteoarthrosis and in altering the natural history of this disorder, is an understanding of the cellular processes that regulate the functional activities of chondrocytes in both physiological and pathological conditions.

CAUSE OF PAIN IN OSTEOARTHROSIS

The majority of patients with osteoarthrosis present to orthopaedic surgeons seeking relief of pain and associated restoration of function. Cartilage itself is aneural but there is rich sensory innervations of other joint tissues. Unmyelinated type C-fibers capable of nociception are sparsely but specifically distributed in the knee. Most are located outside the synovial space, within bone, periosteum, and capsule. Within the joint space, these fibers seem to be confined to the outer rim of the meniscus and through some areas of synovium, particularly if the synovium is inflamed.

Basett and McGlone (1928)

Felt that the pain in ostearthrosis is due to deformation of the sinusoids which stimulated the vaso sensory endings.

Magnuson (1941)

Believed that the pain in osteoarthrosis is because of the two rough surfaces moving against each other. They believed that roughness within the joint was responsible for the gradual building up of the joint obstruction in the form of rough surfaces and exostosis around the margin and that the synovial membrane was not in any way responsible for the symptoms or the continuation of the symptoms. He emphasized on complete removal of mechanical irritants in his debridement procedure.

Liyod and Robert (1953)

Found that fragments from degenerated articular cartilage surfaces, presumably detached by trauma are taken up by the synovial membrane and give rise to an inflammatory response and fibrosis. This shortening of the capsule which follows the fibrosis may give rise to the pain on movements.

Harrison, Schatjowich and Trueta (1953)

In their injection studies on cadavers found a hyperplasia of intra-osseous arteries in the femoral head and on the basis of these observations they assumed that the arterial inflow to the weight bearing cancellous bone was increased in osteoarthrosis.

Trueta (1954)

Stated that there is an associated hypervascularity of the juxta-articular bone which may also be a source of pain.

Lawrence (1962)

The degree of trauma which is required to produce ligamentous strain in osteoarthritic joints may be so slight as to be forgotten by patient. He proposed these ligaments strains as the main cause of pain.

Helal (1963)

Described three distinct types of pain in osteoarthrosis.

- **Muscular** : It is a cramp like pain felt in the quadriceps muscle. It is more during activities and also persists for some time after stopping exercise. It can be elicited by static exercise of the quadriceps in those patients who has this type of pain.
- **Capsular** : It is a sharp pain usually felt on the inner side of the back of the knee. It occurs with movements of the joint. It can be produced by forced extension or flexion and can be relieved temporarily by injection of anaesthetics into capsule and ligaments of the joint.
- **Venous** : It is a dull aching or throbbing pain felt diffusely around the knee. It worsens towards the end of the day and persists for a while after retiring to bed. This pain can be artificially produced by raising the intramedullary pressure in the bone adjacent to the affected joint.

Helal, by means of intra-osseous phlebography found evidence of disturbed venous outflow from the epiphysis and metaphysis of the distal third of femur in osteoarthritic knee.

Ondoucher (1963) : Proposed that tension within the subchondral cyst may be the cause the pain.

Meerit (1989) : Intra-articular hypertension caused by synovial hypertrophy, excess fluid, or mechanical derangement may stimulate capsular mechanoreceptors and ischaemia from mild synovitis may excite synovial nociceptors.

Rand (1991) : In their retrospective review of the outcome after arthroscopic debridement in patients with osteoarthrosis, they found that those patients who underwent partial meniscectomy as part of the procedure were more likely to improve.

Fisheer (1993) : Thought that periarticular involvement is common and often overlooked as cause of knee pain. These include – bursitis, enthesopathy, tendinitis, ligamentous sprain and myalgia.

Despite decades of study, the relationship of pathology in the subchondral bone to cartilage breakdown in osteoarthrosis is still an enigma. Interest in this relationship has increased recently because of observation that.

1) **Bone marrow edema** may be related to both pain and bone remodelling in osteoarthrosis.
2) **Osteocytes** undergo metabolic changes related to bone remodelling and secrete cytokines that stimulate cartilage degeneration.
3) **Focal osteonecrosis** occurs in osteoarthrosis, suggesting common mechanisms of disease.

MANAGEMENT OF OSTEOARTHROSIS

Goals of managing Osteoarthrosis include controlling pain, maintaining and improving the range of movement and stability of affected joints, and limiting functional impairment. Many options exist for the management of osteoarthritic knee.

Non Operative Treatment

This is always the first line of treatment. Surgical treatment is offered only after conservative treatment fails.[51]

Education

Education of patients with Osteoarthrosis can reduce their pain and improve their quality of life. The aim is to provide patients, with an understanding of the disease process, its prognosis and the rationale and implications of managing their condition.

Rest

During an acute episode, bed rest is recommended to reduce the inflammation.

Weight Loss

Being overweight is the single most important potentially modifiable risk factor for the development of lower limb Osteoarthrosis. It can be achieved by diet and exercises.

Physical Therapy Interventions

It is generally accepted that a therapeutic exercise program can improve functional capability and provide an analgesic effect in Osteoarthrosis patients without exacerbating their symptoms. Exercise

therapy should be individualized and patient centered so as to take into account, factors such as age, co-morbidity, and overall mobility.

1) **Range of Motion Exercises** : An osteoarthritic joint should be put through a full functional range of motion on a regular basis. Range of motion exercises are generally important in order to prevent motion loss that can occur within the osteoarthritic joint.
2) **Stretching Exercises** : All muscle groups crossing a joint should be stretched so as to prevent abnormal force to develop across a joint as might occur if that muscle group is tight.
3) **Muscle Strengthening Exercises :** Isometric rather than isotonic exercises are preferred to build muscle power while minimizing joint stress.

Mechanical aids

Load on the joint is decreased by using stick, crutches or walker. Patients should be encouraged to wear shock-absorbing footwear with good medio-lateral support, adequate arch support and calcaneal cushion. Lateral heel wedges may reduce pain related to Osteoarthrosis of the medial tibio-femoral compartment. In patients with significant varus deformity, use of a tube-like knee support or an unloader brace both reduce pain.

Traction

Traction is used in acute inflammatory stages to separate the joint surfaces and to stretch the contracted capsule.

Aerobic Conditioning

The mechanism by which aerobic conditioning exercises yield an analgesic effect is not completely clear. However, there is evidence that aerobic conditioning exercises cause the release of endogenous opioids.[52]

Pharmacological treatment

1) Analgesics and anti-inflammatory drugs.
2) Intra-articular therapy

   Viscosupplementation or Hyaluronic Acid Replacement Therapy : Hyaluronic acid (hyaluronan) therapy has been shown to modulate pain in Osteoarthrosis of the knee with variable evidence of potential disease-modifying effects on articular cartilage.[49,53]
3) **Nutraceuticals** : Although the nutraceuticals, glucosamine and chondroitin sulfate continue to be controversial, evidence is accumulating to suggest that, individually or in combination, they yield significant improvement in pain compared with placebo.[54]

Alternative Medicine

Various herbs such as ginger, avocado oil, soybean oil has been found useful but no clinical trials are available. Other modalities such as acupuncture, yoga have also been found useful for relieving the pain.

Surgical Management

When non-operative treatment of Osteoarthrosis of the knee fails to alleviate pain, and knee function is compromised, operative intervention is warranted. Various options are available which are –

Open Debridement

As described by Magnuson in 1941. This procedure includes complete removal of all the diseased tissue and mechanical irritants.

Arthrodesis : Gives a stable and pain free joint at the cost of mobility.

High Tibial Osteotomy :

Described by Jackson and Waugh in 1958. Gives pain relief and mobility. Especially useful for unicompartmental osteoarthrosis.

Arthroplasty

Introduced as a simple concept in the late 1960s by Gunston. It gives pain relief, stability and mobility. It can be unicompartmental or total knee replacement.[55]

Arthroscopic lavage and debridement

HOW LAVAGE WORKS

Various mechanisms have been given behind the improvement in osteoarthrosis due to arthroscopic lavage and debridement.

There are

1) Removal of cartilage debris, proliferation of synovium, osteophytes, etc, interrupts the joint degeneration – the damage – the vicious circle of degeneration.
2) Removal of mediators of inflammation such as cytokines.
3) Cooling effect.
4) By adjusting the osmotic pressure of the synovial fluid and pH, and by adding electrolyte to improve the intra-articular environment, thus restoring the normal secretion of synovial fluid and improving the nutritional supply of cartilage.
5) Dilution of the degenerative compounds.
6) Disrupts the adhesions.
7) Degenerated meniscus and loose body removal relieves the pain and locking.
8) Placebo effect.

MATERIALS AND METHODS

This study was done in R.L.Jalappa Hospital and Research centre attatched to Sri Devaraj Urs Medical College,Tamaka, Kolar, from november 2010 – june 2013.Total number of patients in the study were 30.

Inclusion criteria :

1. Age>50 years.
2. Joint space>=2mm.
3. Associated with loose bodies and meniscal tears.

Exclusive criteria :

1. Patients with secondary osteoarthritis.

A thorough history was taken and clinical examination was done. Standard anterio-posterior and lateral plain radiographs of the knee were taken and grading was done using the Kellgren and Lawrence system into 4 grades.

Radiological grading of osteoarthrosis was done by

The Kellgren and Lawrence system (1958)

Grade I : Unlikely narrowing of the joint space, possible osteophytes.

Grade II : Identified small osteophytes, possible narrowing of the joint.

Grade III : Multiple, moderately size osteophytes, definite joint space narrowing, some sclerotic areas, possible deformation of bone ends.

Grade IV : Multiple large osteophytes, severe joint space narrowing, marked sclerosis and definite bony end deformity.

A written informed consent was taken prior to the surgery regarding the procedure.

Operative procedure

Patient positioned supine over the operating table, under spinal anaesthesia and tourniquet was applied. Parts were scrubbed, painted and draped.

With knee flexed 70 degrees the patellar apex palpated and a longitudinal stab incision is made just lateral to the border of the patellar tendon – this is the anterolateral portal.

Similarly medial side portal was made – Anteromedial portal.

Following compartments are examined.

- Suprapatellar pouch.
- Medial compartment
- Medial para patellar gutter
- Lateral para patellar gutter
- Patellofemoral joint
- Intercondylar notch
- Lateral compartment

We specifically define arthroscopic debridement as

1) Joint lavage that includes dilution of the concentration of degradative enzymes as well as removal of small, free, mechanically irritating products of chondral, meniscal or synovial degeneration;
2) Removal of discrete chondral or osteochondral loose bodies.
3) Partial meniscectomy, and / or
4) Judicious chondroplasty.

After examining the joint, all degenerative tissues were removed.

Loose body if any were also removed.

Menisci and cruciate ligaments were examined. Torn and degenerated fragments were removed and menisci were balanced.

Thorough lavage was given with normal saline, cartilage debris (wear particle, macromolecules) were be seen in wash fluid.

Skin incision was closed with 2-0 ethilon.

Sterile dressing and compression bandage was applied and tourniquet was deflated.

Articular cartilage degeneration was graded according to the outer bridge's arthroscopic classification.

The Outer Bridge classification

- **Grade 0 :** Normal.
- **Grade I :** Softening and swelling of the articular cartilage.
- **Grade II :** Partial thickness fissures.
- **Grade III :** Full thickness fissures.
- **Grade IV** : Bone exposed.

Post operative management

Intravenous antibiotics and anti inflammatory drugs were given as a routine. Post operative dressing was done in the form of compression bandage which is removed the next day.

Quadriceps and hamstrings strengthening exercises were started from 1st post operative day,and patient made to walk the same day with help of walker. As soon as patients were mobilized out of bed,they were discharged.

Sutures were removed on 14th post operative day.

At 6 months follow up the results were evaluated based on the different variables _ varus deformity / radiographic grading / arthroscopic grading to determine the indications for arthroscopic lavage and debridement for osteoarthrosis of the knee joint.

EVALUATION OF RESULTS BASED ON

Rationale of the knee society clinical rating system[56]

KNEE SCORE (1989)

Pain

None	50
Mild or occasional	45
Stairs only	40
Walking & stairs	
Moderate	30
Occasional	20
Continual	10
Severe	0

Range of motion : (5 degree = 1 point) 25

STABILITY (maximum movement in any position)

Anteroposterior

<5 mm	10
5 – 10 mm	5
10 mm	0

Mediolateral

$<5^0$	15
$6^0 – 9^0$	10
$10^0 – 14^0$	5
$>15^0$	0

Subtotal = ……

Flexion contracture

$5^0 – 10^0$	2 points
$10^0 – 15^0$	5
$16^0 – 20^0$	10
$>20^0$	15

Extension lag

$<10^0$	5
$10^0 – 20^0$	10
$>20^0$	15

Alignment

$5 – 10^0$	o points
$0 – 40^0$	3 points each degree
$11 – 15^0$	3 points each degree
Other	20

Total deductions = ……

Knee score = ……

FUNCTIONAL SCORE

Walking

Unlimited	50 points
>10 blocks	40
5 – 10 blocks	30
<5 blocks	20
Housebound	10
Unable to walk	0

Stairs

Normal up and down	50
Normal up, down with rail	40
Up & down with rail	30
Up with rail; unable down	15
Unable	0

Sub total = ……

Deductions

1 cane	5 points
Two canes	10
Crutches or walker	20

Total deductions = ……

Functional score = ……

Score – 100 – 80 = Excellent, 70-79=Good, 60-69=Fair and <60=poor.

OBSERVATIONS AND RESULTS

Table No.1

Sex Distribution

Sex	Frequency	Percent
M	14	46.7
F	16	53.3
Total	**30**	**100.0**

Chart No.1

Sex Distribution

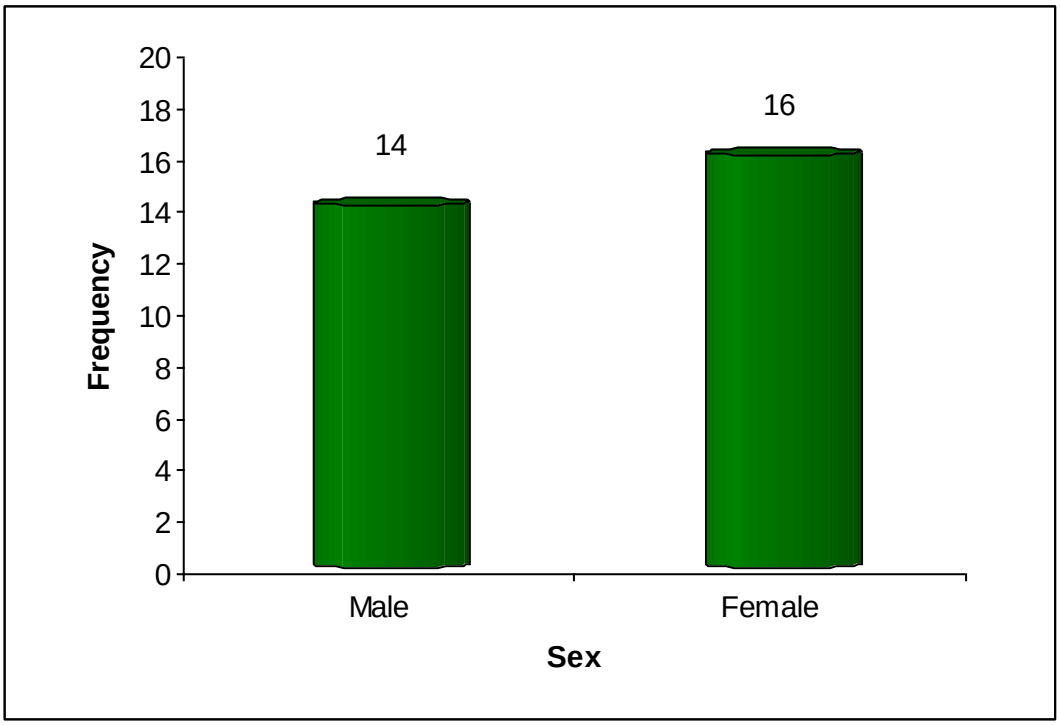


Table No.2

Side Involved

Side	Frequency	Percent
Right	16	53.3
Left	14	46.7
Total	**30**	**100.0**

Chart No.2

Side Involved

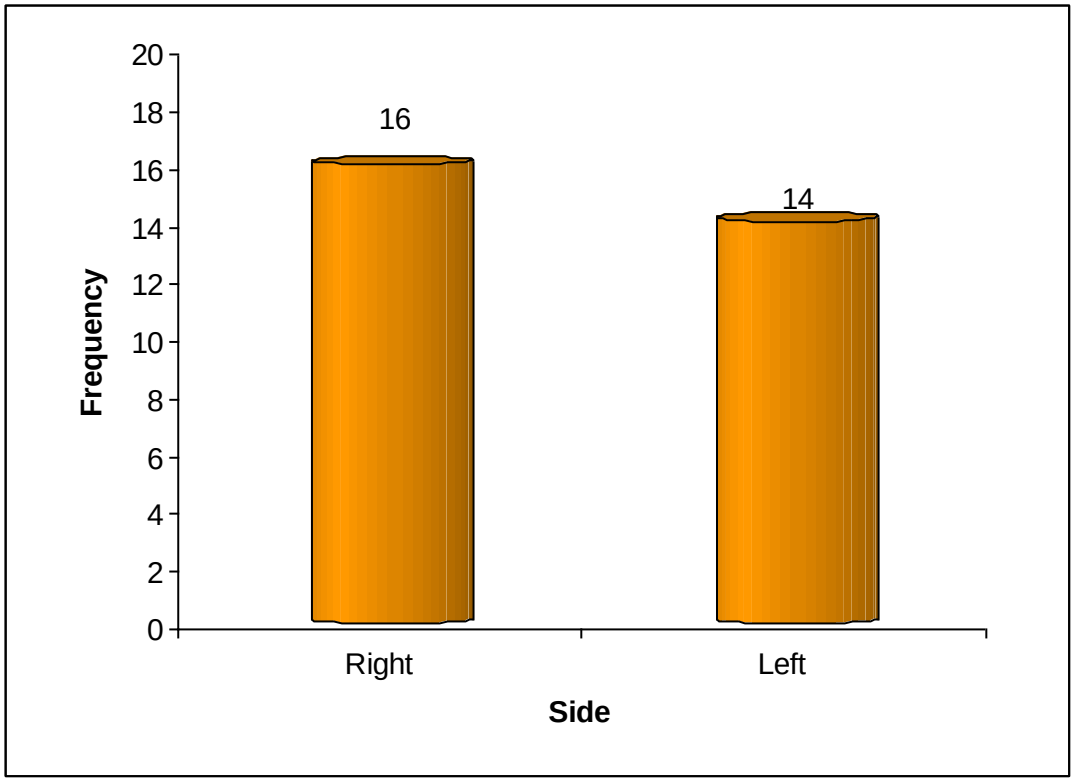


Table No.3

Varus Angulation of the Knees

Angulation	Frequency	Percent
$>10^0$ (+)	9	30.0
$<10^0$ (-)	21	70.0
Total	**30**	**100.0**

Chart No.3

Varus Angulation of the Knees

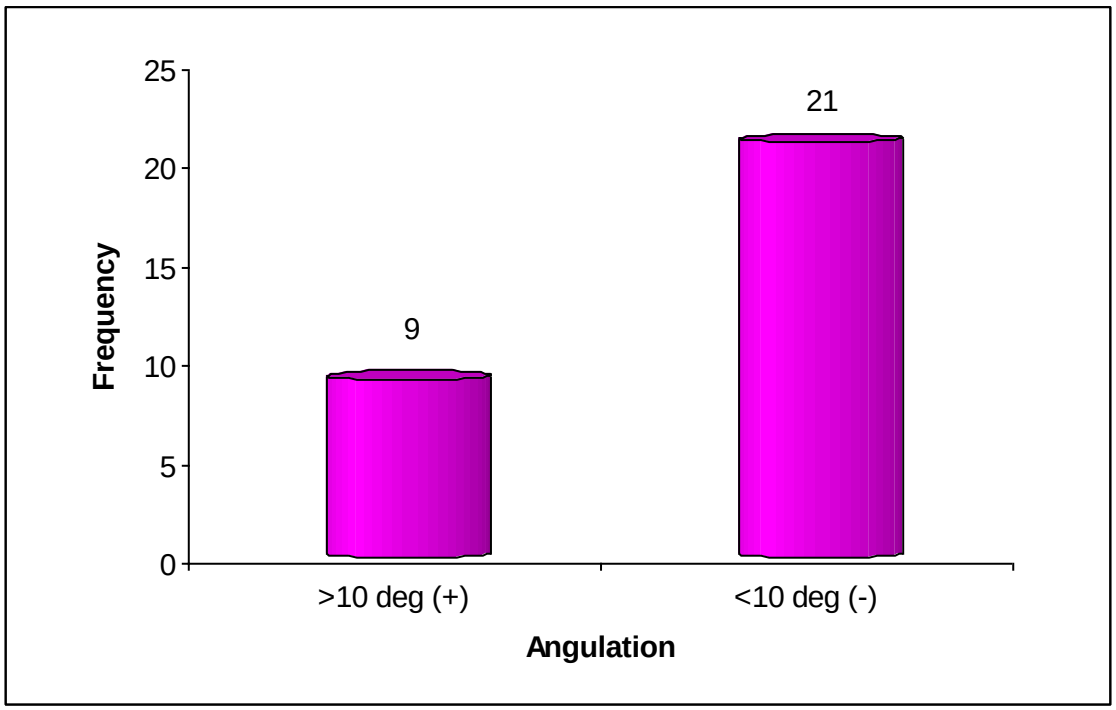


Table No.4

Radiological grading

Grades	Frequency	Percent
I	5	16.67
II	9	30.0
III	13	43.33
IV	3	10.0
Total	**30**	**100.0**

Chart No.4

Radiological grading

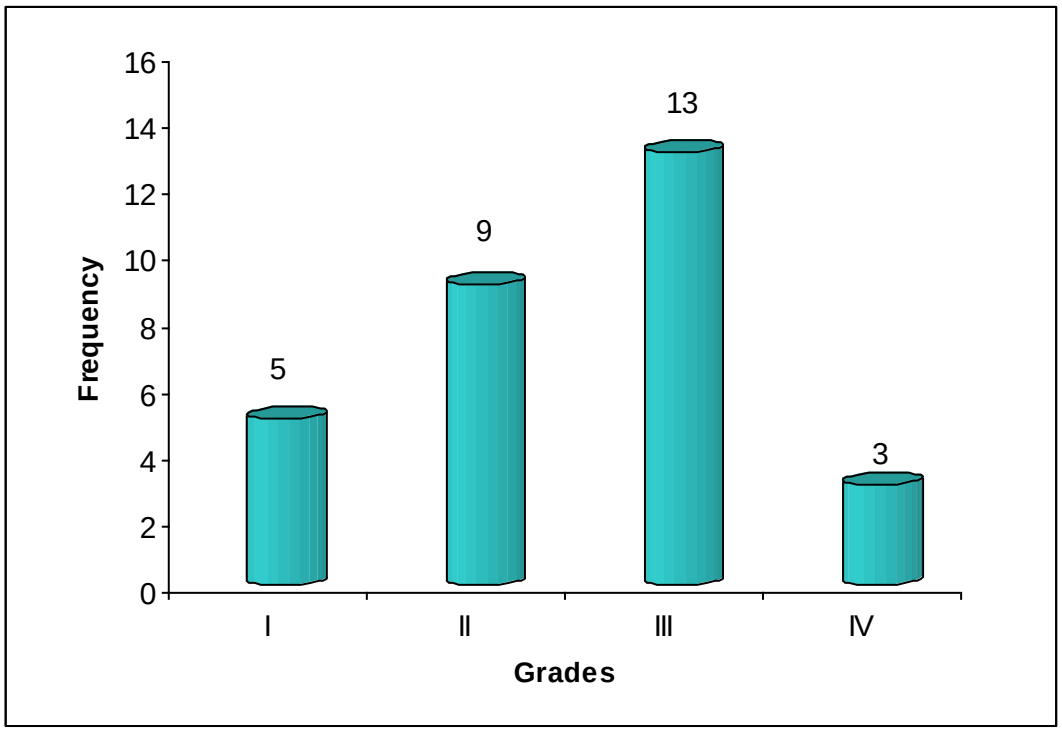


Table No.5

Loose bodies

Loose bodies	Frequency	Percent
Present (+)	7	23.33
Absent (-)	23	76.67
Total	**30**	**100.0**

Chart No.5

Loose bodies

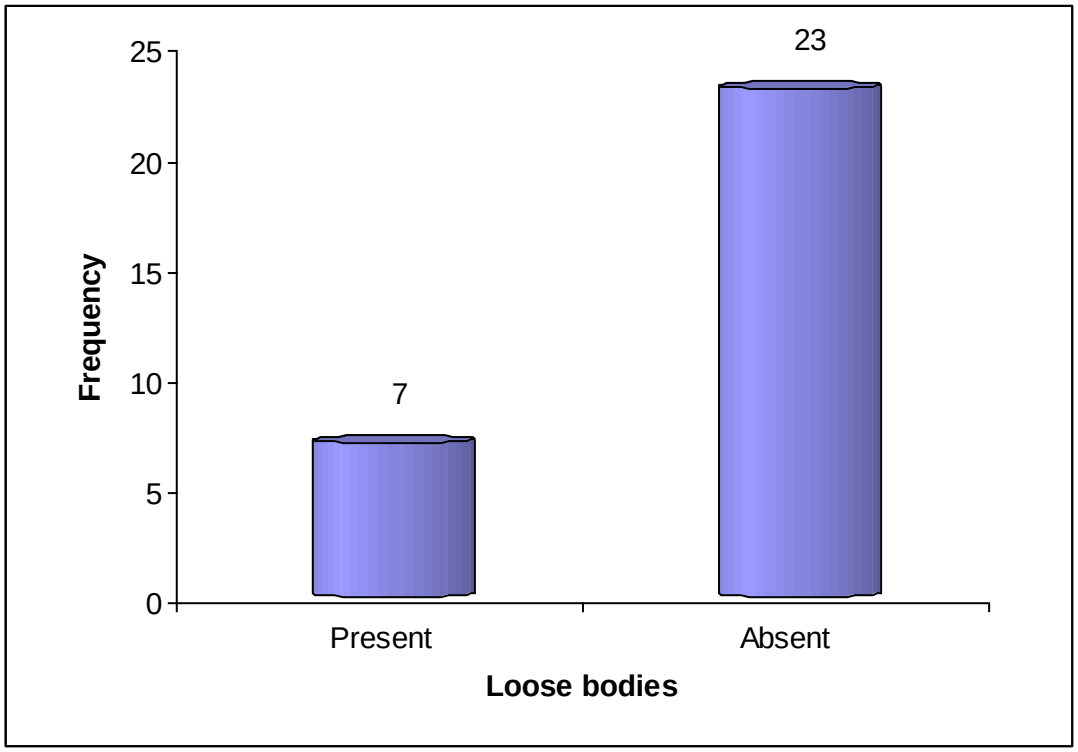


Table No.6

Meniscal tear

Meniscal tear	Frequency	Percent
Present (+)	10	33.33
Absent (-)	20	66.67
Total	**30**	**100.0**

Chart No.6

Meniscal tear

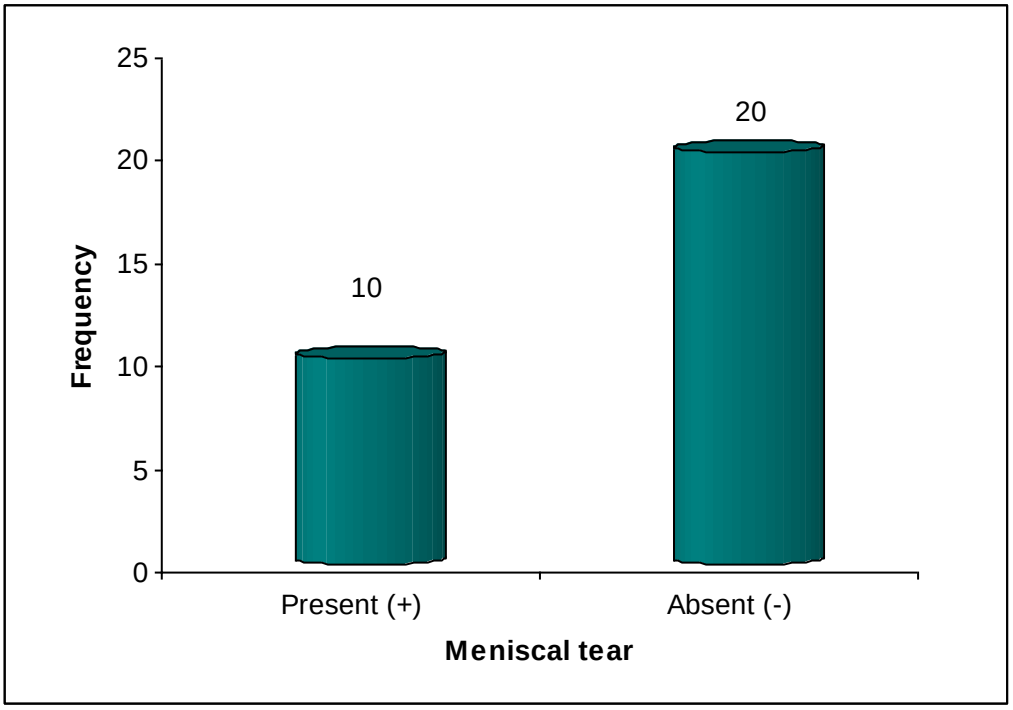


Table No.7

Arthroscopic grading

Grades	Frequency	Percent
I	2	6.67
II	14	46.67
III	9	30.0
IV	5	16.67
Total	**30**	**100.0**

Chart No.7

Arthroscopic grading

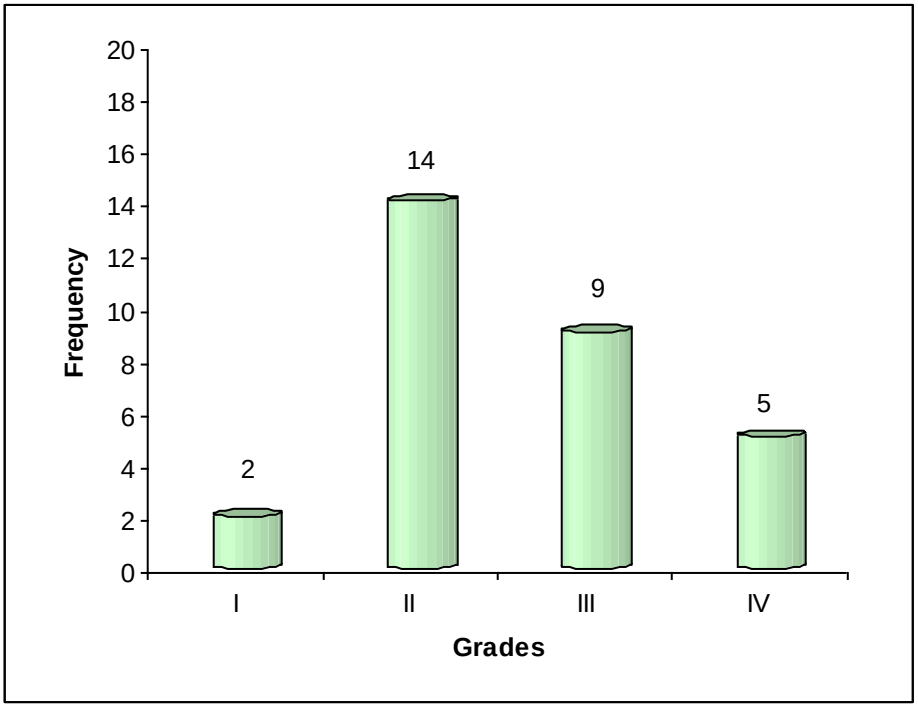


Table No.8

Assessment at 1 month follow up

Total No. of patients = 30

Results	Frequency	Percent
Excellent	16	53.3
Good	10	33.3
Fair	4	13.4
Total	**30**	**100.0**

At 1 month follow up 86.6% patients had excellent to good results.

Chart No.8

Assessment at 1 month follow up

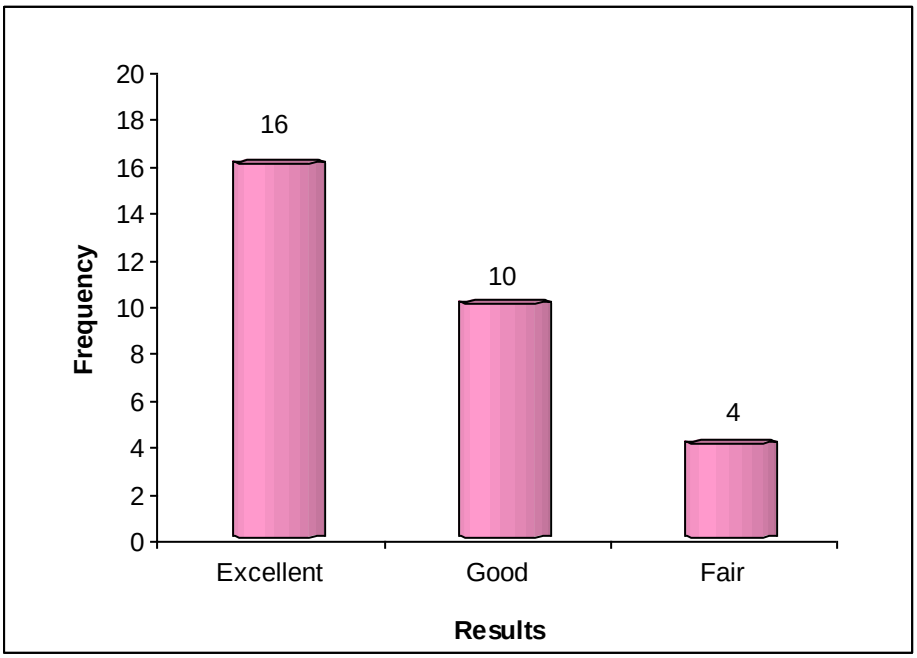


Table No.9

Assessment at 6 month follow up

Total No. of patients = 30

Results	Frequency	Percent
Excellent	5	16.7
Good	13	43.3
Fair	9	30.0
Poor	3	10.0
Total	**30**	**100.0**

At 6 month follow up 60% patients had excellent to good results.

Chart No.9

Assessment at 6 month follow up

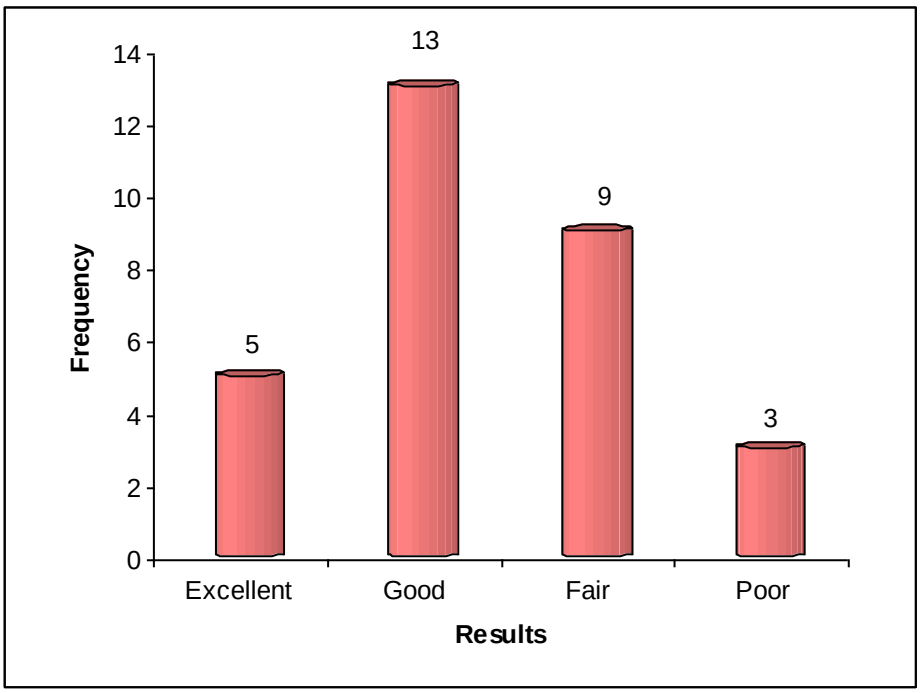


Table No.10

Assessment at 12 month follow up

Total No. of patients = 14

Results	Frequency	Percent
Excellent	1	7.1
Good	4	28.6
Fair	4	28.6
Poor	5	35.7
Total	**14**	**100.0**

At 12 months follow up 35.7% patients had excellent to good results

Chart No.10

Assessment at 12 month follow up

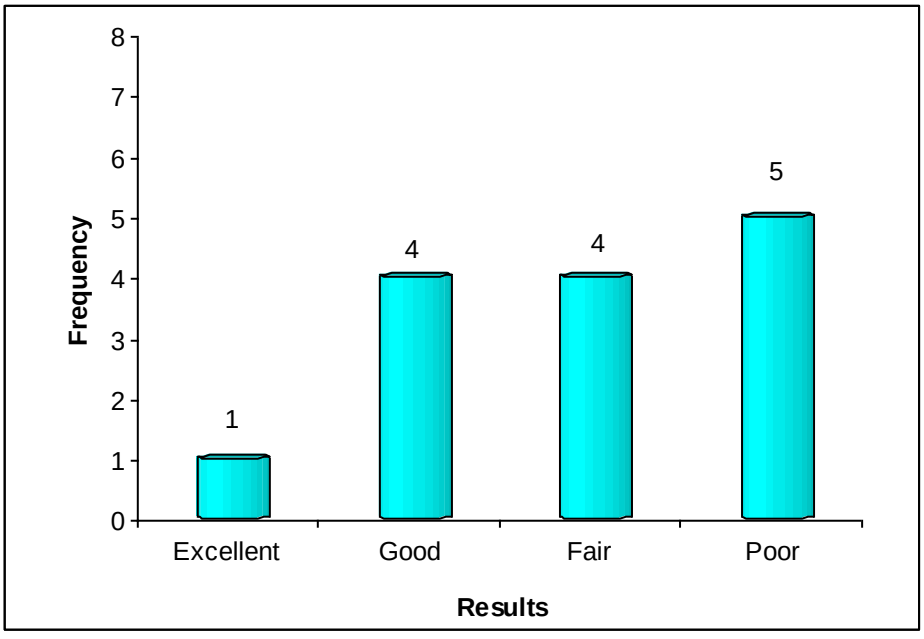


Table No.11

Results versus Varus angulation – 6 months

Results	Varus angulation		Total
	$>10^0$ (+) (n=9)	$>10^0$ (+) (n=21)	(n=30)
Excellent	0 0%	5 23.8%	5 16.7%
Good	0 0%	13 61.9%	13 43.3%
Fair	6 66.7%	3 14.3%	9 30%
Poor	3 33.3%	0 0%	3 10.0%

χ^2 = 18.64 p value = 0.0003 Highly Significant.

Chart No.11

Results versus Varus angulation – 6 months

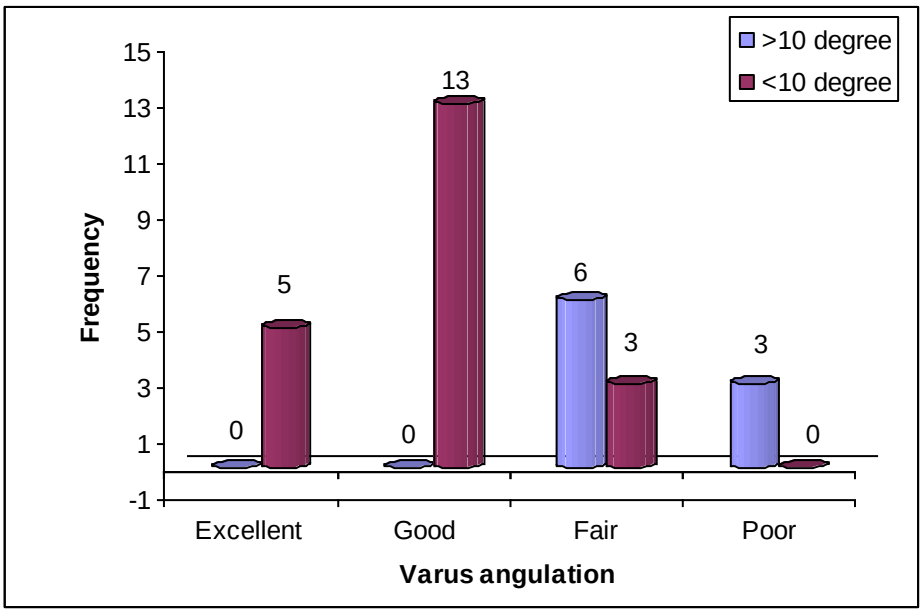


Table No.12

Results versus Radiological grading – 6 months

Results	Radiological				Total
	I (n=5)	II N=9)	III (n=13)	IV (n=3)	(n=30)
Excellent	3 60%	2 22.2%	0 0%	0 0%	5 16.7%
Good	2 40%	7 77.8%	4 30.8%	0 0%	13 43.3%
Fair	0 %	0 0%	8 61.5%	1 33.3%	9 30%
Poor	0 %	0 0%	1 7.7%	2 66.7%	3 10%

χ^2 = 32.34 p value = 0.0001 Highly Significant.

Chart No.12

Results versus Radiological grading – 6 months

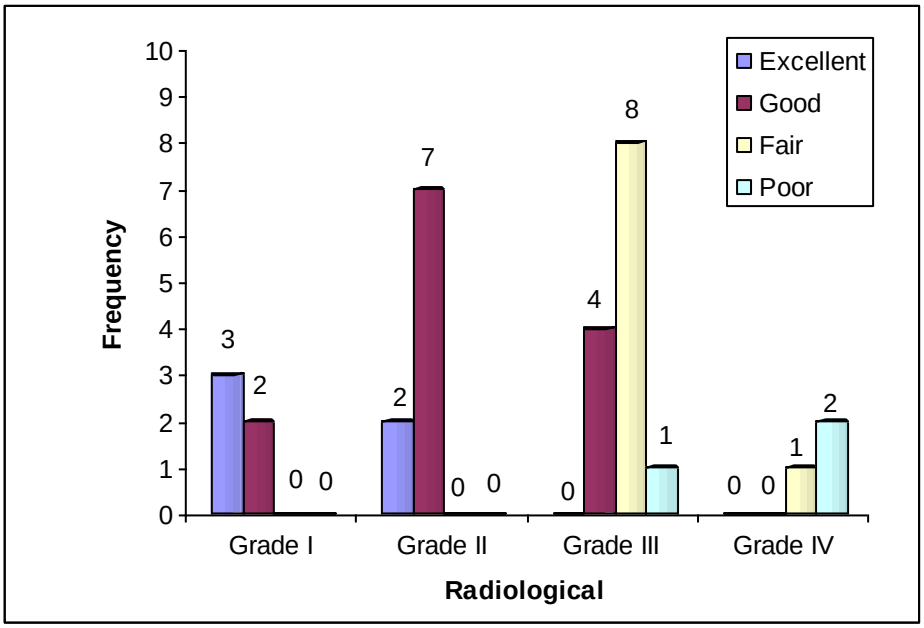


Table No.13

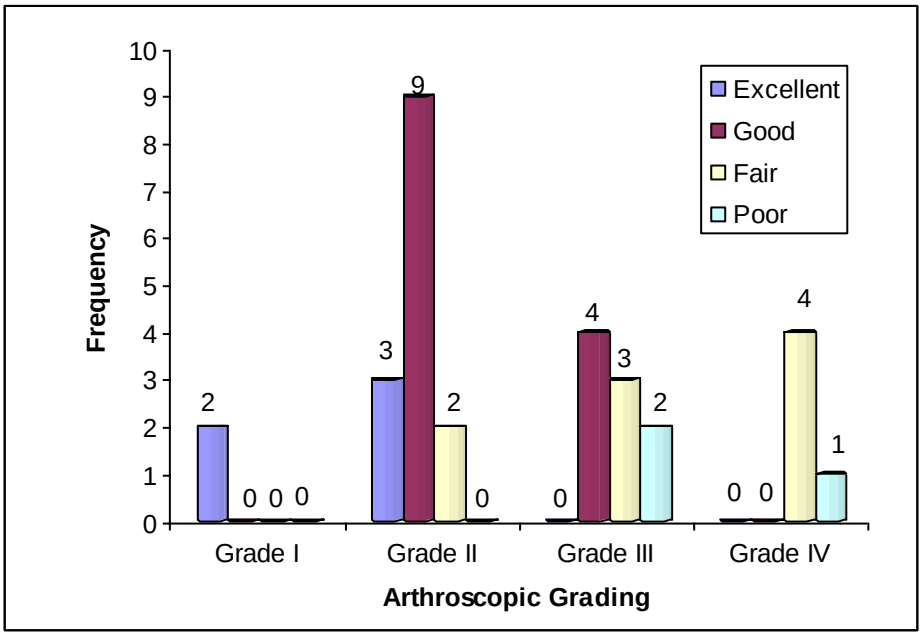
Results versus Arthroscopic grading– 6 months

Results	Arthroscopic grading				Total
	I (n=2)	II N=14)	III (n=9)	IV (n=5)	(n=30)
Excellent	2 100%	3 21.4%	0 0%	0 0%	5 16.7%
Good	0 0%	9 64.3%	4 44.4%	0 0%	13 43.3%
Fair	0 0%	2 14.3%	3 33.3%	4 80.0%	9 30.0%
Poor	0 0%	0 0%	2 22.3%	1 20.0%	3 10.0%

χ^2 = 27.92 p value = 0.0009 Highly Significant.

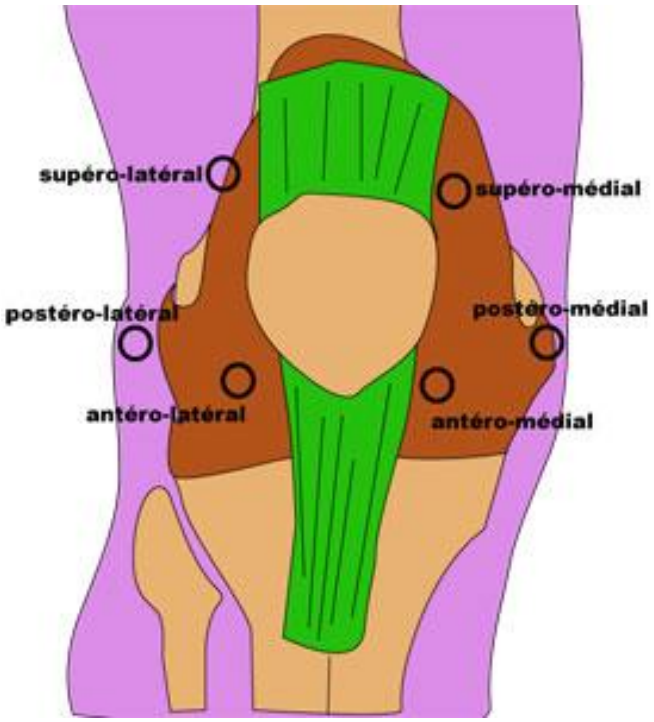
Chart No.13

Results versus Arthroscopic grading– 6 months



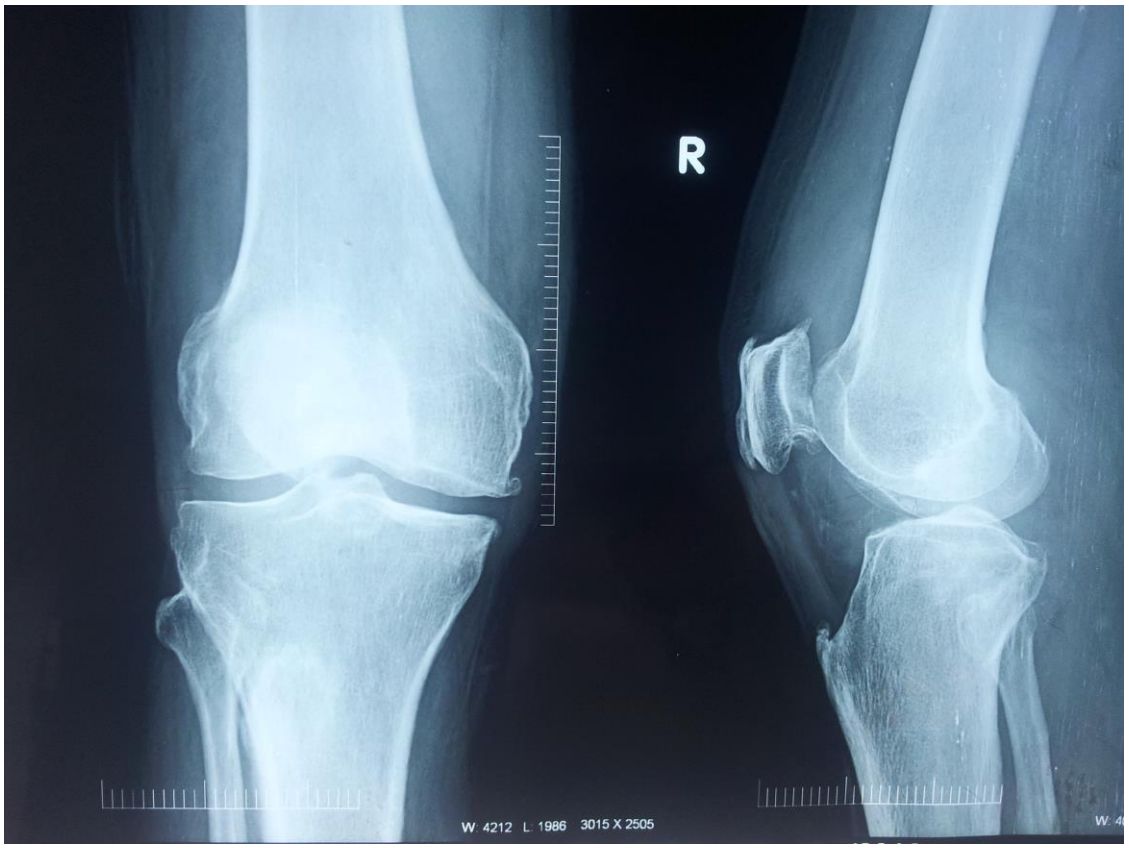
ARTHROSCOPIC INSTRUMENTS

ARTHROSCOPIC PORTALS

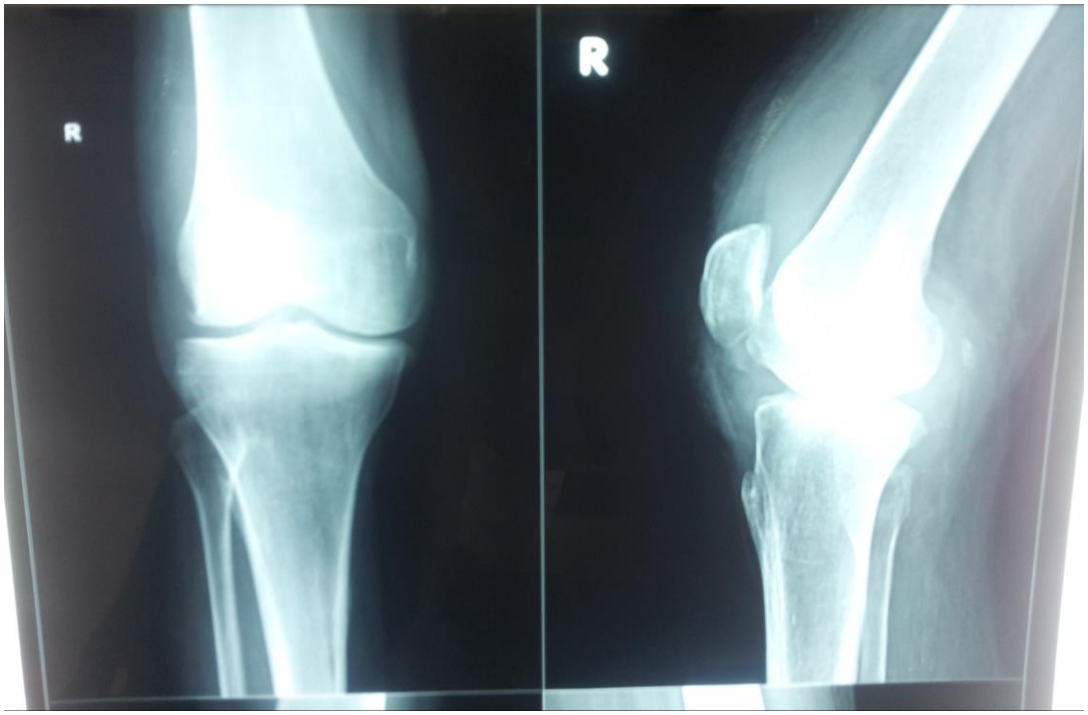


X-RAYS

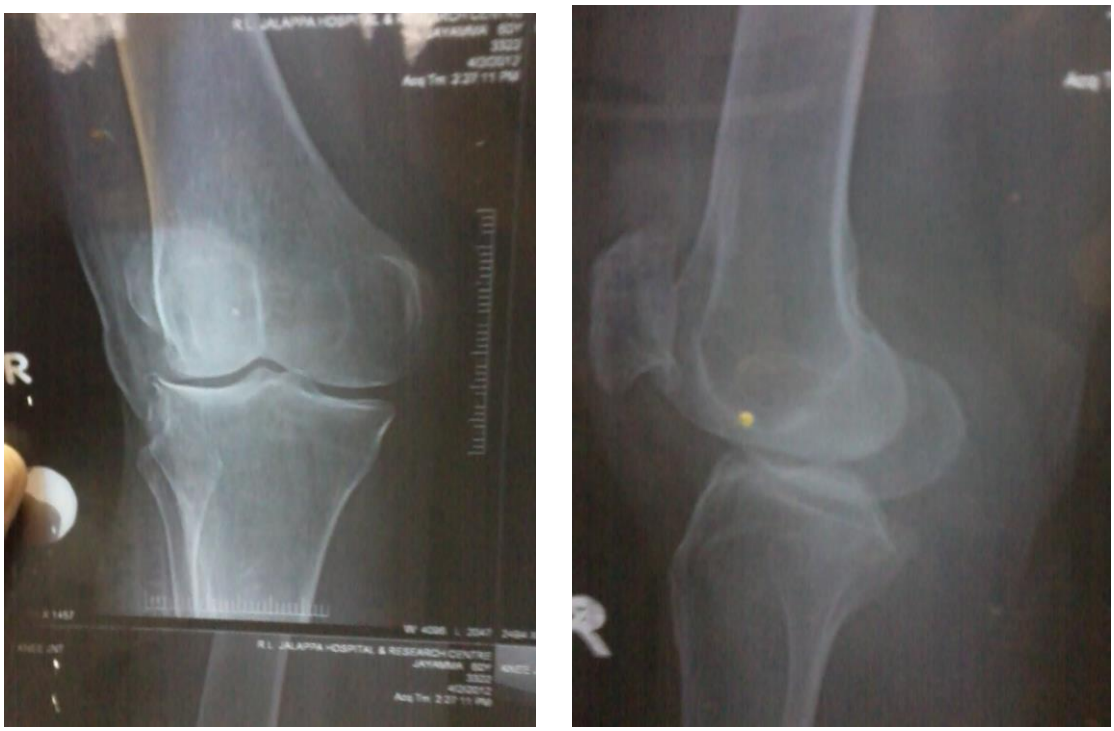
Case No.3



Case No.6



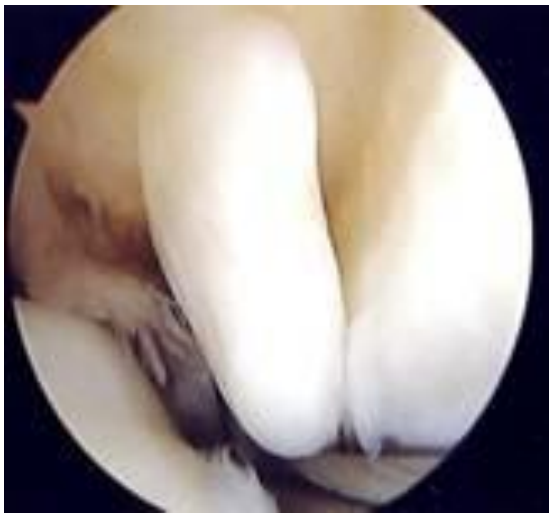
Case No.4



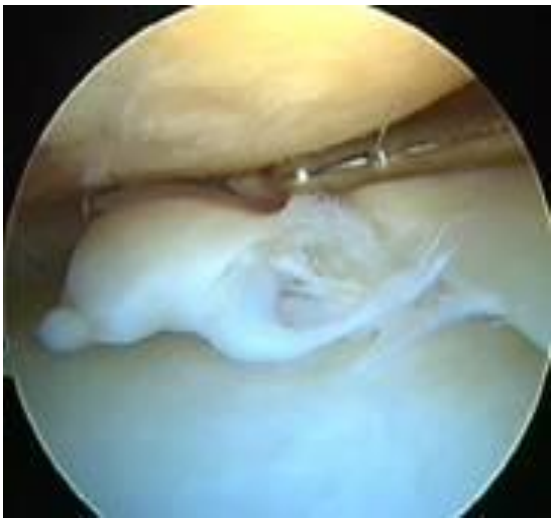
Case No.5

LOOSE BODY

Case No.8

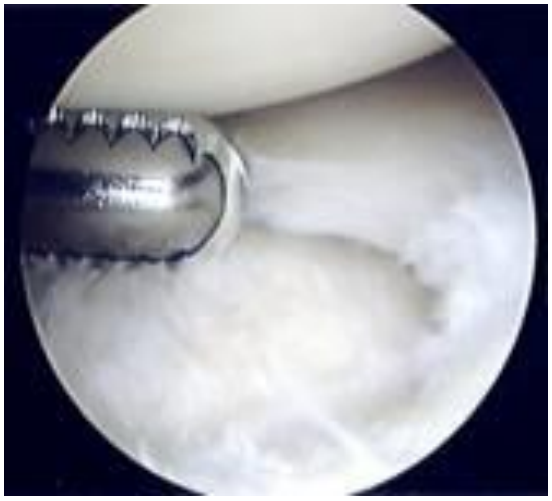


Case No.14



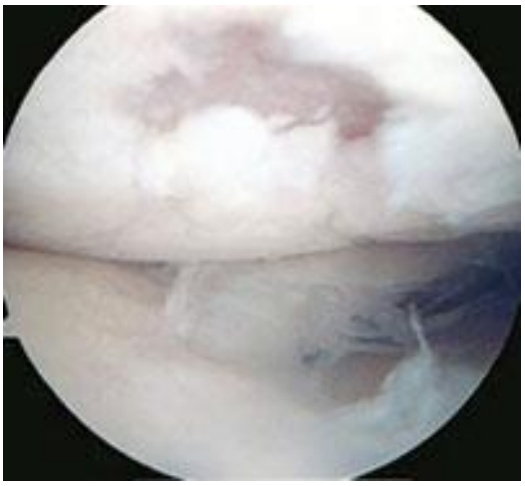
Meniscal Tear

Case No.10



Osteochondral defect

Case No.1



DISCUSSION

In our study we performed arthroscopic lavage and debridement for thirty patients with primary osteoarthrosis knee. We carefully examined the knee joint and did joint lavage that included dilution of the concentration of degradative enzymes as well as removal of small, free, mechanically irritating products of chondral, meniscal or synovial degeneration. we removed discrete chondral or osteochondral loose bodies, did partial meniscectomy, and / or judicious chondroplasty, removing unstable cartilage but taking care not to damage healthy cartilage.

At the end of 1month, 86.6% had excellent to good results and at the end of 6 months, 60% of our patients were having significant improvement in their pain and function, 30% of the patients were having some pain relief whereas 10% patients were not having improvement. Those patients with poor outcome had severe osteoarthrosis and had mal aligned knee joint.

We have evaluated our results with variables like grade of osteoarthrosis, mal alignment of the knee and presence or absence of mechanical irritants.

Mal-alignment: Previous studies underline the importance of minimal axial limb mal alignment and biomechanically stable joints in achieving good results.[16,38]In our study we have found out that patients with malalignment >10 degrees have poor outcome and their pain returns to pre operative levels within 6 months.

Radiological grading : Previous studies had showed significant correlation between pre-operative radiological grading and the outcome.[50]In our study also we have found that there is significant correlation between these two and patient with grade I or II arthritis do well with the procedure. Patients with grade III arthritis had fair improvement.

Mechanical irritants : A study stated that patients with mechanical irritants such as loose bodies or degenerative meniscal tears are more likely to benefit from arthroscopic lavage and debridement.[41] In our study we have found that all the paitents with loose bodies or meniscal tears had excellent to good results after arthroscopic removal. The response was long lasting. .

Judicious debridement : A study reported that over-debridement leads to poorer functional outcome.[38] We also suggest that the surgeon should be judicious in his debridement. The purpose of this surgical technique is not to restore the cartilage integrity or the lower limb alignment but to remove the intraarticular irritating factors with the purpose to alleviate the knee pain and to slow down the Osteoarthrosis progression.

Subjective element : A study in 2002 suggested that the perceived benefits of arthroscopic debridement were simply due to the placebo effect alone because there were no differences in knee pain between the placebo group and either the lavage group or the debridement group at 1 or 2 years postoperatively.[57] These results challenged the continuing use of arthroscopic debridement in the osteoarthritic knee.Critics of this study

have questioned the validity of the results because of poor study design. Rather than applying specific inclusion criteria, any patient younger than 75 years with osteoarthrosis of the knee and knee pain, who had been treated with nonsurgical treatments for 6 months but had not undergone arthroscopy of the knee in the prior 2 years, was considered a candidate.. We do not agree that the improvement is only subjective because long lasting symptom free outcomes cannot be attributed only to subjective element. Though subjective component does play a role.

The most important factor in determining success is proper patient selection, and many who have osteoarthrosis of the knee will not benefit from arthoroscopic debridement. In our experience patients who have had end stage osteoarthrosis or severe mal alignment and those who had no mechanical symptoms were unlikely to improve.

Most of the published literature on arthroscopic lavage and debridement for osteoarthrosis of the knee joint has comprised retrospective studies. The results vary among different observers and this modality of treatment is still controversial. Current orthopaedic surgeons have not reached a consensus with regard to which patients should be applied this surgical procedure for the treatment of knee osteoarthritis. Most of the authors report improvement in 50 to 80% individuals, however, as one would expect with the degenerative condition, results deteriorate with time but many were unable to identify pre-operative factors predicting long term results.

The philosophy of management is that patients with degenerative joint disease have, by the time they report and seek treatment, often reached a point at which the damage to the articular cartilage is irreversible. Therefore, in these instances, a return to a state of youthful normality is not possible, and treatment is directed toward minimizing symptoms in the simplest way possible with the least complications. The patients are informed that arthroscopic lavage and debridement are not a cure, but merely comprise temporizing therapeutic method that can give significant relief of discomfort in most cases. Patients readily accept this concept, because they are usually reluctant to undergo major surgical procedures. Their hope is that by the time further treatment is necessary, additional knowledge and techniques for repair and regeneration may be available to give them a better chance at an excellent end result. Moreover, some patients believe that, if they can manage to function for a few more years, their activity level will be less in retirement or in later life, and perhaps major replacement surgery to the affected joint will not be necessary.

Decrease of the knee pain level was the most common short and medium term result obtained in selected patients by performing debridement arthroscopy for osteoarthrosis. Patients must be counseled, that in addition to the routine risks of knee arthroscopic surgery and anaesthesia, the results of arthroscopic debridement of the Osteoarthrosis knee not entirely predictable, the goals are limited and that their prognosis includes a likely need for future and additional arthritis treatment, including a possible need for reconstructive surgery.

CONCLUSION

1. Athroscopic Lavage and Debridement is an effective short term method of treatment for Osteoarthrosis knee in properly selected patients.
2. Patients with grade I and grade II osteoarthrosis had good results and grade III osteoarthrosis had fair results.
3. Poor results were seen in knees with mal-alignment.
4. Patients with symptoms of pain and locking due to loose bodies or degenerative meniscal tears benefitted maximum from arthroscopic lavage and debridement.

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ANNEXURES

ANNEXURE - I

PROFORMA

Name	:	I.P. No.	:
Age	:	Date of Admission	:
Sex	:	Date of Surgery	:
		Date of Discharge	:
Address	:		

PRESENTING COMPLAINTS

1) Pain :
2) Swelling :
3) Locking :
4) Deformity :
5) Inability to bear weight / walk :
6) Morning stiffness :

H/O OF PRESENTING ILLNESS

Pain

Onset, Progression, aggravating and relieving factors

Swelling

Mode of onset, progress, impairment of function

Locking

Degree of locking, nature of locking, amount of flexion

Varus deformity

Inability to walk

On flat surface, going up or downstairs, going on and off toilet

Morning stiffness

Duration

PAST HISTORY

1) Diabetes mellitus
2) Hypertension
3) Tuberculosis
4) Trauma to knee

PERSONAL HISTORY

Smoker

FAMILY HISTORY

GENERAL EXAMINATION

CNS

CVS

Respiratory system

P/A

LOCAL EXAMINATION

Inspection

1) Skin over knee
2) Swelling
3) Muscle wasting
4) Deformity
5) Gait – antalgic

Palpation

Tenderness

Bony irregularity

Patellar tap

Synovial thickening

Crepitus

INVESTIGATION (PRE-OP ASSESSMENT)

Radiography of weight brearing bilateral knee joint.

AP, lateral and skyline view if needed

Routine blood investigation

CRP and RA factor

SURGICAL TREATMENT

Type of anaesthesia

Position of patient

Prophylactic antibiotics

Tourniquet application

Duration of surgery

Per operative findings

Histopathological examination of tissues

POST OPERATIVE CARE

Analgesics

Antibiotics

Physiotherapy

COMPLICATIONS

Complications of anaesthesia.

Infection

DURATION OF STAY IN HOSPITAL

FOLLOW UP

At first month

At 3rd month

At 6th months

1 year

EVALUATION OF RESULTS BASED ON

Rationale of the knee society clinical rating system[56]

KNEE SCORE (1989)

Pain

None	50
Mild or occasional	45
Stairs only	40
Walking & stairs	
Moderate	30
Occasional	20
Continual	10
Severe	0

Range of motion : (5 degree = 1 point) 25

STABILITY (maximum movement in any position)

Anteroposterior

<5 mm	10
5 – 10 mm	5
10 mm	0

Mediolateral

$<5^0$	15
$6^0 – 9^0$	10
$10^0 – 14^0$	5
$>15^0$	0

Subtotal = ……

Flexion contracture

$5^0 – 10^0$	2 points
$10^0 – 15^0$	5
$16^0 – 20^0$	10
$>20^0$	15

Extension lag

$<10^0$	5
$10^0 – 20^0$	10
$>20^0$	15

Alignment

$5 – 10^0$	o points
$0 – 40^0$	3 points each degree
$11 – 15^0$	3 points each degree
Other	20

Total deductions = ……

Knee score = ……

FUNCTIONAL SCORE

Walking

Unlimited	50 points
>10 blocks	40
5 – 10 blocks	30
<5 blocks	20
Housebound	10
Unable to walk	0

Stairs

Normal up and down	50
Normal up, down with rail	40
Up & down with rail	30
Up with rail; unable down	15
Unable	0

Sub total = ……

Deductions

1 cane	5 points
Two canes	10
Crutches or walker	20

Total deductions = ……

Functional score = ……

Score – 100 – 80 = Excellent, 70-79=Good, 60-69=Fair and <60=poor.

ANNEXURE – II : MASTER CHART

A	B	C	D	E	F	G	H	I	J	K	L	M	N
Sl. No.	**Name**	**Hosp. No.**	**Age**	**Sex**	**Side**	**AD**	**RG**	**MT**	**LB**	**AG**	**1M**	**6M**	**12M**
1	Sufiya Begum	664897	70	F	L	+	IV	+		IV	F	P	P
2	Nanjamma	663795	50	F	R	+	III		+	II	G	F	F
3	Munegowda	674342	52	M	R		II	+		II	E	E	G
4	Subbamma	674200	55	F	L		II			II	E	G	G
5	Abdul Subhan	680052	73	M	R	+	III			III	G	F	P
6	Srinivas Achari	702808	58	M	L		I			I	E	E	E
7	Kadirappa	707432	50	M	L		III	+		III	G	F	P
8	Rathnamma	694489	55	F	L		III		+	II	E	G	G
9	Veerabadrappa	721838	54	M	R		I			I	E	E	G
10	Raghupathi	695685	60	M	R	+	III	+		III	G	F	F
11	Obakka	729946	53	F	R	+	IV	+		IV	G	F	F
12	Shyamallamma	734278	50	F	R		III			IV	G	F	P
13	Mangamma	733844	58	F	L		III			IV	G	F	P
14	Sampanjiyamma	743855	55	F	L		II	+	+	II	G	G	F
15	Rathnamma	743135	65	F	R		III	+		III	G	G	
16	Ramachandrappa	757600	55	M	R		II			II	E	G	
17	Munivenkatamma	705111	55	F	R		I			I	E	G	
18	Chikkanaraynappa	756064	60	M	L		III	+		III	E	G	
19	Ramachandra	757600	52	M	R	+	III			III	F	P	
20	Muniyallamma	759005	50	F	L		II		+	II	E	G	
21	Lakshmamma	762983	60	F	R		II			II	E	E	
22	Kader Ali	780363	56	M	R		III	+		II	E	G	
23	Venkatamma	790303	55	F	L		II		+	III	E	G	
24	Rathnamma	793628	50	F	L		II		+	II	E	G	
25	Munireddy	797660	50	M	R	+	III			IV	F	F	
26	Jyothappa	716718	58	M	L		II			II	E	G	
27	Chowdappa	803268	52	M	R	+	III			III	G	F	
28	Venkatamma	812758	58	F	L	+	IV			III	F	P	
29	Byramma	810103	52	F	R		I		+	II	E	E	
30	Subbanna	847193	56	M	L		I	+		II	E	G	

KEY TO MASTER CHART

A - Serial Number

B - Name

C - Hospital Number

D - Age in Years

E - Sex : M = Male, F = Female

F - Side : R = Right, L = Left

G - AD : Angular Deformity of the Knee Joint

H - RG : Radiological Grading

I - MT : Meniscus Tear

J - LB : Loose Bodies

K - AG : Arthroscopic Grading

L - 1M : Assessment at 1 month follow up

M - 6M : Assessment at 6 month follow up

N - 12M : Assessment at 12 month follow up