

Osteoarthritis in younger patients. Is it different from osteoarthritis in older patients? Review of literature.

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What is osteoarthritis? Everyone knows about it. In a simple way if you describe osteoarthritis, it is a condition in which the cartilage - the cushion between bones, in joints begins to wear out, causing inflammation and pain in joints, thereby restricting movement. "Itis" means inflammation. Actually there is no inflammation in the joint. So the term osteoarthritis is a misnomer. So the current terminology is Osteoarthrosis. Among the group of arthritic conditions, osteoarthritis is the commonest condition affecting the synovial joints. Osteoarthritis especially of the knee is the single-most important cause of locomotor disability especially in the elderly and poses a challenging problem in young individuals.

What are the compartment of Knee joint? Knee joint has three compartments. These are medial, lateral and patellofemoral compartments. Osteoarthritis can develop in any of these compartments. Out of these, medial compartment osteoarthritis is the commonest.

Knee malalignment is strongly associated with an increased risk of OA progression. Biomechanical evidence demonstrates that varus malalignment increases force through the medial compartment whereas valgus malalignment places a greater proportion of the force through the lateral compartment of the knee. If the prevalence of knee malalignment varied between sex and racial groups, it could lead to different patterns of OA in different compartments of the knee. To date, only a few studies have tested this hypothesis. The results are conflicting.

The challenge in unicompartmental arthritis is addressing single compartment articular cartilage wear and biomechanical overload while preserving the integrity of the remaining knee joint. Medial compartment arthritis of knee is a common problem that is typically associated with varus malalignment. In a young patient with unicompartmental osteoarthritis, there are only limited treatment options that assure an active lifestyle. The options include supervised neglect, conservative measures or surgery. The usual practice is to exhaust all conservative measures or ask the patient to live with the problem till he/she reaches the age for replacement. But we need not renounce these patients to head towards replacement because the option of carefully selected osteotomy can work wonders for these patients.

Osteoarthritis of the knee usually occur secondary to mechanical factors, which include malalignment of the tibia or femur, ligamentous laxity, post-trauma, partial or complete meniscectomy, femoral and tibial osteonecrosis. Literature has shown that body weight has no co-relation with initiation or progress of osteoarthritis. However, literature confirms the mechanical malalignment of the limb to be the single-most important factor for progress of MCOA. When associated with other causes like meniscus injury or meniscectomy, ligament laxity or post-traumatic malalignment the cartilage degeneration is further accelerated.

Every patient with bowlegs (varus) does not develop MCOA as long as the muscles are doing the balancing of the knee and compensating for the deformity. However, once osteoarthrosis sets in a person with bow leg, it is progressive in 95% cases, if left untreated.

Axial alignment of the lower extremities is critical with respect to the demands to which articular cartilage is repeatedly exposed during gait. At present there is general agreement that the cause of degenerative arthritis is mechanical, not inflammatory. Commonly called degenerative arthritis, this expression is inappropriate because inflammation is a secondary result not the principal cause. *Arthrosis is the preferred word for describing purely degenerative pathology of the joint.*

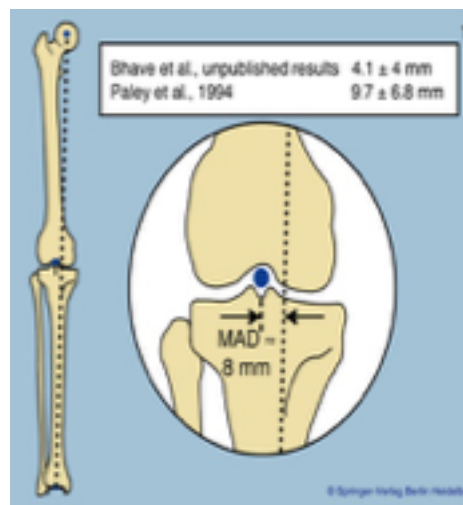
Unicompartmental knee arthrosis is often associated with malalignment resulting from deformity either in tibia, femur or in the joint. Although the association between malalignment and arthrosis is acknowledged, the possible pathogenic relationship is less well documented. This may represent the response of abnormal cartilage to normal forces or may reflect the response of normal cartilage to excessive stress. Direct clinical evidence of a cause and effect relationship between malalignment and arthrosis has not been possible, but substantial evidence from the orthopaedic literature supports this hypothesis.

The concept of weight bearing axis is not new and is usually termed the mechanical axis. Normally this passes through the center of the knee joint so that the load is distributed equally in both compartments of

knee i.e. 50% load passing through each leg and 25% load passing through each compartment (patello-femoral compartment doesn't contribute to weight bearing). When the load bearing axis passes medial or lateral to the centre of the knee such as in deformities of frontal plane – Genu varum or Genu valgum, this creates a moment arm acting to increase force transmitted across either the medial or lateral tibiofemoral compartment, respectively. This abnormal mechanical axis results in either MCOA or LCOA.

Alignment and orientation are best judged using the standing long AP view (Full length weight bearing) radiograph of the entire lower extremity on a single film, so that one can assess the *Mechanical axis deviation* (MAD). The distance between the mechanical axis line and centre of the knee in the frontal plane is the MAD. Medial and lateral MADs are referred to as varus or valgus malalignment, respectively. Supine radiograph is not useful for the assessment of the mechanical axis of the lower extremities. Proper rotation of the limb is critical and requires the patella be centered between the femoral condyles and directed forward.

Fig (1) :-MAD



Patients generally present with symptoms of pain in the knee that has worsened over time, the knee generally feels worse in the morning when they awaken, and the pain lessens with activity. But as their activity increases during the day, so does their pain. Pain due to joint overload or early arthrosis is often made worse by prolonged activity and may be present at night. Pain will be localized to the joint line of the involved compartment.

It is important to ascertain whether trauma to the knee has occurred, indicating an old history of fracture, articular damage, ligamentous injury and malalignment. A history of pain in other joints may alert the physician to an aetiology of inflammatory arthritis or bilateral lower extremity malalignment.

Physical examination may reveal varus or valgus alignment of the knee, assessed by looking at the standing patient's legs from a distance (as seen in clinical pictures). There may be crepitus in the knee. Range of motion of the knee may be decreased compared to the opposite side. Fixed flexion contractures are uncommon but may occur. The integrity of the cruciate ligaments and collateral ligamentous stability may determine the feasible treatment options.

Treatment options

Conservative: includes non-steroidal anti-inflammatory drugs (NSAIDs), unloading braces, physical therapy and intra-articular injection – steroid or visco-supplement. These may provide some relief, often delaying the need for surgical intervention. The single-most beneficial conservative method is a regular exercise program catering to quadriceps and hip abductor & extensor strengthening. But the others provide

only temporary relief without removing the core cause. Rather these measures allow further damage to the articular cartilage with a pseudo feeling of well-being in the knee.

Surgical options: are Arthroscopy, Joint debridement, High tibial Osteotomy alone or Cartilage replacement in conjunction with Osteotomy, Unicompartmental Arthroplasty (UKA) and Total Knee Arthroplasty (TKA/TKR). There is no prospective study to compare the different treatment options available and few longitudinal data to determine the clinical result in the absence of intervention.

Knee Replacement Long term studies show that, the longevity of this procedure last between 15 to 20 years. It generally is indicated in older patients with more modest activities and in young patients who have limited function because of systemic arthritis.

a)



b)



c)



Fig (2):-a) X ray AP view after TKR, b) TKR implant inside joint, c) X ray AP view after UKA

UKA is the partial surface replacement of the knee joint. The advantages of this procedure are it replaces only the compartment which involved preservation of the bone stock, faster recovery time and minimal invasiveness compared to TKR. But it cannot be done if other compartment is involved. It is contraindicated in anterior cruciate ligament deficiency patients.

High tibial osteotomy

The ideal candidate for an HTO is a young (physiological age of less than 65 years) and highly active person with MCOA. The advantages of HTO are: it can be done in cases of ACL deficiency and ligament instability of the knee joint besides being minimally invasive, preservation of the natural joint and the ability to restore active lifestyle & active sports. The only contraindication is the arthritic involvement of other compartments and age more than 65 years.

High tibial osteotomy can be done by closed or open wedge. And it can be fixed by internal fixation by means of plates and external fixation by means of *Ilizarov* ring or *Orthofix* unilateral external fixators. It has been reported that in varus deformities the best results are achieved when the postoperative *femoro-tibial angle* is 168 to 175 degree valgus.

Naudie et al, Sprenger et al, Koshino et al, noted 80%, 90% & 93.6% survivorship of HTO at 10-15 year follow-ups respectively. The literature has shown that the HTOs with maximum survival for 15 or more years had a range of correction of 3-6° of femoro-tibial valgus angle. An angle < 3° & angle > 6° would lead to persistence of MCOA or leads to LCOA.

Traditional *closing wedge* (Coventry) osteotomy has inherent problems like lack of precision, bone removal, large incision and alteration of bony anatomy – posing a problem for future TKR. Same thing applies to the dome osteotomy where accurate correction is difficult.

The *open wedge* HTO with the assistance of an external fixator (*Orthofix* or *Ilizarov* or *Hexapod*) provides the adjustability to get an accurate correction down to a degree. A precise correction ensures the success and longevity of the results. Besides an external fixator the newer Computer Navigation Systems allow for an accurate correction with the added advantage of being able to use an implant internally.



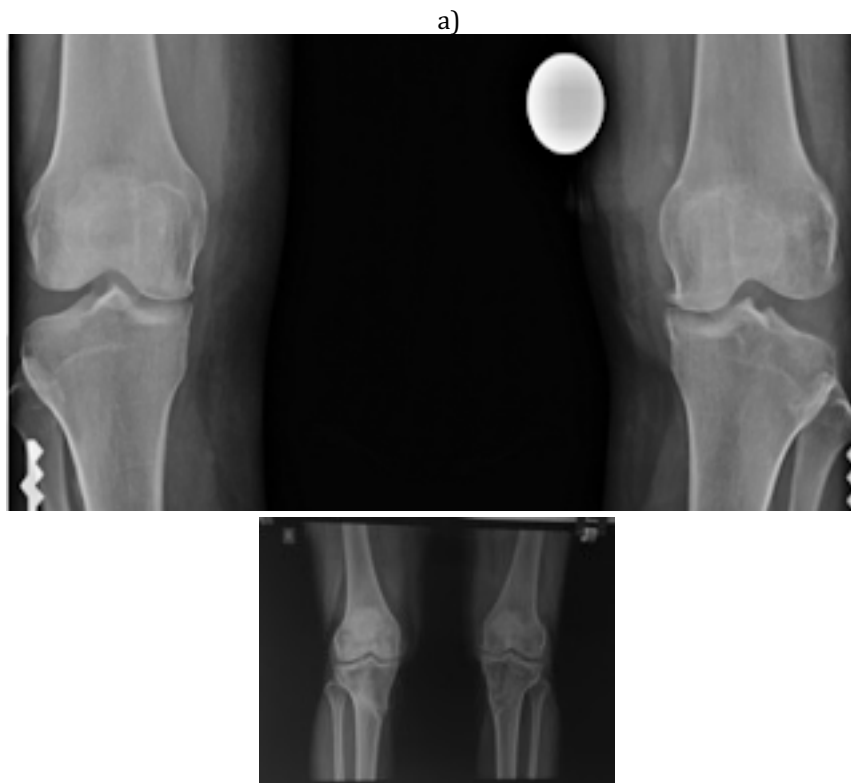


a,b,c,d
Fig 4): -a) & b) preoperative, c) After HTO on both sides

HTO or Knee Replacement?

Even though they are different procedures with different philosophies, in some cases they share the same indications. Therefore, some authors describe them as alternative options, while others deny any overlap of indications. HTO has long been considered a successful and widely performed procedure to address malalignment and subsequent unicompartmental osteoarthritis. TKR in elderly is well documented as effective for relief of pain, correction of deformity, and improvement of function. However, concerns about potential loosening and the need for multiple revisions have discouraged the widespread use of TKR in younger patients who have osteoarthritis.

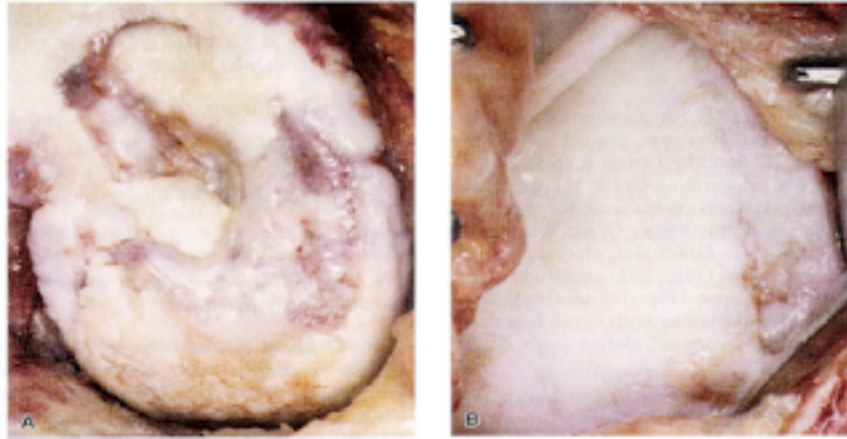
The benefits of osteotomy are: customized osteotomy gives good or excellent results at 15 years in more than 95%; open wedge osteotomy burns no bridges - can be revised to TKR or UKA and may even make TKR easier. It breaks the myth that the cartilage can't regenerate. The cartilage that grows and fills the defects is not the normal hyaline cartilage but a very high quality fibro-cartilage and shows in the radiographs as the restored joint space.



b)

Fig 5):-a) Preoperative X ray shows Joint space reduction, b) Post HTO correction X ray shows restoration of joint space

Fig 6):- a) Cartilage damage before HTO b) Cartilage regeneration after HTO



Remember, knee prosthetic replacement is an amputation of the knee joint, so why don't we consider osteotomy for the young MCOA patient. Arthroplasty is an excellent surgery, but only when it's done for the correct indications and correct age. With longer life spans revision arthroplasty is increasing in numbers; let us not add to it!

For more details on this treatment see www.limbconstruction.in