Management of osteoarthritis of the hip and the knee

This common condition will affect 50% of those over the age of 60.

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Incidence

Osteoarthritis (OA) is a common condition affecting over 40 million people annually. There is an association with advanced age, with the prevalence rising from 1% in the population under 30 years to over 50% in those over the age of 60 years.

The burden of the treatment of osteoarthritis rises with increase in life expectancy. It has been predicted that the demand for primary hip and knee arthroplasty in the USA will increase by 174% and 673% respectively from 2005 to 2030.[1]

Aetiology

There are patients in whom no cause can be clearly identified and these may represent a biological condition that results in cartilage failure. These patients represent primary osteoarthritis, which can be considered a diagnosis of exclusion. In addition, because of its various potential causes, OA can be thought of as a syndrome rather than a single entity.

A simplified way of classifying the causes of OA is given below.

Changes in cartilage matrix

As cartilage 'ages' it shows diminished cellularity, reduced proteoglycans concentration and loss of elasticity. These factors predispose to OA, but do not represent OA itself.

Septic arthritis, inflammatory conditions, crystal deposit disease and haemophilia may cause cartilage damage by inflammatory mediators and enzymes.

Changes in the subcondral bone

Fractures in or around the joint may alter the articular surface or the peri-articular bone supporting the cartilage. Avascular necrosis can also contribute in a similar fashion.

Increased mechanical stress

Deformities that affect the lever arm system around the joint will cause increased load, e.g. a varus deformity of the knee. Incongruency or instability of a joint will cause reduction of the articular contact area, e.g. hip dysplasia, damaged cruciate ligament or femoroacetabular impingement (FAI).

Recently it has become evident that most patients with hip OA have an underlying mechanical cause. FAI has become recognised as a mechanical abnormality of the hip in which the anterior femoral neck impinges on the acetabulum. This can be either a cam or pincer type. The cam type is due to an abnormality in the development of the proximal femoral neck causing a large neck-head ratio on the anterior part of the neck (Fig. 1). The pincer type is caused by a deep-seated retroverted acetabulum. Both types may co-exist.[2]

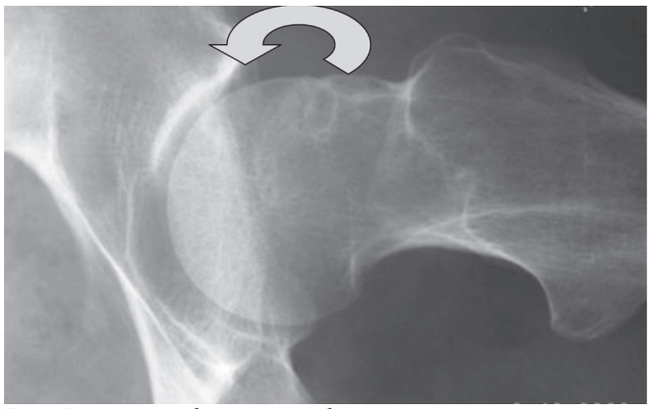

Fig. 1. Impingement due to cam mechanism.

Pathogenesis

The current concept is that OA involves the entire joint organ, including the secondary bone, menisci, periarticular muscle, capsule and synovium. In essence there is a failure of the chondrocyte to maintain or repair damaged cartilage.

Repetitive microtrauma creates biomechanical alterations in the cartilage matrix.

The water content and the proteoglycans content changes. The chondrocytes and leukocytes release inflammatory mediators, e.g. interleukin 1, which regulate the production of catabolic enzymes, e.g. metaloproteasis. These in turn cause further destruction and thinning of the cartilage.

More subchondral bone becomes exposed, which leads to increased stresses with the development of osteophytes. Subchondral cysts form as synovial fluid is forced beneath the joint surface.[3]

Clinical features

Osteoarthritis targets specific joints, possibly those that have undergone recent evolutionary changes in function, particularly related to bipedal locomotion and precision grip, without yet adapting adequately. These include the joints of the axial skeleton, the weight-bearing joints and the first carpal-metacarpal joint.

The presenting symptom of pain, at least initially, tends to be mostly mechanical with activity-related pain or pain with certain motions resulting from mechanical irritation or impingement.

As the disease progresses symptoms may become more severe and constant.

Inflammatory arthritis most commonly has multi-joint involvement and is accompanied by stiffness and relieved by activity.

Arthritis of the hip joint usually presents as groin pain but can locate as thigh or buttock pain.

Pain of a spinal origin would commonly present as buttock pain, usually radiating below the level of the knee and often accompanied by neurological symptoms. Similarly, hip pathology can present with knee pain. This pain is usually more proximal and vague.

The individual's function, quality of life, occupation, mood, relationships and leisure activities should be assessed. Any co-morbid diseases and medication used could influence treatment plans and should be documented.

When examining the patient, the physician must try to determine the origin of the pain. The exact location of point tenderness should be noted as well as which movements cause pain.

In suspected lumbar pathology the examiner should look for spinal nerve root compression and tension signs.

Examination of the hip may show a Trendelenburg lurch because of pain and/or weakness. There may be true or apparent shortening of the leg. Usually the earliest limitation of motion is loss of internal rotation. Disease progression can result in a complete ankylosis of the hip. Flexion adduction contracture may also be present.

In the knee, quadriceps muscle atrophy should be noted as well as the presence of an effusion. Commonly, OA presents with limited motion, crepitus, a varus deformity (Fig. 2), medial joint line tenderness and flexion contracture.

Fig. 2. Medial compartment OA with a varus deformity of the knee.

Special investigations

In the majority of cases the diagnosis can be made on good-quality X-ray films (Fig. 3). The four radiological signs are:

- focal narrowing of the joint line
- subchondral sclerosis
- peri-articular cysts
- osteophytes.

Fig. 3. This X-ray shows the classic signs of joint space narrowing, osteophytes, cysts, and subchondral sclerosis.

In contrast, inflammatory arthritis shows a more diffuse narrowing of the joint space with fewer osteophytes and more pronounced cystic changes (Fig. 4). It is important to note that the severity of the clinical and radiological picture does not necessarily match. In rare cases where the diagnosis is unclear, further imaging may be required, e.g. MRI for suspected avascular necrosis or villonodular synovitis. Blood tests are generally only required if the diagnosis is unclear or if surgery is contemplated. Infiltrating the hip with a local anaesthetic might help to determine whether the spine or the hip is the cause of pain.

Treatment

The treatment sequence should be non-pharmacological, pharmacological and, finally, surgical.

Non-pharmacological approaches

Education

Education should include explanation to the patient of the disease process and management. Reassurance may be given that nothing sinister is suspected and that OA does not neccesarily lead to progression requiring surgical treatment. Simple advice can be given in terms of reducing repeated impact loading, e.g. avoiding deep knee flexion and repeated stair climbing.

Fig. 4. This X-ray shows signs of inflammatory arthritis: generalised joint space narrowing with osteopenia and protrusion of the hip.

Weight loss

Modest weight loss is proven to be effective, especially in women with OA of the knee. Obese patients tend to become symptomatic earlier in the disease process. The association between obesity and OA of the hip is less well defined. In women an increased body mass index at an early age is a risk factor for developing OA of the hip.[4]

Physical therapy

Exercise should be part of the treatment plan, irrespective of age, co-morbidity, or pain (Fig. 5). However, it should be adjusted according to the severity of symptoms and disability. Muscle-strengthening programmes for specific joints and general aerobic conditioning have both been proven to decrease pain and disability. Manipulation and stretching may be beneficial. Transcutaneous electrical nerve stimulation (TENS) has been proven to be better than placebo and could also be considered. There are uncontrolled studies supporting the use of acupuncture.

The above three modalities are the mainstay of treatment of OA and should be regarded as core treatment.

Biomechanical devices

Braces are available, e.g. a valgus-producing device to correct a varus deformity of the knee. However, brace-wear compliance remains a problem. Orthotics in the form of lateral heel wedges can help correct a varus deformity. Shock-absorbing shoes could offer some advantage. The results of studies evaluating these adjuncts are difficult to interpret due to commercial bias.

Fig. 5. Part of the core treatment for every patient with OA is physical therapy.

Pharmacological

Oral analgesics

Oral paracetamol should be the first line of treatment and regular dosing may be required.

If this proves inadequate, a topical non-steroidal anti-inflammatory drug (NSAID) should be added. Topical NSAIDs are more effective if the problem joint is relatively superficial, e.g. the knee joint.

When the topical agent is ineffective it should be replaced with an oral NSAID/COX-2 inhibitor. In either case these should be prescribed with a proton-pump inhibitor.

The physician must be aware of the potential for gastrointestinal, liver and/or renal toxicity when choosing these agents. In addition to the above-mentioned drugs, intermittent use of an opioid may be added.

Dietary supplements

There are almost as many review articles on this topic as there are primary clinical trials. The initial perceived benefit from these drugs was that they would modify the rate of structural change of cartilage. The evidence for this is scanty. Clinical trials provide some justification for the use of glucosamine and chondroitin, compared with placebo, and probably only for their analgesic and anti-inflammatory effects. They are safe agents but relatively expensive.

Intra-articular injections

Injectable corticosteroids

Multiple studies have supported an improvement of symptoms over placebo at 1 - 2 weeks after injection, but by 4 weeks no benefit is shown.

Side-effects include allergic reactions, hyperglycaemia in diabetics, and cartilage degeneration due to decreased collagen formation. The injections should always be given under sterile conditions, as infection is a small but devastating risk. Moreover, the masking of symptoms may cause overuse and cartilage breakdown.

Viscosupplementation

Hyaluronic acid injections are thought to improve the viscoelastic properties of the arthritic joint. Multiple studies appear to support the efficacy of these injections, which are similar to NSAIDs but with low risk of side-effects. The relief in symptoms can last up to 6 months. A major side-effect is a sterile partial effusion, which can be difficult to distinguish from infection. It is an expensive drug with questionable cost effectiveness and the profile of the patient most likely to benefit still needs to be defined.

Referral for surgery

Referral for joint surgery should be considered in those who experience joint symptoms (pain, stiffness and reduced function) that have a substantial impact on their quality of life and are refractory to non-surgical treatment.

Referral should be made before there is a prolonged and established functional limitation.

Patient factors including age, gender, smoking and obesity, or other co-morbidities should not be barriers to referral.[5]

Surgery for OA of the knee

Arthroscopic treatment

A study by Moseley *et al.* showed no benefit of arthroscopic debridement versus placebo in a control group.[6] This frequently quoted study casts doubts on the use of arthroscopic debridement, although critics have questioned the validity of the results due to poor study design, e.g. the usual patient selection criteria to ensure good results were not used and 44% of the patients who met the selection criteria refused to participate.

Appropriate patient selection is crucial and is still being refined. At present the best prognosis after arthroscopic debridement is for the younger patient with recent onset of mechanical symptoms, good range of motion, minimal limb malalignment and moderate to mild radiographical changes.

Arthroscopic debridement includes removal of loose bodies, excision of unstable meniscal fragments and chondral flaps, and lavage of the joint. The creation of full-thickness cartilage lesions should be avoided.

The marrow-stimulating procedures promote the release of mesenchymal marrow cells which stimulate the fibrocartilage repair process in the treated lesion.

Abrasionplasty is performed with a bur removing the superficial layer of subchondral bone.

Subchondral drilling is a technique where multiple holes are drilled through the denuded bone.

Microfracture has the potential advantage that it does not cause any thermal damage to the bone. The remaining cartilage is first removed with a shaver before multiple holes are created with an awl.

These techniques are best suited for small isolated lesions in a knee without any malalignment. The postoperative regimens require long periods of non-weight bearing.

Clinical data do not support the routine use of these procedures for generalised OA of the knee.

Mosaicplasty or autologous chondrocyte transplantation can be performed in young patients with small lesions but are currently not advocated for diffuse or advanced cases of OA.

Osteotomy

The malaligned knee with unicompartmental OA can be treated with an osteotomy. In the case of a varus deformity and isolated medial compartment arthritis, a valgus-producing osteotomy of the upper tibia is indicated (Fig. 6). If a valgus deformity with isolated lateral compartment arthritis exists, a varus-producing distal femoral osteotomy should be used.

Fig. 6. Open-wedge valgus osteotomy of the same knee as in Fig. 2.

The patient should preferably be <50 years, and have an intact anterior cruciate ligament, minimal flexion contracture, good range of motion and no inflammatory arthritis.

These procedures are being performed less due to the apparent short-term superiority of unicompartmental arthroplasty. This remains a good operation for the young male manual worker.

Unicompartmental arthroplasty

Previously this procedure was used for the female patient >60 years with a sedentary lifestyle. More recently it is being performed on the middle-aged patient with unicompartmental involvement as the first arthroplasty and as a staged procedure before the final common pathway of total knee arthroplasty (TKA).

Possible advantages are less invasive surgery, less blood loss and faster recovery than TKA. Pain relief is better than after osteotomy. This surgery is still evolving and long-term results still do not match those of TKA.[7]

Total knee arthroplasty

TKA provides a durable and reliable solution to patients with severe tricompartmental disease, inflammatory arthritis, severe deformities and contractures. The overall complication rate of 5.5% includes infection, deep-vein thrombosis and poor wound healing. Operative mortality is 0.5%.[8]

Surgery for OA of the hip

Labral debridement

Labral tears in isolation are extremely rare and are usually associated with other bony abnormalities.

Acetabular and femoral neck resection

This procedure is used for cam and/or pincer-type impingement (see causes of hip OA). Through an open procedure the offending bone is removed to allow movement without impingement.

Proximal femoral osteotomy

This procedure has fallen out of favour as a treatment for OA of the hip due to unreliable results. However, it should be considered for those who have a deformity due to previous childhood hip conditions, e.g. slipped femoral epiphysis and Perthe's disease, as well as malunited fractures.

Periacetabular osteotomy

This is a technically demanding procedure used to treat acetabular dysplasia, whereby the whole acetabulum is rotated in the pelvis.

Resurfacing of the hip joint

This treatment modality has the advantage of sparing the femoral neck and part of the head, thereby preserving bone stock for possible future revision surgery (Fig. 7).

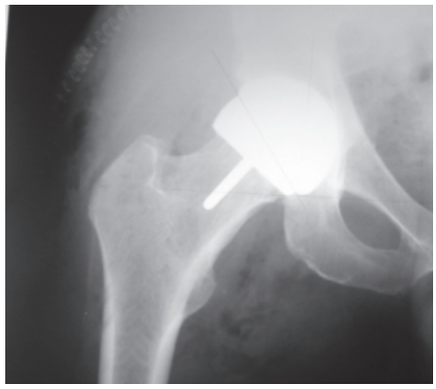

Fig. 7. Resurfacing offers possible bone-sparing procedure.

The patients most likely to benefit from resurfacing are those with reasonable bone density, a large femoral head-neck ratio and minimal deformity. A large metal-on-metal bearing surface has the potential benefit of longevity and stability, but there are some concerns regarding the unknown effect of long-term exposure to elevated metal ions. The most significant concern at present is the relatively short-term nature of the reported results.

Total hip arthroplasty

For two decades the Charnley Low Friction Arthroplasty design was the most commonly used system in the world. Recently the polished tapered cemented hip prosthesis and uncemented hip replacements have become more popular.

As many as 95% of total hip replacements are expected to continue functioning well into their second decade after surgery. Possible complications include infection, dislocation, aseptic loosening and thromboembolism.[9]

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In a nutshell

- OA is a major cause of disability and is thought to be more than just wear and tear degeneration.
- In the evaluation of the patient, the doctor should consider other causes of joint pain and an effort should be made to determine the origin of the pain.
- In the majority of cases a good-quality X-ray is all that is needed to confirm the diagnosis.
- The most important aspects of treatment are education, weight loss and exercise.
- In addition, symptom-relieving drugs and topical agents may be of benefit.
- Corticosteroid injections into the knee have some short-term benefit, but should be used with caution.
- There are surgical procedures for patients with OA or pre-arthritic conditions other than joint replacements that are of benefit for specific indications.
- Total hip and knee replacements are highly effective and reliable treatment options, but have associated risks.