

Osteoarthritis

SUMMARY

Osteoarthritis is a common disorder of synovial joints, seen most often in older patients. The joints affected most commonly are the knee, hip, hands and the first metatarsophalangeal joint. Involvement of other joints such as the ankle, wrist and shoulder is uncommon, and suggests a secondary etiology. Although osteoarthritis may be present in many joints, symptoms are usually evident in one or two joints at the most. The three main symptoms are pain, morning stiffness and a tendency for the affected joint to gel with immobility. Treatment includes rest; weight loss; physiotherapy; aids such as canes, shoe lifts, and elastic knee supports; and judicious use of anti-inflammatory medications. (Can Fam Physician 1984; 30:1503-1507)

SOMMAIRE

L'ostéarthrose est une affection fréquente des articulations synoviales, que l'on rencontre le plus souvent chez les patients âgés. Les articulations les plus fréquemment affectées sont le genou, la hanche, les mains et la première articulation métatarsophalangienne. Il est plutôt rare de la rencontrer dans d'autres articulations telle la cheville, le poignet et l'épaule; il faut alors songer à une étiologie secondaire. Même si l'ostéarthrose se rencontre dans de nombreuses articulations, les symptômes se manifestent habituellement dans une ou deux articulations tout au plus. Les trois symptômes principaux sont la douleur, la raideur matinale et une tendance à ne pas mobiliser l'articulation affectée. Le traitement comprend le repos, la perte de poids, la physiothérapie, des accessoires telles des cannes, des corrections dans les chaussures, des supports élastiques pour le genou et une utilisation judicieuse des anti-inflammatoires.

Dr. Atkinson is a clinical associate professor of medicine at the University of Calgary. Reprint requests to: 381 Palliser Square East, 115 9th Ave. S.E., Calgary, AB. T2G 0P5.

OSTEARTHROSIS is a disorder of synovial joints characterized by cartilage degeneration with secondary changes in the adjacent bone. Osteoarthritis is probably not a single disease, but rather a common response to a variety of metabolic, anatomical and physiological conditions.

Osteoarthritis is a common term for this disorder. However, it is less than ideal because, although secondary synovitis is usually present to some degree, the primary event is not inflammatory.

Classification

Most osteoarthritis is of unknown etiology, and is referred to as primary osteoarthritis. Secondary osteoarthritis describes cases in which causes are known (see Table 1).

Epidemiology

Radiological surveys indicate that 80% of people over age 50 have some

evidence of osteoarthritis, but there is a large discrepancy between clinical symptoms and radiological findings. Men and women are generally equally affected; men are more often affected before age 45, and women after 45.¹

Primary Osteoarthritis

Aging

Because osteoarthritis is most common in old people, it is often proposed that the disease is part of the aging process.² The evidence for this is contradictory, but it does seem reasonable to assume that the ability of articular cartilage to resist fatigue-testing diminishes with age, and that aging cartilage might represent an accumulation, over time, of mechanical insults.

Obesity

While it is unclear whether obesity is associated with an increased prevalence of osteoarthritis in non weight-bearing joints, it seems evident that obesity is associated with increased osteoarthritis of the knee, but not of the hip. Most obese people exhibit varus deformities of the knee, presumably because of attempts to bring the feet under the centre of gravity when the thighs are separated by fat.³ This

results in increased load on the medial compartment of the knee, with subsequent degeneration.

Heredity

Genetic factors play a complex role in osteoarthritis. Certainly some genetic diseases (e.g., congenital hip disease) change joint structure so there is secondary degeneration. Also, some inborn errors of metabolism can result in metabolic changes in cartilage leading to secondary degenerative change (e.g., ochronosis). It is unknown whether any of the changes in normal joints which predispose people to osteoarthritis are genetically determined. On the other hand, Heberden's and Bouchard's nodes do appear to be genetically influenced. According to Stecher,⁴ Heberden's nodes depend upon a single autosomal gene, sex-influenced to be dominant in women and recessive in men. Gene frequency analysis suggests three percent of the population are homozygous affected, 27% are heterozygous, and 70% are homozygous normal. Thus, 30% of women over age 45 have evidence of Heberden's nodes, whereas only three percent of men are affected.⁴

TABLE 1
Causes of Primary and Secondary Osteoarthritis

Primary
Unknown
Secondary
Anatomical abnormalities
—Congenital hip dysplasia
—Avascular necrosis
—Slipped femoral epiphysis
—Fractures
Trauma
Neuropathic disorders (Charcot joints)
—Syringomyelia
—Diabetes mellitus
—Syphilis
Hypermobility disorders
Metabolic disorders
—Ochronosis
—Hemochromatosis
—Gout
—Chondrocalcinosis
—Hemophilia
—Paget's disease
—Wilson's disease
Inflammatory conditions
—Rheumatoid arthritis
—Seronegative arthropathies
—Septic arthritis

Altered congruity of joint surfaces

Subtle incongruity of the articulating surfaces of joints may account for many cases of osteoarthritis in the hip

and knee. In fact, the majority of cases of 'primary' osteoarthritis of the hip may well be secondary to a developmental abnormality which occurs during growth.⁵ The commonest cause is congenital hip dysplasia, which accounts for at least 25% of osteoarthritis of the hip in older people.⁵ Other causes are Legg-Perthe's disease and slipped femoral epiphysis. Similarly, many causes of 'primary' osteoarthritis of the knee are secondary to fractures of the femoral condyles, ligamentous laxity resulting in instability, chronic patellar dislocation and severe valgus and varus deformities.

Inflammatory joint disease

Inflammatory diseases such as rheumatoid arthritis and septic joints can lead to extensive cartilage damage and secondary osteoarthritis. Initial damage to cartilage is probably initially enzymatic, with breakdown of cartilage by enzymes released from inflamed synovium or from leukocytes within the joint cavity.

Deposition diseases of cartilage

A variety of metabolic diseases result in the deposition in the cartilage of materials which are noxious and damage the chondrocytes or cartilage matrix itself. These metabolic diseases in-

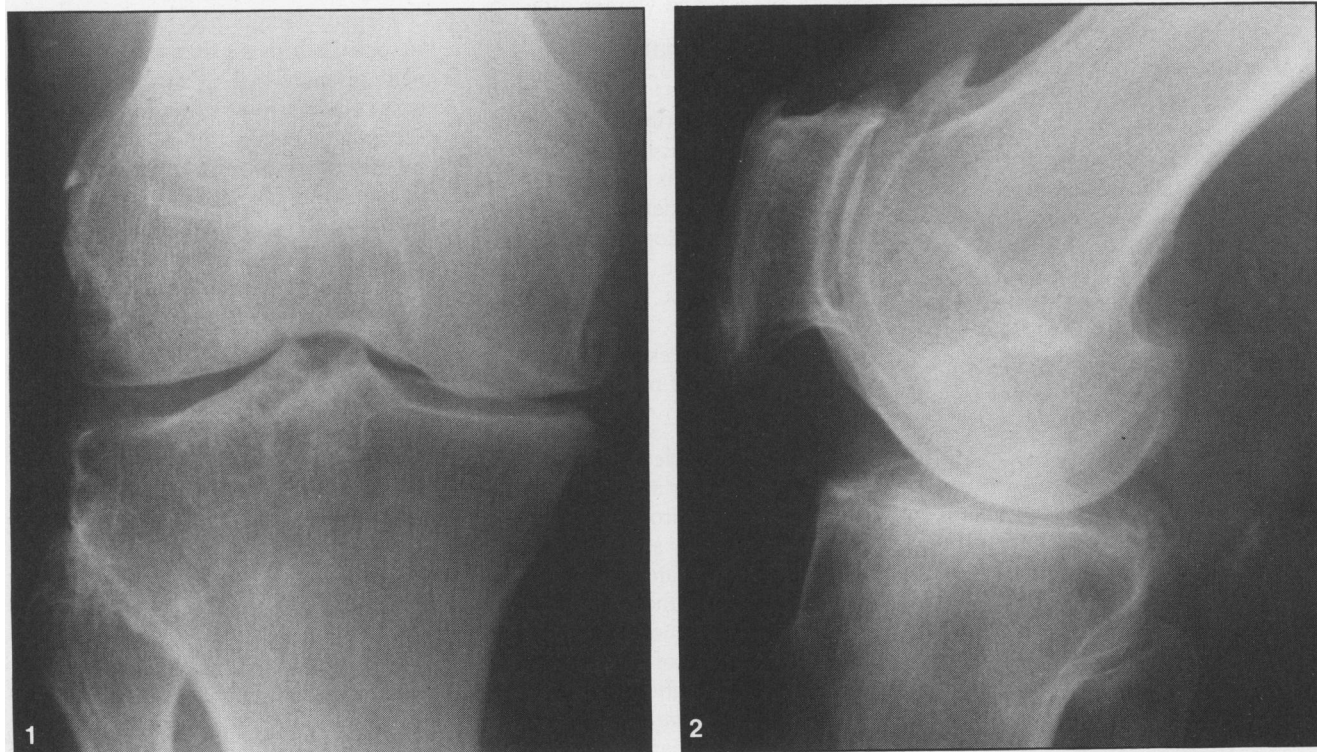
clude hemochromatosis, Wilson's disease, gout, calcium pyrophosphate dehydrate (CPPD) crystal deposition disease and ochronosis.

Clinical Characteristics Of Osteoarthritis

Although osteoarthritis may be present in many joints, symptoms are usually in one or two, the most common being the hip and knee. The three main symptoms are pain, morning stiffness and a tendency for the joint to gel with immobility. Pain may arise from several sources, including increased venous pressure in subchondral bone; trabecular microfractures; elevation of the periosteum by osteophytes; ligamentous strain as a result of joint laxity, aggravated by muscle weakness; distension of the joint capsule with effusion; and synovitis.

Morning stiffness is usually short-lived and does not have the duration and intensity of that seen in rheumatoid arthritis. There is also a tendency for the joint to gel with sitting, but this is also short-lived. Physical signs include tenderness of the joint, especially with active synovitis or capsular thickening. Joint effusions are common and usually are due to phagocytosis of cartilage debris by synovial cells, traumatic effusion as a result of

Figs 1 and 2. AP (Fig. 1) and lateral (Fig. 2) views of the knee showing typical changes of osteoarthritis in the medial and patellofemoral compartments.



ligamentous laxity, or a crystal synovitis as a result of CPPD or hydroxyapatite crystals. Limitation of motion results from loss of joint congruity, muscle spasm and capsular thickening with flexion contractures. Crepitus is a sense of grating or crackling, presumably due to one roughened surface rubbing against another. Joint enlargement and deformity occur late, but serviceable joint function is usually preserved.

Radiological Features

Osteoarthritis is characterized by four chief features on X-ray. These are joint space narrowing, subchondral bone sclerosis, marginal osteophytes, and subchondral cysts (Figs. 1-3).

Clinical Presentations

Primary osteoarthritis is most common in the knee, hip, hands and first metatarsophalangeal joint. Involvement of other joints such as the ankle and glenohumeral joints of the shoulder and wrist is uncommon. If these joints are involved, suspect a secondary etiology.

Hip: Osteoarthritis of the hip is more often unilateral than bilateral and is ascribed to underlying developmental defects in up to 80% of cases. Symptoms of degenerative hip disease

include pain in the inguinal region, trochanteric region, lateral buttock and proximal thigh. About 20% of people experience pain in the distal thigh and knee. This is due to referred pain, because a branch of the obturator nerve, which supplies the hip, also serves the subsartorial plexus.⁶

Internal rotation is the first motion lost, followed by extension, abduction and hip flexion. With loss of cartilage, there may be leg length disparity due to shortening of one leg. Patients tend to walk with an antalgic gait when symptoms are severe.

Knee: Etiological factors in osteoarthritis of the knee include fractures of the femoral condyles or tibial plateaus, causing mechanical incongruence, ligamentous injuries producing instability, chronic patellar dislocation and severe valgus and varus deformities. Meniscectomy has been a very popular operation, but it is now known that after meniscectomy, degenerative changes in the joint are frequent.⁷ Degenerative arthritis of the knee can affect the patellofemoral compartment or either of the medial or lateral compartments. Involvement of all three compartments usually signifies secondary osteoarthritis.⁸ Patellofemoral involvement results in pain with any movement that compresses the patella in the patellofemoral

groove. Such movement includes climbing stairs, kneeling, bending or sitting with the knees bent for prolonged periods.

Subsequent cartilage loss can result in redundancy of the collateral ligaments and joint instability. This may lead to a traumatic synovitis. Quadriceps atrophy occurs early in osteoarthritis of the knee and this can lead to further joint instability. A most important part of the examination of the knee is comparing varus and valgus deformities of the extended knee with and without weightbearing. Accordingly, weight-bearing X-rays of the knees will demonstrate the full extent of cartilage loss.

Ankle and foot: Primary osteoarthritis of the ankle is rare, probably because the fibula absorbs 12% of the body weight during normal walking.⁹ This shock-absorbing function can increase tremendously with increased force.

First metatarsophalangeal joint: In contrast to the low incidence of primary osteoarthritis in the hind part of the foot, the first metatarsophalangeal (MTP) joint is affected by osteoarthritis about as frequently as the distal interphalangeal joints of the hands. The osteoarthrotic process may occur without great toe deformity or hallux valgus. Hallux valgus is common in middle-aged women, and is initiated by shoes that force the great toe to deviate laterally. Secondary osteoarthrotic changes subsequently develop.⁹ Sometimes degenerative changes are so profound that severe limitation of motion in the first MTP joint occurs, leading to a hallux rigidus. Usually, women complain more about the unattractive appearance of hallux valgus than joint discomfort.

Hands

Heberden's and Bouchard's nodes: At the distal interphalangeal joint, osteophytes grow from the dorsal aspect of the base of the distal phalanges and result in palpable, visible prominences. These are Heberden's nodes; Bouchard's nodes are similar deformities on the proximal interphalangeal joints. These nodes occur gradually and are usually quite painless. Because the nodes are governed by a sex-influenced dominant gene, they occur

Fig 3. AP X-ray of the hands showing typical changes of osteoarthritis in many of the PIP and DIP joints.



much more frequently in women. Trauma also plays a role. The distal interphalangeal joint is one of the most highly loaded joints in the body, particularly in a 'pinch grasp', which is the predominant 'female grasp'; men more commonly use a 'power grip'.¹⁰

First carpometacarpal joint: The carpometacarpal joint may also be involved, and as the joint space narrows there is radial subluxation of the base of the thumb with 'squaring' and prominence of this joint. Pain may be quite prominent, especially in patients who must use this joint repetitively (e.g., seamstresses).

It is important that osteoarthritis of the hands is not misdiagnosed as some other, more serious arthritic condition. The distribution in the proximal and distal interphalangeal joints is quite typical, as is the involvement of the carpometacarpal joint of the thumb. X-ray findings are also quite typical (see Figure 3), with joint space narrowing, marginal osteophytes on the proximal and distal interphalangeal joints, and conspicuous sparing of the metacarpophalangeal joints.

It is important to remember that rheumatoid factor occurs in five percent of normal people, but this figure may increase up to 24% in older patients.¹¹ Therefore, the presence of rheumatoid factor in a patient with knobby fingers does not necessarily point to rheumatoid arthritis. However, because Heberden's nodes are so prevalent in older women, they are bound to be seen with other inflammatory arthropathies and so their presence should not necessarily preclude a diagnosis of rheumatoid arthritis or other inflammatory arthropathy.

Treatment

Before treatment is carried out, it is important that the correct diagnosis be made. Diagnosis must be based on the joint distribution, the clinical findings, joint fluid analysis and X-ray changes. Once the diagnosis of osteoarthritis has been established, a treatment program can be designed according to the following principles.

General measures

Reassurance is very important. To the general population, the term 'arthritis' connotes a crippling joint affliction which will lead inexorably to a wheelchair existence. The physician should point out to the patient that it

is unlikely joints other than those presently affected will ever be involved. This will help patients to adjust to their disease and to develop an approach to the future.

Rest

The pain of osteoarthritis is characteristically associated with joint use and is relieved with rest. Few patients require complete bed rest or immobilization; they need to learn to live with the activities which their joints will tolerate. Usually patients can do more with damaged joints by dividing the day with rest periods, rather than working throughout the day. Several short periods of walking are preferable to one long one. Patients whose hip or knee is involved should be instructed to avoid walking on rough ground and, when navigating stairs, should go upstairs with the 'good' leg first and come down with the 'bad' leg first.

Weight loss

For the patient with painful hips, knees or back because of osteoarthritis, a program of weight reduction will often relieve symptoms.

Physical therapy

Heat: Heat can be very soothing to painful osteoarthrotic joints. It may be applied with baths, showers, hot packs and, for deep-seated areas, ultrasound. Some people find heat increases discomfort, but obtain relief from the application of ice. Ice can best be applied to a joint by wrapping a plastic bag or frozen corn or peas around the joint. Alternatively, a styrofoam cup filled to the brim with water and then frozen can be applied to the affected joint like a deodorant stick. The decision to try heat or ice is arrived at by trial and error to determine the patient's preference.

Exercises: Muscle wasting occurs very quickly across painful joints, and it is important to design an exercise program to strengthen the muscles around an affected joint and thus increase support. Exercise is often easier when it is preceded by the application of heat, which not only relieves pain but also decreases muscle spasm. Emphasize active rather than passive exercises. Muscles in the lower limbs are best strengthened by lifting weights, starting with a small load and gradually working up. A stationary exercise bicycle may be very useful, but patients with patellofemoral os-

teoarthritis should be cautioned against using one, because under load the repetitive knee flexion will just aggravate knee pain.

Helpful devices

Cane: There seems to be a social stigma attached to the use of a cane, and patients usually must have a lot of pain before they will agree to use one. Canes usually are used incorrectly unless there has been appropriate instruction. Patients should be instructed to hold the cane in the hand *opposite* to the affected limb. The cane should be on the ground at the same time that the affected leg is in the stance phase. In this way, during weightbearing much of the body's weight will be on the cane rather than on the affected joint.

Shoe lift: Often there is leg length disparity, especially in osteoarthritis of the hip with significant cartilage loss. A lift under the shortened limb can greatly relieve pain.

Knee supports: Elastic knee supports can provide increased stability and protection against sudden stresses which might increase knee pain.

Drug therapy

The main symptom of osteoarthritis is pain, and its relief is the most important part of therapy. While it has been argued that pain relief by drugs may allow patients to stress their joints and thus increase the damage in them,¹² there is little evidence to support this.

Many people with osteoarthritis are older and may have concomitant disease for which they are taking medication. The introduction of anti-inflammatory drugs may interact with medications being taken for other conditions, or may aggravate and worsen the underlying condition itself. It therefore behooves the physician to be fully aware of the patient's other conditions and medications.

Two groups of drugs are available—those which are purely analgesic and those which combine analgesic with anti-inflammatory properties. Analgesic drugs are popular in the treatment of osteoarthritis. Some physicians believe that the inflammatory portion of the disease is negligible and that analgesics have fewer attendant risks than anti-inflammatory drugs. In practice, pure analgesic drugs appear less effective. This may be because there is an inflammatory component present in many cases of osteoarthritis. Although such inflammation is much

milder than that seen in patients with rheumatoid arthritis, it undoubtedly contributes to the patient's symptoms.

Analgesics

Acetaminophen: Acetaminophen is widely used as an analgesic, either alone or compounded with codeine. It may be given in doses of 325-650 mg every four hours.

Non-acetylated salicylates: There is little evidence that non-acetylated salicylates have significant anti-inflammatory activity.¹³ Diflunisal is one of the newer non-acetylated salicylates and is usually given in doses of 500 mg bid.

In view of the potential for addiction, dextropropoxyphene and other narcotic analgesics should be discouraged for the longterm treatment of chronic pain.

NSAIDs

Indomethacin: When given in doses of 25 mg tid, this drug can be extremely useful, especially for osteoarthritis of the hip or knee. In fact, many physicians consider this the drug of choice for osteoarthritis of the hip. The dosage may be increased to 50 mg tid, but obviously the incidence of side effects is higher at this dosage.

Other indole derivatives: Tolmetin (Tolectin), a distant cousin of indomethacin, may be given in doses of 200-400 mg qid. Another indole derivative is sulindac (Clinoril). The usual dose is 150-200 mg bid. While sulindac is an inert 'pro drug' which only becomes activated when it has been absorbed and metabolized in the liver,¹⁴ most of the gastric irritant effects of the anti-inflammatory drugs are mediated through systemic prostaglandin inhibition, and so an inert drug given by mouth probably has only a theoretical advantage.

Many NSAIDs cause deterioration of renal function, especially in older people treated with diuretics for congestive heart failure. This deterioration of renal function is thought to be due to the renal inhibition of prostaglandin synthesis. Sulindac is unique among the NSAIDs in not inhibiting prostaglandin synthesis in the kidney.¹⁵ It may thus be one of the safest drugs for treating osteoarthritis in older people.

Propionic acid derivatives: Four propionic acids are currently available in Canada. Ibuprofen (Motrin) may be given in doses of 300-600 mg qid, naproxen (Naprosyn) in doses of 250-500 mg bid, fenopropfen (Nalfon) in

doses of 300-600 mg qid and ketoprofen (Orudis), in doses of 50 mg qid. Individuals vary in their response to the propionic acids, and just because one of these drugs does not work, that does not mean other members will not. Experiment with more than one member of this family before moving to a different class of drugs.

Oxicams: Piroxicam (Feldene) is the only member of this class available in Canada at present. It has a long half-life of 38 hours and need be given only once a day in a dose of 10-20 mg od.¹⁶

Phenylbutasone: Phenylbutasone is one of the older anti-inflammatory drugs available, but it has a great tendency to cause fluid retention in older people and may precipitate congestive heart failure. A rare complication of chronic phenylbutasone use is aplastic anemia. For these reasons, this drug should not be used for treating osteoarthritis.

Phenacetic acids: Diclofenac (Voltaren) given in doses of 25-30 mg tid is effective in the treatment of osteoarthritis but I have not found that it offers any advantage over the others.

The choice of anti-inflammatory drugs for the treatment of osteoarthritis is empirical. In my experience, one group does not have any less tendency to cause gastric irritation or ulceration than another, and the individual response to any particular drug is unpredictable. One must experiment to find the medication that best suits a patient. Indomethacin seems to me to be the most predictable in relieving pain in the osteoarthrotic hip.

Intra-articular steroids

Intra-articular steroids have limited use in the treatment of osteoarthritis. When there is significant effusion, suggesting underlying inflammation, aspiration and the instillation of a depot preparation of steroid (Depo-Medrol, Decadron-TBA) might be very helpful but, unfortunately, the results usually do not last.

Surgery

There are many surgical procedures which may be of great benefit when medical therapy fails. Total hip replacement arthroplasty has become a standard surgical procedure for the hip when the patient has intractable pain which is unresponsive to conservative measures.

Tibial osteotomy may be used for correcting valgus and varus deformities in the knee. Partial or total knee replacement arthroplasties also can be used in selected cases.

There is a myriad of operations for correcting hallux valgus deformities, and their use is influenced by the surgeon's preference.

Silastic trapezium implants may help people with disabling pain at the carpometacarpal joint of the thumb. Alternatively, fusion of this joint may be performed. ●

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