Ontario

Osteoarthritis

Discussion paper prepared for

The Workplace Safety and Insurance Appeals Tribunal

June 1994

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OSTEOARTHRITIS

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There are three types of arthritis: rheumatoid, infective and osteoarthritis. Rheumatoid arthritis is an inflammatory disease of unknown etiology. It affects multiple joints and can be severely disabling. Infective arthritis results from a specific bacterial infection such as tuberculosis or gonorrhea. Both rheumatoid and infective arthritis are rarely encountered as workers' compensation problems. Osteoarthritis is common. It usually affects one joint, most often a weight bearing one. It is basically a wear and tear or degenerative disease. It is common1y an issue in workers' compensation cases because a worker attributes its onset to a (usually remote) injury at work.

Before giving the details of osteoarthritis, an understanding of the anatomy of a normal joint is required.

Articular Cartilage

This material is a translucent semi-elastic smooth surface substance which caps each of the ends of the bones participating in the joint. Its surface is smooth and has an extremely low coefficient of friction. When a joint moves, it is the articular cartilage that slides on. articular carti1age. Most of this composition is ground substance which gives it its texture or qualities.

Synovial Lining

This tissue paper thin membrane lines the anterior of the joint. It has the cells that produce synovial fluid which lubricates the articular cartilage thereby reducing the coefficient of friction even more to permit more effortless movement. As articular cartilage does not have its on blood supply the synovial fluid also carries nutrition for the cartilage and washes away the waste products of metabolism.

Fibrous Capsule

The joint is held together by a fibrous capsule which is condensed in certain areas to form fibrous bands called ligaments and the integral security of the joint usually relates to the strength of the capsule.

Bone

The bone under the cartilage (subchondral bone) is dense as is the bone on the outside of the shaft. This is referred to as compact bone. The central part of the bone is more porous in structure and is referred to as cancellous bone and is richly supplied by blood vessels and contains red and yellow marrow.

Structural Abnormalities

So called degenerative changes within the joint create the condition referred to as degenerative arthritis or more familiarly osteoarthritis (although the correct term is osteoarthrosis). The changes that occur in osteoarthritis relate both to the articular cartilage and the subchondral bone. A change may occur in the physical chemical structure of the ground substance of the cartilage, creating a material which may have less elasticity and more prone to the development of minute cracks in its surface. As this change progresses the cracks may deepen forming fissures and small superficial flakes of the cartilage may separate leaving a roughened surface. If further progression occurs these defects may deepen so the articular cartilage may be completely lost. The underlying bone (subchondral bone) then becomes the articulating surface. As this material is much less suited for a frictionless movement, frequently the joint will become stiffer to move and movement will be associated with noises from within the joint (crepitus). The initiating factor for the change in the composition of the ground substance of the articular cartilage in the idiopathic form of osteoarthritis is not known. If the interior of a joint has been damaged by a previous injury such as a fracture or inflammation (such as an inflammatory arthritis or infection), the altered cartilage in the surface may promote this deterioration or degenerative change. Part of the degenerative process may involve new bone growth in the subchondral region. This will further thicken the subchondral bone. There may be associated new bone formation at the margins of the joint forming excrescences which are referred to as spurs. This will be observable clinically as bony enlargement of the joint and may mechanically reduce the potential range of movement in the joint. In osteoarthritis (degenerative arthritis) changes in both the articular cartilage and bone may occur.

However they need not occur at the same pace so that in some situations there will be more tendency to spur formation before much change has occurred in the articular cartilage and in others, there may be fairly marked change in the articular cartilage before much bony change is identified.

The resulting osteoarthritic joint then has articular cartilage which is brittle, eroded and resistant to free movement and has bone in the region of the joint which is heavier and thicker with new growth called spurs.

Radiological Features

Plain x-rays identify calcium containing structures, mainly bone. Normal articular cartilage does not contain calcium and therefore is invisible in plain x-rays. However, if there has been significant loss of articular cartilage, then the bone ends appear closer to each other than is normal (narrowing of the joint space). The increased thickness of the subchondral bone and the spurs however are quite evident in the x-rays as they are calcium containing structures.

Clinical Features

A sensation of stiffness (increasing work to move a joint), pain on movement of the joint or in more severe cases pain at rest, and visible or palpable firm enlargements about a joint are the features of degenerative arthritis or osteoarthritis. However the appearance of the joint clinically or radiologically does not necessarily parallel the degree of symptoms. In some symptoms of pain and stiffness will be very marked with little to set clinically or radiologically and in other situations, the x-rays and clinical examination may be quite dramatic but the symptoms are minimal. Thus the degree of change on the x-ray does not parallel the degree of symptoms a person may have. Although osteoarthritis is classed as a non-inflammatory arthritis, at times local irritation from some cartilage fragments may initiate an irritative phenomenon characterized by an increased amount of joint fluids (effusion) and at times even alight warmth about the joints.

Types of Osteoarthritis

Although the structural changes described above are common of the following conditions, the clinical course of these may be quite different. There are various classifications of osteoarthritis and the following is a modified abridged form:

1. Primary Idiopathic

(a) generalized;

(b) erosive.

2. Secondary Pre-Disposing Factors

(a) physical insults such as joint trauma;

(b) previous joint diseases such as inflammatory arthritis;

(c) mechanical/anatomical disturbances such as previous surgical removal of a meniscus from the knee;

(d) endocrine/metabolic such as calcium pyrophosphate crystal deposition;

(e) neurological disease causing neuritis e.g. diabetes;

(f) childhood disease that deforms the joint surface usually in the hip. They are congenital dislocation of the hip (commoner in girls), Legg-Perthe's disease and slipped femoral epiphysis (both commoner in boys);

(g) conditions that cut off the blood supply to the bone forming one side of the joint. When this happens the bone dies and becomes soft and before it can be replaced by healthy bone the joint surface becomes deformed. The main examples occur in the hip and include fracture of the upper part (neck) of the thigh bone, Caisson disease ("the bends") and excessive use of steroids - drugs derived from the adrenal gland and widely used in the treatment of arthritis and in organ transplantation.

In secondary osteoarthritis there has been a structural or metabolic change in the joint pre-disposing to the degenerative process. In the idiopathic form the trigger for the development is not known.

Primary Osteoarthritis

This form frequently develops in women about the time of the menopause. There is a strong family history. Joint involvement tends to be the joints of the fingers (interphalangeal joints), the joints at the base of the thumb and the base of the great toe. Other joints such as the knuckles, (metacarpal phalangeal joints), the wrists and other small joints of the feet are usually not affected. The incidence is difficult to estimate but this pattern of osteoarthritis is common. In the finger joints the joint is enlarged by bony thickening referred to as nodes. Those involving the distal joints are referred to as Heberden's nodes and those of the proximal joints referred to as Bouchard's nodes. The condition itself is referred to as nodal or hypertrophic osteoarthritis. There is a more unusual form, erosive, associated with significant inflammatory reaction with ultimately more significant joint change wherein actual bony erosions as well as spurs occur, thereby creating a significantly deformed joint with reduced function. These forms of primary osteoarthritis namely nodal, hypertrophic osteoarthritis and the erosive osteoarthritis are referred to as idiopathic as the trigger for their onset is not known. They do not arise out of working conditions, damp environment or dietary indiscretion.

However a number of factors may alter the symptoms of osteoarthritis. A number of people are weather sensitive finding their joint symptoms worsen under certain climatic conditions. Others will find certain dietary indulgences will be associated with more stiffness and pain. Repeated physical activity stresses the joint and may be followed by increased pain and stiffness. None of these factors causes the arthritis but may worsen the symptoms of an already established arthritis.

Secondary Osteoarthritis

Structural changes are similar to those described for primary osteoarthritis but in these situations a preceding or underlying situation or condition may be identified as the cause of the altered structure. The symptoms here also may be varied as mentioned above but if a joint is further insulted then the symptoms and the degree of the osteoarthritis may worsen.

Prevalence

Eased on radiological assessment more than 80% of people over the age of 55 have some degree of osteoarthritis. The prevalence increases with age, but one radiological survey has shown a 10% prevalence of osteoarthritis in people 15 to 24 years of age. Another study found evidence of osteoarthritis in the hands of 33% of the American population but symptoms were present in only 4%.

Treatment

The treatment of osteoarthritis is either medical or surgical. Most respond well and obtain prolonged relief by the use of anti-inflammatory drugs of which the commonest is aspirin. Injecting the joint with steroids and physiotherapy are also useful. Surgery is very much a last resort. There are three main types of operation. Fusion (arthrodesis) in which the patient exchanges joint movement for freedom from pain, osteotomy in which the bone near the joint is realigned to permit weight bearing through a healthier part of the joint, and arthroplasty (artificial joint). No artificial joint will last forever so the first two procedures are recommended in younger patients with the idea that an arthroplasty can always be done at a later date.

Further information on the generalized nature of osteoarthritis may be found in the Textbook of Rheumatology, 2d Edition, W.N. Kelly, publisher LB. Saunders 1985 or in a review article by T.D.B. Cooke and I.L. Dwocsh entitled "The Clinical Features of Osteoarthritis in the Elderly" published in the Clinics of Rheumatic Disease, Vol. 12, p. 155 1986. (Copies available in the WCAT Library.)

Questions Commonly Asked About Osteoarthritis

1. What is the usual incidence of this condition in the general population? Is it gender related? Is it more frequently found in some joints than others?

Eighty percent (80%) of the population over age 55 have x-ray evidence of osteoarthritis in one or another joint. There is no clear sex distribution with the exception of the fingers when it is commoner in females. It is commoner

in weight bearing joints (knee, hip and mid foot). There is an unproven contention that osteoarthritis of the knee is commoner in overweight bow-legged females. There is a definite familial pattern in some patients in whom painful joints start in the second and third decade in both sexes.

2. At what age do symptoms usually become noticeable?

Usually the fifth and sixth decades in primary osteoarthritis and within a few years of the incident that damaged the joint in secondary osteoarthritis.

3. Does the presence of osteoarthritis in the x-ray of an asymptomatic patient suggest he or she will likely become symptomatic?

Yes. The disease is slowly progressive and sooner or later the patient will become aware of pain and stiffness in the involved joint.

4. What factors might precipitate the onset of symptoms in osteoarthritis?

In both primary and secondary arthritis pain is related to episodes of joint inflammation. This is believed to be the result of irritation of the joint lining caused by fragments of abraded cartilage lying in the joint fluid. Often such episodes follow a trivial injury such as twisting the knee during a golf stoke, missing a step, squatting down, etc. As a rule patients with secondary arthritis develop symptoms fairly soon after whatever injury or disease damaged the joint and their symptoms tend to be more unremitting and more steadily progressive. Patients with primary osteoarthritis develop symptoms at a later age (fifth and sixth decades) and the pain is characteristically intermittent with a very slow progress to the stage where the patient may be significantly disabled.

5. When an individual exhibit symptoms of osteoarthritis do they correlate with the x-ray findings?

No. Often the patient with slight x-ray changes develops an acutely painful swollen joint or a patient with marked x-ray changes has few if any symptoms of which he is aware of.

6. What signs suggest the condition is advancing?

A physician would notice more swelling, progression of deformity and stiffness, more easily demonstrated crepitus when the rough joint surfaces rub on each other and increase in the amount of abnormal mobility. In the

x-rays there would be increase in the amount of joint narrowing, increase in the number and size of osteophytes, and increase in the amount of dense bone under the joint surfaces.

7. Is osteoarthritis usually a one joint or multiple joint disease?

Usually one joint. The hips and knees are commonly (about 10%) bilateral. Both usually progress at the same rate unless one side sustains a distinct injury in which event it may become more symptomatic.

8. What is the effect of treatment on the symptoms and the disease process?

Host patients respond well to simple treatment consisting of the use of anti-inflammatory medication of which aspirin is the mainstay and physiotherapy. Only a small number eventually require surgery. This sort of treatment obviously does not affect the underlying disease process or its progress; it simply settles down the acute flare-ups which are so bothersome to the patient.

9. In many appeals to the Tribunal it is claimed that an accident has contributed to the development of osteoarthritis in other joints. For example, someone with osteoarthritis of one knee or one hip claims that his altered gait contributed to the development of osteoarthritis in the opposite limb.

There is no scientific basis whatsoever for this contention. In nearly every case where osteoarthritis on the opposite side develops the patient was probably one of the group with symmetrical disease with only one side being symptomatic at the time of the injury. Osteoarthritis of one knee or one hip is common so that if the limping caused by it really did produce osteoarthritis on the opposite side it would be a clearly known medical fact and this is simply not the case.

10. As most appeals relate to osteoarthritis developing after an injury it would be useful to understand how a specialist determines whether an injury caused the osteoarthritis or whether the injury aggravated pre-existing primary osteoarthritis.

If the injury caused the osteoarthritis than there is clear evidence in the x-rays either of an altered weight transmission through the joint caused by a fracture deforming the limb on either side of the joint or a fracture which entered the joint surface, damaging it. When there is pre-existing osteoarthritis the x-rays usually give the clue. The doctor looks for narrowing of the joint space for spur formation, etc., in the x-rays made immediately

after the injury. If they are present this means that the changes which take a long time to develop preceded the injury. The changes in congenital dislocation of the hip, Legg-Perthe's disease and slipped femoral epiphysis are quite characteristic and cannot be confused with an injury occurring in adult life. When there is pre-existing primary osteoarthritis of the knee, the x-ray changes are quite characteristic and the doctor looks for narrowing of the joint space, osteophytes and so forth as reliable evidence the condition preceded the injury by a number of years. If there is similar arthritis in the opposite knee this confirms the notion that the osteoarthritis preceded the injury.

Difficulties arise when a patient claims long afterwards that an injury caused osteoarthritis and by that time the original x-rays have been destroyed. If the reports of original x-rays are available these are often sufficient. If they are reported as normal and the current x-ray showed changes typical of primary osteoarthritis and if the patient has not had that joint operated upon (e.g. a meniscectomy) then the conclusion is that the osteoarthritis was probably going to develop any way and that the patient's injury was but one episode in a long slow progression of the disease.

11. When there is an obvious pre-existing condition that caused the secondary arthritis, how long does it take for symptoms to develop?

It depends on the nature of the pre-existing condition:

(a) The childhood diseases of the hip already mentioned are usually asymptomatic during the balance of the childhood and early adult life so that symptoms are rare before the fourth decade.

(b) When the joint is damaged by a fracture through a joint surface or obstruction to the blood supply of the joint symptoms begin usually soon afterwards, within a year or two. But not all such damaged joints become symptomatic: about a third are symptom-free.

12. Does removal of a meniscus (semi-lunar cartilage) from the knee cause osteoarthritis? How long does it take to develop? Is it affected by a second more recent injury to the knee?

Yes. Removal of a meniscus does cause late secondary arthritis. It usually takes 10 to 20 years to develop. Complete removal of the meniscus alters the way weight is taken through the joint and the way the lubricating synovial fluid is distributed so that our current practice is to remove only the torn part or where possible to repair the tear by stitching it together. When the secondary arthritis does occur it is more prone to aggravation by more injury

so that if the original injury (requiring the meniscectomy) was compensable, the second injury may be said to have aggravated the original compensable condition. But if the original condition is non-compensable and a second injury occurs that is compensable, the second injury may be said to have aggravated a pre-existing condition that was slowly progressive.