Osteoarthritis: pathogenesis, clinical features and management


Summary
Osteoarthritis is a degenerative disorder of the synovial joints that is characterised by joint pain, stiffness and limited range of movement. The majority of nurses will encounter patients with this condition even though this might not be the reason they are seeking health care. This article discusses the associated signs and symptoms, investigations, diagnosis and treatment of this condition.

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Incidence
The number of people with osteoarthritis in the UK is continuing to rise alongside the prevalence of risk factors such as obesity and poor fitness levels (NICE 2008). Brouwer et al (2005) estimate that approximately 12% of people over the age of 65 years have symptomatic osteoarthritis. At least 4.4 million people in the UK have radiological evidence of moderate-to-severe osteoarthritis in their hands and approximately 500,000 have moderate-to-severe osteoarthritis of the knees (Arthritis Research Campaign 2002). However,
it should be noted that many people with radiological evidence of osteoarthritis may remain asymptomatic, and that symptomatic osteoarthritis is not an inevitable consequence of ageing. Familial studies have demonstrated that inheritance is a considerable factor, especially in hand and generalised osteoarthritis (Doherty et al 2006). Heritability for osteoarthritis of the knee and hip has been estimated to be between 40% and 60% (NICE 2008). Osteoarthritis of the knee is prevalent in all racial groups, but hip, hand and generalised osteoarthritis are more common among Caucasians. Osteoarthritis is more prevalent and more frequently symptomatic in women, with the exception of hip osteoarthritis, which affects men equally (Doherty et al 2006).

Pathogenesis The structures in the joint are dependent on each other for strength and function (Figure 1). Disruption to the cartilage, bone, synovial membrane, capsule, ligament or the muscle will result in changes affecting the whole joint. Osteoarthritis is a dynamic process that involves tissue production and the remodelling of the shape of the joint. Cartilage changes are characteristic of osteoarthritis with enzymatic degeneration of collagen and aggrecan, and focal loss of hyaline cartilage. This is usually around the point of maximum load bearing rather than widespread destruction. Cysts may develop in the bone, which Doherty et al (2006) suggest may be the result of small areas of osteonecrosis caused by increased pressure in the bone when the cartilage is no longer adequate in its load-transmitting function.

Osteophytes are evident at the margins of the joint where new fibrocartilage has been produced and has undergone ossification. Other pathological changes with osteoarthritis may include: subchondral bony sclerosis, synovial hyperplasia, thickening of the joint capsule, osteochondral bodies in the synovial membrane, secondary entheseopathy (inflammation of the insertion points of ligaments and tendons into bone) and secondary bursitis (Doherty et al 2006).

Signs and symptoms

Onset of symptoms is typically insidious, with the principal symptoms being pain and stiffness. Pain may be transient or even absent. Pain associated with osteoarthritis worsens with joint use and is usually reduced at the start of the day or following rest and more severe at the end of the day (NHS CKS 2008). Severe osteoarthritis can, however, cause pain at rest and restrict the ability to mobilise and engage in self-caring or leisure activities. Pain may be variable and intermittent over a period of time with patients having ‘good days’ and ‘bad days’. Morning stiffness or stiffness following a period of inactivity (gelling) is usually of short duration and generally lasts less than 15-30 minutes. Clinical features can include: crepitus, reduced range of movement, joint instability, joint line tenderness, pain on movement or when the joint is being stressed, and mild synovitis.

Restricted movement can occur in the affected joint due to pain, capsular thickening or the presence of an osteophyte. Palpable and audible coarse crepitus may be apparent on movement due to rough articular surfaces. On visual inspection there may be some deformity of the affected joint (usually without instability) due to the presence of osteophytes. Joint line and periarticular tenderness may be apparent on palpation. Reduced muscle strength or wasting of the muscles may also be present.

Pain is characteristically related to one or a few joints, as opposed to multiple regional pain. Pain can be directly related to the osteoarthritis process and attributed to:

- Increased pressure in the subchondral bone (which may cause night pain).
- Trabecular micro-fractures – fractures that occur in the meshwork of cancellous bone.
- Capsular distention, which may result from the presence of bursitis or entheseopathy.

With osteoarthritis of the hand there may be squaring of the first carpometacarpal joint due to osteophyte formation – as with changes at the proximal interphalangeal joints, known as Bouchard’s nodes, and the distal interphalangeal joints, termed Heberden’s nodes (Figure 2).
Investigations and diagnosis

Diagnosis is largely based on patient history and examination. However, X-rays are required to diagnose hip and knee osteoarthritis if the symptoms change or the patient is referred for orthopaedic surgery. X-rays may show joint space narrowing, sclerosis or cysts (NHS CKS 2008).

Before diagnosis of osteoarthritis, other conditions should be excluded (Box 1). Other differential diagnoses include (NHS CKS 2008):

- Pseudo gout (calcium pyrophosphate deposition) — typically affects knees, wrists, shoulders and metacarpophalangeal joints and can co-exist with osteoarthritis.
- Rheumatoid arthritis.
- Psoriatic arthritis.
- Septic arthritis — typically presents as a monoarthritis, but may be polyarticular in immunocompromised patients or in gonococcal or seronegative spondyloarthropathies, such as ankylosing spondylitis.
- Reactive arthritis, for example, Reiter’s syndrome, Chlamydia or Salmonella.
- Viral arthritis, for example, parvovirus or hepatitis B.
- Connective tissue disease, for example, systemic lupus erythematosus or scleroderma.

Other medical conditions that may present with an arthropathy should be excluded before diagnosing osteoarthritis. These include sarcoidosis, thyroid disease, multiple myeloma and haemochromatosis. Referred pain should also be excluded by examining the joint above and joint below, and carrying out a distal neurovascular examination.

Management

The aim of osteoarthritis management is to reduce pain and stiffness while maintaining or improving joint mobility and limiting the progression of joint damage. A management plan should focus on maintaining normal function and activities of daily living. Strategies should address functional disability and attempt to avoid or reduce the use of drugs where possible. Management should address the symptomatic sites specifically, as the approach can vary depending on which joints are affected.

An assessment of medical, social and psychological needs enables a tailored approach to treatment options. Management strategies need to be considered in relation to the context of pain, quality of life and limitation experienced. For example, an older woman living alone and unable to mobilise due to pain will require a different approach than a primary school teacher with early osteoarthritis. Treatment needs to be tailored to suit different circumstances and outcomes need to be monitored. Healthcare professionals should review the effect of symptomatic osteoarthritis on individuals’ function, quality of life, occupation and leisure activities periodically. Co-morbidities that can compound the effect of osteoarthritis should also be considered when formulating a management plan.

A therapeutic relationship between patients and health professionals should focus on a patient-centred approach to communication and a positive approach to rehabilitation (Stewart et al 2003). Decision making which endorses the individual’s ability to manage the condition is essential (NICE 2008) as this not only provides a greater sense of self-empowerment, but also reduces reliance on health services and pharmacological therapies (Sobel 1995, Corben and Rosen 2005). Care should focus on the provision of appropriate information regarding disease and management strategies, particularly activity or exercise and, where appropriate, interventions to promote weight loss in patients who are overweight or obese. However, this should reflect the individual’s need and level of disability (NICE 2006).

Differential diagnoses

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<td>Anserine bursitis.</td>
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<td>Referred pain from hip or spine.</td>
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<td><strong>Osteoarthritis of the hip</strong></td>
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<td>Trochanteric bursitis.</td>
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<td>Referred pain from the spine.</td>
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(Doherty et al 2006, NHS CKS 2008)
Non-pharmacological management

Aids and equipment Patients with biomechanical joint pain or instability should be given appropriate information by allied health professionals on footwear, insoles, splints and braces that may be beneficial in the management of osteoarthritis. In a systematic review, Brouwer et al (2005) identified that the use of neutrally and laterally shaped wedged insoles improved pain and stiffness in knee osteoarthritis, with laterally shaped wedges resulting in reduced use of non-steroidal anti-inflammatory drugs (NSAIDs). The application of a valgus knee brace may also improve pain, stiffness and physiological function (Brouwer et al 2005). This equipment should be considered as an adjunct to core treatment (NICE 2008).

The use of a cane may reduce the force through the affected joint and therefore improve pain, function, stride length and cadence (Chan et al 2005). Van der Esch et al (2003) identified that 44% of people with osteoarthritis possessed a walking aid, particularly those of advancing age or those with a greater disability. Non-use was associated with negative views about walking aids.

Wielandt et al (2006) identified that non-use of assistive technology was associated with poor perceptions of assistive technology and associated benefits, poor recollection of training or poor perception of the disability or illness. It is important that patients receive appropriate professional advice and guidance about assistive devices such as long-handled reachers, chair raisers, raised toilet seats, perch stools and other home adaptations that may improve independence. Referral to occupational therapists may be required for assistive technology to improve function and activities of daily living, or for the use of hand splints in patients who have osteoarthritis of the hand (NICE 2008).

It is important that patients are able to discuss openly their perception of their illness and difficulties experienced so that appropriate measures can be taken to address any misconceptions and provide devices to enhance independence.

Referral to physiotherapy or occupational therapy may help patients reach an informed decision regarding the use of assistive devices, splints, braces or walking aids and maximise the potential for future self-management. Input from the multidisciplinary team can be particularly important in patients with complex multiple co-morbidities and who require assistance to optimise their level of independence and ability to self-care. Nurses are ideally placed in many healthcare settings to discuss concerns that patients may have or offer reassurance about the use of new equipment and technology.

Exercise The management of patients with osteoarthritis should include an exercise programme focusing on local muscle strengthening and general aerobic fitness (NICE 2008). Exercise is widely used by patients and health professionals to reduce pain (Fransen et al 2002) and improve function (NICE 2008). Roddy et al (2005) demonstrated that exercise reduced pain and disability, and improved physical function including stair climbing, walking distance and muscle strength in patients with knee osteoarthritis. Further benefits included a reduction in medication and improved mental health. However, these effects have not been replicated in patients with hip and hand osteoarthritis.

MacCarthy et al (2004) demonstrated that class-based exercise was effective in reducing pain and disability and improved walking speed in patients with knee osteoarthritis. However, there is limited evidence regarding the benefits of one exercise programme over another (NICE 2008). Patient preferences should inform the design of exercise programmes, as tailoring programmes to meet specific patient needs is more likely to achieve long-term positive behavioural change.

Exercise can be targeted at affected areas with the aim of improving general mobility, function and self-efficacy. More intensive exercise programmes may focus on strengthening muscles around the affected joint. Brosseau et al (2003) conducted a systematic review that studied the intensity of exercise and concluded that high and low intensity exercises were equally effective.

Manual therapy (soft tissue massage, stretching and passive movement of the joints and soft tissue) can also be used with exercise and physiotherapy programmes. Manipulation can use high velocity thrusts and mobilisation that are graded and tailored appropriately to the patient’s signs and symptoms (NICE 2008).

While some individuals can experience an exacerbation of symptoms following controlled exercise, the majority will not have any adverse reaction (Hurley et al 2007).

Pacing may be advantageous to some individuals, who are taught to ‘pace’ activities, integrating specific exercise sessions with periods of rest and activity throughout the day. In some cases analgesia may be required to allow participation in exercise. If patients are
given adequate information and support regarding exercise and the use of pacing or appropriate analgesia, they will find it easier to manage such activities on a daily basis without having to seek healthcare advice repeatedly. Exercise should be considered a core treatment of osteoarthritis irrespective of age, co-morbidity, pain severity or disability. However, this needs to be tailored to individual requirements, risk factors and preferences. Exercise programmes should include local muscle strengthening and general aerobic fitness. Appropriate assessment by healthcare professionals needs to ensure effective patient participation and consider the individual’s needs, circumstances, self-motivation and availability of local facilities. Failure to take account of these issues will hamper the patient’s ability and enthusiasm to engage in exercise on a long-term basis.

**Weight loss** The association of obesity with the development and progression of osteoarthritis (especially in the knee) provides justification for weight loss (NICE 2008). Weight loss is recommended if the patient’s body mass index is greater than 28 (NHS CKS 2008) and can be achieved through diet and exercise (NICE 2006). Published data suggest that weight loss and other interventions that reduce excess load lead to an improvement in function, providing the magnitude of weight loss is sufficient. However, the effect of weight loss on pain is inconsistent (NICE 2008). Messier et al (2004) identified that the combination of weight loss and exercise leads to greater improvements in function and pain than weight loss or exercise alone. Christensen et al (2007) identified that a weight loss of 10% in people with osteoarthritis of the knee improved their overall function score by 28%.

**Pain management** People with osteoarthritis apply heat and cold locally as part of self-management techniques despite the scarcity of good evidence that doing so is effective (NICE 2008). This can be in the form of hot/cold packs, massage or a hot/cold bath. The local use of cold or heat therapies should be considered as an adjunct to core treatment strategies. The use of transcutaneous electrical nerve stimulation (TENS) therapy can also provide symptomatic relief and has minimal contraindications for use. Osiri et al (2000) found that the use of TENS to treat patients with osteoarthritis of the knee improved pain and stiffness significantly compared to placebo.

**Pharmacological and invasive management** If oral analgesics are required then paracetamol (with or without codeine) is the drug of choice. Oral NSAIDs, such as diclofenac, ibuprofen or naproxen may also be required if adequate analgesia is not achieved with regular use of paracetamol (NHS CKS 2008). When NSAIDs are taken on a regular basis, prescription of a proton-pump inhibitor, such as omeprazole, is advised (NICE 2008). The lowest effective dose of NSAID should be taken for the shortest duration to reduce the risk of associated morbidities such as gastrointestinal, liver or renal complications. If the patient is taking low-dose aspirin then other analgesics should be considered before commencing an NSAID.

The use of topical NSAIDs is associated with fewer adverse effects than oral NSAIDs, although they are no more effective (Mason et al 2004). Lin et al (2004) concluded from their systematic review that topical NSAIDs were more effective than placebo in improving pain and function in patients with osteoarthritis over a fortnight; however there was no evidence to support long-term use of topical NSAIDs. Similar findings have been echoed by Mason et al (2004) on investigating the management of chronic musculoskeletal pain. NICE (2008) recommends the use of topical NSAIDs for hand or knee osteoarthritis. The use of topical capsaicin may also be of benefit in some patients. Corticosteroid injections deliver high doses of corticosteroid to the affected joint while minimising the systemic effect and are effective in providing short-term pain relief. Glucosamine and chondroitin products are not recommended by NICE (2008).

Most people with osteoarthritis are managed in the primary care setting. However, if the condition becomes severe or there is progressive limitation in activities of daily living then a referral should be made to an orthopaedic surgeon (American College of Rheumatology Subcommittee on Osteoarthritis Guidelines 2000). NICE (2007) recommends that arthroscopic lavage and debridement are not offered as treatment unless the person has osteoarthritis of the knee and a clear history of mechanical locking or radiological evidence of loose bodies. Osteotomy may delay the need for joint replacement and relieve pain by reducing intraosseous pressure (Doherty et al 2006), particularly in those who are not yet candidates for joint replacements, such as those who are young or active (NHS CKS 2008). Joint replacement can be considered if conservative measures are not successful and if there is a substantial effect on quality of life (NICE 2008). The use of total knee replacement in moderate to severe osteoarthritis may relieve pain and improve function. However, it is important to ensure that patient expectations of surgical outcomes are realistic.
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Conclusion

Osteoarthritis is a disease process that affects many individuals and can have devastating consequences on independent living, quality of life and body image. Clinical effects of this condition can be well managed in primary care with effective use of allied health professionals and patient-centred care. The appropriate use of assistive devices, walking aids and exercise may improve patients’ functional ability and consequently their level of independence, particularly when these strategies are used in conjunction with pain management techniques, such as thermal therapies, TENS or adequate angesia.

Orthopaedic intervention is beneficial in managing patients with moderate-to-severe osteoarthritis and requires appropriate and timely referral to an orthopaedic surgeon. While there is a variety of management options available to patients, it is essential that care is planned with the patient to encourage self-management once he or she is feeling confident. Nurses are ideally placed to discuss relevant issues and concerns with patients and involve appropriate members of the multidisciplinary team in the assessment process.

References


