Current approach to diagnosis and management of osteoarthritis

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Abstract

Osteoarthritis (OA) is a common chronic degenerative joint disorder and a major cause of pain and disability, especially in the elderly. The prevalence is steadily rising due to an increase in life expectancy and certain lifestyle factors. OA is a complex dynamic process involving all tissues of the joint organ. Multiple risk factors are associated with the occurrence and progression of OA. There is extreme variability in presentation at different joint sites and between individuals. Management of OA involves a comprehensive approach consisting of preventative measures and numerous therapeutic modalities which should be tailored to individual needs. The family practitioner plays a vital role in the diagnosis of OA, the initiation of treatment and the ongoing monitoring of the condition.

Introduction

OA is the most common form of arthritis in the world. It is one of the leading causes of disability, pain and health care utilisation in the elderly.[1,2] The risk for disability from OA of the knee is comparable to that of cardiovascular disease.[3] OA is a multifactorial disease and current therapies are largely directed toward pain control and limitation of functional disability. In patients 45 years and over, consultations for OA account for about 15% of all musculoskeletal consultations, which rises to 25% in those aged 75 years and over.[4] It is, therefore, important for the clinician to have a basic approach to diagnosing and managing this common condition. This review will focus on risk factors, aetiopathogenesis, diagnosis and current approaches to the management of OA.

Epidemiology and risk factors

The exact prevalence and incidence rates of OA are difficult to determine because symptoms do not always correlate with structural changes (joint radiographs). The prevalence of OA for hands, knees and hips consistently increases with age.[5] Symptomatic OA is, however, not an inevitable consequence of ageing. More than one third of adults aged 60 years and over demonstrate radiographic OA changes, however only 12% are symptomatic.[6] After the age of about 50 years, the prevalence of radiographic knee and hand OA is higher in women than men,[7,8] with women being more symptomatic. The overall prevalence of OA is expected to grow over the next several decades, with increasing longevity and the obesity epidemic. It is estimated that OA will be the fourth leading cause of disability by the year 2020.[9]

OA is a complex disorder with multiple risk factors. Risk factors may vary between different joint sites and various risk factors may also differ in their contribution to the initiation and progression of OA. Older age, obesity, female gender, previous knee injury, occupational activity involving kneeling, stooping or crouching, and the presence of hand OA are the factors that are consistently associated with increased risk of knee OA.[10] Malalignment[11] and generalised OA[12] are the strongest risk factors for progression of knee OA. Low vitamin D and C intake also appear to be associated with OA progression in the knee.[13,14] There is no conclusive evidence that sports activities, such as running, increase the risk of OA progression in a normal joint. The European League Against Rheumatism (EULAR) evidence-based major risk factors for hand OA are > 40 years of age, female gender, positive family history, occupation and obesity.[15] For primary and secondary prevention purposes, it is useful to divide risk factors into those that are reversible or avoidable (obesity, joint trauma, occupation, weak muscles) and those that are non-modifiable (age, gender, genetics).

Aetiopathogenesis and classification

OA was previously considered to be a "wear and tear" degenerative process affecting only articular cartilage. It is now described to be a condition affecting the whole joint unit, including not only cartilage but also periarticular bone, synovium/capsule, ligaments, tendons and muscles.[16] The structural and functional changes that occur are a result

Figure 1: The development of osteoarthritis. Reproduced from Nuki[18] with permission from Arthritis Research UK
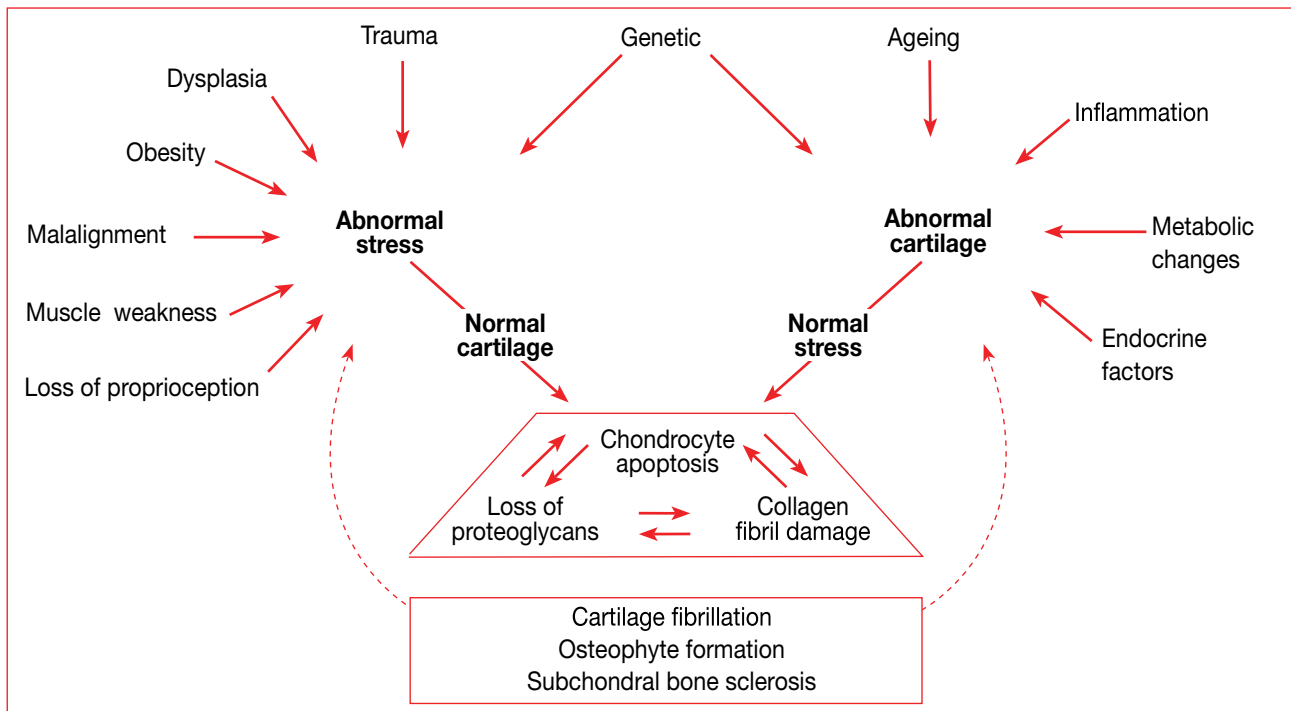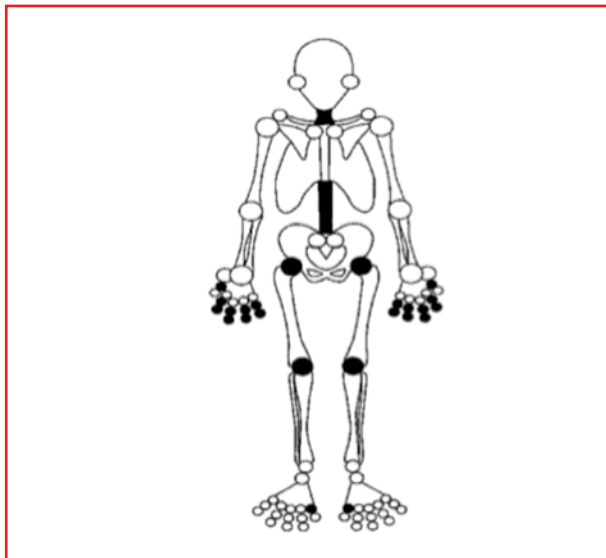

Figure 2: Joints commonly involved in osteoarthritis

KEY POINTS
- The prevalence of OA is increasing
- OA accounts for significant disability
- Multiple risk factors are associated with OA
- The whole joint organ is involved in OA
- Weight-bearing joints are commonly affected
- Secondary causes of OA should be excluded

of various biomechanical, biochemical, inflammatory and immunologic factors.[17] The pathological process involves fragmentation and thinning of articular cartilage, thickening of subchondral bone and cyst formation, development of osteophytes, variable degrees of inflammation, ligamentous laxity and muscle weakness. The interplay between various local and systemic factors resulting in the development of OA is depicted in Figure 1.[18]

OA commonly affects weight-bearing and stressed joints (hips, knees and 1st metatarsophalangeal joints), small hand joints and the cervical and lumbar spine (Figure 2). The spine will not be discussed for the purposes of this article. The recognised subsets of hand OA now include

nodal (presence of Heberden's and Bouchard's nodes), generalised (hand OA, with OA at other sites), thumb-base, and an erosive variant characterised by subchondral erosions and an inflammatory component.[19]

Most OA can be categorised into primary and secondary variants. Primary (idiopathic) OA occurs in previously undamaged joints and can be further classified as localised (1 or 2 sites) or generalised (≥ 3 sites). Ageing and genetic factors are the key players in the development of primary OA. Secondary OA is associated with well-recognised causes such as trauma, anatomic abnormalities, rheumatoid or other inflammatory arthritides, and metabolic or endocrine disorders (Table I).[20]

Table I: Secondary causes of osteoarthritis[20]

- Inflammatory arthritis e.g. rheumatoid or psoriatic arthritis
- Crystal arthropathy e.g. gout; calcium pyrophosphate deposition disease
- Postinfective arthritis e.g. septic arthritis/tuberculosis
- Prior joint trauma or surgery
- Endocrinopathies e.g. acromegaly; hyperparathyroidism
- Metabolic disorders e.g. haemochromatosis; ochronosis
- Neuropathic arthropathy e.g. diabetes ; tabes dorsalis ; peripheral nerve injury
- Prior bone diseases e.g. Paget's; osteonecrosis
- Bleeding dyscrasias e.g. haemophilia
- Congenital or developmental e.g. dysplasias; slipped femoral capital epiphysis; Marfan syndrome

Clinical features and diagnosis

There is extreme variability in the clinical presentation of OA. The American College of Rheumatology (ACR) has developed classification criteria for OA based on symptoms, signs and radiographic findings.[21,22,23] These criteria have been developed for clinical research studies, but are useful to differentiate OA from other inflammatory arthritides. A thorough history and examination remains the most important aspect in the diagnosis of OA, as radiology and laboratory investigations may be normal.

Key features on history:
- Joint pain worse with activity
- Morning stiffness lasting no more than 30 minutes
- Stiffness after periods of immobility
- Impairment of function

Key features on examination:
- Bony swelling
- Crepitus
- Joint line tenderness
- Limitation of joint mobility
- Joint instability
- Periarticular muscle atrophy
- Joint effusions may be present

During the consultation, all the patient's risk factors for OA should be elicited as this will impact on further management. A simple assessment of severity should include questioning on levels of pain (intensity, frequency and duration) and how the patient performs with activities of daily living (e.g.self-care, ambulation, movement).

Of note, cartilage is not innervated and the source of pain in OA usually originates from adjacent bone, periosteum and soft tissue. Local joint pathology must be distinguished from periarticular problems e.g. bursitis or tendonitis. Involvement of atypical joints such as wrists, elbows, shoulders, ankles, metacarpophalangeal joints of the hands and 2nd-5th metatarsophalangeal joints of the feet should always prompt a search for a secondary cause of OA such as rheumatoid arthritis.

Laboratory

A typical clinical presentation of OA does not require laboratory testing. The erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) are usually normal. The full blood count is normal. Rheumatoid factor (RF) and antinuclear antibodies (ANA) are usually negative. Note that these antibodies may be low positive and of no significance in elderly patients and in some chronic conditions. Synovial fluid analysis usually indicates a low white cell count < 2 000/μL. Laboratory investigations should only be performed if secondary causes of OA are clinically suspected.

Radiology

It is important to note that pain and severity of radiographic changes do not always correlate. However, patients with a longer history and persistent severe symptoms of OA are more likely to demonstrate structural X-ray changes. The characteristic X-ray features of OA include focal joint space narrowing, subchondral sclerosis, subchondral cysts and osteophytes (Figure 3). Calcification of cartilage may point to secondary OA and pseudogout. Weight-bearing standing radiographs of knees should be requested to correctly evaluate for joint space narrowing. Ultrasound and magnetic resonance imaging modalities are not discussed here.

Figure 3: Radiograph of the knee shows medial joint space narrowing, subchondral sclerosis and osteophyte formation (arrows)

Site specific patterns of osteoarthritis

OA impacts differently at different sites. A few patterns of OA joint disease are highlighted here.

Hands. The most affected joints are the distal inter-phalangeal (DIP), proximal interphalangeal (PIP) and the first carpometacarpal (CMC) joints. Involvement of the first CMC joint results in a "squared-off" appearance which often impairs manual dexterity. The typical bony articular nodules of Heberden's and Bouchard's nodes develop in the DIP and PIP joints, respectively (Figure 4). These develop slowly over time and the swollen joint may feel soft (mucinous cysts) or

Figure 4: Nodal OA of the hand with Heberden's nodes at the DIP joints (arrows)

Figure 5: Erosive OA of the hand with classical "gull-wing" appearance (arrows) of the DIP joints

hard (osteophytes). The tendency to develop nodes may be familial. An erosive variant, which almost exclusively affects postmenopausal females, is characterised by frequent recurrent inflammatory flares over many years. Multiple DIP or PIP joints may be involved often resulting in deformity and ankylosis of the joint. Inflammatory markers (CRP and ESR) may be slightly elevated. Radiographs are characteristic showing central erosions with a hallmark "gull-wing" appearance (Figure 5). It is important to rule out superimposed gout in patients with erosive OA. Periarticular "punched out" erosions may be present with underlying tophaceous gout.

Knees. OA can affect the medial tibiofemoral, lateral tibiofemoral and the patellofemoral compartments. The medial compartment is most frequently involved resulting in genu varus (bowed-leg deformity). Genu valgus (knock-knee deformity) is most often seen in females. Symptoms of "gives way" may indicate muscle weakness, ligamentous laxity or meniscal damage; "locking" may point to the presence of loose bodies in the joint space. Synovial effusions can occur during OA flares. Patellofemoral OA is a common cause of anterior knee pain mainly during climbing or descending stairs. Other causes of regional knee pain may include periarticular conditions (e.g. pes anserine/pre-patellar bursitis or a tendonitis) and referred pain (e.g. from the hip or spine disorder). Intra-articular pathology can be distinguished from periarticular pathology by testing range of motion (ROM) of the joint. In periarticular conditions, active ROM is decreased and passive ROM is normal or impaired at the end of movement in one direction only. In intra-articular pathology, both active and passive ROMs are decreased. The presence of systemic symptoms, very warm joints or uniform joint space narrowing on X-rays should always alert the clinician to search for secondary causes of OA.

Hips. OA of the hip occurs more frequently in men than in women. The patient may present with an antalgic gait and pain is most commonly located in the groin, but less often referred to the lateral hip, buttocks or knee. Reduced extension and limited motion on internal rotation are characteristic early features of hip OA. The superior aspect is most commonly involved on radiographic images. Other causes of "hip pain" may include trochanteric bursitis, thoracolumbar or sacroiliac disease and intrapelvic pathology.

KEY POINTS
- OA is most often a clinical diagnosis
- Pain on usage is the cardinal symptom of OA
- Be sure the pain is related to the involved joint area
- Risk factors, severity and effect on function should be assessed
- Laboratory tests are not useful in primary OA
- X-ray features do not always correlate with symptoms
- Recognise joint-specific features
- Atypical joint involvement should prompt further investigation

Management

The current management of OA, which includes both non-pharmacologic and pharmacologic modalities, is primarily directed toward pain control and reduction in functional limitation. Treatment should be tailored according to individual needs taking into consideration patient age, acceptability, comorbidities, safety and cost. There are currently no approved OA therapies with a disease-modifying effect. Of the many treatments that are available, many only have marginal benefits over placebo.[24] This does not imply that we can adopt an attitude of "nothing can be done" for patients with OA. Rather, it serves as a challenge for the clinician to capitalise on not only using existing therapies effectively, but also to target modifiable risk factors from the outset.

Guidelines for OA management have been developed by EULAR,[25,26,27] the OA Research Society International (OARSI)[28,29,30] and the National Institute of Clinical Excellence

(NICE), of the UK.[31] The recommendations are based on research evidence, expert and patient opinion. The overall agreed treatment objectives are:

- patient education and information access
- pain relief
- optimisation of function
- beneficial modification of the OA process

The management of every patient should include the core treatments of education, exercise and interventions to reduce adverse mechanical factors (e.g. weight loss). Adjunctive and pharmacological treatments are then added as appropriate. Involvement of allied disciplines is encouraged. The sections that follow are based on the available guidelines.[25-31]

Non-pharmacological therapy

Education. Patient education is an ongoing, integral part of management. The practitioner should address aspects of the disease process and benefits and risks of treatment options. Empowering the patient, by involving them in shared decision making and providing them with positive skills directed at lifestyle changes, goes a long way to ensure treatment adherence.

Exercise. Exercise should be encouraged in all patients, irrespective of age. There is now convincing evidence that exercise reduces pain, improves functional capacity and reduces long-term disability if adherence is maintained. The role of exercise as lifestyle intervention for OA has recently been reviewed by Schwellnus et al.[32] Overall, the guideline recommendations for large joint OA include: (1) aerobic exercise; and (2) local neuromuscular training, strengthening and range of motion exercises for quadriceps and gluteal muscles. Patients should be advised to pace themselves according to their levels of pain and ability. For hand OA, range of motion and strengthening exercises, together with education on joint protection, is recommended.

Reduction of adverse mechanical factors. Obesity is a risk factor for the development of OA in the knee, hip and hand, and for the progression of OA in the knee and hip. It remains one of the strongest modifiable risk factors for OA and weight reduction is an effective primary and secondary disease prevention strategy. Weight loss improves pain and function, particularly for knee OA and, to a lesser extent, hip OA. It should be achieved by a combination of correct dietary habits (eat correctly, regularly and less) and exercise. Many patients with OA share other chronic cardiac and metabolic diseases and the benefits of weight loss are substantial. UK studies have concluded that referral to weight loss support groups (e.g. Weight Watchers) is the most effective route to longterm weight loss.

All patients with lower limb OA should be advised about appropriate footwear. A shoe with soft thick soles and no raised heel is recommended. Lateral or medial wedged insoles can be used to reduce pain and improve function in patients with medial or lateral tibiofemoral OA, respectively.

Assistive devices. The use of a cane, frame or wheeled walker in patients with hip or knee OA reduces mechanical loading and pain. Patients should be educated on the proper use of canes. The cane or crutch should be held in the hand contralateral to, and moved together with, the affected limb. The total length of the cane should be equal to the distance between the upper border of the greater trochanter of the femur and the bottom of the heel of the shoe. This should result in elbow flexion of about 20°.

Knee braces can be used in patients with OA and mild-to-moderate varus or valgus malalignment. Overuse and unnecessary use of braces may worsen joint instability by contributing to muscle atrophy. They should only be used when there is a flare of inflammation, to protect the joint during unusual activity and when all other treatment modalities have failed.

For patients with thumb base OA, splints and orthoses are recommended to correct lateral angulation and flexion deformity.

Alternatives. The use of thermotherapy (heat or cold) and transcutaneous electrical nerve stimulation (TENS) are recommended in most guidelines as safe adjunctive modalities for pain relief. Although acupuncture may provide relief to some patients, there is less universal support for its use.

Nutraceuticals and vitamins. The public make wide use of natural products and practitioners are likely to be faced with questions. The evidence to indicate that glucosamine and chondroitin salts have symptom-relieving benefits and structure-modifying effects still remains highly controversial. Most guidelines give only partial support to the use of glucosamine sulphate and chondroitin sulphate for pain relief.[25-30] NICE have not recommended their use in OA.[31] There is now also more evidence for mild symptomatic efficacy of avocado soybean unsaponifiables and rosehip supplements[33,34] and some guidelines do make mention of them.[26,27,30] Vitamin D has complex beneficial effects on bones, cartilage and muscle. Evidence indicates that Vitamin D improves muscle strength and may reduce pain in OA. Supplementation may be of use, particularly in the elderly. Overall, a therapeutic trial of nutraceuticals could be considered, but advise discontinuation of nutraceuticals if no response is apparent after six months of use.

Pharmacological therapy

Paracetamol. Paracetamol (up to 4 g/day) has been the recommended first-line oral analgesic for mild to moderate OA pain.[25-29,31] In the most recent OARSI review,[30] evidence has come to light that long-term use of paracetamol, at doses greater than 3 g/day, may be associated with upper gastrointestinal (GIT) side effects[35] and mild loss of renal

function.[36] Additional concerns about paracetamol's narrow therapeutic margin for liver toxicity, has prompted the FDA to recently recommend that daily doses should be less than 4 g/day. Despite these dose-related concerns, paracetamol still remains the safest first line option.

Opioids. The addition of weak opioids (e.g. tramadol, codeine) should be considered if paracetamol or non-steroidal anti-inflammatory drugs (NSAIDS) are ineffective, poorly tolerated or contraindicated. Stronger opioids (e.g. fentanyl) should only be reserved for severe refractory pain in exceptional circumstances.[25,26,29] Narcotic analgesics should be used with caution in the elderly, as they may cause side effects like constipation, confusion and dizziness.

Non-steroidal anti-inflammatory drug. Oral NSAIDs, including selective and non-selective COX-2 inhibitors (COXIBs), can be added or substituted in patients who respond inadequately to paracetamol.[25-31] All NSAIDs/COXIBs are about equally effective for pain relief in OA, however patient responses may vary considerably to specific agents. The choice of drug should be carefully based on the patient's age, comorbidities, side effect profile and cost. All oral NSAIDs should be used at the lowest effective dose for the shortest possible time.

Major concerns include their potential to cause serious GIT, renal and cardiovascular complications. The EULAR[25-27] and OARSI[29] guidelines recommend that patients at risk of GIT toxicity are to use either a COX-2 selective inhibitor or a non-selective NSAID coprescribed with a proton pump inhibitor (PPI) or misoprostol for gastroprotection. Of note is that many elderly patients are in the at-risk GIT category and have cardiovascular disease necessitating aspirin use. The protective benefits of the COXIBs are, unfortunately, negated if the patient takes aspirin. For this reason, and based on a cost-effective analysis, the NICE guidelines suggest routine addition of a PPI to both non-selective NSAIDs and COX-2 inhibitors.[31] Overall, it is preferable to avoid all NSAIDs and consider other analgesics in any patient with a significant history of peptic ulceration or bleeding.

The risk of atherothrombotic events is common to both COXIBs and the traditional NSAID. It appears that the risk may be lower with naproxen.[37] The safe recommendation is that all NSAIDs should be avoided in patients with ischaemic heart disease or stroke. In patients with significant risk factors for heart disease (e.g. hyperlipidaemia, hypertension, diabetes, smoking), these agents should be used with caution.

NSAIDs are contraindicated in patients with renal dysfunction. Elderly patients often have multiple comorbidities and drug interactions and renal function should be carefully monitored if NSAIDs are prescribed. Any patient with a history of a bleeding diathesis or on anticoagulation therapy should avoid NSAIDs.

Tricyclic compounds and antidepressants. Chronic pain in OA is often accompanied by a vicious cycle of poor sleep, anxiety and depression. The use of amitryptyline at a dose of 10-25 mg at night may be of benefit. Antidepressants (e.g. selective serotonin reuptake inhibitors) may be added in selected patients.

Topical treatments. Topical NSAIDs or capsaicin are effective as adjunctive treatments for hand and knee OA.[27,29,31]

Intra-articular injections. Intra-articular (IA) injections of long-acting corticosteroids may be considered for patients experiencing acute flares with knee effusions, hip OA (given under ultrasound or X-ray guidance) or CMC joint OA not responding to analgesics and NSAIDs.[25-27,29] IA steroids give rapid pain relief and the effect may last for four to 12 weeks. Proper aseptic technique should be employed.

Hyaluronic acid is a glycosaminoglycan found in synovial joint fluid that allows viscous lubrication. IA hyaluronan gives a delayed onset but more prolonged duration of pain relief compared to IA corticosteroids. They are very costly and repeated injections are often required for symptomatic relief. Most guidelines give guarded recommendations for their use in knee or hip OA, however NICE does not support this use.

Surgery. Referral for joint replacement surgery should be considered in patients who experience persistent pain and reduced function that are refractory to non-surgical therapies, and which impact markedly on their quality of life.[25,28,31] Hip and knee arthroplasties should not be delayed until there is prolonged functional limitation and generalised deconditioning. Unicompartmental knee replacement may be considered for patients with involvement of one tibiofemoral compartment. In younger, more mobile, symptomatic patients, corrective osteotomies and joint-preserving procedures (e.g. hip resurfacing) may delay the need for total joint replacement.[29] Current evidence does not support arthroscopic lavage and/or debridement as part of unselected knee OA treatment.[30,38] Several surgical options are available for severe thumb base OA when conservative therapies have failed.[2]

KEY POINTS
- Treatment should be individualised
- Consult allied health professionals to deliver effective symptomatic therapy
- Patient education, exercise and weight loss are core treatments
- Paracetamol is recommended as first-line analgesic
- Topical preparations are useful adjuncts for hand and knee OA
- Prescribe NSAIDs with caution, based on patient risk factors
- NSAIDs should be given at the lowest effective dose for the shortest time
- Weak opioids can be considered as alternative analgesics
- IA corticosteroids can be used for flares and provide rapid pain relief
- Refractory pain and loss of function are indications for surgical referral

Conclusion

Osteoarthritis is manageable, by applying various modalities of treatment. Because of its high prevalence, the family practitioner plays a central role in the care of patients with OA. The main reasons for secondary referral to a specialist should be where there is diagnostic uncertainty, where there is a suspicion of secondary causes of OA and for patients requiring surgical intervention.

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