

Healthy lifestyle interventions in general practice

Part 10: Lifestyle and arthritic conditions

– Osteoarthritis

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Abstract

Chronic musculoskeletal disease is one of the most common causes of disability worldwide with considerable economic impact in health care. Osteoarthritis (OA) is the most common chronic musculoskeletal disease affecting a large proportion of the population with an increasing predicted prevalence in the next two decades. Regular physical exercise, nutritional intervention, psychological support and other lifestyle interventions are very important components of the non-pharmacological management of patients with OA. The main rationale to include regular exercise as part of a lifestyle intervention programme for OA is to improve muscle strength and proprioception, and to promote the other general health benefits of participating in regular physical activity. Nutritional intervention should focus on weight reduction while basic nutrients that are required for healthy joints should be provided. Glucosamine and chondroitin supplementation is commonly used and may reduce pain, improve function and reduce or arrest disease progression. Psychological intervention has a particular role in assisting with pain management.

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Introduction

Chronic musculoskeletal disease is one of the most common causes of disability worldwide.¹ Arthritis and related rheumatic conditions are becoming increasingly prevalent and are the leading cause of chronic pain and disability.² It has been projected that these chronic conditions will increase by 40% in the next two decades,² and this has been one of the main drivers in declaring the past decade (2000 to 2010) as the Bone and Joint Decade.

Among the chronic musculoskeletal diseases, Osteoarthritis (OA), Rheumatoid Arthritis (RA) and Low Back Pain (LBP) are the most important causes of disability-adjusted-life years in both developed and developing countries.¹ Of these three conditions, the most common is OA,³ and one of the other significant arthritic conditions is RA. It has been estimated that 20% of all adults in the USA suffer from some form of arthritis.² In other countries (both developing and developed) OA and RA also account for the largest burden of musculoskeletal diseases.¹

The economic impact of arthritic conditions is also important to consider. In 2003, it was estimated that there were 46.1 million adults with arthritis and other rheumatic

conditions in the USA who incurred a total annual health expenditure of about 322 billion US Dollars in 2003 (compared with about 234 billion US Dollars in 1997).⁴ This increase in annual health care cost was attributed to an increased number of diagnosed patients, rather than an increase in more expensive types of treatment.⁴

As in most chronic diseases, lifestyle interventions also play a very important role in the aetiology and management of chronic musculoskeletal disease. The focus of this article, the tenth in the series, is on the role of lifestyle interventions in OA. In subsequent articles in this series, the role of lifestyle interventions in other chronic musculoskeletal diseases will be discussed.

Definition of OA

OA, also known as “wear and tear” or degenerative arthritis, is one the most common causes of arthritis that frequently affects weight bearing joints (mostly the knee and hip), but can also affect other joints in the body including the hands. There is no precise definition of OA, but for the purposes of this article it can be viewed as the clinical and pathological outcome of a range of disorders that result in structural and functional failure of synovial joints with loss and erosion of

articular cartilage, subchondral bone alteration, meniscal degeneration a synovial inflammatory response and bone and cartilage overgrowth.⁵

Risk factors for OA

The general risk factors for OA are best understood as resulting from excessive mechanical stress that is applied to a susceptible or vulnerable joint.⁵ Increased age (> 40–50 years), genetic predisposition, positive family history, ethnicity, female gender, and nutritional factors can increase the risk of a susceptible joint.^{5–7} Excessive mechanical stress can result from malalignment, muscle weakness, obesity and previous joint injury that altered the structural integrity of the joint.^{5,6} In the context of this article, it is important to note that a number of these risk factors for OA can be modified through appropriate lifestyle changes.

Diagnosis and general management of OA

The diagnostic criteria for OA are based on symptoms, clinical signs and radiographic findings. These criteria have been reviewed for OA in general, and for OA in specific joints.^{6,7} The principle symptoms of OA are joint pain, joint stiffness (usually early morning) and functional limitation.^{6–8} Classic clinical signs on examination are reduced range of movement, joint crepitus and tenderness.^{6–8} The presence of Heberden's nodes is a specific clinical feature of OA in the hand.⁷ The main radiographic signs of OA are joint space narrowing, subchondral sclerosis, marginal osteophytes, and subchondral cysts.^{6–8}

A detailed discussion of the management of OA of is beyond the scope of this article and has been reviewed for OA in general,⁹ and for OA in specific joints.¹⁰ However, it is important to note that the principles of treatment of OA are to reduce joint pain and stiffness, maintain and improve joint mobility, reduce physical disability and handicap, improve health-related quality of life, limit progression of joint damage, and to educate patients about the nature of the disorder and its management.⁹ Optimal management of OA requires non-pharmacological (lifestyle and use of aids including footwear) intervention, pharmacological intervention and possible surgery.^{9,10} The remainder of this article will focus on the role of lifestyle interventions in the management of OA.

Lifestyle interventions in the management of OA

The main lifestyle interventions for patients with OA are regular exercise, nutritional intervention, psychological intervention, patient education and other lifestyle interventions.¹¹

Regular exercise as a lifestyle intervention for OA

It is well documented that most patients with lower limb OA have reduced muscle strength, impaired proprioception, poor balance and a tendency to fall.¹¹ Furthermore, reduced muscle strength in OA patients is associated with increased pain and disability.¹¹ Therefore, the main rationale to include regular exercise as part of a lifestyle intervention programme for OA is to improve muscle strength and proprioception, and to promote the other general health benefits of participating in regular physical activity. As indicated, one of the main principles of treatment of OA is to reduce joint pain, and as a result many of these patients are often advised not to exercise. However, this could lead to decreased strength in the peri-articular muscles, decreased flexibility, weight gain and poor endurance capacity. In particular, weak muscles could result in progression of the disease because muscles function as important shock absorbers.

There is now considerable evidence from randomised trials and systematic reviews that exercise improves pain¹² and physical function (including muscle strength and endurance)^{5,8,11,13–16} in patients with OA.

The general aims of an exercise programme for patients with OA should be to:

- increase or maintain joint range of movement
- increase the strength and endurance of the peri-articular muscles
- increase endurance capacity
- assist with weight loss
- improve the functional capacity in the activities of daily living

Prior to starting an exercise programme, patients with OA require a thorough medical evaluation. Attention should firstly be given to the general indications and contra-indications to exercise training.^{17,18} There are few contra-indications to exercise in patients with OA. There are two specific precautions that must be taken before exercise is prescribed for patients with OA.¹⁹ Firstly, exercise is contraindicated in an acute setting if the joints are swollen and inflamed. In this instance, the inflammation should first be treated before an exercise programme is started. Secondly, endurance training should only be prescribed once cardiac or systemic disease has been excluded or treated.^{17,18} A more specific clinical assessment should focus on OA. The following aspects should be evaluated (i) the sites of involvement, and (ii) complications of OA such as contractures and instabilities.

Once this has been performed, an individualised patient-centred exercise programme can be prescribed for the patient.¹⁹ It has been documented that supervised exercise

Table I: Guidelines for exercise prescription in patients with OA

Exercise goal	Practical implementation of the exercise goal
Improving the joint range of movement (ROM) of affected joints	<ul style="list-style-type: none"> Active range of movement (ROM) exercises can be performed daily (best in the afternoon after a hot bath or shower) Start with 2–3 repetitions daily and gradually increase to 10 repetitions daily All the muscle groups around affected joints should be stretched actively
Increasing the strength and endurance of peri-articular muscles ^{13,19}	<ul style="list-style-type: none"> Isometric exercises at different ranges of movement are recommended initially for all the peri-articular muscles Provided the exercises do not aggravate the disease, resistance training (isokinetic and later isotonic exercises) can be introduced early¹³ Resistance exercises should not be performed more than 3 times a week Initially one set of 10 to 15 repetitions is used. This can later be increased to 3 sets of 10 to 15 repetitions Patients may benefit from local heat or cold application before an exercise session
Increasing endurance capacity ¹⁹	<ul style="list-style-type: none"> Endurance training must be introduced as soon as possible into the programme Activities such as walking, cycling, swimming, aerobics, rowing and aqua-aerobics may be introduced The choice of the type of activity will depend on the joints that are affected and patient preference Cyclic loading of the affected joints must be avoided Activities should be performed for 20 to 30 minutes, 3 to 5 times per week at an intensity of 60–80% of their maximum heart rate (calculated as 220-age)
Special considerations	<ul style="list-style-type: none"> Attention should be given to equipment such as footwear,¹¹ and surfaces

programmes for OA are potentially more effective in reducing pain and improving function compared with home programmes.¹¹ However, supervised group-based and supervised individual sessions are equally effective.¹¹

The guidelines for exercise prescription in patients suffering from OA are listed in the Table I.

Another important consideration for health professionals that requires discussion is the possible role of regular exercise in the aetiology of OA. In particular, it is important to briefly review whether participation in exercise over many years increases or decreases the risk of developing OA, in particular OA in the weight bearing joints (mainly hip and knee).^{5,8,15,20}

The possible role of regular exercise as a cause of OA has recently been reviewed^{5,8,15} and remains controversial.¹⁵ However, the main conclusions from these reviews are as follows:

- There is no increase in the rate of progression of knee OA in individuals who exercise regularly compared with those who do not – this is particularly true for running
- There is convincing evidence that general increased levels of exercise lowers the incidence of musculoskeletal disability, reduces pain and increases functional capacity
- There is a higher incidence of OA in occupational settings where there is repetitive squatting, kneeling and bending
- There is a higher risk of OA in high-impact sports where

there is overuse and torsional loads

- There is a possible increased risk of OA in athletes following joint injury in specific sports (Table II) – however, all these associations will still have to be examined carefully through well-conducted scientific studies to prove that the development of early OA is a risk factor in these sports

Table II: Possible associations between specific sports and OA in specific joints

Sport	Joint/s at risk for OA
Rugby	Knee, cervical spine
Soccer	Ankle, foot, cervical spine, hip, knee
Cricket	Finger
Cycling	Patellofemoral
Boxing	Hand (carpometacarpal)
Ballet	Ankle, foot, cervical spine, hip, knee
Baseball	Elbow, shoulder
	Elbow, shoulder, wrist, hip
Martial arts	Spine
Parachuting	Ankle, knee, spine
Weight lifting	Spine
Wrestling	Cervical spine, elbow, knee

Nutritional lifestyle interventions for OA

Beyond meeting daily nutritional requirements, the potential beneficial role that nutrition can play in certain chronic disease states is becoming increasingly recognised by the scientific community.²¹ More specifically, symptoms related to arthritic conditions can be improved by nutrition.²¹ However, it remains to be seen whether nutritional intervention plays a role in prevention and disease progression. The role of nutritional lifestyle interventions for OA will now be briefly reviewed.

Obesity

It is well documented that obesity is a major risk factor for OA as excess body weight is an additional burden placed on the weight-bearing joints.^{5-7,11,22} Obesity is therefore classified as a risk factor that is mechanical in nature, rather than systemic, which is consistent with its association in weight bearing joints.²² The risk for knee OA has been shown to increase as the body mass index (BMI) increases.²³ BMI in excess of the normal healthy range has also been associated with accelerated disease progression.²² Furthermore, an increase in obesity (BMI > 30 kg/m²) has been associated with poor balance in older adults, suggesting that there is an association between obesity, poor balance and subsequent falls of risk that is independent of strength.²²

Furthermore, insulin resistance and nutrient excess, which are typically associated with obesity, are also associated with chronic inflammation due to excessive production of pro-inflammatory cytokines.²² The progression of insulin resistance in obese adults results in exacerbated inflammation and another cycle of excess nutrient intake, insulin resistance and inflammation.²² This inflammation may therefore contribute to disease progression and limitations in functional capacity as a result of the higher concentrations of inflammatory markers observed in obese individuals.²²

Therefore, the burden of OA can be reduced by controlling obesity which is a modifiable risk factor.^{22,24} For obese adults, it should be the first choice of therapy, and should further become a critically important goal in the public health arena.²² It has been suggested that by controlling obesity, up to 24% of surgical procedures for knee OA can be avoided.²² A 10% reduction in weight could result in a moderate to large reduction in disability related to OA.²² In older adults, more appropriate outcomes include years of healthy life and quality of life, as the public health implications for morbidity and mortality are more relevant in the aged population.²²

Interventions aimed at lifestyle modification, including a combination of moderate exercise along with diet-induced

weight loss have been found to be effective for OA.^{25,26} The diet should remain well-balanced, and consistent with established dietary guidelines that promotes a desirable body weight. Factors including personal contact, adherence to diet and exercise regimens, inclusion of significant others, behavioural change strategies, social support, extended treatment, increased hours of intervention contact, follow-up and maintenance, and addressing barriers, are key to successful weight management programmes.^{22,25} It is recommended that all obese individuals suffering from OA, be encouraged to undertake a comprehensive weight loss and exercise regimen, under the guidance and support of a dietitian, an exercise medicine specialist, and a nurse or primary care physician.²²

Vitamins and mineral supplementation in OA

The basic nutrients required for healthy joints are calcium, Vitamin D, phosphorus, protein and zinc.³ Currently, inadequate serum levels of vitamin D are being studied as a possible risk factor in the progression of OA.²⁷ It is advised to ensure intakes to at least the levels of daily reference intakes (DRIs). A comprehensive nutrition assessment should determine acceptable sources as well as the need for supplementation of the diet, in order to achieve the recommended levels of all nutrients. Much of the cumulative damage to tissues related to the degenerative changes associated with ageing is mediated by reactive oxygen species. Therefore, it has been postulated that large doses of dietary antioxidants may be beneficial in the management of OA, including vitamin C, E, beta-carotene and selenium.²⁸ However, some research failed to confirm the beneficial effects of vitamin E supplementation.^{29,30} Further research is needed before routine supplementation with antioxidants can be recommended for patients with OA.

Alternative nutritional intervention therapies for OA

For patients suffering from OA, there is increasing scientific evidence to suggest that certain nutrition interventions could provide symptomatic relief.²¹ Alternative therapies are often used in order to reduce the need for NSAIDs, aspirin and other drugs. The most important nutritional interventions are glucosamine, chondroitin, other nutraceuticals and functional foods such as certain oils and herbs.

Glucosamine sulphate and chondroitin sulphate: Glucosamine and chondroitin are two nutritional substances that are widely used as nutritional supplements in the management of OA. These substances are both involved in the production of cartilage. The clinical effectiveness and cost efficacy of glucosamine and chondroitin supplementation in slowing or arresting disease progression in OA of the knee has recently been reviewed.³¹ There is some evidence that

these supplements cause a moderate reduction in pain and an improvement in function in OA patients,³¹ and this is supported by a number of clinical trials and reviews.^{32,32,33} In one study, the reduction in pain and improved function was more evident in patients with moderate-severe OA who received a combination of glucosamine and chondroitin.³⁴ In some cases, the improvement in pain and function was either equal or superior when compared to ibuprofen.²⁷ In addition, there is some evidence from reviews of clinical trials > 12 months, that glucosamine and chondroitin supplementation may reduce joint space loss in some,^{31,33,35-37} but not all studies.^{38,39} There are also early data to suggest that glucosamine and chondroitin supplementation may reduce the need for knee arthroplasty (reduced from 14.5% to 6.3% over a 8 year follow-up period).⁴⁰ Currently, 1500 mg/day and 1200 mg/day of glucosamine sulphate and chondroitin sulphate respectively, in divided doses, have been suggested as safe doses for all individuals with OA. In patients with diabetes or insulin resistance, concern has been raised about the potential effect of glucosamine on insulin regulation.²⁷ However, no change in glucose tolerance as observed in the GAIT Trial (NIH, 2008).³⁸ It is worthy to take note of the fact that chondroitin may cause excessive bleeding if it is used in conjunction with commonly prescribed anti-coagulants.⁴¹

Nutraceuticals and functional foods: In a systematic review of the scientific evidence supporting the effect of nutraceuticals and functional foods in patients with OA, for avocado soybean unsaponifiables, good evidence exists; moderate evidence for methylsulphonylmethane and a cocktail of plant extracts (SKI306X); whilst limited evidence exists for Duhuo Jisheng Wan, (a Chinese plant extract), cetyl myristoleate, green-lipped mussel lipids, and *Harpagophytum procumbens* plant extracts.²¹ Whether these nutritional compounds have structure-modifying effects remains to be investigated.

Summary – Nutritional lifestyle intervention for OA

Patients suffering from OA often turn to alternative and complementary medicines when modern medicine fails to provide permanent symptom relief or promise of a cure. Together with this, controversial remedies and treatments, claiming their effects and benefits, are gaining increased exposure due to growing access to the Internet – often with unsupported scientific evidence. To this extent, registered dietitians play a key role in informing patients of the safety and effectiveness of such therapies, in addition to assisting with optimal dietary planning, as medical nutrition therapy plays a key role in the treatment (alleviation of symptoms and management of pain) in patients with arthritic conditions. Further, it is important to consider co-morbidities, such

as cardiovascular disease, obesity and diabetes, all of which need dietary intervention, and to balance the goal of symptom relief and health promotion both in the short and long-term. For all patients with arthritic conditions, a diet rich in vegetables and fruit, whole grains and omega-3 fatty acids, can be safely recommended.

Psychological lifestyle intervention for OA

Psychological distress is common in patients with arthritis and often exacerbates the experience of physical discomfort.⁴² This is generally true for chronic pain conditions, irrespective of aetiology, and as such, it is useful to consider the psychological dimensions of arthritides in the general context of chronic pain syndrome.

The pathophysiology of chronic pain is characterised by dysregulation of nociceptive pathways in the spinal cord, subcortical and cortical regions of the neuraxis.^{43,44} The consequence of this ‘centralisation’ of pain is the complex syndrome observed clinically, which includes physical (noxious stimuli), mental (e.g. beliefs and thoughts such as ‘I cannot live with the pain’, or ‘my life is over’) and emotional (e.g. fear, anger, sadness, loss, depression) components, with a consequential effect on behaviour (e.g. withdrawal, passivity, avoidance) and on relatedness (aversion and withdrawal).

OA is one of the most common causes of arthritis-related chronic pain and intervention will depend on the stage at presentation and the severity of functional impairment. That said, working with patients who inhabit a world in which pain is more or less a constant presence, albeit with varying intensity, it is most helpful to appreciate the pathophysiology of chronic pain and its physical and psychosocial interplay, and always consider management in a multi-disciplinary context. It is easy to overlook the value of individual or group psychotherapy and stress management programmes and focus only on the physical dimensions such as medication and physiotherapy. Simply put, chronic pain conditions require a wide therapeutic net. Psychological interventions and lifestyle modifications in arthritis have recently been reviewed.⁴⁵ An example of an effective biobehavioural intervention in chronic pain is Mindfulness-based stress reduction (MBSR). An eight week out-patient programme teaching patients mindfulness practices to enhance self-regulation has been used effectively for symptom reduction in chronic pain conditions, with 3-year follow up showing maintenance of gains.⁴⁶ These data suggest that we carefully consider a variety of factors when choosing which interventions are best suited for patients, and that no single intervention works for everyone, even within a homogeneous patient population. Further, it gives credence to the importance of doing more integrative and

comparative research so that clinicians are better informed about nuanced differences in approach which will enhance our patients' well-being.

Educational lifestyle intervention for OA

Education is an important component of any lifestyle intervention for chronic disease, including OA.¹⁰ Educational strategies have been shown to increase adherence to other interventions such as exercise.¹¹ Education concerning joint protection is therefore recommended as part of the exercise intervention for OA.¹⁰

Other lifestyle interventions for OA

Footwear

Attention to footwear is an important component of a lifestyle intervention programme for OA but this area has not been researched well.¹¹ However, the following recommendations for footwear in patients with OA currently apply¹¹:

- Use footwear with thick, soft, shock absorbing soles
- Use footwear with minimal heel raises
- Footwear with a broad fore-foot will allow splaying of the toes during forefoot landing
- Deep, soft uppers are recommended

Summary and conclusion – Lifestyle interventions for OA

The main lifestyle interventions for patients with OA are 1) regular physical exercise to increase range of motion, improve muscle strength, and improve proprioception and balance, 2) nutritional intervention to reduce weight and optimise joint health, 3) psychological intervention to assist with pain management, and 4) education and other interventions such as use of appropriate footwear.

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