Osteoarthritis: when to promote exercise

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Despite the common misconception that exercise can be potentially damaging to joints, there is no firm evidence to support a deleterious effect of exercise in the setting of normal joints and moderate activity. Indeed, exercise is a central component of any effort to conservatively manage osteoarthritis and should be actively encouraged in individuals with normal joints and no prior joint injury.

MedicineToday 2012; 13(1): 64-68

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Exercise and sport involvement are widely promoted as having salutary benefits for aiding weight control, cardiovascular disease and diabetes and for improving psychological wellbeing, among an array of other benefits. In contrast, however, is the lay press and community perception that exercise can also be potentially deleterious to joints, in particular those of the lower extremities.

The purpose of this article is to provide an overview of the epidemiology of osteoarthritis, focusing on the risk relating to exercise and joint injury, and also to consider the role of exercise in disease management. By the end of this article the reader should have a clear understanding of the relationship between exercise and osteoarthritis, dispelling the common misconception that exercise is damaging to joints. By virtue of the extant literature in the osteoarthritis field, the predominant focus of this article is knee osteoarthritis.

THE IMPACT OF OSTEOARTHRITIS IN AUSTRALIA

Osteoarthritis is a heterogeneous disease characterised by failure of the synovial joint organ (Figure 1).[1,2] Osteoarthritis is not limited to cartilage but can affect all of the joint tissues (including bone, ligaments, muscle and synovium). The disease occurs when the dynamic equilibrium between the breakdown and repair of joint tissues becomes unbalanced, often in a situation where the mechanical loads applied exceed those that can be tolerated by the joint tissues.

Osteoarthritis is a disease of remarkable prevalence and

impact. In 2007, some 7.8% of Australians had osteoarthritis, two-thirds of whom were aged under 65 years.[3] By 2020, the number of people in Australia with osteoarthritis is predicted to be double – largely due to the exploding prevalence of obesity and the greying of the 'baby boomer' generation. Furthermore, osteoarthritis is the leading significant cause of musculoskeletal pain and disability in Australia.[4] Health expenditure on osteoarthritis in Australia was $2.03 billion in 2007, and the total cost of arthritis in Australia – attributable to the burden of disease, productivity costs and direct health costs – was almost $24 billion.[3]

AETIOLOGY OF OSTEOARTHRITIS

Osteoarthritis is perhaps best understood as resulting from excessive mechanical stress applied in the context of systemic susceptibility. The risk of osteoarthritis may be increased in part by genetic inheritance (a positive family history increases risk), age, ethnicity, nutritional factors and female gender.[5] Susceptibility to knee osteoarthritis can also be influenced by the mechanical environment; local mechanical factors such as the adduction moment, malalignment, the presence of meniscal tears or bone marrow lesions (Figures 2a and 2b) and muscle strength make the knee joint vulnerable to the progression of osteoarthritis.

Although the aetiology of osteoarthritis may be complex,[5] the two major risk factors for the development of knee osteoarthritis – obesity and joint injury – are modifiable.[6] To date, however, little is being done in the public health setting to address or modify these risk factors in this context.

Similarly to the knee, recent evidence has highlighted the importance of local mechanical factors in the development of hip osteoarthritis. Most cases of hip osteoarthritis (90% or more) are attributed to anatomical abnormalities. These anatomical or shape abnormalities are termed femoroacetabular impingement and this insight into the cause of hip osteoarthritis is one of the most important and provocative new tenets in osteoarthritis research.[7] Currently, however, the role of sport in shape abnormality development and subsequent labral tears and hip osteoarthritis remains to be determined.

THE ROLE OF SPORTS INJURY IN OSTEOARTHRITIS

Rupture of the anterior cruciate ligament (ACL) is among the most common and morbid musculoskeletal injuries affecting physically active men and women. ACL injuries have an annual incidence of at least 81 per 100,000 people aged between 10 and 64 years.[8] Most young and active individuals who sustain ACL injuries (77%) proceed to develop moderate to severe disabilities, such as osteoarthritis, instability and meniscal and chondral surface damage.[9]

Knee injury or trauma has been identified as the most important modifiable risk factor for subsequent knee osteoarthritis in men, and is second only to obesity in women.[10] It is estimated that 25% of incident symptomatic knee osteoarthritis cases in men, and 14% of cases in women, could be avoided by preventing knee injuries.[11] Neuromuscular conditioning programs have demonstrated efficacy in preventing injury in numerous trials, notably, reducing the risk of ACL injury by as much as 60%.[12] These programs are simple and have impact. They typically consist of a warm up, stretching and strengthening exercises, plyometrics and sport-specific agility training.

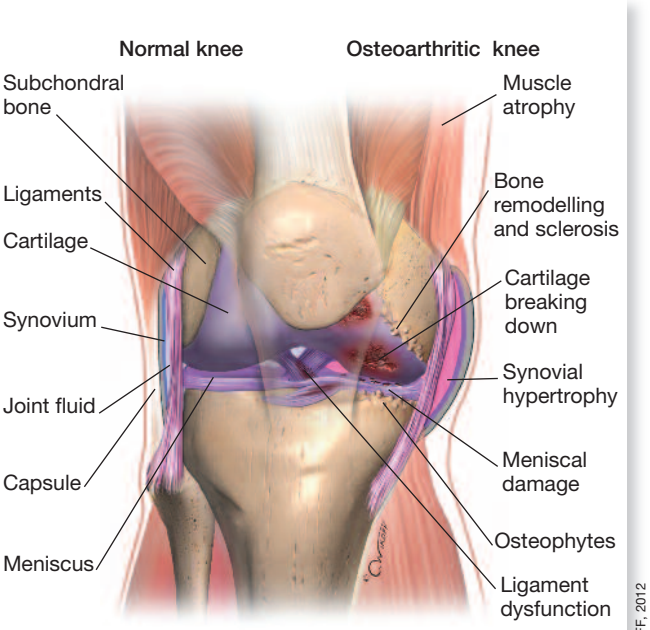

Figure 1. Pathogenic features consistent with osteoarthritis ('joint failure').[2]

Neuromuscular conditioning programs have generated widespread support from eminent international organisations, including the International Olympic Committee and FIFA. Yet despite the impact of joint injury and the known efficacy of these programs in prevention trials, dissemination and implementation of neuromuscular conditioning has been limited in Australia. More action is needed to help prevent sports injury in Australia; sporting organisations, health professionals involved in sport, governments and health insurers should recognise both the importance of this problem and the simple remedies available to address injury at all levels of sport.

DOES EXERCISE CAUSE OSTEOARTHRITIS?

Recent years have witnessed an enormous increase in the popularity of recreational exercise. In concert with this increase, individuals with normal joints often ask whether exercise programs may increase the risk of developing osteoarthritis. Initial

Figure 2a. Anteroposterior left knee radiograph showing diffuse marginal osteophytosis of the tibia and femur (arrows). There is a mild to moderate medial tibiofemoral joint space narrowing.

studies evaluating the relationship between regular, recreational weight-bearing exercise and osteoarthritis of the knee generally found no ill effects on the joints as a result of exercise participation.[13,14] These findings have since been confirmed by more recent studies.[15,16]

What is clear from the data is that the risk of subsequent osteoarthritis relates mostly to the intensity of the level of participation, the performance level (e.g. elite *v.* recreational) and the concomitant presence and/or likelihood of joint injury. The results from these studies show that individuals with normal joints who participate in low-impact exercise do not have an increased risk of developing osteoarthritis of the knee or hip as they age, independent of joint injury. Thus, there is no good evidence supporting a deleterious effect of exercise on joints in the setting of normal joints and moderate activity.

In contrast, there does appear to be an association between elite sports participation and an increased risk of osteoarthritis. However, the nature of the sport is important in relation to the degree of risk.[17] The sports associated with the most risk are those that involve repetitive, high-intensity, high-impact forces through the affected joints, especially where there is a high associated risk of injury. Categorising exercise into different levels of impact is somewhat arbitrary, but relates to the extent of compressive loading during the activity. Common examples of high-impact exercise include running, dance, tennis, netball, basketball, rugby, soccer and squash. Examples of low- to moderate-impact exercises include walking, swimming, stair climbing, rowing and cross-country skiing.

Thus, elite athletes who perform their activities with high impact and high stress to their joints appear to have an increased risk of osteoarthritis in the hips and knees compared with age-matched controls. Again, the concomitant presence or likelihood of joint injury increases the risk of developing osteoarthritis.

CURRENT MANAGEMENT OF OSTEOARTHRITIS

Osteoarthritis is a condition that can often be poorly managed in clinical practice, despite its prevalence and impact on disability.[18] In the context of osteoarthritis being an increasingly prevalent and disabling disease, management strategies in Australia appear to be somewhat nihilistic; more can be done to prevent the disease developing, and treatment of patients with existing disease is largely palliative. Practice patterns for the treatment of

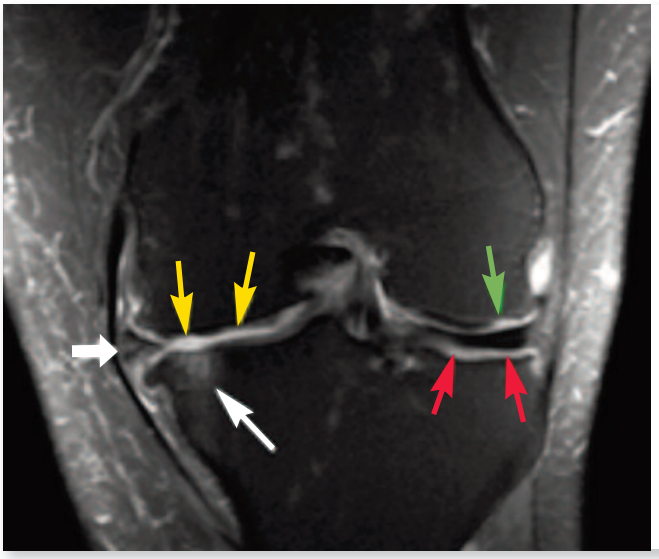

Figure 2b. Coronal fat-suppressed proton density-weighted MRI (performed the same day as Figure 2a) showing subchondral bone marrow lesion (narrow white arrow) at the medial tibial plateau just subjacent to a focal full-thickness cartilage defect. There are multiple partial thickness defects of the medial femoral condyle cartilage (yellow arrows). Surprisingly, there are more extensive focal full thickness cartilage defects (green arrow) at the lateral femoral condyle and almost complete denudation (red arrows) subchondral bone at the lateral tibia, as opposed to a radiographically normal appearing lateral tibiofemoral joint space width. Indeed, most of the joint space narrowing of the medial tibiofemoral joint is secondary to a partially macerated and extruded medial meniscus (thick white arrow). There is attrition of the medial and lateral tibial plateaus and marginal osteophytosis.

osteoarthritis may vary, but current clinical management is often limited to the use of analgesic and/or anti-inflammatory medication followed by cautious waiting for the eventual referral for total joint replacement.[19]

Another challenge in the management of osteoarthritis is that the placebo effects can be quite substantial for many current therapies (e.g. paracetamol, hyaluronic acid, glucosamine, acupuncture and arthroscopic debridement and lavage). Differences between the outcome of placebo treatment and active therapy can be generally indistinguishable.[20,21] These management problems are further compounded by the fact that many agents used to treat osteoarthritis have side effect profiles that raise legitimate concerns about their long-term safety, especially relating to gastrointestinal and cardiovascular safety concerns.[22]

Recent years have seen the development of a number of evidence-based guidelines for osteoarthritis management.[23-25] Although, there is some consistency between the guidelines (see the box on this page),[26,27] and in spite of some dissemination attempts, clinical practice does not generally reflect these recommendations.[28-31] In the absence of a cure, current therapeutic modalities are primarily aimed at reducing pain and improving joint function (Figure 3) – mainly through the use of agents targeted toward symptoms that do not facilitate any improvement in joint structure or long-term disease amelioration. With few conservative options being offered to patients by doctors, increasing numbers of patients are turning to untested alternative therapies and aggressively-marketed dietary supplements, some of which have little substantive evidence to support their efficacy.[32]

Most patients with arthritis are either overweight or obese, and there is good evidence for the efficacy of weight management in managing osteoarthritis.[33] This approach is advocated by most osteoarthritis guidelines; however, in practice, weight management is not frequently implemented.[28,34,35] Another pivotal, and frequently ignored, aspect of conservative treatment in patients with osteoarthritis is exercise. Although guidelines routinely advocate exercise, clinical practice does not appear to reflect this recommendation.[28,34,35]

A large prospective cohort study provided evidence that approximately 70% of knee replacements are associated with, or attributed to, excess weight.[36] Furthermore, it has been estimated that if all overweight and obese people reduced their weight by 5 kg, or to within the normal body mass index range, approximately 25 to 50% of all knee replacements could be avoided.[37] Despite this information, fewer than 8% of Australians reported trying to lose weight as part of their osteoarthritis treatment.[38]

In 2010, an analysis of the Bettering the Evaluation and Care of Health Project (BEACH) for the five years from 2004 to 2009 suggests there is suboptimal use of allied health practitioner interventions to support effective lifestyle behaviour interventions for physiotherapy and weight loss for osteoarthritis management.[39] Over the five-year study period, only 3.9% patients with osteoarthritis were referred for allied health intervention.

PILLARS OF THERAPY IN OSTEOARTHRITIS[24]

Guideline-recommended treatments

- Weight loss (to reduce body weight by 5%)
- Low impact exercise (e.g. cycling, swimming, walking)
- Strengthening exercise (e.g. quadriceps and hamstrings for knee osteoarthritis)
- Analgesics (NSAIDs and paracetamol)

Treatments not currently recommended

- Arthroscopy with debridement or lavage
- Glucosamine
- Intra-articular hyaluronic acid
- Lateral heel wedges

THE ROLE OF EXERCISE IN DISEASE MANAGEMENT

Exercise is a central component of any effort to conservatively manage osteoarthritis. Exercises can be prescribed to facilitate weight loss, preserve joint range of motion, improve strength, improve functional performance and reduce symptoms.[40,41] It is recommended that patients with osteoarthritis who are capable of exercise be encouraged to partake in a low-impact aerobic exercise program (e.g. walking, biking, swimming or other aquatic exercise).[42]

Quadriceps weakness is common among patients with knee osteoarthritis, in whom it is believed to be a manifestation of disuse atrophy, which develops because of unloading of the painful extremity.[43] Muscle strengthening exercises have led to improvements in pain and function in these patients.[44] It is important to individualise exercise therapy for hip or knee osteoarthritis, particularly considering individual patient preference, and to ensure that adequate advice and education to promote increased physical activity is provided.[45] Some exercises are likely to be harmful to patients with osteoarthritis in the long term, particularly those that involve high-velocity impact (e.g. running, step aerobics, etc.) on an already injured joint surface, and therefore should be actively discouraged.

GPs play a vital role in providing medical input and in leading the multidisciplinary management of patients with osteoarthritis. In 1999, the Australian Government implemented financial incentives to support GPs in managing the needs of people with chronic disease in the form of Medical Benefit Schedule (MBS) item numbers. It was intended that these items

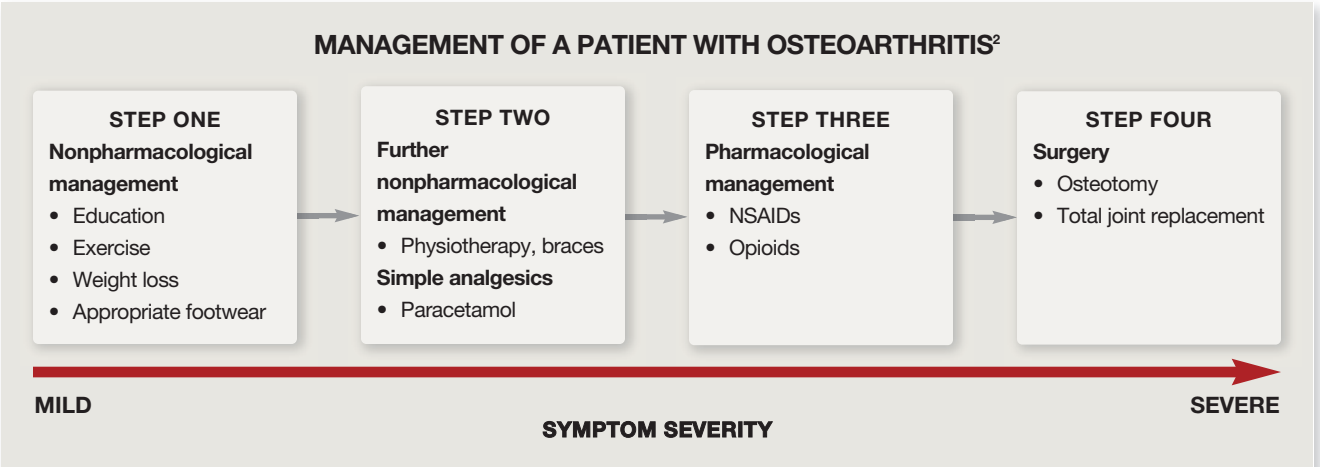

Figure 3. Stepwise algorithm for the management of a patient with osteoarthritis. This is an example of a treatment algorithm that is modified according to the patient's response and the clinician's preference. It highlights the encompassing need to consider nonpharmacological management as first-line treatment for all patients with osteoarthritis.

would encourage primary care referrals to allied health practitioners for chronic disease management through the Enhanced Primary Care (EPC) Program. However, the uptake of EPC items and care plans utilising allied health services has been extremely slow and limited.[46]

Individual clinician, episodic provision of care may not be able to meet the needs of patients with chronic, complex care needs. A comprehensive and integrated model for the management of osteoarthritis will facilitate implementation of best-evidence clinical treatment, patient education, patient self-management and the collaboration and communication between healthcare providers.[47,48] A number of chronic care programs have been recently established for osteoarthritis to facilitate such needs, including the Orthopaedic Waiting List (OWL) Program in Victoria and the Osteoarthritis Chronic Care Program (OACCP) in NSW.

CONCLUSION

Based on current evidence, individuals with normal joints and no joint injury should be actively encouraged to exercise regularly both for the benefits as they pertain to the joints and for the benefits to general good health. There is no strong evidence to suggest that vigorous low-impact exercise is associated with an accelerated rate of development of osteoarthritis. The current evidence in those who participate in elite sports activity, particularly in sporting disciplines susceptible to joint injury, suggests that these individuals are at increased risk for osteoarthritis as a result of their participation. However, it is unclear whether participation in these sports in the absence of injury is harmful.

When considering the individual risk of osteoarthritis development, it is important to consider the type of sports participation, its intensity and extent of joint impact, the existence of concomitant joint injury, family history of osteoarthritis and body weight, as well as occupational risk. Exercise has played, and will continue to play, an important role in both the pathogenesis and management of osteoarthritis. MT

ACKNOWLEDGMENTS

Dr Hunter is funded by an Australian Research Council Future Fellowship.

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A list of references is available on request to the editorial office.

COMPETING INTERESTS: None.

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