Physical therapy for patients with knee and hip osteoarthritis: supervised, active treatment is current best practice

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ABSTRACT

Most patients with knee and hip osteoarthritis (OA) should be treated in primary care by non-surgical treatments. Building on substantial evidence from randomised trials, exercise therapy and education, typically delivered by physical therapists, are core first line treatments universally recommended in treatment guidelines for OA alongside weight loss, if needed. Exercise therapy provides at least as effective pain relief as pharmacological pain medications, without serious adverse effects; furthermore, the treatment effect from exercise therapy is similar, irrespective of baseline pain intensity and radiographic OA severity. Exercise therapy should be individualised to the preferences and needs of the individual patient, but at least 12 supervised sessions, 2 sessions per week, are required initially to obtain sufficient clinical benefit. Structured patient education concerning OA and its treatment options, including self-management, is important to retain motivation and adherence to an exercise programme and thereby maintain the effects over the long-term. If treatment effects from exercise therapy and patient education are insufficient, the physical therapist can deliver supplementary interventions that include knee orthoses and manual treatment.

Introduction

Joint pain and functional disability are cardinal symptoms of knee and hip osteoarthritis (OA) (1, 2). It is often implied that these symptoms are due to structural damage, which must be 'fixed' and not treated with non-surgical approaches (3, 4). By contrast, contemporary evidence demonstrates that OA is a 'whole person condition' in which different biopsychosocial factors that modulate inflammatory processes as well as behavioural responses which trigger pain and disability interact to affect a person's joint health (5, 6). This viewpoint highlights the key role of active, non-surgical treatments in the management of OA.

In many, but not all, health care systems, exercise therapy is typically delivered by physical therapists. In this article, we focus on knee and hip OA, as evidence concerning treatment of OA in other peripheral joints remains limited. It is likely that the physical therapy treatment paradigm for OA in those joints will shift as new evidence emerges. We use the phrase "knee and hip OA" throughout this manuscript to refer to patients suffering from OA of the knee, of the hip, or of both the knee and hip.

Physical therapy as treatment of knee and hip OA

Exercise, patient education and weight loss [at a Body Mass Index (BMI) of 25 or higher] comprise first-line treatment recommended in treatment guidelines for knee and hip OA. If patient education and exercise therapy are unsuccessful to improve pain and function, the physical therapist may offer supplementary treatments such as knee orthoses and manual treatment (7-10). Also, a supplementary pain-relieving treatment such as acupuncture sometimes is included initially as an additional alternative to oral pharmacological pain relievers, to facilitate starting an exercise programme, although evidence remains inconclusive concerning its effectiveness (Fig. 1) (11, 12). Weight loss is rarely offered by the physical therapist and therefore will not be described in detail in this article. However, it should be noted that even modest weight loss of 5% appears to have a significant impact on symptoms (13); therefore, weight loss is an important part of the treatment plan for overweight, and especially obese patients.

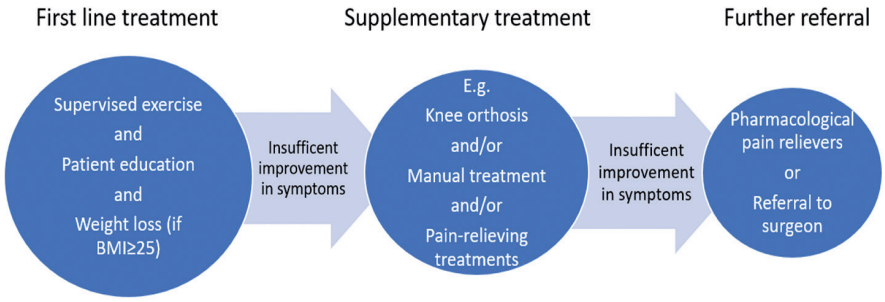

Fig. 1. The universally recommended treatment approach to hip and knee osteoarthritis. The sizes of the blue ovals indicate that fewer patients would need supplementary treatment and even fewer would need further referral.

First-line treatment

Exercise therapy

Exercise therapy is the most important non-surgical treatment of knee and hip OA, not only because of the positive effect on joint symptoms (14-16), but also because evidence highlights that exercise and physical activity help prevent at least 35 chronic conditions (17) and improve symptoms in at least 26 chronic conditions (18). Up to two out of three patients with knee and hip OA have one or more comorbidities, including hypertension, type 2 diabetes and depression (19), and therefore exercise and physical activity are crucial for maintaining good general health and well-being in patients with OA (16).

Over the last 25 years, more than 54 randomised controlled trials evaluating the effect of exercise therapy in knee OA patients (14) and more than 12 trials evaluating the effect of exercise therapy in hip OA patients (15) have been reported. The conclusion is unquestionable: pain and physical function are improved significantly following a supervised exercise intervention in patients with knee and hip OA (14, 15). Based on existing evidence, exercise therapy appears to have a larger effect on both pain (effect size of 0.49 *vs*. 0.38) and function (effect size of 0.52 *vs*. 0.38) in knee OA patients compared with hip OA patients. Although the treatment effect is slightly smaller (20), water-based exercise may offer a viable alternative, if the patient is unable to perform land-based exercises, due to, for example, intolerable symptoms from loading the joint and/or severe obesity.

• *Exercise therapy as a painkiller in OA irrespective of radiographic severity*

The effects of exercise therapy and physical therapy in general are not associated with radiographic severity of knee OA (21, 22) or the degree of pain (21) that the patients experienced before the treatment. The modern diagnosis of OA is based on clinical findings without necessarily including radiographic evidence (2), and the x-ray findings generally do not change the initial clinical management of the patient (23). In patients with moderate to severe knee or hip OA awaiting total joint replacement, 95% of one-hour twice weekly weight-bearing exercise sessions were performed with no more than acceptable pain (36). Therefore, the clinician plays an important role in explaining to the patient that OA severity has no clinical impact on the potential effect he or she may expect from the exercise programme.

Strikingly, exercise therapy appears more effective and safer for relief of pain than the traditional pharmacological pain relievers offered today. On a group level, exercise therapy has at least the same pain-relieving effect as NSAIDs and 2–3 times as large effect as acetaminophen in patients with knee OA (21, 24, 25). At the same time, exercise therapy is associated with only mild side effects such as muscle soreness and temporary pain flares(26), whereas pharmacological pain relievers may be associated with a considerable risk of side effects including on the stomach, liver and cardiovascular system (27-29).

Patients with severe pain that prevents them from participating in an exercise therapy programme may benefit from supplementary pharmacological pain relievers, in consultation with their general practitioner (30, 31). Once the patient's symptoms decrease as a result of the exercise therapy, the patient may stop or reduce the intake of pharmacological pain relievers. According to recent guidelines, topical NSAIDs are preferred over oral pharmacological pain relievers in most patients due to a better safety profile, and acetaminophen (paracetamol) is not recommended due to the absence of clinical effects compared to placebo (25).

It is good to inform patients that pain flares are to be expected with frequent daily activities such as repeated chair stands (32) and when starting to exercise (33). This is not a sign of danger to the cartilage (34, 35), but rather a sign of exposing the body to a new or repeated activity and similar to what all people (even who do not have any arthritis) would experience when starting any new activities. In patients with knee and hip OA who start exercising twice weekly, pain flares decrease with number of exercise sessions and are gone for most patients after about 5–6 weeks (33). Remarkably, also in patients with severe knee and hip OA awaiting total joint replacement, 95% of pre-operative exercise sessions can be performed with acceptable pain, *i.e.* temporary increase of pain intensity to no more than 5 on a 0–10 scale (36).

• *Individualisation and exercise dose are important to increase the clinical effects*

Unfortunately, existing studies have applied a number of different exercise programmes that are not detailed enough to be incorporated into clinical practice (37). If the exercise programmes for knee OA are grouped into three subgroups, aerobic, resistance, and performance exercise, effects are similar for these three subgroups (21). This does not mean that the all patients should be offered the same exercise programme. On the contrary, individualisation might further increase treatment effects, as an increasing number of studies have shown that effects of

exercise may vary considerably based on individual patient characteristics (38-40). For instance, it appears that patients with varus thrust may benefit more from a neuromuscular exercise programme, whereas patients with a BMI of 30 or more may benefit more from quadriceps strengthening (38) (Figure 2 presents examples of neuromuscular exercises).

Supervision and exercise dose are essential elements and may have a large impact on the effect of exercise therapy. An element sometimes forgotten is a need for progression of the exercise programme. When patients respond to exercise and improve their muscle strength and function, the exercises should be made more difficult to ensure further gains in muscle function. That is one reason why supervision is needed, as individual adjustments will maximise benefits of the programme. Another reason is to coach and reassure the patient if pain flares are experienced. Pain during exercise and exercise-induced pain flares are common, especially in the early phase of a programme (33), and an individualised and progressive exercise plan is essential to optimise results (41). Furthermore, patient preferences is important to consider to ensure long-term motivation and adherence (16).

It is not yet possible to present any strong specific exercise dose recommendations. However, it appears that a minimum of 12 supervised sessions is more effective compared to fewer than 12 sessions among knee OA patients(21). Also, studies on knee OA that follow the recommendations from the American College of Sports Medicine (ACSM) regarding strength training (41) provide superior outcomes compared to exercise interventions that do not follow these recommendations (42). In hip OA, the same importance has not been established for number of supervised sessions; however, pain and physical function appear to improve more if the exercise intervention follows the ACSM criteria for strength training (43).

More research is needed to develop an optimal, individualised exercise protocol. Until then, the existing evidence should be applied as summarised in Table I. Some countries already have evidence-based national individualised knee and hip OA programmes consisting of education and exercise supervised by certified physical therapists, *e.g.* GLA:D® which is available in Denmark, Canada, Australia, China and Switzerland (44, 45). For more information and results, please visit glaid.dk; gladcanada.ca; gladaustralia.com.au and gladswitzerland.ch.

Fig. 2. Examples of neuromuscular exercises for patients with knee and hip osteoarthritis (Photo: Jørn Ungstrup; GLA:D®).

Table I. Eight exercise recommendations for knee and hip OA.

Number	Recommendation
1	Offer the patient supervised, progressive aerobic, resistance or performance exercise tailored to the patient's needs, preferences and characteristics.
2	Consider water-based exercises if the patient is unable to perform land-based exercises, especially during the initial part of the programme.
5	After an adjustment period, and if symptoms allow it, consider three weekly sessions to increase the effect.
6	Offer patient education to improve compliance and long-term effects.
7	Consider follow-up sessions after the programme to improve compliance and long-term effects.
8	Consider supplementary treatment such as knee orthoses and manual treatment if the intervention shows no effect.

- *The combined effect of exercise therapy and other treatment modalities*

Exercise therapy combined with patient education appears more effective than exercise therapy or patient education alone in patients with knee OA (46), and combined treatment is also recommended for hip OA patients based on the existing evidence (25, 47). A combined treatment plan consisting of exercise and weight loss also is more effective in improving pain and physical function in overweight knee OA patients than either exercise and weight loss alone (48).

Two recent parallel randomised controlled trials investigated the effect of a tailored 12-week treatment plan consisting of neuromuscular exercise, patient education, weight loss, pharmacological pain relievers (if indicated), and insoles for knee OA patients (31, 49). One study found that on a group level, the tailored treatment plan was more effective in improving pain and function than leaflets with information and treatment advice (49). The other study investigated the effectiveness of total knee replacement followed by the tailed treatment plan compared with the tailored treatment plan alone. On a group level, the total knee replacement group had improvement in pain and function that was twice as large as the tailored treatment plan only group. However, the tailored treatment plan group also experienced clinically relevant improvements in pain and function, allowing for 3 out of 4 to postpone surgery for one year (31), and 2 out of 3 at two years (50). Contrary to the total knee replacement group, patients following the tailored treatment plan had no knee-related serious adverse events (31).

A study performed in hip OA patients found that the combination of exercise therapy and patient education could reduce total hip replacement by 44% as compared to those patients who received patient education alone (51). Based on the presented evidence, exercise combined with other non-surgical treatments is effective and can postpone surgery for a large number of OA patients. If a patient ultimately decides to request a total knee or hip replacement, having participated in a preceding exercise programme will help lead to faster postoperative recovery (52).

Patient education

The effect measured immediately after a supervised exercise programme is favorable, but diminishes over time (14, 15), most likely explained by low adherence to the exercise regime and lifestyle changes (16, 53). Patient education alone may have only a small effect on pain and function (25); however, patient education that is combined with follow-up sessions after the completion of the programme (54), may be key to increasing self-efficacy and retaining motivation and adherence to an exercise programme and thus maintaining benefit in OA patients (16, 55). Patient education should include information about causes, risk factors and disease mechanisms, the importance of physical activity and consequences of inactivity, effective and ineffective treatments and coping strategies and a self-help guide to help patients successfully manage their disease (16). This information will support the patient in understanding how to manage pain and exercise-induced pain flares and motivate him or her to life-long exercise and physical activity.

Supplementary treatment

Several physical therapeutic treatments beyond exercise and education are available to patients suffering from knee or hip OA who desire and need further therapy. Some of these treatments have not been analysed in formal clinical trials or other clinical research, which must be kept in mind before they are offered as part of the treatment plan. The most widely-used supplementary treatments are described in more detail below. In agreement with clinical guidelines, supplementary treatments should never be offered as a stand-alone treatments, but always combined with exercise therapy, patient education and weight loss (if relevant).

Manual treatment in the form of joint mobilisation and manipulation appears to provide moderate benefit for pain and function in knee OA patients (7), and can be considered in the treatment of hip OA based on previous studies (8, 9). However, the quality of existing studies on knee and hip OA is poor, and the added effect of manual treatment in addition to exercise therapy is uncertain (56, 57), Therefore, firm conclusions concerning this type of treatment remain a subject for further clinical research.

Unloader braces for knee OA that shift load from the medial compartment appear to result in small-to-moderate improvements in pain and function in patients with medial knee OA (10). However, the effect size was small compared to a control group that used a neutral knee brace, neoprene knee sleeve, or shoe insert (10). Importantly, compliance ranged from 45% to 100%, and up to 25% of patients reported complications with brace use, including poor fit, swelling and skin irritation (10), highlighting the importance of individual adaptation of the fit of the brace if needed and supervision of usage, in order to optimise the potential for clinical effects.

Another study has investigated the efficacy of lateral wedge insoles as a treatment for pain in medial knee OA and found no significant effect compared with a neutral insole (58), probably because custom orthotic insoles require individual adjustments or are helpful only to certain subgroups of OA patients. The effect of insoles, shoes and knee braces on lateral and patellofemoral compartment knee OA has not been sufficiently investigated to make specific recommendations (59).

A recent Cochrane review concluded that there is little or no effect of acupuncture compared with placebo acupuncture on hip OA(11). By contrast, another recent review found a small effect of acupuncture compared with placebo acupuncture on knee OA symptoms (12), while the additional effects from acupuncture beyond exercise are questionable (12). There remains insufficient evidence to conclude whether or not acupuncture is an effective treatment for OA.

Other passive treatment approaches such as massage, neuromuscular electrical stimulation, transcutaneous electrical nerve stimulation (TENS), ultrasound and laser cannot be recommended as part of the treatment plan, based on the absence of high-quality supportive evidence (25, 47, 57).

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Competing interests

E.M. Roos is deputy editor of Osteoarthritis and Cartilage, the developer of the Knee injury and Osteoarthritis Outcome Score (KOOS) and several other freely available patient-reported outcome measures, and co-founder of Good Life with Osteoarthritis in Denmark (GLA:D®), a not-for profit initiative hosted at University of Southern Denmark aimed at implementing clinical guidelines for osteoarthritis in clinical practice.

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