



COMPARATIVE STUDY

Effects of non-surgical joint distraction in the treatment of severe knee osteoarthritis



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KEYWORDS

Knee;
Osteoarthritis;
Distraction;
Pain;
Function

Summary Purpose: The aim of this study was to evaluate the clinical results of non surgical knee distraction in patients with severe knee osteoarthritis.

Method: forty female patients with severe knee osteoarthritis were randomly divided in two groups. A standard physiotherapy treatment was applied to both groups and in one group it was accompanied with 20 min knee joint distraction. The patients were treated for 10 sessions. Clinical examination consisted of functional examination, completion of a quality of life questionnaire, pain scale, and assessment of joint mobility and joint edema.

Result: The standard physiotherapy treatment accompanied by knee distraction resulted in significantly higher improvement in pain ($P = 0.004$), functional ability ($P = 0.02$), quality of life ($P = 0.002$) and knee flexion range of motion ($p = 0.02$) compared to the standard physiotherapy treatment alone post treatment and after 1 month follow up.

Conclusion: Adding knee distraction to standard physiotherapy treatment can result in further improvement in pain relief, increased functional ability and better quality of life in patients with severe knee osteoarthritis.

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Introduction

Osteoarthritis (OA) is known as a degenerative joint disease, characterized by joint pain and stiffness. These clinical symptoms are the result of cartilage damage, changes in the subchondral bone, and bony outgrowth at the joint margins (Michael et al., 2010).

Normal synovial joints can survive loading during normal activities for a lifetime without developing OA. When the mechanical demand exceeds the tolerance of the joint (cartilage, bone or ligaments) however, it could lead to development and progression of osteoarthritis. The association between physically demanding occupations (Felson, 2004, 2005; Rossignol et al., 2005), severe sport activities (Buckwalter and Martin, 2004), obesity (Felson, 2004; Holmberg et al., 2005) and osteoarthritis suggests that intense joint loading is associated with early onset and progression of joint degeneration.

There is also reported association between joint injury and later development of osteoarthritis. Damage to joint articular structures such as menisci, ligaments, and capsules can lead to permanent joint instability and/or incongruity of the articular surface, causing increased contact pressure on articular surfaces. This increased stress can initiate or accelerate joint degeneration (Buckwalter and Martin, 2004). The impact of lower limb alignment during gait has also been suggested to have an important role in the development and progression of OA (Krohn, 2005). In general, mechanical factors, specifically in the weight-bearing and large joints such as knee, are involved in the actual initiation of the joint damage in OA (Andriacchi et al., 2004).

If over loading has a major impact on development and progression of OA, then unloading may be able to, at least, slow down its progression. There are numerous examples that show different unloading techniques, including weight loss (Christensen et al., 2005; Messier et al., 2005), wedged insole and unloader knee brace (Krohn, 2005), surgical osteotomy (Annette et al., 2005; Börjesson et al., 2005; Hoell et al., 2005; Ito et al., 2004, 2005; Tang and Henderson, 2005) and surgical joint distraction (Chiodo and McGarvey, 2004; Westacott et al., 1997) are able to improve pain, stiffness, physical symptoms and slowing down structural damage.

Measures that may decrease the intensity and frequency of impact and torsional loading of joints during sports also have been reported to prevent joint injury and development and progression of osteoarthritis (Buckwalter and Martin, 2004). More importantly, it has been demonstrated that the proper joint loading could result in constructive alterations in cartilage composition and biomechanical properties of the joint. This observation supports the concept that OA joints are possibly able to show positive adaptation to unloading (Herzog et al., 2003).

Although knee distraction is one of the mobilization techniques applied by physiotherapists for reduction of pain and dysfunction (Donatelli and Wooden, 2001; Kisner and Colby, 2002), the effect of non surgical short term knee distraction on the improvement of pain and functional ability of these patients has not been investigated previously.

Materials and method

Participants

Forty female patients with severe knee osteoarthritis who met the inclusion criteria were selected by non-random sampling method from patients referring to 17 Shahrivar clinic, Tehran, Iran, over 9 months period of time. Orthopedist referred patients to physiotherapy based on inclusion criteria. The criteria for selection of subjects included: symptomatic Kellgren–Lawrence grade 3 or 4 knee OA, skeletally mature, age ≤ 65 years and capacity to walk with or without using ambulatory aids. Excluded from the study were patients who met any of the following criteria: history of inflammatory arthritis, previous history of knee surgery, metabolic or endocrine disease, the presence of other symptomatic joints in lower extremity, current history of alcohol or drug abuse, having injection in the knee or taking new medication for osteoarthritis within the previous 30 days. The study was approved by the local institution ethics committee and written, witnessed consent was obtained from all patients.

Methodological study

To evaluate repeatability of clinical variables, the knee range of motion (ROM) and 6 min walking test (6 MWT) were repeated twice in 6 patients with one week interval.

Main study procedure

Patients were randomly assigned to one of these groups: the standard physiotherapy treatment (control group $n = 20$) and standard physiotherapy treatment accompanied by knee distraction (experimental group $n = 20$).

Standard physiotherapy treatment included: 2 hot packs to anterior and posterior of the knee for 20 min, 10 min continuous 1 MHz ultrasound (5 min anterior and 5 min posterior to the knee) at an intensity of 1 W/cm² and conventional TENS (frequency: 100 HZ, pulse Duration: 50 μ s) for 30 min. Exercises for strengthening of quadriceps, gluteals and gastrosoleus muscles were also included in the treatment procedure.

Standard physiotherapy treatment was provided for all patients. For patients in the experimental group, besides receiving standard physiotherapy treatment, joint distraction was also integrated. To distract the knee joint, a special greave was designed and built. Sustained traction was applied in supine position for 20 min while the knee was placed in 30° flexion by the use of a platform under the lower thigh to induce a counter pressure (Picture 1). The correct knee angle was checked for each patient by a goniometer. The amount of traction was set to the perceptual threshold of the patients in each session. In the other words, the lowest load that patients start feeling distraction was used for distraction.

Patients received a total of 10 treatment sessions, 5 sessions weekly for 2 weeks. Dependent variables consisted of a pain visual analog scale (VAS), a 6 min walk test (6 MWT), the KOOS (knee injury and osteoarthritis outcome score) questionnaire; range of motion (ROM) and edema.

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