Purpose: Perioperative rehabilitation seems to be effective for final results of total knee arthroplasty, but clinical practice guidelines concerning this kind of rehabilitation are lacking. The aim of this study was to develop clinical practice guidelines concerning perioperative rehabilitation for total knee arthroplasty.

Methods: The SOFMER 3-stage method for developing guidelines involves systematic literature review, collection of information about professional practice and final scientific committee review, including patient opinion. Questions were asked about preoperative multidisciplinary rehabilitation, predictive criteria for transfer of patients to a rehabilitation ward after total knee arthroplasty and early postoperative rehabilitation.

Results: Preoperative rehabilitation for patients undergoing total knee arthroplasty has benefit in terms of length of hospital stay and discharge destination (to a rehabilitation ward or home). A preoperative rehabilitation program comprising at least physical therapy and education is recommended. Multidisciplinary rehabilitation, comprising occupational therapy and education, is desirable for the most fragile patients because of major disability, comorbidity, or social problems. The main criteria determining transfer to a rehabilitation ward are demographic criteria such as older age or female sex; psychosocial and environmental criteria such as living alone, feeling unable to return home directly (preoperative education could modify this criterion); and surgeon advice based on the pre- and postoperative clinical and functional status. Early continued and passive motion does not seem to increase the frequency of complications and seems to help with rapid recovery of the joint range of motion.

Conclusions: Complementary studies must be undertaken to define the minimum perioperative rehabilitation program for total knee arthroplasty. Economic criteria such as length of stay in hospital, rehabilitation costs and patient satisfaction must be considered.

EVIDENCE FOR THE EFFECTIVENESS OF BRACING IN LOWER-LIMB OSTEOARTHRITIS BY SFR (FRENCH SOCIETY OF RHEUMATOLOGY) AND SOFMER (FRENCH PHYSICAL MEDICINE AND REHABILITATION SOCIETY)

Purpose: OARSI and EULAR recommendations for knee and hip osteoarthritis (OA) recommend nonpharmacological treatment, particularly braces. The aim of this study was to develop clinical practice guidelines concerning the use of bracing – rest orthosis, knee sleeves and unloading knee braces – for lower-limb osteoarthritis.

Methods: The SOFMER (French Physical Medicine and Rehabilitation Society) methodology, associating a systematic literature review, collection of everyday clinical practice, and external review by multidisciplinary expert panel, was used.

Results: Few high-level studies of bracing for lower-limb osteoarthritis were found. No evidence exists for the effectiveness of rest orthosis. Evidence for knee sleeves suggests that they decrease pain in knee osteoarthritis, but their use is associated with few improvement. These actions do not appear to depend on a local thermal effect. The effectiveness of knee sleeves for disability is not demonstrated for knee osteoarthritis. Short- and mid-term follow-up indicates that valgus knee bracing decreases pain and disability in medial knee osteoarthritis, appears to be more effective than knee sleeves, and improves quality of life, gait perception, quadriceps strength, and gait speed. However, results of response to valgus knee bracing remain inconsistent; discomfort and side effects can result. Thromboembolic risk of the lower limbs has been reported with the braces. Braces, whatever kind, are infrequently prescribed in clinical practice for osteoarthritis of the lower limbs.

Conclusions: Modest evidence exists for the effectiveness of bracing – rest orthosis, knee sleeve and unloading knee braces – for lower-limb osteoarthritis, with only low level recommendations for its use. Braces are prescribed infrequently in French clinical practice for osteoarthritis of the lower limbs. Randomized clinical trials concerning bracing in lower-limb osteoarthritis are still necessary.

COST-EFFECTIVENESS OF HOME-BASED AND CLINICAL-BASED PHYSIOTHERAPY PROGRAMS IN PATIENTS WITH KNEE OSTEOARTHRITIS

Purpose: Osteoarthritis (OA) is the most common joint disorder in a larger number of people older than 65 years. Several recent longitudinal studies conclude that carefully controlled therapeutic exercise programs in OA designed primarily to address. The purpose of this study was to evaluate the cost effectiveness of home-based and clinical-based physiotherapy programs for patients with OA.

Methods: Patients were randomly allocated either home-based (n=29) (mean age: 54.3±8.1 years) or clinical-based (n=29) (mean age: 55.2±7.4 years) physiotherapy program. A total of 58 patients with bilateral knee OA were participated into the study. Clinical-based group was received neuromuscular electrical stimulation (NMES), ice application, and exercises. Both groups were given an individualized exercise program for reducing pain, improving balance, and function. The patients in both groups also received 20 minutes of cold packs and muscle strengthening exercises. Treatment programs were composed of 5 times weekly for 4 weeks/20 sessions. Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), Functional Squat System-Proprioceptive Test, peak torque (PT) measurements of the knee extendors and flexors at 180°/sec on an isokinetic dynamometer (ISOMED 2000), timed performance test (timed up & go) (TUG) and visual analogue scale for the intensity of pain were used to quantify the variables.

Results: The results of pre and post treatment for both group demonstrated the significant improvement in pain and function (p<0.05). No differences found in body weight, body mass index and body fat percent in both groups (p>0.05). In home-based group proprioceptive abilities were not changed significantly (p>0.05) and isokinetic muscle strength in both legs in clinical-based group were not showed any significance (p>0.05). When analysing differences between groups WOMAC (t=2.27, p=0.026), proprioception (t=2.25, p=0.027), pain at right knee (t=2.94, p=0.04) and pain at left knee (t=2.01, p=0.04) results were significantly different and clinical-based group showed better results.

Conclusions: Both clinical and home-based programs were improved pain and function in patients with knee OA but the cost of delivering the exercise program is unlikely to be offset by any reduction in clinical-based programs. In conclusion, this program was a cost-effective treatment strategy in patients with osteoarthritis pain.
of persons with painful knee effusions. Both groups made significant gains in peak flexion and extension of the knee.

**Conclusions:** The physiotherapy programme tested in this trial reported positive effects on pain and disability in OA and improve muscle power, but isometric exercise are useful for improving the function of persons with painful knee. This data suggest that isokinetic training improve joint stability and increase the range of movement.

**Therapy – Pharmacologic**

**528 INTRA-ARTICULAR HYALURONAN TREATMENT REDUCES SYNOVIAL PATHOLOGY AND IMPROVES GAIT IN AN OSTEOARTHRITIS MODEL**

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**Purpose:** Synovial fluid hyaluronan (HA) content and molecular weight are decreased in osteoarthritis (OA). According to a Cochrane review intra-articular (IA) HA injection provides symptomatic relief that has slower onset but is more sustained than corticosteroids. The mechanism for this long-lasting effect is unknown, but MRI shows a strong association between synovitis, capsular fibrosis and knee pain in OA. We determined the effect of two HA preparations on gait, synovial and cartilage pathology in established OA in a sheep model.

**Methods:** Four months after bilateral meniscectomy, sheep (n=6/group) received 1% saline or Hyalgan® (Fidia Farmaceutici) weekly for 5 weeks or IA HYADD4®-G (an amide derivative; Fidia) weekly for 2 weeks. Cartilage damage and osteophyisis were assessed using modified Mankin and OARSI histopathology scores. Expression of MMP-1, -6, -13, -14, ADAMTS-4 & -5 and TIMP-1,-2 & -3 in cartilage were assessed by RT-PCR. Synovial sections were scored for intimal hyperplasia, inflammatory cell infiltrate, vascularity and sub-intimal fibrosis and intimal cell number and depth of fibrosis (μm) were quantified. Pro-fibrotic and inflammatory factors (TGFβ, CTGF, HSP47, CD44, TNF, iNOS) were immunolocalized in synovium. HA synthesis by isolated synovial fibroblasts was quantified.

**Results:** OA reduced all GRF parameters (p<0.01) and abolished the normal two-peak vector. GRF were partially restored by both HA preparations: Hyalgan® increased peak vertical force at 6 weeks, whilst HYADD4®-G increased vertical impulse at all times. Both HAs restored a two-peak composite force vector at 6 weeks. OA increased cartilage damage and osteophytosis (p<0.001), and modified Mankin and OARSI histopathology scores (p<0.005), with no effect of either HA. ADAMTS-5, MMP-1 and MMP-13 mRNA were increased in OA cartilage versus non-operated controls (NOC). Hyalgan® did not change cartilage gene expression while HYADD4®-G decreased MMP-13 and TIMP-1. Subintimal fibrosis, vascularity, aggregate score, intimal cell numbers and depth of fibrosis were higher in OA synovia versus NOC (p<0.01) but inflammatory cells did not increase. Both HAs decreased vascularity (p<0.03) while intimal hyperplasia was only reduced by HYADD4®-G (p=0.03). Fibrosis depth was decreased by Hyalgan® (p=0.03). Staining for CTGF, iNOS and CD44 increased in OA synovium but were not altered by either HA. HA synthesis was increased only in cells from HYADD4®-G treated joints (p=0.04).

**Conclusions:** GRF following meniscectomy in sheep mimic data for human meniscectomy and OA. In addition to cartilage damage, there is significant synovial pathology in this model, as in human OA. HA treatment reduced OA resulted in improved gait and, our results suggest this clinical benefit was achieved by modifying synovial pathology. The effect of HA on synovium was not associated with changes in staining for the inflammatory or pro-fibrotic molecules examined. As cartilage damage was already established at the time of initiating HA therapy, the change in the ensuing 10 weeks may have been insufficient to detect a therapeutic effect. The reduced expression of MMP-13 by HYADD4®-G could limit continued cartilage erosion. The more prolonged clinical benefit with HYADD4®-G may be related to its effect on endogenous HA synthesis. HA preparations such as HYADD4®-G, with increased joint retention and reduced treatment frequency, may offer advantages in OA treatment.

**529 EFFICACY OF INTRA-ARTICULAR HYALURONAN INJECTION FOR KNEE OSTEOARTHRITIS IN HEMODIALYSIS PATIENTS**

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**Purpose:** To clarify whether intraarticular hyaluronan injection is effective for knee osteoarthritis in hemodialysis patients.

**Methods:** The subjects were 15 knees of 10 hemodialysis patients, 3 males and 7 females, with symptomatic knee osteoarthritis. Mean patient age was 63.5 years, range 55 to 82 years. The mean duration of hemodialysis was 14.7 years, range 10 months to 31 years. There were 3 knees with Kellgren-Laurence (K-L) grade II, 6 with grade III, and 6 with grade IV. Intraarticular injection of hyaluronan (ARTZ Dispo® 25 mg, Kaken Pharmaceutical Co. Ltd., Tokyo, Japan) was performed 5 times per week. We assessed the visual analogue scale (VAS) of knee pain and the Japan Knee Osteoarthritis Measure (JKOM) score for evaluation of knee function. We also analyzed the concentrations of MMP-3, chondroitin 6-sulfate (C6S), chondroitin 4-sulfate (C4S), and hyaluronan in aspirated synovial fluids.

**Results:** Intraarticular hyaluronan administration reduced the degree of pain in 11 of 15 knees (73.3%), most markedly in 9 of 12 knees (75%) with K-L grades III and IV. JKOM scores were improved in 5 of 10 patients (50%). The concentrations of MMP-3, C6S and C4S were decreased in 5 of 6 knees (83%).

**Conclusions:** Intraarticular hyaluronan injection reduced the degree of knee pain and improved knee function in hemodialysis patients with knee osteoarthritis by decreasing the concentrations of MMP-3, C6S and C4S in synovial fluid.

**530 VITAMIN K2, MENAQUINONES, DELAYS THE PROGRESSION OF KNEE OSTEOARTHRITIS CHANGES IN HARTLEY GUINEA PIG**

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**Purpose:** Vitamin K is a family of structurally similar, fat-soluble, 2-methyl-1,4-naphthoquinones, including phyloquinone (K1), menaquinones (K2), and menadione (K3). Among these molecules, menaquinones exerts an influence on bone building, especially in osteoporosis. This effect is demonstrated by its ability of posttranscriptional modification of a number of vitamin-K dependent proteins such as osteocalcin or matrix GLA protein (MGP), a bone protein containing gamma-carboxyglutamic acid. Our previous study revealed that MGP played a critical role in regulating endochondral chondrocyte maturation and ossification processes by inhibiting cartilage mineralization in vitro and vivo assays. MGP is not only present in the mineralizing zone of the growth cartilage, but also present in articular cartilage. Hence, there might be the possibility that vitamin K influences physiological or pathologic course of articular cartilage. This study demonstrates the effect of oral administration of vitamin K2 on the pathological progress of OA using Hartley guinea pigs.

**Methods:** Hartley strain female guinea pigs (n=45) were obtained at 4 months of age from Charles River Laboratory (Wilmington, MA). Animals were divided into 9 groups (n=5) at random. Food and water were available ad libitum. One group was harvested at 4 months of age as control subjects. Eight groups were raised for the subsequent 2, 4, 6, and 8 months with or without following vitamin K2 (10 mg/kg). Animals were euthanized by administration of lethal doses of pentobarbital, and bilateral knee joints were then dissected for following experiments. The dissected joints were fully exposed by disarticulating the patella and severing the cruciate ligaments. After application of India ink, gross morphologic changes of tibial plateau were evaluated. The ratio of ink-retained area to total cartilage surface was determined. Coronal plane sections (5 μm) cut at 200-μm intervals of tibial plateau were stained with hematoxylin and eosin, and Safranin-O. Histological scoring of a serial sections of each knee was also performed. Histopathologic alterations in the knee joints were graded according to the Mankin criteria. All sections were graded and median scores were determined for statistical analysis. All data are expressed as the mean±SD. Statistical analysis was performed by using the un-paired t-test.