Rehabilitation and improvement of knee pain in primary care patients

Rehabilitación y mejoría del dolor de rodilla enpacientes de atención primaria

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Abstract

Introduction: Chronic knee pain is considered a consequence of aging.The combination of exercise and self-management could improve its separate benefits
Objective: To compare the effectiveness of a rehabilitation program to improve functioning in people with knee pain in primary care.
Methods: A single-blind, pragmatic, cluster randomized controlled trial was conducted. Participants were recruited from 54 primary care practices.
Results: Baseline WOMAC function was 27.2 (6-week assessment), functioning improved (usual care 25.9, 95 % CI 23.4, 28.3.
Conclusions: the program could impact the treatment of knee pain: for the large and growing number of people with chronic knee pain.

Keywords: rehabilitation, knee pain, primary care, source functioning: DeCS
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Resumen
Introducción: El dolor crónico de rodilla se considera una consecuencia del envejecimiento. La combinación de ejercicio y autocontrol podría mejorar sus beneficios por separado
Objetivo: Comparar la efectividad de un programa de rehabilitación para mejorar el funcionamiento en personas con dolor de rodilla en atención primaria.
Método: Se realizó un ensayo controlado aleatorizado por grupos, pragmático, a simple ciega. Los participantes fueron reclutados de 54 prácticas de atención primaria
Resultados: La función WOMAC inicial fue de 27,2 (evaluación de 6 semanas), el funcionamiento mejoró (atención habitual 25,9, IC del 95 % 23,4, 28,3.
Conclusiones: el programa podría tener un impacto en el tratamiento del dolor de rodilla: para el gran y creciente número de personas con dolor crónico de rodilla.
Palabras clave:rehabilitación, dolor de rodilla, atención primaria, funcionamientofuente :DeCS

Introduction

Chronic knee pain is considered a mundane, unavoidable and unmanageable consequence of aging. However, this overlooks the suffering, physical disability, psychosocial distress, health care costs and socioeconomic burden caused by chronic knee pain and its indirect role through impaired mobility and function in the development of common chronic comorbidities (hypertension, diabetes, etc.)[1].

Primary care physicians label chronic knee pain as osteoarthritis (OA) and prescribe pain-relieving medications, but there are concerns about the safety, efficacy, and costs of medications, particularly nonsteroidal anti-inflammatory drugs. In addition, palliative medication does not address functional impairment[2]. Improvement in function is best achieved if patients experience the benefits gained from exercise and patient education/self-care interventions. These interventions are usually administered separately, but self-care interventions that do not include a significant exercise component are of limited value[3]. Combining exercise and self-management might enhance their separate benefits, but few people will benefit if this produces complex and unfeasible rehabilitation programs. As more people live longer and incidence patterns change, safe, effective and efficient interventions that improve functioning and can be applied to large numbers of people will be needed[4].

A study was conducted integrating a simple, personalized, progressive exercise regimen with patient education, self-management, and active coping strategies: Enabling Self-Management and Coping with Arthritic Knee Pain through Exercise (ADRAE). The primary hypothesis was that participation in ADRAE would improve functioning better than continuing primary care. A subsidiary hypothesis was that rehabilitation would be equally effective whether administered to individuals or groups of people.

Method

A single-blind, pragmatic, cluster randomized controlled trial was conducted. Participants aged ≥50, reporting knee pain for >6 months, were recruited from 54 primary care practices between August 2020 and October 2021. This study was approved by the Universidad Regional Autónoma de Los Andes (UNIANDES).

This pragmatic study compared usual primary care with a rehabilitation program designed to improve functioning using exercise, education, and self-management strategies to modify behavior and dispel inappropriate health beliefs according to a prespecified protocol. A pragmatic trial is conducted in a clinical setting. It evaluates a feasible intervention for that setting using broad inclusion criteria to recruit a representative sample of the reference population, with few exclusion criteria to avoid maximizing the treatment effect size by excluding individuals who are unlikely to benefit.

A cluster-randomized trial design was chosen to minimize the risk of patients assigned to different arms exchanging information or primary care physicians altering their usual care. Primary care practices were the unit of randomization. Practices were randomized in blocks of 3 to receive 1) usual primary care (whatever intervention a participant's primary care physician deemed necessary and appropriate), 2) usual primary care plus individual rehabilitation (IR), or 3) usual primary care usual care plus cluster rehabilitation (GR) from ~8 participants

Broad inclusion criteria were adopted. Individuals aged 50 years or older were recruited who had consulted a primary care physician for mild, moderate, or severe knee pain of more than six months duration. Many participants' conditions had been labeled OA based on clinical presentation and history without attempting to identify the cause of pain using investigations that are not routinely available to primary care physicians (e.g., radiographs). Exclusion criteria were: lower limb arthroplasty, physical therapy for knee pain in the previous 12 months, intra-articular injections in the previous six months, unstable medical conditions, inability/unwillingness to exercise, wheelchair dependence, and inability to understand English. Participants were not excluded if they used assistive walking devices; had stable comorbidities common in this age group (e.g., type II diabetes, cardiovascular or respiratory disorders); or had back lower extremity, or upper extremity pain.

The content and format were identical for IR and GR, with 12 supervised sessions (twice a week for six weeks) that combined discussion of specific topics related to self-management and coping, etc., with a progressive, individualized exercise regimen.

The Likert version of the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) was administered at each study visit. This questionnaire yields a total score (WOMAC-total, 0-96 points), with subscores for physical functioning (WOMAC-func, 0-68 points), pain (WOMAC-pain, 0-20 points), and stiffness (0-20 points)[5]. Participants completed the WOMAC. Lower WOMAC scores indicate better health status.

Secondary outcomes were pain (WOMAC-pain), objective functional performance (time of aggregate functional performance of 4 common activities of daily living [TRFA])[6], exercise self-efficacy and health beliefs questionnaire (ExBeliefs)[7], anxiety and depression (Hospital Anxiety and Depression Scale [HADS])[8], self-reported health status (EuroQol)[9] converted to quality-adjusted life years,Patient-Specific Preferred Health-Related Quality of Life Questionnaire (McMaster Toronto Arthritis [MACTAR])[10], quadriceps strength (maximum voluntary quadriceps contraction) and voluntary quadriceps activation[6]. Lower values for TRFA and HADS and higher values for other outcomes indicate better health status. The assessment time was ~45 minutes.

All outcomes were assessed at baseline, immediately after completion of the intervention or recruitment into the usual primary care arm (6-week assessment), six months after rehabilitation completion or 7.5 months after recruitment into the usual care arm. Blinding success was assessed by asking assessors to identify each participant's allocation at each assessment; if they identified rehabilitation, they were asked to identify whether the participant had been in the RI or RG rehabilitation arm. Results for the three arms of the trial are presented as the mean ± standard deviation (SD) or median (range), and standardized effect sizes (95 % confidence intervals [95 % CI]) were calculated from the difference between the mean outcome at six months for one group minus the mean outcome at six months for another divided by the SD of the mean outcomes adjusted for baseline outcomes. The database and statistical processing of the data were performed and analyzed in the SPSS 26 statistical program (SPSS Inc., Chicago, IL, USA). Descriptive statistics were used for the results collection, presentation and interpretation.

Likelihood ratio tests were used to test random effects and the Wald test to test fixed parameters. WOMAC function scores were compared initially in the three treatment arms, then for usual care versus rehabilitation (individual rehabilitation and group rehabilitation arms combined) and, pairwise, each arm versus another arm, using the baseline WOMAC function score as a covariate.

To estimate the effect of missing data, logistic regression was used to identify predictors of abstinence. A longitudinal model was then constructed that jointly modeled the outcome at six weeks and the outcome at six months, allowing the outcome for each participant to be correlated. Variables associated with abstinence were included in the model, allowing the effect of these variables to be different at six weeks and six months. This adjusts for the measured characteristics of participants who withdrew being different from those who remained in the trial. Missing data were assumed to be missing at random.

Results

76 primary care practices were invited to collaborate; 22 declined or could not

participate. Database searches of the 54 consented practices identified 1098 potentially eligible participants who could be contacted. Of these, 186 (16%) were ineligible, 381 (34%) were not interested, and 113 (12%) were unable to participate; 418 (38%) were recruited. Although it was slightly more difficult to recruit participants in RG, there was no evidence of differential recruitment for the test arms and all baseline characteristics were balanced.

At six months, 76 (18%) participants had withdrawn. There was no evidence of differential attrition. Only 5 (1 %) participants withdrew due to exercise-related adverse events; 3 had exacerbation of pain (2 knee, one hip) and 2 with cardiac pacemakers had concerns about exercise, despite reassurance. No patients with outcome data were excluded from the analysis.

The mean baseline WOMAC function was 27.2 (Table 1). Immediately after completing the program (6-week assessment), functioning improved (usual care 25.9, 95 % CI 23.4, 28.3; rehabilitation 20.0, 95 % CI 18.3, 21.7; RI 19.8, 95 % CI 17.6, 22.0; RG 20.2, 95 % CI 17.6, 22.9). At the primary endpoint, six months after completion of the program, some of these improvements had been lost, but WOMAC-func differed significantly between the three arms (pooled Wald test, *P* = 0.04). WOMAC-func was better after rehabilitation compared with usual care (difference in WOMAC-func -3.33, 95 % CI -5.88, -0.78, *P* = 0.01; effect size 0.29, 95 % CI 0.07, 0.52; ICC 0.04) .

Table 1. Estimated mean outcome (95 % confidence intervals) at six months for the usual primary care and rehabilitation groups, adjusted for baseline values*.

		Results at sixmonths	
Variables ofresults	Initial mean (n = 418) †	Usual primary care (n = 113)	Rehabilitation (n = 229) ‡
Primaryresult WOMAC function	27,2 (25,7, 28,6)	25,0 (22,9, 27,1)	21,6 (20,2, 23,1)
Secondaryresults			
WOMAC-pain	7,6 (7,2, 8,0)	6.7 (6.1, 7.4)	5.7 (5.3, 6.2)
WOMAC-total	38,4 (36,5, 40,3)	35,0 (32,0, 38,0)	30,4 (28,3, 32,6)
AFPT, seconds	63,3 (59,8, 66,7)	61,0 (57,2, 64,9)	57,6 (54,9, 60,2)
ExBeliefsself-efficacy	13,8 (13,5, 14,1)	14,0 (13,4, 14,6)	15,3 (14,9, 15,7)
ExBeliefs total	64,2 (63,5, 65,0)	64,0 (62,7, 65,3)	67,5 (66,6, 68,5)
HADS anxiety	6.53 (6.11, 6.95)	5,97 (5,46, 6,49)	5,32 (4,96, 5,68)
HADS depression	4,86 (4,53, 5,20)	4,28 (3,87, 4,69)	3,93 (3,64, 4,22)
MACTAR	31,6 (31,1, 32,1)	41,8 (40,3, 43,3)	44,0 (42,9, 45,0)
EQ-5D	0,60 (0,57, 0,63)	0,66 (0,60, 0,71)	0,64 (0,61, 0,68)
QMVC right, newtons	227,8 (216,5, 239,2)	230,2 (217,7, 242,7)	237,4 (228,8, 246,0)
QVA, right, %, % QVA,	71,0 (68,3,	68,3 (61,8, 74,8)	74,7 (70,1, 79,4)

right, % QVA, right	73,6)		
QMVC left, newtons	203,4 (193,5, 213,6)	203,0 (187,6, 218,3)	210,8 (199,7, 221,9)
QVA, left, %, % QVA, left, %, % QVA, left	72,5 (70,0, 75,0)	70,6 (66,2, 75,0)	76,3 (73,3, 79,4)

Source : statistical analysis ,WOMAC = Western Ontario and McMaster Universities Osteoarthritis Index; WOMAC-function = WOMAC-function subscale; WOMAC-pain = WOMAC-pain subscale; WOMAC-total = total score; TRFA = aggregate function run time; ExBeliefs self-efficacy = exercise health belief self-efficacy subscale; ExBeliefs total = total score of exercise-related health beliefs; HADS anxiety = Hospital Anxiety and Depression Scale anxiety subscale; HADS depression = Hospital Anxiety and Depression Scale depression subscale; MACTAR = McMasters Toronto Arthritis Questionnaire; EQ-5D = EuroQol generic assessment of health status; QMVC = maximal voluntary quadriceps contraction; QVA = voluntary quadriceps activation. p≤ 0,05

Mean WOMAC-function scores for the RI and RG arms were significantly different from usual care (difference in WOMAC-func: RI -3.53, 95 % CI -6.52, -0.55, *P* = 0.04; RG -3.16, 95 % CI -6.55, -0.12, *P* = 0.04) but not from each other (RI 21.5, 95 % CI 19.3, 23.6; RG 21.8, 95 % CI 19.6, 24.0).

Participants who withdrew from the study between the 6-week and 6-month assessment had poorer functioning at six weeks than those who remained in the study (mean WOMAC function of 28.0 for dropouts versus 21.5 for non-dropouts; *P*= 0.013 for the test of difference). In particular, participants in the usual care arm who dropped out tended to have worse functioning at six weeks (mean WOMAC function 34.8 for dropouts versus 24.5 for non-dropouts), whereas participants in RG who dropped out tended to have better functioning 6-week WOMAC function 14.8 for dropouts versus 20.5 for non-dropouts). Adjusting for missing 6-week WOMAC function scores improved the mean WOMAC function to -6.45 (95 % CI -12.5, -0.44) in RI and -6.14 (95 % CI -11.6, -0.70) in RG. These point estimates indicate a much larger effect than our main analysis, with larger confidence intervals due to the added uncertainty in the model.

Baseline depression (HADS depression) did not influence the treatment effect but was a significant covariate, i.e., high baseline depression was associated with poor outcome (0.48, *P* = 0.011). Initial positive beliefs about exercise and confidence in exercise ability (total ExBeliefs) did not influence the treatment effect but were a significant covariate, i.e., participants with higher initial total ExBeliefs scores had better functioning at six months (-0.24, *P* = 0.001). The same pattern of results was observed with higher confidence in exercise ability (ExBeliefs self-efficacy), i.e., no interaction but better functioning at six months (-0.62, *P = 0.*001).

The results did not differ between the two evaluators. The assessors correctly identified assignments in 133 (61%) of 219 participants in the rehabilitation groups. WOMAC function was slightly, but not significantly, better in participants whom the assessors identified as having received rehabilitation (difference in WOMAC function -0.60; 95 % CI -3.31, 2.11; *P* = 0.66). The effect size for the subgroup of participants in rehabilitation whose allocation was not disclosed was smaller than usual care (difference in WOMAC function -2.32; 95% CI -5.21, 0.57).

Of the participants who attended the 6-month follow-up, 105 (85 %) of 120 IR participants and 59 (55 %) of 107 GR participants attended ≥10 of the 12 sessions.

Discussion

For people with chronic knee pain, supplementing usual primary care with a personalized progressive rehabilitation program integrating exercise, education, and active coping strategies (ADRAE) improved functioning up to 6 months after completing rehabilitation, regardless of whether it was delivered to individuals or small groups of patients. The main strengths of this trial are its rigor, size, realism, and applicability to less controlled clinical settings[11]. This is the first pragmatic efficacy trial for this complex health intervention for chronic knee pain in primary care. It was designed, conducted and analyzed according to a prespecified protocol and had a high follow-up rate. The trial enrolled a representative inner-city population with common comorbidities that primary care physicians encounter in daily practice. While there are no guidelines for primary care management of chronic knee pain, there are guidelines for the management of OA, but they are poorly adhered to for many reasons[12]. The participants reported management typical of what has been reported in primary care[13]: they used few health care resources and had disparate pharmacologic regimens with occasional referrals[14]. The rehabilitation program was conducted in a typical outpatient department. In addition, although its overall content was similar, the specific exercise components, tailored to address the needs of individuals, varied among participants and within participants over time as the exercises progressed to remain challenging. These factors reflect the usual clinical context and practice, improving the likelihood that the intervention and its effects will be replicated when delivered in clinics[15].

Potential participants were told the intervention they would receive before entering the trial, but because similar numbers of participants accepted, declined, or withdrew from all arms of the trial, preferential recruitment is unlikely to have affected the results. An advantage of the cluster design was that we could unambiguously explain the intervention they would receive to potential participants, avoiding the need to explain randomization procedures. We believe this facilitated recruitment and retention in a trial that required a significant commitment of time and effort on the part of participants. In addition, documentation of the reasons for nonparticipation and withdrawal allows us to assess the generalizability of the findings[16].

The trial did not achieve the target recruitment but found significant differences between arms. This is largely because the sample size calculation did not account for the inclusion of baseline score as a covariate in the final analysis; doing so reduces the sample size required for the specified power by almost half, and recruiting many groups with a relatively low average number of patients per practice minimized the effect of the design. In addition, recent work suggests that 12% may represent a significant change[17].

Psychological variables and health beliefs are important determinants of functioning. In this study, participants with positive beliefs about exercise who were confident in their ability to exercise had better functioning, whereas those with higher baseline depression had a worse outcome. People intuitively appreciate that movement is good for the joints but associate movement with pain. As a result, they become confused and frightened without appropriate counseling and refrain from activities they believe may cause harm[18]. ADRAE was designed to improve functioning, understanding and confidence by combining education, counseling, reassurance and simple coping strategies with the experience of supervised functional activities and exercises. Successful performance of simple exercises and activities without painful exacerbation, together with information, advice and reassurance from a trained health professional, may have increased participants' understanding of the importance and benefit of physical activity, restored confidence in their abilities and enabled them to appreciate how they could help themselves. In this regard, exercise health beliefs and self-efficacy changes are notable [19].

As the prevalence of chronic ill health increases, so does the need for affordable, safe, effective, low-tech interventions that promote self-care and can be delivered to many people. Moreover, such interventions permeate populations more

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effectively than complex and costly interventions that can have large effects that few people can access and benefit from[20].

Conclusions

Consequently, ADRAE could have an impact on the treatment of knee pain: for the large and growing number of people with chronic knee pain, it provides health benefits through active coping strategies that enable people to help themselves; for healthcare providers, it provides an adequate, relatively brief and simple alternative or adjunct to medication without adverse side effects.

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