Osteoarthritis (OA) can develop in any joint, but most frequently affects the knees, spine, and hands. OA is considered a final common pathway of several diseases characterized by degradation and loss of articular cartilage, sclerotic remodeling of the subchondral bone, formation of cysts and osteophytes at the edges of joints, contraction and loosening of the ligaments, muscular atrophy and contractures, and inflammation of the synovial membrane. OA can develop in any joint, but most frequently affects the knees, hips, hands, the facet joints, and feet. The radiographic prevalence of OA of the hand varies from 27% to over 80%, and symptomatic OA of the hand becomes more prevalent with age, and is more frequent in women and in certain races.

We created an educational program for patients with OA of the knee which from the outset included clinical and radiographic evaluation of all patient complaints, including the hands, in addition to classes on joint protection. Approximately 70% of our sample was composed of patients with multiple OA and comorbidities, mainly affecting the knees, spine, and hands. The program addressed holistic treatment of OA that extended beyond an educational program involving education on hand function in patients with rhizarthritis.

INTRODUCTION

Osteoarthritis (OA) is the most frequent cause of musculoskeletal disability worldwide. It is considered a final common pathway of several diseases characterized by degradation and loss of articular cartilage, sclerotic remodeling of the subchondral bone, formation of cysts and osteophytes at the edges of joints, contraction and loosening of the ligaments, muscular atrophy and contractures, and inflammation of the synovial membrane. OA can develop in any joint, but most frequently affects the knees, hips, hands, the facet joints, and feet. The radiographic prevalence of OA of the hand varies from 27% to over 80%, and symptomatic OA of the hand becomes more prevalent with age, and is more frequent in women and in certain races.

We created an educational program for patients with OA of the knee which from the outset included clinical and radiographic evaluation of all patient complaints, including the hands, in addition to classes on joint protection. Approximately 70% of our sample was composed of patients with multiple OA and comorbidities, mainly affecting the knees, spine, and hands. The program addressed holistic treatment of OA that extended beyond an educational program involving education on hand function in patients with rhizarthritis.
with or without classes and provided patients with routine diacerein, analgesics, hand orthotics, acupuncture and physiotherapy as required. Patients were always instructed to perform regular physical activity at least three times per week and to lose weight if they were overweight or obese.

The objective of this study is to verify whether the program and/or the personal characteristics for physical behavior and the degree of rhizarthritis in the patients improved arm function and hand grip strength.

METHODS

This retrospective study was conducted using data collected during the PARQVE Project (Project Arthritis Recovering Quality of Life through Education, Projeto Artrose Recuperando Qualidade de Vida pela Educação), which was conducted in the Osteometabolic Diseases Group at the Instituto de Ortopedia e Traumatologia do Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo (IOT-HC/ FMUSP) from January 2012 to January 2014. The study was approved by the institutional review board for research ethics (CAPPesq, number 622/11).

To comprise the sample of this study, we selected patients who participated in the education program for knee OA (outpatients) who also presented arthritis of the trapezium-first metacarpal joint according to the classification by Eaton et al. Other patient inclusion criteria were age 45 years or above, clinical and/or radiographic diagnosis of knee arthritis with knee pain requiring analgesics, no neurological pathologies, and the ability to understand and provide informed consent.

The exclusion criteria were: patients undergoing surgery during the study which would stop them from performing physical exercise, participation in another clinical trial or another nutritional support group, and patients without initial and final evaluations (complete clinical and radiological assessments) for carpal-metacarpal arthritis in the thumb.

Intervention

All patients received a book and a DVD containing information about OA and lifestyle change, and were advised to read the material at least three times at home. The patients also received periodic reinforcement from the medical team (in the ambulatory follow-up visits every six months) related to daily practice of physical exercise and diet, as well as prescriptions for diacerein and analgesics, hand orthotics, acupuncture, and physiotherapy. After two years in the project (after the last evaluation), some patients received viscosupplementation in the trapezium-first metacarpal joint, and all participated in one more day of class with the multiprofessional team, where occupational therapists taught the participants specific exercises for the hands.

Data Collection

At inclusion and at the end of two years, participants completed the SF-36 questionnaire (Medical Outcomes Study 36-Item Short-Form Health Survey), the DASH assessment (Disabilities of the Arm, Shoulder and Hand), and the HAQ (Health Assessment Questionnaire), and underwent hand dynamometry, which quantified palmar grip strength, key (lateral) pinch strength, pulp to pulp pinch strength, and tripod pinch strength. Data were also collected on the type, frequency, and intensity of physical activity patients habitually practiced each week, as well data such as age, sex, race, educational level, weight, height, body mass index (BMI), and body fat percentage (BFP) were also collected. X-rays were taken of the hands of all patients. The X-rays were analyzed by a group of three orthopedists and stratified according to the classification by Eaton et al. When there was disagreement between the two observers, the third observer broke the tie.

The diagnosis of rhizarthritis was established if the patient had positive typical symptoms and/or radiographic signs of carpal-metacarpal arthritis of the thumb.

Statistical analysis

Improvement was considered to be a reduction of at least three points on the DASH, an increase of five points for quality of life scores (HAQ and SF-36), and for the other assessments, improvement of 5% between the initial and two-year evaluations. For the strength measurements, if one side improved by at least 5%, the patient was considered to have improved in the analyses in which the patient was evaluated as a whole, not the hands separately. Intense physical activity was defined as swimming, cycling, or weight lifting and/or frequency of more than 180 minutes of physical activity per week. The degrees of rhizarthritis were defined according to the classification by Eaton et al.

The quantitative characteristics were described according to the improvement in each criterion using summary measurements (mean, standard deviation, median, minimum, and maximum) and were compared using Student’s t-test or the Mann-Whitney tests. The improvements in each criterion were described according to the qualitative characteristics and association with likelihood ratio or chi-squared tests. The odds ratios were estimated for each variable of interest with improvement in each criterion, along with their respective 95% confidence intervals using simple logistic regression.

Multiple logistic regression models were estimated, selecting the variables in the non-adjusted analysis which demonstrated a descriptive level below 0.2 (p<0.2), and in all models the rhizarthritis variable was maintained to verify the combined influence for reach of the improvement criteria.

To assess the degree to which rhizarthritis influenced improvement in strength measurements, the second degree forces were described using absolute and relative frequencies, and the relationship between the degree and the improvement in strength was assessed using generalized estimation equations with binomial distribution and the logit link function with an interchangeable correlation matrix. To perform the analyses, IBM SPSS for Windows software version 20.0 was used, and Microsoft Excel 2003 was used to tabulate the data. The tests were performed at a 5% significance level.

RESULTS

Of the 195 patients with knee OA (isolated or multiple OA, with and without comorbidities) who completed the two-year program, 49 did not have complete clinical and radiological assessment of the hands and were excluded. Among the 146 patients with complete clinical and radiological assessments, 108 patients had clinical and/or radiographic rhizarthritis. (Figure 1) The 146-patient sample consisted of 112 women (76%) and 34 men, with an average age of 69.2±9.2 years (minimum 48, maximum 89 years) and 8±3 years of schooling; 93 declared their race as White, 17 Black, 31 mixed-race of African descent, 4 Asian, and 1 did not declare race. The initial mean BMI was 31.1±5.5 (minimum 20.06, maximum 49.0) and the mean final BMI was 31.1±5.7. The initial BFP was 36.10±8.5% (minimum 11.32%, maximum 52%) and the mean final BFP was 37.9±8.7%. Only 16 of the patients performed intense physical activity, while 43 did not perform any physical activity.

With regard to the diagnosis of carpal-metacarpal arthritis of the thumb 108 patients were diagnosed with rhizarthritis (38 without rhizarthritis); 83 had bilateral arthritis and 25 had unilateral rhizarthritis. A total of 191 hands with rhizarthritis were observed: 19 stage 1 on
Table 1. Improvement in the physical component of the SF-36 (PCS) according to qualitative characteristics and the results of the statistical tests.

| Variable | Improvement in Physical Component of the SF-36 (PCS) | OR not adjusted | 95% CI | p | OR adjusted | 95% CI | p |
|----------|-----------------------------------------------------|-----------------|--------|---|-------------|--------|---|
| Type of physical activity, n (%) | | | | | | | |
| None | 20 (62.5) | 12 (29.3) | 41 | 1.00 | 0.498 |
| Class I/Stretching | 20 (62.5) | 12 (29.3) | 39 | 1.45 | 0.54 | 3.87 |
| Walking/Gymnastics/Water aerobics | 38 (70.6) | 15 (19.4) | 51 | 1.01 | 0.41 | 2.48 |
| Swimming/Cycling/Lifting Weights | 8 (50) | 8 (50) | 16 | 2.42 | 0.74 | 7.93 |
| Intensity of physical activity, n (%) | | | | | | | |
| None | 31 (72.1) | 12 (27.9) | 43 | 1.00 | 0.484 |
| Light Activity | 31 (69.3) | 22 (46.7) | 52 | 1.46 | 0.63 | 3.40 |
| Moderate Activity | 19 (69.6) | 11 (42.1) | 29 | 1.22 | 0.48 | 3.45 |
| Intense activity | 3 (42.9) | 4 (18.7) | 7 | 3.44 | 0.47 | 17.73 |
| Sex, n (%) | | | | | | | |
| Male | 25 (78.1) | 7 (21.9) | 32 | 1.00 | 0.011 |
| Female | 60 (63) | 40 (37) | 108 | 2.10 | 0.83 | 5.30 |
| Age, n (%) | | | | | | | |
| White | 60 (68.2) | 28 (31.8) | 88 | 1.00 | 0.039 |
| Mixed race of African descent | 40 (60) | 26 (40) | 66 | 3.06 | 1.06 | 8.88 |
| Asian | 4 (100) | 0 (0) | 4 | 4.00 | 0.08 | 17.45 |
| Rhiz, n (%) | | | | | | | |
| No arthritis | 26 (72.2) | 10 (27.8) | 36 | 1.00 | 0.336 |
| Unilateral arthritis | 10 (52.6) | 9 (47.4) | 19 | 2.24 | 0.73 | 7.46 |
| Bilateral arthritis | 57 (67.1) | 28 (32.9) | 85 | 1.28 | 0.54 | 3.01 |
| Study Time (years) | | | | | | | |
| Minutes per week | 104.7 (113.6) | 144.6 (163.8) | 118.2 (133.3) | 1.02 | 0.005 | 1.035 |
| Mean (SD) | 146.8±19.5 | 27.9±18.5 | 118.2±133.3 | 1.00 | 1.000 | 1.000 |
| Median (min; max) | 90 (0; 840) | 120 (0; 840) | 90 (0; 840) | 1.01 | 0.988 | 1.039 |
| Age (years) | | | | | | | |
| Mean (SD) | 67.6±9.3 | 70.1±8.6 | 69.1±9.1 | 1.07 | 0.019 | 0.035 |
| Median (min; max) | 69 (48.89) | 71 (50.86) | 69 (48.89) | 1.03 | 0.019 | 0.035 |
| Study Time (years) | | | | | | | |
| Mean (SD) | 8.2 (2.7) | 7.8 (3.4) | 8.1 (2.7) | 0.950 | 0.841 | 1.072 |
| Median (min; max) | 8 (1; 15) | 8 (1; 15) | 8 (1; 15) | 1.037 | 0.914 | 1.104 |
| BMI (kg/m²) | | | | | | | |
| Mean (SD) | 30.7 (15.6) | 31.8 (5.7) | 31.1 (5.6) | 30.9±5.6 | 19 (9.8; 49.9) | 50.5±19.8 | 49.9 | 1.030 | 0.986 | 1.076 | 0.185 | 1.004 | 0.940 | 1.079 | 0.897 |
| Median (min; max) | 37.2 (14.1; 48.7) | 41.3 (15.1; 49.1) | 40.4 (15.1; 49.1) | 37.2±8.7 |
| BMI Variation (kg/m²) | | | | | | | |
| Mean (SD) | -0.08 (1.8) | 0.01 (1.8) | -0.05 (1.76) | -0.08 (1.8) | -0.02 (3.21; 4.44) | -0.01 (-3.73; 4.44) | -0.02 (-3.73; 4.44) | -0.22 (0.89) | 1.027 | 0.838 | 1.259 | 0.298 |
| Median (min; max) | -0.10 (1.88; 4.42) | -0.02 (3.72; 4.44) | -0.01 (-3.72; 4.44) | -0.10 (-3.72; 4.44) | -0.01 (-3.72; 4.44) | -0.01 (-3.72; 4.44) | -0.10 (-3.72; 4.44) | -0.10 (-3.72; 4.44) | 0.977 | 0.917 | 1.041 | 0.479 |
| Man’s sex | | | | | | | |
| Mean (SD) | -1.43 (4.5) | -2.19 (7.98) | -1.7 (5.93) | -1.54 (14.62) | -2.14 (-17.88; 35.72) | -1.79 (-17.88; 35.72) | -1.79 (-17.88; 35.72) | -1.79 (-17.88; 35.72) | -1.79 (-17.88; 35.72) | -1.79 (-17.88; 35.72) | -1.79 (-17.88; 35.72) | -1.79 (-17.88; 35.72) | -1.79 (-17.88; 35.72) |
| OR: Odds Ratio; CI: Confidence interval; Logistic regression results

Chi-squared test; # Likelihood ratio test; * Mann-Whitney test; ** Student’s t-test; CR: Odds Ratio; CI: Confidence interval; Logistic regression results

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Table 2. Improvement in the mental component of the SF-36 (MCS) according to qualitative characteristics and the results of the statistical tests.

| Variable                                                                 | Total | OR not adjusted | 95% CI | p | OR adjusted | 95% CI | p     |
|--------------------------------------------------------------------------|-------|-----------------|--------|---|-------------|--------|-------|
| **Type of physical activity, n (%)**                                     |       |                 |        |   |             |        |       |
| No                                                                       | 70    | 46 (65.7)       | 55.5   | 6.3 | 1.00        | 0.66   | 1.56  |
| Yes                                                                      | 28    | 14 (50)         | 35.3   | 1.7 | 0.06        | 0.56   | 2.39  |
| **Class text/Stretching**                                                |       |                 |        |   |             |        |       |
| No                                                                       | 18    | 14 (77.8)       | 73.9   | 1.0 | 1.00        | 0.89   | 1.10  |
| Yes                                                                      | 36    | 24 (66.7)       | 63.5   | 1.0 | 0.77        | 0.54   | 1.07  |
| **Walking/Gymnastics/Water aerobics**                                    |       |                 |        |   |             |        |       |
| No                                                                       | 12    | 7 (58.3)        | 54.2   | 1.0 | 1.00        | 0.66   | 1.56  |
| Yes                                                                      | 50    | 24 (48)         | 68.0   | 1.0 | 0.77        | 0.54   | 1.07  |
| **Swimming/Cycling/Lifting Weights**                                     |       |                 |        |   |             |        |       |
| No                                                                       | 9     | 6 (66.7)        | 63.5   | 1.0 | 1.00        | 0.89   | 1.10  |
| Yes                                                                      | 33    | 13 (39.4)       | 41.2   | 1.0 | 0.77        | 0.54   | 1.07  |
| **Intensity of physical activity, n (%)**                                |       |                 |        |   |             |        |       |
| No                                                                       | 29    | 14 (48)         | 51.7   | 1.0 | 1.00        | 0.89   | 1.10  |
| Yes                                                                      | 41    | 18 (43.9)       | 47.6   | 1.0 | 0.77        | 0.54   | 1.07  |
| **Light Activity**                                                       |       |                 |        |   |             |        |       |
| No                                                                       | 9     | 6 (66.7)        | 63.5   | 1.0 | 1.00        | 0.89   | 1.10  |
| Yes                                                                      | 33    | 13 (39.4)       | 41.2   | 1.0 | 0.77        | 0.54   | 1.07  |
| **Moderate Activity**                                                    |       |                 |        |   |             |        |       |
| No                                                                       | 20    | 10 (50)         | 39.5   | 1.0 | 1.00        | 0.89   | 1.10  |
| Yes                                                                      | 29    | 14 (48)         | 51.7   | 1.0 | 0.77        | 0.54   | 1.07  |
| **Intense activity**                                                     |       |                 |        |   |             |        |       |
| No                                                                       | 16    | 6 (37.5)        | 32.3   | 1.0 | 1.00        | 0.89   | 1.10  |
| Yes                                                                      | 34    | 18 (52.9)       | 54.1   | 1.0 | 0.77        | 0.54   | 1.07  |
| **Sex, n (%)**                                                           |       |                 |        |   |             |        |       |
| Male                                                                     | 108  | 46 (42.9)       | 44.1   | 1.0 | 1.00        | 0.89   | 1.10  |
| Female                                                                   | 16    | 6 (37.5)        | 32.3   | 1.0 | 1.00        | 0.89   | 1.10  |
| **Race, n (%)**                                                          |       |                 |        |   |             |        |       |
| Black                                                                    | 57    | 19 (33.3)       | 29.7   | 1.0 | 1.00        | 0.89   | 1.10  |
| Asian                                                                    | 30    | 12 (40)         | 39.3   | 1.0 | 1.00        | 0.89   | 1.10  |
| **Minutes per week**                                                     |       |                 |        |   |             |        |       |
| Median (min; max)                                                        |       |                 |        |   |             |        |       |
| No arthritis                                                             | 57    | 19 (33.3)       | 29.7   | 1.0 | 1.00        | 0.89   | 1.10  |
| Yes                                                                      | 29    | 12 (41.4)       | 32.6   | 1.0 | 1.00        | 0.89   | 1.10  |
| **BMI (kg/m²)**                                                          |       |                 |        |   |             |        |       |
| Male                                                                     | 23    | 10 (43.5)       | 39.2   | 1.0 | 1.00        | 0.89   | 1.10  |
| Female                                                                   | 37    | 17 (45.9)       | 39.2   | 1.0 | 1.00        | 0.89   | 1.10  |
| **% Body Fat (%BF)**                                                     |       |                 |        |   |             |        |       |
| Male                                                                     | 23    | 10 (43.5)       | 39.2   | 1.0 | 1.00        | 0.89   | 1.10  |
| Female                                                                   | 37    | 17 (45.9)       | 39.2   | 1.0 | 1.00        | 0.89   | 1.10  |
| **Chisquared test; # Likelihood ratio test; * Mann-Whitney test; ** Student's t-test; OR: Odds Ratio; CI: Confidence interval; Logistic regression results**
In the analysis of the data for strength, age and the presence of rhizarthritis both separately and jointly influenced improved grip strength (p<0.05). After adjustment, the chance of improved grip in patients with unilateral rhizarthritis was 5.30 times the chance of improvement than in patients without rhizarthritis (p=0.015), and for each additional year of patient age the chance of improved grip decreased 6.8% (p=0.004). (Table 5) For pulp to pulp pinch strength, the only factor which influenced improvement was sex (p<0.05), and after adjustment, female patients had a 2.95 greater chance of improvement than male patients (p=0.018). (Table 6) With regard to the evaluation of key (lateral) pinch or tripod pinch strength, none of the evaluated characteristics influenced improvement, alone or after adjustment (p>0.05).

No relationship was found (using the chi-square test) between the presence of rhizarthritis and improved quality of life or arm functionality by scores on the SF-36 (p>0.05), DASH (p=0.089), or HAQ (p=0.864).

There was also no relation between the presence of rhizarthritis and improved palmar grip strength (p=0.819), pulp to pulp pinch strength (p=0.222), or key (lateral) pinch strength (p=0.411) measured by dynamometry. Improvements in tripod pinch strength were more likely in patients with rhizarthritis than in patients without the disease (p=0.036).

Stratification according to the Eaton classification showed no relationship between the degree of rhizarthritis and improvements in palmar grip strength (p=0.222), pulp to pulp pinch strength (p=0.470), key (lateral) pinch strength (p=0.815), or tripod pinch strength (p=0.463), measured by dynamometry.

**DISCUSSION**

Although this study is retrospective, it is part of a thematic project called PARQUE. 1,13,10 The main objective of this project was to offer multiple-modality treatment for patients with OA of the knee. Seven teams (orthopedic doctors, physiotherapists, a dietitian, physical educators, occupational therapists, social workers, and psychologists) joined forces to develop a two-day educational program explaining the disease and its treatment. Each team developed subprojects evaluating objective and subjective parameters within its area.

At inclusion, the prevalence of OA was similar to that described in the literature (23.7%). 1,8,12 but after one year prevalence of symptomatic OA of the hands was 47.4%, alerting us to the need to evaluate how effective the program was for OA of the hands.

Since at least one fourth of our patients obtained examinations outside of our institution, we were unable to recover the electronic file images from 49 of these patients, who were excluded. (Figure 1) Consequently, of the 146 patients with clinical and radiological assessments of the hands, 108 had rhizarthrosis in at least one of their hands (74%). The prevalence of OA of the hand is known to be higher in women, and increases with age and obesity. 1,8 Our sample contains 76% obese women (obesity I, on average) with a mean age of 69 years, extending to 89. Of the 108 patients with rhizarthritis, 83 had bilateral involvement.

Intense physical activity, weight lifting, and frequent physical activity exceeding 180 minutes per week were factors that positively impacted the function of patients with knee OA, 1,3,4 but this was not the case with OA of the hand. One explanation could be that rhizarthritis exercises aim to relax the thenar region and strengthen the thumb.
### Table 5. Improvement in palmar strength according to qualitative characteristics and the results of the statistical tests.

| Variable                          | Improvement in Palmar Grip | Total | OR not adjusted | 95% CI       | p   | OR not adjusted | 95% CI       | p   |
|-----------------------------------|----------------------------|-------|-----------------|--------------|-----|----------------|--------------|-----|
| Type of physical activity, n (%)  |                            |       |                 |              |     |                 |              |     |
| None                              | 22 (0.7)                   | 22 (0.7) | 1.00            |              | 0.876 |
| Class text/Stretching             | 10 (6.3)                   | 10 (6.3) | 1.14            | 0.44         | 3.31 |
| Walking/Gymnastics/Water aerobics | 5 (6.2)                    | 5 (6.2)  | 1.30            | 0.46         | 3.57 |
| Swimming/Cycling/Lifting octaves  | 6 (6.2)                    | 6 (6.2)  | 1.00            |              | 0.876 |
| Walking/Gymnastics/Water aerobics | 19 (37.5)                  | 19 (37.5) | 2.24            | 0.61         | 8.16 |
| Swimming/Cycling/Lifting octaves  | 27 (54.0)                  | 27 (54.0) | 1.00            |              | 0.876 |
| Median (min; max)                 | 9 (0; 480)                 | 9 (0; 480) | 1.00            |              | 0.876 |
| Sex, n (%)                        |                            |       |                 |              |     |                 |              |     |
| Male                              | 27 (0.7)                   | 27 (0.7) | 1.00            |              | 0.876 |
| Female                            | 73 (3.7)                   | 73 (3.7) | 1.00            |              | 0.876 |
| Place, n (%)                      |                            |       |                 |              |     |                 |              |     |
| No                                | 12 (0.6)                   | 12 (0.6) | 1.00            |              | 0.876 |
| Yes                               | 73 (3.8)                   | 73 (3.8) | 1.00            |              | 0.876 |
| Chin-squared test; # Likelihood ratio test; * Mann-Whitney test; ** Student's t-test; OR: Odds Ratio; CI: Confidence interval; Logistic regression results

### Table 6. Improvement in pulp pinch strength according to qualitative characteristics and the results of the statistical tests.

| Variable                          | Pulp Pinch Grip Improvement | Total | OR not adjusted | 95% CI       | p   | OR not adjusted | 95% CI       | p   |
|-----------------------------------|-----------------------------|-------|-----------------|--------------|-----|---------------- |--------------|-----|
| Type of physical activity, n (%)  |                            |       |                 |              |     |                 |              |     |
| None                              | 10 (29.4)                   | 10 (29.4) | 1.00            |              | 0.788# |
| Class text/Stretching             | 17 (6.5)                    | 17 (6.5) | 1.00            |              | 0.788# |
| Walking/Gymnastics/Water aerobics | 4 (6.8)                     | 4 (6.8)  | 1.00            |              | 0.788# |
| Median (min; max)                 | 10 (7.4)                    | 10 (7.4)  | 2.06            | 0.62         | 7.12 |
| Walking/Gymnastics/Water aerobics | 28 (6.9)                    | 28 (6.9)  | 1.00            |              | 0.788# |
| Median (min; max)                 | 10 (7.4)                    | 10 (7.4)  | 2.06            | 0.62         | 7.12 |
| BMI Variation (kg/m²)             |                            |       |                 |              |     |                 |              |     |
| Mean (SD)                         | 27 (0.7)                    | 27 (0.7)  | 1.00            |              | 0.788# |
| Median (min; max)                 | 10 (7.4)                    | 10 (7.4)  | 2.06            | 0.62         | 7.12 |
| Age (years)                       |                            |       |                 |              |     |                 |              |     |
| Male                              | 27 (0.7)                    | 27 (0.7)  | 1.00            |              | 0.788# |
| Female                            | 73 (3.7)                    | 73 (3.7)  | 1.00            |              | 0.788# |
| Sex, n (%)                        |                            |       |                 |              |     |                 |              |     |
| Male                              | 27 (0.7)                    | 27 (0.7)  | 1.00            |              | 0.788# |
| Female                            | 73 (3.7)                    | 73 (3.7)  | 1.00            |              | 0.788# |
| Place, n (%)                      |                            |       |                 |              |     |                 |              |     |
| No                                | 12 (0.6)                    | 12 (0.6)  | 1.00            |              | 0.788# |
| Yes                               | 73 (3.8)                    | 73 (3.8)  | 1.00            |              | 0.788# |
| Chin-squared test; # Likelihood ratio test; * Mann-Whitney test; ** Student's t-test; OR: Odds Ratio; CI: Confidence interval; Logistic regression results
extensor and abductor muscles to stabilize the trapeziometacarpal joint, while gym exercises develop palmar grip on equipment. Black participants were 4.8 times more likely to improve their physical quality of life than white participants, and the presence of rhizarthritis did not affect improvement in the physical component of the SF-36. (Table 1) Time seemed to affect improvement in the mental component of the SF-36, but no variable influenced this improvement. (Table 3) Women showed 79% less chance of improvement than men in the HAQ (p=0.037), and each decrease of 1% in body fat percentage increased the chance of improvement in the HAQ by 9.2% (p=0.038). (Table 4) We already knew that patients who lose weight improve their overall muscular strength (as assessed by the HAQ), but even though few participants lost weight, this result was constant at each annual evaluation. As expected, age and the presence of rhizarthritis influenced grip strength. Patients with unilateral rhizarthritis are 5.3 times more likely to improve than patients without rhizarthritis, because these patients were expected to be worse and after treatment their grip may have improved. Here we should recall that all patients received diacerein for knee OA, and that patients who had hand symptoms were fitted for orthotics by the occupational therapists. Patients with unilateral rhizarthritis could (data not analyzed) have milder degrees of OA than patients with bilateral rhizarthritis. As expected, and like the functional results for the knees, age had a negative impact on grip strength, probably because of sarcopenia. Sex influenced pulp to pulp pinch strength, with females 2.95 times more likely to improve their pulp to pulp pinch strength than men (p=0.018). The simple explanation may be that they were more affected than men in this area and that treatment offered more significant improvement in women than in men. Tripod pinch strength improved more in patients with rhizarthritis than in patients without this disease. The degree of rhizarthritis did not influence strength improvement to the same extent as other joints with OA.

CONCLUSION

Patients with multiple arthritis and rhizarthritis improved their quality of life and grip strength through clinical treatment, an educational program, and fat loss.

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