Pain and Disability Related to Osteoarthritis of the Trapeziometacarpal Joint

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Abstract We investigated the relationship between trapeziometacarpal arthrosis, pain, and upper extremity specific disability by surveying patients from a prior prevalence study. The 456 adult (age 18 or greater) patients from a prior prevalence study were mailed a questionnaire consisting of the full DASH outcome measure as well as additional questions to identify sources of pain other than the thumb, pain in the thumb and whether the patient has received treatment for thumb arthritis. A response rate of 27% was achieved (122 responses). Thumb pain correlated with pain elsewhere in the arm ($r=0.354$, $p<0.001$), but not with higher grades of arthrosis. The average DASH score was 9.9 [range 0–60.0]. Higher grades of arthrosis ($p=0.013$), pain in the thumb ($r=0.602$, $p<0.001$) and pain elsewhere in the arm ($r=0.665$, $p<0.001$) were found to be predictors of a higher DASH score. Arthrosis grade explained only 3% of the variation of DASH scores in linear regression modeling, but was included in the best multivariable model—along with thumb pain and pain elsewhere in the arm—which explained 52% of the variation in DASH scores. Higher grades of trapeziometacarpal arthrosis do not correlate with complaints of thumb pain and have a significant, but very limited affect on arm-specific disability, compared to pain elsewhere in the arm.

Keywords Thumb · Arthritis · Carpometacarpal · Trapeziometacarpal · Pain · Disability

Introduction

In a previous study by Sodha et al. [1], the age and gender-related prevalence of trapeziometacarpal arthrosis in patients who presented for treatment of a distal radius fracture was evaluated. Arthrosis was found to be nearly universal with increasing age and leads to complete joint destruction sooner in women than in men. However, no assessment of symptoms or disability was conducted.

Symptoms at the trapeziometacarpal joint are often discordant with the degree of radiographic arthrosis [2–4]. While psychosocial factors are increasingly important in understanding these symptoms [1], other factors may influence the degree of pain experienced as well. Here we present a follow-up study of the same patient cohort with focus on the relationship between trapeziometacarpal osteoarthritis, pain and disability.

Materials and Methods

Sodha et al. [1] identified 615 consecutive patients who presented with distal radius fractures. All patients had posteroanterior, oblique and lateral radiographs of the wrist at the time of injury. A three-grade scale was used to rate the degree of trapeziometacarpal arthrosis. Grade I indicated minimal or no arthrosis. Grade II indicated definite arthrosis but the presence of a residual joint. Grade III indicated complete joint destruction. Moderate reliability was demonstrated in this grading system. The observers who graded the trapeziometacarpal arthrosis were blinded to the patient's gender, age, symptoms, and disability.

A questionnaire was constructed to elucidate the level of disability and pain experienced by these patients. This

Level of Evidence: Level IV

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questionnaire incorporated all 30 questions of the DASH. In addition, because the DASH includes the shoulder and arm, supplemental questions were added to identify sources of upper extremity pain other than the thumb, pain in the thumb (on an ordinal scale from 1 to 10), and whether the patient has had treatment for “thumb arthritis”. This questionnaire was mailed to the 456 adult patients (age 18 or greater) among the 615 patients addressed in the paper by Sodha and colleagues. Responses received over the next 3 months were included in this study.

Statistical Methods

Univariate statistical comparisons assessed the relationship between the explanatory (independent) variables (age, gender, and thumb arthrosis) and the response (dependent) variables (DASH score and thumb pain) using Pearson or Spearman correlation, Student's *t*-test and ANOVA with post-hoc Tukey. The Spearman statistic was utilized when analyzing ordinal data (gender, arthrosis grade). Multivariable linear regressions with backwards conditional analyses were conducted to determine the best models for determining disability (DASH score) and thumb pain. All analyses were performed by SPSS statistical package (version 12.0, SPSS, Chicago, Illinois)

Results

Of the 456 questionnaires sent, 122 were completed and returned (27%). The 27 other responses received included: nine opt-outs, nine unable to complete study, five incomplete surveys and four deceased patients. Ninety-four surveys were returned to sender for changed addresses. The average age of respondents was 62 years (range: 18–86 years), 83 females and 38 males.

The average DASH score among the 122 completed questionnaires was 9.9 [range: 0.0–60.0]. Fifty-five respondents reported pain in their arm at locations other than the base of thumb and five reported treatment for “thumb pain”. Of the participants with thumb pain, the average degree of pain was 1.9 [range: 1–10].

Statistical Analysis

Predictors of DASH Score: Univariate Analysis

There was no association between DASH score and age ($p=0.26$) or gender ($p=0.54$). A higher grade of trapeziometacarpal arthrosis correlated with a higher DASH score ($p=0.013$, ANOVA). Post-hoc Tukey analysis demonstrated that Grade III arthrosis was found to be a predictor of higher DASH score when compared to grade I ($p=0.011$)

and grade II ($p=0.018$) arthrosis, but there was not a significant difference between patients with Grade I and II arthrosis. Pain elsewhere in the arm ($r=0.602$, $p<0.001$) and thumb pain ($r=0.665$, $p<0.001$) were associated with higher DASH scores.

Predictors of DASH Score: Multivariable Analysis

Two sets of multivariate regression analysis using DASH score as the dependent variable were performed, one with and one without the response to the questions about thumb pain and pain elsewhere in the arm. The best model without pain included arthrosis grade alone and only explained 3% of the variation in DASH scores. ($R^2=0.03$, $p=0.043$). The best model with pain included incorporated arthrosis grade, thumb pain, and pain elsewhere in the arm as the independent variables and explained 52% of the variation in DASH scores ($R^2=0.52$, $p<0.001$)

Predictors of Thumb Pain: Univariate Analysis

There was no correlation between thumb pain and age ($p=0.80$) or gender ($p=0.10$). Higher grades of trapeziometacarpal arthrosis were not correlated with more thumb pain ($p=0.90$, ANOVA). Thumb pain was correlated with pain elsewhere in the arm ($r=0.354$, $p<0.001$).

Predictors of Thumb Pain: Multivariate Analysis

Pain elsewhere in the arm—the only factor associated with thumb pain—explained only 13% of the variation in thumb pain in a multiple linear regression model ($R^2=0.12$; $p<0.001$).

Discussion

Sodha and colleagues [1] demonstrated that trapeziometacarpal arthrosis was age-related, with more than 90% of patients older than 80 having Grade II or III arthrosis. With such a high prevalence, it is important to understand how arthrosis manifests itself as thumb pain or disability. In this follow-up study, we found that subjective complaints of thumb pain were not correlated with higher grades of arthrosis. Furthermore, we found that while thumb pain and pain elsewhere in the arm were strongly associated with a higher DASH score, severe arthrosis of the trapeziometacarpal joint was a significant, but relatively inconsequential predictor of disability. It is notable that only five patient had ever sought treatment for thumb pain.

In contrast to nociception, pain is a complex biopsychosocial behavioral phenomenon. The limited correlation between objective physical abnormalities (presumably a

source of nociception) and complaints of pain and disability has been observed fairly consistently in many anatomical sites [5–12]. Studies have shown that psychosocial factors affect perceived levels of pain and may be particularly important when physical derangements are absent or symptoms and disability are disproportionate [13–19]. It is notable that pain at other sites in the arm predicted both thumb pain and arm-specific disability, which suggests that among patients with a given pathology (in this case trapeziometacarpal arthrosis), there may be certain common factors that lead to increased complaints of chronic pain and greater disability no matter the anatomical location. Additional research is needed to determine how much of the disparity between disease and illness behavior is the result of psychosocial factors and how much is related to an incomplete understanding of the pathophysiology of trapeziometacarpal arthrosis.

One limitation of this follow-up study was the relatively low response rate. We attribute this in part to the time lapse between the patient's original injury and the current survey mailing; on the other hand, this response rate is representative of the typical response rate for survey mailings in our area. Approximately 15% of patients could not be reached due to change of address. Given the variance in the responses and the high levels of significance in the findings, we do not believe that a higher response rate would appreciably change the findings.

Had arthrosis been correlated strongly with pain or disability, further investigation might have yielded a pattern that would lead to more effective early treatment of this disease process, thereby avoiding the pain and disability that would, say, been linked to severe arthrosis. However, such a correlation was not found. Given that pain and disability bring patients to the doctor and lead them to consider surgery, but trapeziometacarpal arthrosis is not a strong predictor of pain and disability, greater consideration needs to be given to other aspects of this illness. Heightened illness concern, depression and catastrophizing in particular are responsive to treatment [20–24]. Additional research is needed, but a multidisciplinary approach to chronic arm pain and disability seems merited, even for discrete objective sources of pain.

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