Impact of Chronic Plantar Heel Pain on Health-Related Quality of Life

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Background: Chronic plantar heel pain (CPHP) is common and is thought to have a detrimental impact on health-related quality of life. However, no study has used normative data or a control data set for comparison of scores. Therefore, we describe the impact of CPHP on foot-specific and general health-related quality of life by comparing CPHP subjects with controls.

Methods: Foot Health Status Questionnaire scores were compared in 80 subjects with CPHP and 80 sex- and age-matched controls without CPHP.

Results: The CPHP group demonstrated significantly poorer foot-specific quality of life, as evidenced by lower scores on the foot pain, foot function, footwear, and general foot health domains of the Foot Health Status Questionnaire. The group also demonstrated significantly poorer general health-related quality of life, with lower scores on the physical activity, social capacity, and vigor domains. In multivariate analysis, CPHP remained significantly and independently associated with Foot Health Status Questionnaire scores after adjustment for differences in body mass index. Age, sex, body mass index, and whether symptoms were unilateral or bilateral had no association with the degree of impairment in people with CPHP.

Conclusion: Chronic plantar heel pain has a significant negative impact on foot-specific and general health-related quality of life. The degree of negative impact does not seem to be associated with age, sex, or body mass index. (J Am Podiatr Med Assoc 98(4): 283-289, 2008)

One of the most common foot disorders encountered by health professionals is chronic plantar heel pain (CPHP). It has been reported to affect one in 10 people at some time in their life,[1] and it accounts for an estimated 1 million patient visits per year to physicians in the United States.[2] Chronic plantar heel pain is most commonly reported by overweight, sedentary people aged 40 to 60 years, but it can occur throughout the lifespan[3,4] and in people who are physically active.[5] The typical presenting complaint is pain under the medial heel, especially in the morning and at the commencement of weightbearing activities.[6,7]

Similar to many conditions in which the pathologic origin is unclear, CPHP has become a generalized term that includes a variety of pathologic conditions that affect the heel.[8] Plantar fasciitis is considered to be the most common cause of pain, and the terms are often used interchangeably in the literature; however, other causes of pain include subcalcaneal bursitis, neuritis, and calcaneal periostitis.[1,9] There is no clear consensus on the risk factors for CPHP, but increased body mass index, decreased ankle joint dorsiflexion range of motion, decreased first metatarsophalangeal joint extension range of motion, and prolonged standing have all been implicated.[10] Common treatment interventions include plantar fascia stretching, calf stretching, low-Dye taping, orthotic devices, extracorporeal shockwave therapy, iontophoresis, and surgery. As with the etiologic evidence, there is only limited evidence regarding the effectiveness of these interventions.[1]

Many health-related quality-of-life measures have been used in the CPHP population. These measures can be considered specific, with a focus entirely on

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the foot, or general (generic), with an assessment of universal aspects of general health and well-being.[11] Examples of foot-specific measures include the Foot Function Index,[12] the Foot Disability Questionnaire,[13] the Rowan Foot Pain Assessment Questionnaire,[14] and the American Academy of Orthopaedic Surgeons Foot and Ankle Questionnaire.[15] General measures include the Medical Outcomes Study 36-Item Short-Form Health Survey[16] and the Lower Extremity Functional Scale.[17] The Foot Health Status Questionnaire[18] also has been commonly used, and it can be considered a composite questionnaire because it has a section specific to the foot and a general health-related section analogous to the 36-Item Short-Form Health Survey.

Despite the widespread assessment of health-related quality of life in the CPHP population, to our knowledge, no study has used normative data or a control set of data for comparison of scores. As such, it is not possible to make inferences from reported data as to the impact of the condition on foot-specific or general health-related quality of life. Therefore, the primary objective of this study was to describe the impact of CPHP on foot-specific and general health-related quality of life by comparison with a control group. A secondary objective was to determine which factors were associated with quality of life. It was hypothesized that people with CPHP would demonstrate significant impairments in foot-specific and general health-related quality of life and that factors such as increased age and increased body mass index would be associated with the degree of impact experienced.

Methods

Participants

Case Group. Case subjects were drawn from a recent randomized controlled trial[19] that examined the effects of a topical wheatgrass cream on CPHP. Eighty case subjects were recruited through advertisements placed in local and state newspapers requesting volunteers older than 18 years who had experienced plantar heel pain. Subjects with a history of plantar heel tenderness or pain on arising in the morning or on recommencing activity after periods of rest were included in the study. The exclusion criteria were any history of trauma to the heel in the previous 12 weeks, symptoms lasting less than 6 months, pregnancy, seronegative arthropathies, and any skin lesions over the plantar aspect of the heel. Subjects who had received a corticosteroid injection or an orthotic device or who had commenced conservative treatment, such as stretching exercises or heel pads, in the previous 8 weeks were excluded. Continuation of conservative treatments that had commenced before the 8-week period was allowed; however, no such subjects were identified. These criteria were selected because they each had the potential to bias results on one or more of the outcome measures. Subjects with unilateral or bilateral heel pain were included. The median duration of symptoms was 12 months (range, 6–96 months).

Control Group. The control group consisted of 80 individuals each matched for age (±2 years) and sex to a case subject. All of the control subjects reported that they never had experienced plantar heel pain and that they had no lower-limb injury in the previous 12 months that prompted an alteration in their weightbearing status (ie, partial weightbearing or nonweightbearing). The exclusion criteria and recruitment methods were the same as those used for the case group. The first 80 volunteers that could be matched to a case group participant were included in the study. Written informed consent was obtained from all of the subjects before their participation.

Demographic Characteristics and Medical History

A standard questionnaire was used to obtain information regarding age, CPHP symptom duration, and general medical history. Weight was measured by using a set of digital scales, and height by marking a point on the wall perpendicular to the superior aspect of the skull.

Assessment of Health-Related Quality of Life

Foot-specific and general health-related quality of life was assessed by using the Foot Health Status Questionnaire (version 1.03)[18], which comprises three main sections. Section 1 consists of 13 questions reflecting four foot health-related domains: foot pain, foot function, footwear, and general foot health. This section has demonstrated a high degree of content, criterion, and construct validity (Cronbach α = 0.89–0.95) and high retest reliability (intraclass correlation coefficient = 0.74–0.92),[20] and it has been shown to be the most appropriate measure of health-related quality of life for the CPHP population.[11]

Section 2 includes 20 questions that reflect four general health-related domains: general health, physical activity, social capacity, and vigor. The domains and questions in this section are largely adapted from the Medical Outcomes Study 36-Item Short-Form Health Survey,[16] which has been validated for use in the Australian population.[21] The theoretical constructs underlying the section 1 and 2 domains are described in Tables 1 and 2, respectively.

Section 3 collects socioeconomic status, comorbidity, service utilization, and satisfaction information. Questions 21 (regarding comorbidity) and 22 (regarding smoking) were the only questions from this section used in the present study. They were used to form part of the standard questionnaire regarding demographic characteristics and medical history. Participants in the case group completed the questionnaire at the first assessment, before inclusion in the trial.

Statistical Analysis

Statistical analyses were conducted with SPSS version 11.5 for Windows (SPSS Inc, Chicago, Illinois). All of the data were explored for normality by using the skewness statistic and observations of the normal and detrended Q-Q plots. If data were found to be skewed, scores were transformed, and statistical testing was performed on normally distributed variables. Independent-samples t tests were used to compare scores for all of the Foot Health Status Questionnaire domains and for height, weight, and body mass index measurements between the case and control groups. Chi-squared tests were used to compare the groups on the prevalence of comorbidities. The level of significance was set at $P < .05$. A stepwise multiple linear regression was then performed to determine whether the presence of CPHP was independently associated with Foot Health Status Questionnaire scores after accounting for differences in body mass index between the groups. Associations between participant characteristics and the impact of the condition in the CPHP group were examined by using Pearson r correlation coefficients.

Table 1. Definitions of the Foot Health Status Questionnaire Section 1 Domains

Domain	Theoretical Construct	Meaning of Lowest Score (0)	Meaning of Highest Score (100)
Foot pain	Evaluation of foot pain in terms of type, severity, and duration of pain	Extreme and significant foot pain; acute in nature	No pain or discomfort in any part of the foot
Foot function	Evaluation of feet in terms of impact on physical function	Severely limited in performing a broad range of physical activities because of feet; limited in walking, working, and moving about	Can perform all desired physical activities: walking, working, climbing stairs
General foot health	Self-perception of feet	Generally perceives feet to be in a poor state of health and identifies poor condition of feet	Perceives feet to be in an excellent state of health and condition
Footwear	Lifestyle issues related to footwear and feet	Extremely limited in access to, comfort of, and choice of suitable footwear	No problems obtaining suitable footwear

Table 2. Definitions of the Foot Health Status Questionnaire Section 2 Domains

Domain	Theoretical Construct	Meaning of Lowest Score (0)	Meaning of Highest Score (100)
General health	Evaluation of subject's self-reported health status	Poor perception of health status	Very good general health status
Physical activity	Evaluation of ability in terms of impact on physical function	Severely limited in performing a broad range of physical activities	Can perform all desired physical activities with no impairment or disability
Social capacity	Self-perception of ability to socially interact	Limited ability to interact without problems; socially isolated	Good ability to interact socially and experiences no isolation
Vigor	Lifestyle issues related to perceived energy and activity participation	Lacks energy to do things	No problems with energy levels

Results

Characteristics of the Sample

Age, sex, height, weight, body mass index, and the prevalence of comorbidities for the case and control groups are given in Tables 3 and 4. The case group was found to have significantly greater weight and body mass index than the control group (Table 3). No other differences between the groups were identified.

Comparison of Foot Health Status Questionnaire Scores

Regarding the four foot health-related section 1 domains on the Foot Health Status Questionnaire, the mean ± SD scores were significantly lower in the case group versus the control group for foot pain (35.7 ± 16.4 versus 87.4 ± 16.8; $P < .001$), foot function (57.8 ± 24.4 versus 96.1 ± 12.4; $P < .001$), footwear (44.7 ± 29.8 versus 65.4 ± 24.1; $P < .001$), and general foot health (36.1 ± 28.6 versus 76.0 ± 22.7; $P < .001$). Regarding the four general health-related section 2 domains, the mean ± SD scores were significantly lower in the case group versus the control group for physical activity (59.9 ± 27.7 versus 85.8 ± 19.7; $P < .001$), social capacity (47.5 ± 9.8 versus 93.6 ± 12.9; $P < .001$), and vigor (49.9 ± 5.8 versus 62.0 ± 18.2; $P < .001$). Square root transformation was required before the calculation of a P value for the self-reported general health domain, and no significant difference was found between the case and control groups (mean ± SD, 76.3 ± 25.8 versus 84.0 ± 18.0; $P = .108$). Mean (SD) domain scores in the case and control groups are shown in Figures 1 and 2.

Table 3. Sample Characteristics

Characteristic	Case Group	Control Group
Female sex (No.)	47	47
Age (years)	52.3 (11.7)	51.9 (11.8)
Height (m)	1.69 (0.09)	1.69 (0.08)
Weight (kg)	84.8 (17.4)	79.0 (16.0)[a]
BMI (kg/m^2)	29.8 (5.4)	27.5 (4.9)[b]
Obese (BMI ≥ 30 kg/m^2) (No. [%])	31 (39)	17 (21)[b]

Abbreviation: BMI, body mass index.

Note: Data are given as mean (SD) unless otherwise indicated.

[a] $P < .05$.

[b] $P < .01$.

Table 4. Prevalence of Comorbidities in the Case and Control Groups

Comorbidity	Case Group (n = 80)	Control Group (n = 80)
Diabetes mellitus	4 (5)	3 (4)
Osteoarthritis	4 (5)	6 (8)
High blood pressure	15 (19)	15 (19)
Heart disease	6 (8)	6 (8)
Lung disease	7 (9)	7 (9)
Hormone replacement therapy	4 (5)	7 (9)
High cholesterol	11 (14)	8 (10)
Smoker	5 (6)	8 (10)
Thyroid disease	6 (8)	3 (4)

Note: Data are given as number (%). Chi-squared analysis showed no significant difference between the groups for any comorbidity.

Multiple Regression Analysis

Results of the stepwise multiple linear regression are given in Table 5. The presence of CPHP was significantly and independently associated with lower scores on the foot pain, foot function, footwear, general foot health, physical activity, social capacity, and vigor Foot Health Status Questionnaire domains after accounting for differences in body mass index between the groups.

Correlates of Foot Health Status Questionnaire Scores in the CPHP Group

Age, sex, body mass index, and whether CPHP symptoms were unilateral or bilateral were not associated with any domain of the Foot Health Status Questionnaire.

Discussion

The primary objective of this study was to examine the impact of CPHP on health-related quality of life by comparing scores obtained from the Foot Health Status Questionnaire in a case group of people with CPHP and an age- and sex-matched control group without CPHP. Before discussing the findings in detail, it is worth considering the extent to which the case and control groups are representative of the general population with and without CPHP. The case group, recruited through newspaper advertisements, ranged in age from 18 to 82 years, with slightly more women than men (59%). The broad age range of people with CPHP and the similar representation of men and women is consistent with previous reports in the literature.[4] By definition, case group participants were included according to clinical signs and symptoms (ie, by the presence of CPHP). The condition is a generalized term for a range of osseous and soft-tis-

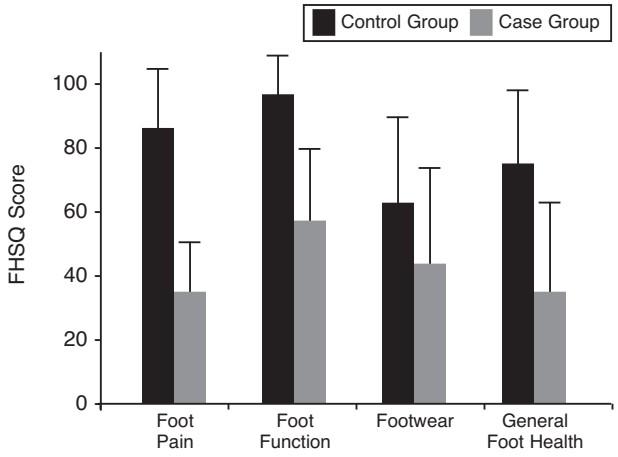


Figure 1. Foot Health Status Questionnaire (FHSQ) section 1 mean scores for the case and control groups. Scores can range from 0 (poorest state of health) to 100 (optimum health). Error bars represent SD. Differences between groups were evaluated by using independent-samples *t* tests. All of the differences were significant at $P < .001$.

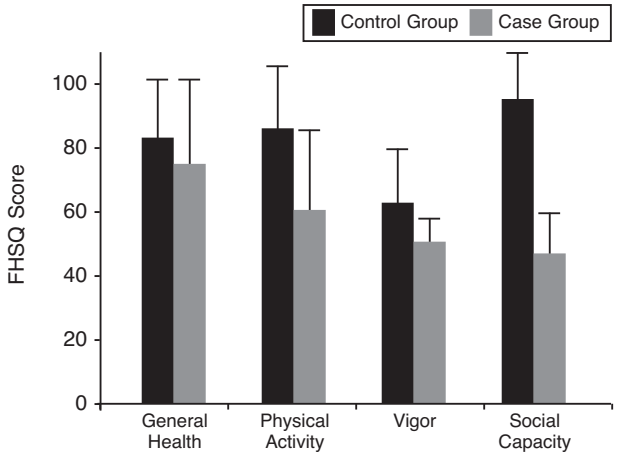


Figure 2. Foot Health Status Questionnaire (FHSQ) section 2 mean scores for the case and control groups. Scores can range from 0 (poorest state of health) to 100 (optimum health). Error bars represent SD. Differences between groups were evaluated by using independent-samples *t* tests. Differences for physical activity, vigor, and social capacity were significant at $P < .001$.

sue pathologic abnormalities that affect the heel.[8] Because these pathologic abnormalities have variable imaging findings,[22-24] participant inclusion via the use of a single imaging modality would have restricted the sample to a particular subset of people with CPHP. Also, diagnostic imaging is not routinely used to assess CPHP in the clinical setting. Therefore, the use of a clinical diagnosis means that the case group was representative of the broader population of people seeking treatment for heel pain.

Table 5. Stepwise Multiple Linear Regression Results

FHSQ Domain (Dependent Variable)	Predictor Variables	β-weight	Multiple r^2
Foot pain	BMI	–0.26[a]	0.26
	+ CPHP	–0.83[a]	0.85[b]
Foot function	BMI	–0.29[a]	0.29
	+ CPHP	–0.67[a]	0.72[b]
General foot health	BMI	–0.25[a]	0.25
	+ CPHP	–0.32[a]	0.40[b]
Footwear	BMI	–0.29[a]	0.29
	+ CPHP	–0.58[a]	0.63[b]
General health	BMI	–0.32[a]	0.32
	+ CPHP	–0.06	0.32
Physical activity	BMI	–0.32[a]	0.32
	+ CPHP	–0.43[a]	0.53[b]
Social capacity	BMI	–0.23[a]	0.23
	+ CPHP	–0.90[a]	0.91[b]
Vigor	BMI	–0.23[a]	0.23
	+ CPHP	–0.38[a]	0.43[b]

Abbreviations: FHSQ, Foot Health Status Questionnaire; BMI, body mass index; CPHP, chronic plantar heel pain.

[a]β-weight significant at $P < .01$.

[b]Indicates a significant increase in the multiple r^2 value when CPHP was added to the model.

Foot-specific health-related quality of life, as indicated by scores on section 1 of the Foot Health Status Questionnaire, was markedly affected by the presence of CPHP, with the case group scoring significantly lower on each of the four domains (foot pain, foot function, footwear, and general foot health). The contribution of CPHP was found to be independent of the effect of body mass index. These findings indicate that people with CPHP experience more foot pain, experience greater limitations when performing a broad range of functional weightbearing activities, have greater difficulties obtaining suitable footwear, and perceive their feet to be in a poorer state of health than those without CPHP.

The impact of CPHP on the scores from section 1 of the Foot Health Status Questionnaire is difficult to compare with other foot pain studies owing to differences in inclusion and exclusion criteria and variations in reporting. However, the case group Foot Health Status Questionnaire scores found herein are broadly similar to those reported in a randomized controlled trial of 135 people with plantar fasciitis,[25] in a randomized controlled trial of 92 people with plantar heel pain,[26] in 140 people awaiting foot surgery for in-

terdigital neuroma,[27] and in 154 people with painful pes cavus.[28]

General health-related quality of life, as indicated by section 2 of the Foot Health Status Questionnaire, was also affected by the presence of CPHP. The case group scored significantly lower on the physical activity, social capacity, and vigor domains; and for each of these, the contribution of CPHP was found to be independent of the effect of body mass index. These results indicate that individuals with CPHP experience greater limitations in performing a broad range of physical tasks, are more socially isolated, and lack the energy to participate in activities compared with those without the condition. The lack of a difference between the groups for the general health domain was not surprising considering that people with heel symptoms potentially related to systemic conditions were excluded and the presence of comorbidities in each group was similar (Table 4). No strong predictors of health-related quality of life in the case group were found. Age, sex, body mass index, and whether symptoms are unilateral or bilateral seem to have no association with the degree of impairment experienced by people with CPHP.

Conclusion

This study shows that CPHP has a significant negative impact on foot-specific and general health-related quality of life. Considering that current evidence for the etiology and treatment of CPHP is limited, these findings highlight the need for further research into this common and disabling condition.

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