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Original research article

Influence of two conservative treatment methods on foot health status in men with chronic calcaneal spur: A randomized controlled study

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ABSTRACT

Objective: This study compared the effectiveness of extracorporeal shockwave therapy (ESWT) with ultrasound therapy (US-control group) in preventing social limitations and the improvement of foot health status (FHS) in men with a chronic calcaneal spur (CS).

Material and methods: Forty men were randomly allocated and then received ESWT or US therapy. Two people from the US group ignored the call for study 3 months later, so they were excluded. Therefore, 38 men were analyzed. The ESWT group received 5 treatments once a week, and sessions took place at weekly intervals. Meanwhile, the US group received 10 treatments, 3 times per week. The FHS was assessed using a foot health status questionnaire (FHSQ). The scores were recorded and compared within the groups and between the groups pre treatment, immediately post treatment, and 3 months post treatment.

Results: We found a significant improvement of FHS and reduction of social limitations immediately post treatment (up to 3 months post treatment in patients with chronic CS).
Conclusion: The results of this study provide evidence that patients with CS can obtain greater significant health benefits of the foot care when treated by ESWT, rather than by US.

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Introduction

CS occurs when calcium deposits build up on the underside of the heel bone, a process that usually occurs over a period of many months. CS often causes foot muscle strain, inflammation of the PF, repeated tearing of the membrane that covers the heel bone, and pain. CS decreases physical activity, social

capacity, deterioration of quality of life, and becomes the cause of frequent absence from work due to sickness. Chronic CS is a disease commonly appearing in adults, and it is also a serious social problem. Australian research points out that it appears in 3.6% of their population (the study included 3206 people), and American research says that it concerns 7% of their population over 65 years old [1,2]. There is no such research in Poland.

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Risk factors for CS include: excess weight and obesity, flat feet, long periods of standing at work, jogging (especially on hard surfaces), poorly fitted or badly worn shoes (especially those lacking appropriate arch support), and walking gait abnormalities, which place excessive stress on the heel bone, ligaments, and nerves near the heel [3–11].

The conservative treatment of CS is mainly analgesic. The previous studies have shown, that ESWT and US effectively reduce pain [12–21], but there are no comparative studies of the FHS and social limitation prevention following ESWT and US treatments in patients with CS. Therefore, the aim of the study was to compare the influence of ESWT and US on improving the FHS and social limitation prevention in men with chronic CS post treatment and 3 months afterwards.

Materials and methods

From January 2013 until December 2014, the men with unilateral CS were examined. This study was performed in the Department of Physiotherapy, Jaworzno, and in the Spa and Rehabilitation, Busko-Zdroj, Poland. The exclusion criteria were local soft-tissue infection, malignant disease, pacemaker, epileptic disorders, rheumatoid arthritis, diabetes mellitus, neurological abnormalities, cardiovascular disease, lung or endocrine disease, skin ulcerations, previous surgical removal of the CS or previous conservative treatment of the CS 12 weeks before the beginning of the study, and history of local corticosteroid injection 12 weeks before the study. The inclusion criteria obtained men diagnosed with unilateral X-ray on the CS at the minimum age of 40, and who had pain under the calcaneal tuber persisting longer than 6 months (Table 1).

After the enrollment of 50 patients, 10 patients met the exclusion criteria (2 with rheumatoid arthritis, 4 who received previous conservative treatment 12 weeks before the beginning

of the study, and 4 with diabetes mellitus). The remaining 40 participants were divided on a 1:1 ratio using a simple random number table into two treatment groups: ESWT and US (control group). Randomization was completed before the first treatment. The researchers responsible for analyzing the data were blinded to the type of treatment procedure. Before the experiment, all participants were informed that they receive treatment with ESWT or US.

We excluded 2 patients from the US group because they ignored the call for study 3 months after the treatment was over. Finally, a total of 38 individuals from 2 groups were statistically analyzed (Scheme 1). This study was designed with respect for the rules of conducting experimental studies with humans after approval by the Bioethical Committee at the Holy Cross College in Kielce – protocol number 1/13/15012013KB, and were similar to those set out in the Declaration of Helsinki. All participants signed consent forms and knowingly participated in the study.

The ESWT group received 1000, 1500, and 2000 pulses during the first, second, and third through fifth treatments respectively (pressure, 2.5 bar; frequency, 8 Hz; energy density, 0.4 mJ/mm²). The patients received 5 ESWT treatments once per week, and each session was completed at a weekly interval. The treatments were performed using a Rosetta ESWT (CR Technology, Korea). Ultrasound gel was applied between the apparatus head and skin. The procedure was performed in the area with the most intense pain. Treatment was administered on the underside of the heel bone, in the area of the calcaneal tuber. The treatment time did not exceed 10 min. During treatments the patients did not receive any drugs.

Meanwhile, the US group received continuous ultrasound waves: intensity, 0.8 W/cm²; 100% fill; carrier frequency, 1 MHz. The patients received a series of 10 treatments, 3 times per week. The treatments were performed using a US 13 EVO Cosmogamma (Emildue, Italy). The active engagement between the apparatus head and skin was ultrasound gel. The applicator head was applied to the calcaneal tuber at a right angle in order to maximize energy absorption by the tissue. Each treatment session did not exceed 10 min. During the treatment, the patients did not receive any drugs.

We measured the FHS pretreatment, immediately post treatment and 3 months post treatment by FHSQ, which comprises 3 sections. Section I has 13 questions that assess 4 health domains concerning feet: Foot Pain (FP), Foot Function (FF), Foot Wear (FW), and General Foot Health (GFH). Section II comprises 20 questions that assess patient's health in 4 domains: General Health (GH), Physical Function (PF), Social Capacity (SC) and Vitality (V). These are generic health measurements similar to those in the SF-36 questionnaire. Each question allows several answers and these are placed on a Likert-type ordinal scale (words or phrases corresponding to a numeric scale). The descriptors for these scales vary for each domain. The person completing the questionnaire has to choose only one response, whichever is thought to be the most appropriate. Section III collects standard demographic data and variables like; socioeconomic status, co-morbidity, etc. FHSQ data analysis software[©] (Version 1.03) was used to convert the initial score for each domain to a score between 0 and 100 (worst to best condition).

Table 1 – Baseline characteristics.

Personal characteristics	ESWT group	US group
Sex (male)	20	18
Age (yr)	54.1 ± 6.2 ^a	55.3 ± 5.4 ^a
Height (m)	176.8 ± 5.7 ^a	178.0 ± 5.7 ^a
Mass (kg)	77.0 ± 6.8 ^a	77.8 ± 5.8 ^a
BMI (kg/m ²)	24.40 ± 0.99 ^a	24.55 ± 0.92 ^a
Obese men	0	0
Level of education (n):		
Primary school graduates	8	10
Secondary school graduates	6	5
University graduates	6	3
Occupation: physical worker/ white-collar worker (n)	14/6	15/3
Marital status – single/ married (n):	5/15	4/14
Duration of symptoms (months)	8.5 ± 1.5 ^a	8.0 ± 1.2 ^a
Unilateral symptoms (left/right foot)	8/12	6/12
Location of pain (calcaneal tuber)	20	18

^a Values are mean ± SD.

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