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## **Chiropractic Adjustments Plus Orthotics Reduced**

### **Symptoms for Workers Standing Six Hours Daily**

#### **Introduction**

Foot pain and discomfort are common in workers whose job requiring long hours on their feet due to weight bearing and complexity of its structure and function<sup>1</sup>. It has been reported that approximately three-fourths of Americans experience foot problems in their life<sup>2</sup>. Foot pain and discomfort often lead to other complications above the level of the foot. The most common problems associated with foot pain and discomfort are ankle, leg, knee, hip and spinal disorders in people who spend many hours standing.<sup>3,4</sup> Foot orthotics have been used as a non-invasive treatment for conditions involving the feet and other parts of lower extremities. Many researchers believe that foot orthotics are effective in solving problems of the feet and other parts of lower extremities, and low back pain<sup>5</sup>. A study of postal workers performed by Carley (1998) revealed a 67% reduction in foot, knee, or back pain as measured by the Borg scale<sup>6</sup>. Sobel et al (2001) reported in a foot orthotics survey of 122 policemen, that 68% of subjects had decreased foot discomfort but had no improvement in back or leg discomfort<sup>7</sup>. However, these studies on foot orthotics remain inconclusive because they lack controls. Furthermore, different patient conditions, orthotics casting, and outcome assessments also contribute to the evaluation of effectiveness inconsistent<sup>8</sup>. Therefore, a newly designed study with controls is necessary to determine the effectiveness of orthotics.

Chiropractic care, as the largest non-drug, non-surgery, non-invasive and holistic health care profession, has been demonstrated to be an excellent choice to treat neuromusculoskeletal

and visceral problems with its effectiveness and safety<sup>9</sup>. More chiropractors have been using foot orthotics as part of their practice. However, there are no studies examining the combination of chiropractic care and orthotics for relieving foot and foot-associated pain and discomfort.

The specific aim of the study was using controlled condition to explore the effectiveness of foot orthotics and chiropractic care on pain, discomfort and quality of life in subjects who's job requires them to stand many hours a day.

## **Materials and Methods**

Participant: Thirty-two subjects who's job requires them to stand at least six hours during the day, and who reported foot problems, were recruited in the study. A pre-screening survey was performed to select the proper subjects and collect the patient medical histories and information of their daily livings.

Inclusion Criteria: The subjects were required to have spent at least six hours per day standing or walking on a hard surface, with discomfort or complains (including pain, fatigue, tingling, weakness etc.) in the lower extremities, spine and/or foot. Subjects signed an informed consent and followed the instructions of the research project.

Exclusion Criteria: A Pre-screening Foot Pain Questionnaire developed by the Research Department was used for patient pre-screening. Subjects under medical treatment, or who had any surgery and trauma within six months or other pathology with contraindications to foot orthotics and/or chiropractic adjustments were excluded.

Research Procedures: The subjects signed an informed Consent Form before participating the study. Then they filled out a Patient Information sheet, and Pre-screening Foot Pain Questionnaire. This was to ensure that the subject meets the inclusion criteria. A foot exam was

performed. Subjects were randomly divided to three groups: orthotics, orthotics plus chiropractic care, and control group. Subjects in the control group did not receive orthotics or chiropractic care until the end of the study.

For the foot orthotics fabrication, the study used a computerized F-Scan provided by Foot Levelers Inc. to record and analyze the foot data. Based on the data collected, the custom orthotics information was obtained and the data was sent to Foot Levelers Inc. for fabrication.

The project started the first day the subject used the orthotics. Subjects were required to answer the Post-Orthotics Foot Pain Questionnaire and the specific regional survey for feet and ankle once every two-weeks, for a six week period. All subjects were instructed to wear the orthotics 2 hours a day for the first 2-3 days as a break in period and then 4-6 hours a day during the study period.

The chiropractic adjustment was performed in the outpatient clinic following the clinic regulations using the Activator technique. The lower extremity muscle release technique was used for muscle rehabilitation for subjects in the chiropractic care plus orthotics group.

In-home exercise was prescribed to the subject receiving orthotics and chiropractic care. Subjects were taught to point both big toes toward the wall without any rotation, and to hold stretch for at least 30 seconds. This exercise only stretches the muscle but not the tendon. All subjects in this group were instructed to perform the exercise five times a day.<sup>10</sup>

### ***Data Treatment and Analysis***

Foot and Ankle Outcome Scores (FAOS) were used for the specific region survey. FAOS was developed to assess the patients' opinion about a variety of foot and ankle-related problems.

FAOS consists of 5 subscales: Pain, Symptoms, Function in daily living (ADL), Function in sport and recreation, and foot and ankle-related Quality of Life (QOL). Standardized answer options are given (5 Likert boxes) and each question gets a score from 0 to 4. A normalized score (100 indicating no symptoms and 0 indicating severe symptoms) is calculated for each subscale. The results are plotted as an outcome profile. FAOS is patient-administered and user friendly. It takes about 10 minutes to fill out.

Student t test was used to assess the differences in pain, symptoms, function in daily living, sport and recreation and quality of life before and after the treatment period. Significance was determined at  $p \leq 0.05$ . SPSS 11.5 statistical software was used for the data analysis.

## Results

Thirty-two subjects (24 male) were recruited and randomly assigned into the three study groups. There were 10 subjects in the chiropractic care plus orthotics group with an average age of  $53 \pm 9$  years old. There were 14 subjects in the orthotics group with an average age of  $47 \pm 11$  years old. In the control group, a total of 8 subjects were recruited with an average of  $46 \pm 7$  years old.

Figure 1 shows that the control group did not experience much change during the testing period. The only change in the trend among the five items was the quality of life that showed slight improvement over the testing period. The orthotics group showed improvement in symptoms ( $P=0.053$ ), function in daily living ( $P=0.058$ ), sport and recreation ( $P=0.186$ ) and quality of life ( $P=0.085$ ) (Figure 2). While trends were apparent, the improvements did not reach statistically significant levels. In contrast, there was no trend with pain ( $P=0.492$ ). The reported

pain level was not high at the beginning of the study, therefore a reduction of pain was difficult to assess in this study. The improvements observed lasted the 6-week testing period.

The orthotics plus chiropractic group showed improvement in four conditions over the study period, again the exception was pain (Figure 3). Greater improvement was seen in the QOL ( $P<0.05$ ); symptoms ( $P<0.05$ ) and ADL ( $P<0.05$ ) which were statistically significant.

Improvement was also seen in Sports and Recreation but it did not reach statistical significant level ( $P=0.097$ ). Again, the reported pain reading was not high at the beginning of the study, therefore, no significant pain reduction was observed ( $P>0.05$ ) (Figure 3).

#### **Typical case presentation:**

A 56- year old Caucasian female presented with complaints of pain in both feet, right dorsal foot numbness and right hip pain after work, which required her to stand. The subject also had pain in her ankle, leg, knee, lower back and neck, either weekly or monthly. Her symptoms had gotten progressively worse since 1999 and the quality of the pain was rated 8 out of 10 at the end of the day using VAS. The patient had difficulty sleeping on her right side. Removing the shoes or elevating the feet temporarily reduced her pain.

The patient had a hairline fracture of the right foot in 1980, and also had bilateral feet surgery for morton's neuroma in 1990. The patient also experienced several ankle inversion sprains or strains. Other past history included an inguinal hernia operation in 1991, a hysterectomy in 1979, appendix removal at age 12, and a tonsillectomy at age 6.

The physical exam revealed a normally developed adult female, 5'5'' in height, and weighting 115 pounds. The inspection showed bilateral foot pronation with left short leg. Static palpation revealed a painful arch and heel on the right foot; bilateral sacro-iliac joints pain and right periformis muscle tender to the touch. Motion palpation revealed subluxation at C1, C5, C7, T1,

T6, T8, T12 and T12 rib, L2, L4, bilateral SI joints, patellar, knee, bilateral calcaneus / talus / naviculare / cuneiform, and metatarsophalangeal joint, decreased the range of motion at the hip joint, ankle and feet.

Orthopedic tests indicated positive Patrick FABERE, Hibb's test, and Kemp's test (seated).

A neurological test revealed weak peroneous longus and brevis, weak hip adduction, decreased sensation at the left L1 dermatome, and increased sensation at the right L4 dermatome

A radiographic exam showed the following results: intercalary bone at L3/L4, osteophytosis at L2/L3, a right tower through the lumbar spine, and spondylosis deformans at L2/L3.

Based on these clinical findings, the following diagnoses were reached: subluxation in lumbosacral and lower extremity, piriformis syndrome, and foot pronation.

An orthotics (Woman's 5th Avenue Combo) was prescribed based on the clinic findings. A pre-orthotic foot pain questionnaire and a specific region survey were performed from the first day of using orthotics and chiropractic care. Chiropractic care included activator adjustment and muscle rehabilitation, which was performed three times a week for six weeks.

**Results:** The pre-orthotic and post-orthotics foot pain questionnaire from the beginning of study to the end of six week showed improvement of pain score from 50 to 83, symptom score from 75 to 82, function in daily living score from 52 to 94, function in sports and recreational activities score from 50 to 95, and quality of life score from 44 to 56.

## **Discussion**

The aim of this study was to evaluate the effectiveness of chiropractic care and orthotics on reducing the discomfort of prolonged standing on the job. The results of the study supported the hypothesis that chiropractic care and orthotics are beneficial in reducing discomfort in the workers required to stand for long periods. The more significant results were seen with the

orthotics plus chiropractic care group that had consistent improvement over the entire 6 weeks treatment period in symptoms, sports and recreational activities, daily living and quality of life. This finding is consistent with a study of 465 podiatric patients reporting various maladies, 62% reported complete resolution after orthotics treatment, whereas an additional 33% gained partial resolution of their chief complaint as measured after 14 weeks of follow-up <sup>11</sup>. Similar findings were reported in a retrospective study with both soft temporary orthotics and permanent rigid orthotics, 96% of patients experienced pain relief, and 70% were able to return to previous activity levels <sup>12</sup>.

Significant pain reduction was not observed in our study. It was reasoned that this lack of reduction was due to the fact that few patients reported pain at the onset of the study. It was postulated that pain could be reduced if the subjects main complain was pain as reported by other studies <sup>5, 13</sup>. This is supported by the case presentation where a 33% reduction in foot pain was observed.

The reduction of discomfort in the orthotics only group was not as significant as compared to the orthotics plus chiropractic group. One major difference was that the orthotics only group did not show strong improvement over the 6 weeks study period, whereas the orthotics plus chiropractic group showed consistent improvement over time. It is not clear why adding chiropractic care causes such consistent improvement. However, we hypothesize that chiropractic adjustments to the lower extremity and spine function synergistically or complimentary with the orthotics, <sup>6</sup> because chiropractic care improves joint mobility and muscle tension which shorten the break-in time for using orthotics. On the other hand, foot orthotics may also play an important role in maintaining the outcome of chiropractic care by supporting appropriate body mechanics.

One study supported the idea that foot orthotics enhance balance, performance and reduce fatigue<sup>14</sup>. Stude and Brink examined the effects of Foot Levelers orthotics devices on the static balance abilities of 12 experienced golfers while they participated in 9 holes of simulated golf<sup>14</sup>. Kuhn et al<sup>15</sup> reported that custom-fitted orthotics fortify the 3 major arches of the foot (medial longitudinal, lateral longitudinal, and transverse). They found that the Foot Levelers orthotics use materials of greater density to provide firm support in each arch. The study used the orthotics over a 6-week period to result in a reduction of fatigue that permitted the golfers to gain a 7% mean increase in club-head velocity. They concluded that the use of custom-fitted flexible orthotics could offer a range of benefits<sup>14</sup>.

The mechanism of improvement of symptoms and functions of workers after using orthotics and receiving chiropractic adjustment was not well understood and need further research. Studies have suggested that foot orthotics could improve gait patterns. A 1990 study found that 77% of patients demonstrated 50% to 100% improvement over a 2-year follow-up period when custom-made foot orthotics were used to correct subtle aberrations in their gait<sup>16</sup>. In 1993, a study described the biomechanical relationship between gait and lumbar stress<sup>17</sup>. It was observed by Dananberg and Guiliano that patients using custom-made foot orthotics experienced twice the improvement in low-back pain compared with subjects using a traditional back-pain treatment<sup>5</sup>. Despite the findings of beneficial effects of foot orthotics with a number of maladies, a critical review by Ball and Afheldt states there is a need for more complete theoretical understanding of the mechanisms of foot orthotics<sup>18,19</sup>.

There are limitations to our study. One of the limitations is the 6-week study period that we used for observing significant changes. It was demonstrated that this 6-week study period provided enough time for the orthotics plus chiropractic group to show statistically significant



improvements but this time period may have been too short for the improvements seen with the orthotics group. Another limitation is the consistency of using the orthotics by the subjects. It was instructed by the researchers to the subjects about using the orthotics during the study period. However, it might have happened that some subjects did not follow the instruction while they were away from the research facility. These limitations will be addressed in future research studies using the foot orthotics.

### **Conclusion**

This study showed that a combination of chiropractic care and orthotics improved symptoms, function in daily living, sport and recreation and quality of life in workers whose job require them to stand six hours daily.

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