Correlations between subjective treatment responses and plantar pressure parameters of metatarsal pad treatment in metatarsalgia patients: a prospective study

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摘要

Abstract

Background

Metatarsalgia is related to repetitive high-pressure loading under the metatarsal head (MH) that causes pain. The high pressure under the MH can be reduced by adequately applying metatarsal pads (MPs). Plantar pressure measurements may provide a method to objectively evaluate pressure loading under the MH. However, it is still unclear if the decrease in plantar pressure under the MH after MP treatment is associated with subjective improvement. This study aims to explore the correlations between subjective pain improvement and outcome rating, and the plantar pressure parameters in metatarsalgia patients treated using MPs.Methods

Thirteen patients (a total of 18 feet) with secondary metatarsalgia were included in this study. Teardrop-shaped MPs made of polyurethane foam were applied just proximal to the second MH by an experienced physiatrist. Insole plantar pressure was measured under the second MH before and after MP application. Visual analog scale (VAS) scores of pain were obtained from all subjects before and after 2 weeks of MP treatment. The subjects rated using four-point subjective outcome scales. The Wilcoxon signed-rank test was used to analyze the difference between the plantar pressure parameters and VAS scores before and after treatment. The Kruskal-Wallis test was applied to compare the plantar pressure parameters in each outcome group. Pearson's correlation was applied to analyze the correlation between the changes in plantar pressure parameters and VAS scores. Statistical significance was set as $p < 0.05$.Results

MP application decreased the maximal peak pressure (MPP) and pressure-time integral (PTI) under the second MH and also statistically improved subjective pain scores.

However, neither the pre-treatment values of the MPP and PTI shift in the position of the MPP after treatment, nor the age, gender and body mass index (BMI) of the subjects were statistically correlated with subjective improvement. Declines in the PTI and MPP values after MP application were statistically correlated with the improvement in VAS scores ($r = 0.77$, $R2 = 0.59$, $p < 0.001$; $r = 0.60$, $R2 = 0.36$, $p = 0.009$).Conclusion
We found that the successful decline in the PTI and MPP under the second MH after MP application was correlated to subjective pain improvement. This study provides a strategy for the further design and application of MPs for metatarsalgia treatment.