Reconstructive foot and/or ankle surgery improves preoperative pathologic pedographic findings at 3-months-follow-up

Richter M, Zech S, Kalpen A

Introduction

Pedography is the most sophisticated method for biomechanical analysis in foot and ankle. However, it is still unclear if and when reconstructive foot and ankle surgery improves preoperatively pathological pedographic findings. The goal of this study is to compare pre- and postoperative pedographic findings in patients with foot and/or ankle surgery to analyze possible changes. The main question was if it is possible to improve a preoperative pathologic pedographic pattern with reconstructive surgery.

Methods

Patients who sustained reconstructive foot and/or ankle surgery in a clinical center from October 1, 2006 to September 30, 2007 were included. Demographic data, clinical and radiological findings were registered. Standardized pedography (three trials, walking, third step) using an EMED™ platform and software (Novel Inc., Munich, Germany) was performed preoperatively and 3-months-postoperatively. The patients were grouped regarding typical pathologies. The pedographic data were analyzed and compared between and between the pre- and postoperative pedography (paired-t-test). The pre- and postoperative data were also compaired with known physiologic pedographic patterns (ANOVA). The null hypothesis at the $p<0.05$ level means there is no difference between groups and pre- and postoperative data.

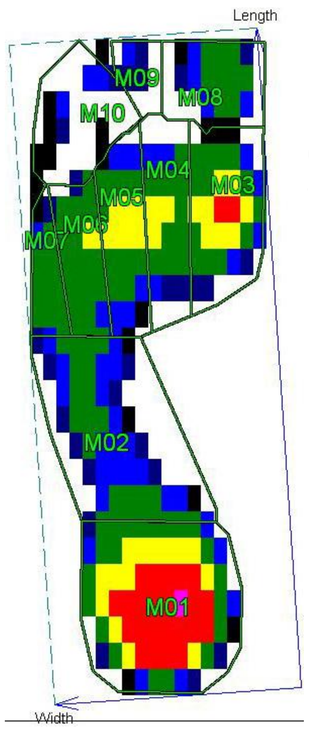


Figure left: Image from computerized mapping. The following regions are defined by the mapping process:
M1, hindfoot;
M2, midfoot;
M3, 1st metatarsal head;
M4, 2nd metatarsal head;
M5, 3rd metatarsal head;
M6, 4th metatarsal head;
M7, 5th metatarsal head;
M8, 1st toe;
M9, 2nd toe;
M10, 3rd-5th toe.

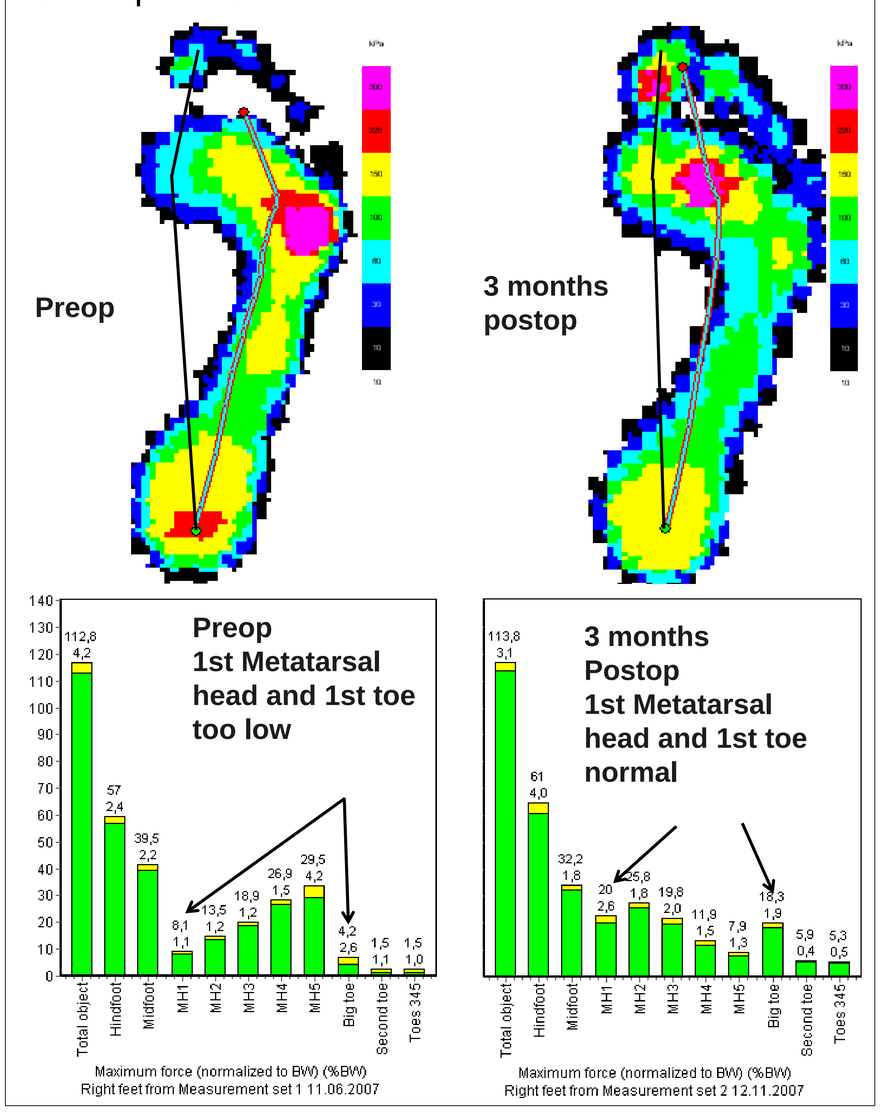
Results

121 patients were included. 94 were female and 27 male. The mean age was 56. The patients were grouped as follows (n=82 (68%) individuals in more than one group): forefoot / isolated Hallux valgus, n=43 (36%); forefoot Hallux valgus & claw toes, n=25 (21%); forefoot others, n=48 (40%); midfoot deformity, n=12 (19%); midfoot others, n=10 (8%); hindfoot varus deformity, n=3 (2%); hindfoot valgus deformity, n=9 (7%); hindfoot others, n=16 (13%); ankle deformity, n=14 (12%); ankle instability, n=2 (2%); flatfoot, n=16 (13%); cavus foot, n=5 (4%). The standard pedographic parameters (contact time, contact area, maximum force, mean force, etc.) differed between the pre- and postoperative pedography (paired-t-test, $p<0.05$). The preoperative data differed to the physiologic comparative data (ANOVA, $p<0.05$). The postoperative data differed not to this physiologic data (ANOVA, $p\geq0.05$) in the groups forefoot / isolated Hallux valgus, forefoot Hallux valgus & claw toes, forefoot others, ankle deformity, ankle instability. The power for these analyses was >0.8. The postoperative data differed to the physiologic data (ANOVA, $p<0.05$) in the groups midfoot deformity, midfoot others, hindfoot varus deformity, hindfoot valgus deformity, hindfoot others. The null hypothesis was rejected for the comparison between preoperative and postoperative pedographic data of all groups and between postoperative data and physiologic data of the groups midfoot deformity, midfoot others, hindfoot varus deformity, hindfoot valgus deformity, hindfoot others and was not rejected for all other comparisons.

Example Hallux valgus

Preoperatively increase hallux angle, decreased force beneath 1st metatarsal head and 1st toe with abnormal push-off

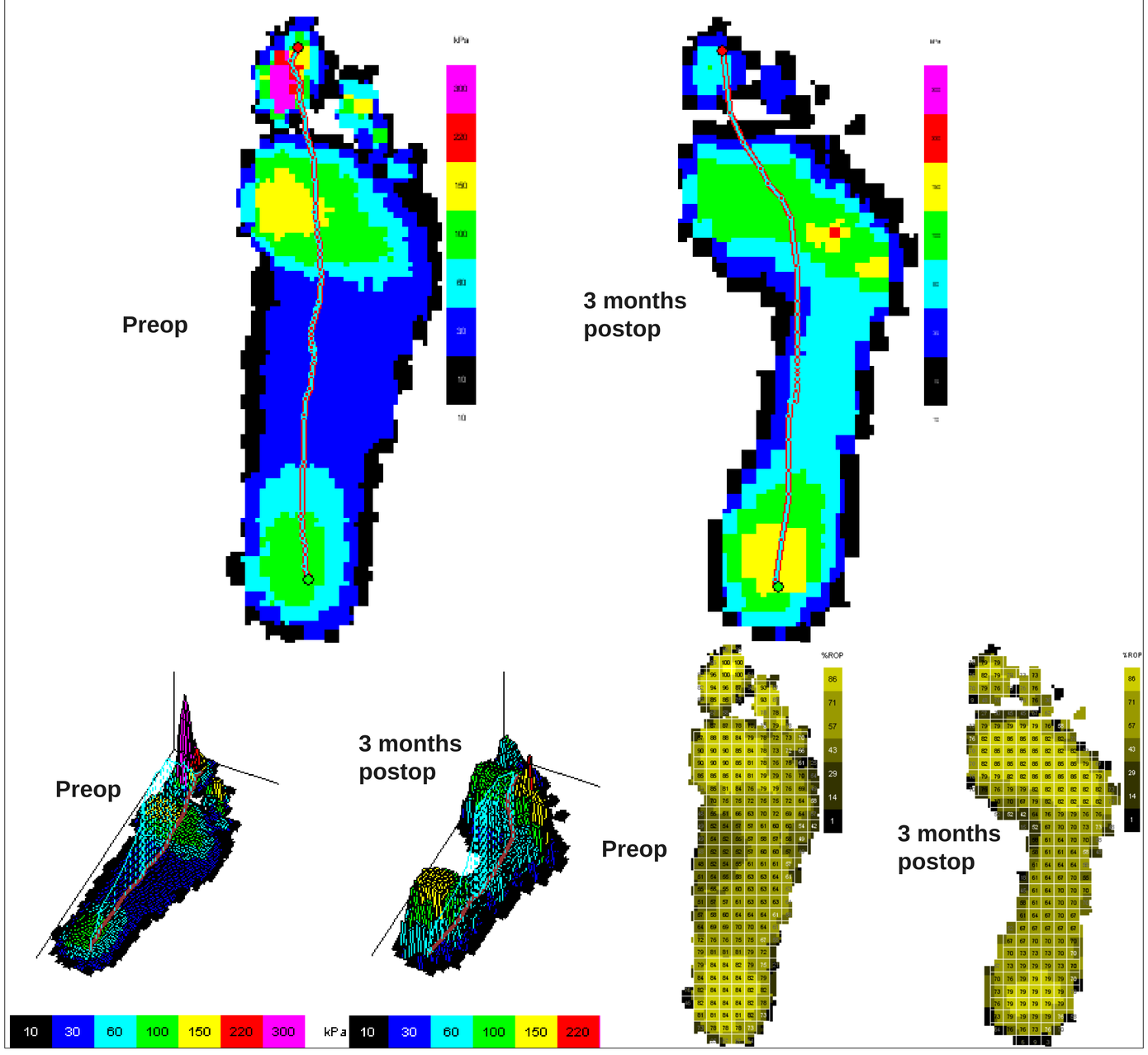
Postoperatively normal hallux angle and normal force beneath 1st metatarsal head and 1st toe with normal push-off



Example Flatfoot

Preoperatively increased arch index and increased midfoot contact area

Postoperatively normal arch index and normal midfoot contact areas



Conclusion

The typical pedographic parameters changed between preoperative and 3-months-postoperative pedography. The pre-operative data differed to comparative physiological data in all groups. The follow-up-data did not differ to the physiologic data in some groups (forefoot / isolated Hallux valgus, forefoot Hallux valgus & claw toes, forefoot others, ankle deformity, ankle instability). Consequently, a clear improvement of pathologic pedographic data after reconstructive surgery could be detected for these groups. It is possible to improve a pathologic pedographic pattern by reconstructive foot and/or ankle surgery.