

## [P22] BIOMECHANICS OF THE CONTRALATERAL FOOT IN DIABETIC PATIENTS WITH UNILATERAL MINOR AMPUTATIONS

Tatiana Tsvetkova<sup>1</sup>, Vadim Bregovskiy<sup>2</sup>

<sup>1</sup>Novel Spb LLC, Saint-Petersburg, Russian Federation

<sup>2</sup>Almazov Federal Medical and Research Centre, St-Petersburg City Diabetes Centre, St-Petersburg, Russian Federation

**Aim:** To study the biomechanical behavior of the contralateral foot in presence of unilateral minor amputations.

**Method:** 98 patients with unilateral minor amputations (Gr.1) and 126 patients with severe peripheral neuropathy without history of amputations and Charcot foot (Gr.2) were examined. Pressure distribution measurements were performed with emed-a50 system. Peak pressure (PP), maximum force (MF), force-time integral (FTI), and contact time (CT) normalized to roll-over process (ROP) were calculated beneath the hindfoot (Hf), midfoot (Mf), metatarsal heads (MTH1-MTH5), big toe (T1), second (T2), and lateral toes (T345). MF and FTI were normalized to the body weight (BW). ANOVA was used for the intergroup comparison ( $p < 0,05$ ).

**Results/Discussion:** Significant differences in Gr.1 vs. Gr.2 are the increased loading of Mf (PP:  $142 \pm 114$  vs.  $126 \pm 113$  kPa,  $p < 0,01$ ), MTH1 (PP:  $366 \pm 262$  vs.  $338 \pm 244$  kPa,  $p < 0,01$ ; MF:  $21,2 \pm 9,1$  vs.  $20,1 \pm 8,7$  %BW,  $p < 0,05$ ; FTI:  $10,8 \pm 5,5$  vs.  $10,0 \pm 5,5$  %BW,  $p < 0,01$ ), MTH4 (PP:  $262 \pm 148$  vs.  $236 \pm 119$ , kPa,  $p < 0,001$  and MF:  $14,2 \pm 4,7$  vs.  $13,6 \pm 4,5$  %BW,  $p < 0,05$ ), and MTH5 (PP:  $314 \pm 246$  vs.  $246 \pm 216$  kPa,  $p < 0,001$ ; MF:  $8,9 \pm 4,7$  vs.  $7,8 \pm 4,4$  %BW,  $p < 0,001$ ; FTI:  $4,3 \pm 2,7$  vs.  $3,7 \pm 2,4$  %BW,  $p < 0,001$ ) and decreased loading of T1 (PP:  $304 \pm 177$  vs.  $341 \pm 214$  kPa,  $p < 0,001$ ; MF:  $11,9 \pm 6,2$  vs.  $12,8 \pm 6,8$  %BW,  $p < 0,01$ ; FTI:  $5,3 \pm 3,5$  vs.  $5,9 \pm 3,7$  %BW,  $p < 0,05$ ) and T345 (MF:  $2,8 \pm 1,9$  vs.  $3,7 \pm 2,9$  %BW,  $p < 0,001$ ; FTI:  $1,4 \pm 1,2$  vs.  $1,8 \pm 1,6$  %BW,  $p < 0,001$ ). Besides, significantly increased CT was found beneath MTH5 ( $79,5 \pm 7,1$  vs.  $78,1 \pm 7,9$  %ROP,  $p < 0,001$ ). No significant changes of the parameters were found beneath Hf, MTH2, MTH3, and T2. The loading distribution pattern was the same in both groups. However, progression of motor neuropathy, clawing of the toes, and increase of the plantar deviation of the metatarsal heads caused the overloading of the lateral metatarsal heads and decrease of push-off in the contralateral feet. The increased loading of the midfoot could be due to the gradual development of non-Charcot associated collapse of the medial and central arches caused with progression of motor neuropathy.

**Conclusion:** Minor amputations influence on the biomechanical functions of the contralateral foot increasing the risk of ulceration and further amputations on the contralateral foot of the medial and lateral metatarsal heads. Similar loading patterns of the feet without amputations in patients with severe neuropathy and of the contralateral feet in operated patients suggest the contribution of “biomechanical continuum” in high risk of amputations.