

## [P52] EFFECT OF ORTHOPEDIC FOOTWEAR CONCEPTS ON PLANTAR PRESSURE RELIEF AND PATIENT SATISFACTION IN PATIENTS WITH DIABETES MELLITUS

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**Aim:** To evaluate the effect on pressure relief and patient satisfaction of different innovative footwear concepts for the high-risk diabetic foot that use pressure analysis in design and evaluation.

**Method:** Twenty-four diabetic patients (15 male, mean age 65.8 years) at high ulcer risk were tested in this cross-sectional study in four different orthopedic footwear concepts: 1) fully-custom-made shoes, evaluated and modified based on in-shoe pressure, 2) custom-made insoles, evaluated and modified based on in-shoe pressure, 3) custom-made insoles, designed based on barefoot pressure and foot shape data, and modified based on in-shoe pressure, and 4) custom-made insoles, designed and manufactured using computer-assisted automated techniques based on barefoot pressure and foot shape data. Concepts 2-4 were tested in the same extra-depth shoes with a stiffened rocker outsole. Footwear concepts were evaluated in random order with Pedar-X during walking at standardized comfortable speed. Peak pressures were calculated for the metatarsal heads, hallux, midfoot and heel regions. Patient satisfaction was assessed using a Visual Analogue Scale (score 0-10) for walking comfort, shoe fit, shoe weight and appearance. Outcomes were compared across concepts using repeated measures ANOVA ( $P < 0.05$ ).

**Results/Discussion:** The lowest mean peak pressures at the metatarsal heads were achieved with footwear concept 1 (117-141 kPa), then 2 (112-155 kPa), and then 3 (119-173), compared to concept 4 (134-199). In >92% of cases with concepts 1 - 2 and in >75% of cases with concept 3, metatarsal head pressures were <200kPa, a level found to indicate some protection against ulceration. Lowest peak pressures were generally found with fully custom-made shoes (concept 1), but only at the first metatarsal head peak pressure were significantly lower compared to all other concepts ( $p < .005$ ). Hallux pressures were not significantly different between footwear concepts. Highest satisfaction on walking comfort (mean score 7.2) and shoe weight (mean score 8.3) was found with concept 3, and on shoe fit (mean score 7.6) and appearance (mean score 6.9) with concept 1.

**Conclusion:** Lowest peak pressures were found in those footwear concepts that used in-shoe pressure to guide footwear modifications after delivery, with expectedly the best results found for the most adapted shoes, the fully custom-made shoes. This does not come at the expense of patient satisfaction, but design and manufacturing costs should be taken into account, as these may differ between concepts, possibly affecting the cost-effectiveness of pressure relief. Design and manufacturing principles from these footwear concepts may be used for definition of the most effective shoe for high-risk diabetic patients.