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Markers of inflammation in wound fluid: do they predict healing in non-infected diabetic foot ulcers?

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Introduction: Non-healing wounds are biochemically characterized by persistent inflammation. The aim of the study was to investigate the predictive value of inflammatory wound fluid markers on healing of diabetic foot ulcers. Methods: Consecutive patients attending the outpatient wound care center of the Department of Surgery, University of Tübingen, Germany presenting without clinical signs of soft-tissue infection were enrolled in the study. Local wound therapy and prospective follow-up were performed according to a comprehensive wound care protocol. Wound fluid was collected by special wound swabs. Wound fluid lactate concentration was determined by a lactate analyzer. MMP protein expression and activity were assessed by ELISA. Results are presented as median [min-max]. A $p < 0.05$ was defined as significant. Results: 50 diabetic patients without clinical signs of soft-tissue infection and a median age of 69 [46-89] years were enrolled. Median wound size was 9.7 [0.19-141] cm². In 38% there was positive probing to bone and in 70% peripheral pulses were not palpable. Wound lactate (10.29 [7.26-26.31] vs. 21.03 [6.15-50.34] mM ($p=0.007$)) and total MMP-8 protein expression (8.13 [0.50-168.40] vs. 33.07 [1.80-149.50] µg/ml ($p=0.035$)) were significantly lower in ulcers that showed healing within a 6 month follow-up period as opposed to those that did not. Moreover, MMP activity was significantly lower in healing ulcers (21.85 [10.20-81.80] vs. 40.85 [8.10-100.13] %; ($p=0.037$)). Conclusions: Markers of inflammation are elevated in wound fluid of non-healing diabetic foot ulcers. These parameters might be helpful in estimating chances for healing.