

Serum matrix metalloproteinase-9 in diabetic subjects with neuropathic foot ulcers
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Wound healing is a complex process that needs appropriate and precise cellular response to inflammatory mediators, growth factors and cytokines. High wound fluid matrix metalloproteinase (MMPs) may be indicative of inflammation and poor wound healing. However, little is known about serum concentrations of MMPs in diabetic subjects with foot ulcers. Moreover, foot ischemia or neuropathy may promote different activation in MMP enzymes in subjects with diabetic foot ulcer. Therefore, the aim of this work was to study the serum levels of MMP-9 in Diabetic subjects with neuropathic foot ulcers and their possible role to predict wound healing. The study was conducted on 80 diabetic subjects {40 with neuropathic foot ulcers (ulcer group), 20 with peripheral neuropathy (Neuropathic group) and 20 diabetic subjects without neuropathy (Diabetic group)}. Sensation was quantified with a biothesiometer (Horwell, UK). Vibration perception threshold >35 V at the apex of the hallux was used as diagnostic criterion for neuropathy. Patients with toe blood pressure < 50 mmHg or evidence of infection were excluded. Estimation of serum MMP-9 was done by ELISA using Raybio^R Human MMP-9 ELISA Kits, Ray-Biotech, Inc. USA. Serum MMP-9 was significantly higher in ulcer group ($104 \pm 46.4 \mu\text{g/L}$) in comparison to neuropathic or diabetic groups (82.95 ± 33.5 and $76.5 \pm 18.64 \mu\text{g/L}$ respectively), $p < 0.002$. Serum MMP-9 levels negatively correlated with % reduction in the ulcer area after 4 weeks follow up ($r -0.309$, $p 0.045$). Measurement of serum MMP-9 revealed a cutoff value of 95 $\mu\text{g/L}$ as the best value to predict 50% reduction in ulcer area after 4 weeks. The sensitivity, specificity, positive predictive value, and negative predictive values were 70%, 80%, 77.8% and 72.7% respectively. Increased serum MMP-9 was found in diabetic subjects with neuropathic foot ulcers in comparison to the neuropathic or diabetic groups. Serum MMP-9 could predict wound healing in diabetic subjects with neuropathic foot ulcers. Enhanced understanding of the molecular abnormalities of chronic wounds could introduce new diagnostic and therapeutic tools.