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Emerging Treatments and Technologies

Original Article

The Impact of the Micro-Lightguide O2C for the Quantification of Tissue Ischemia in Diabetic Foot Ulcers

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OBJECTIVE—Tissue oxygen supply is crucial for wound healing. Especially in diabetic foot lesions, the chances for healing are mainly dependent on the presence or absence of ischemia. This study investigates the impact of the tissue O₂ analysis system "O₂C" for noninvasive quantification of tissue oxygenation in diabetic foot ulcer patients.

RESEARCH DESIGN AND METHODS—O₂C assessed relative blood flow (flow), flow velocity (velo), and hemoglobin concentration (rHb) and hemoglobin oxygenation (SO₂) at 2 and 6 mm depth (means ± SE).

- 1) Measurements were performed on intact skin of the forefoot and forearm of 20 healthy volunteers on 2 consecutive days.
- 2) Parameters were assessed on intact skin of the forefoot of diabetic foot ulcer patients (n = 14).
- 3) Measurements were performed directly at the wound site in diabetic patients (n = 14).

RESULT

- 1) Flow, velo, rHb, and SO₂ at 2 and 6 mm depth were not significantly different when measured at 2 consecutive days.
- 2) There were no significant differences between diabetic subjects and healthy volunteers. Only flow in 6 mm depth was significantly higher in diabetic subjects (75 ± 13 vs. 51 ± 0.4 arbitrary units [AU], $P < 0.05$). When diabetic foot ulcer patients were split into healers and nonhealers, initial readings of SO₂ at 2 mm (32 ± 6 vs. $44 \pm 3\%$, $P < 0.05$) and flow in 6 mm (28 ± 1 vs. 51 ± 0.6 AU, $P < 0.05$) were significantly reduced in nonhealers compared with control subjects, whereas in healers flow in 6 mm (70 ± 0.6 vs. 51 ± 0.6 AU, $P < 0.05$) was significantly higher than that in control subjects.
- 3) Initial SO₂, rHb, flow, and velo were significantly lower in nonhealing compared with healing wounds.

CONCLUSIONS—O₂C is a new reliable and valid method for noninvasive measurement of tissue oxygenation and microvascular blood flow in patients with diabetic foot ulcers.