Casting of Recurrent Diabetic Foot Ulcers

Effective and safe?

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With appropriate wound care and biomechanical off-loading, 80–90% of neuropathic foot ulcers can heal (1). Unfortunately, many ulcers recur (2), and recurrence rates up to 70% have been reported (3–5). Little information is available on the management and outcome of these ulcers. In addition, it is unclear how to approach a patient for whom customized shoes fail to prevent ulceration and whose repetitive ulceration could result in progressive scar formation and impaired wound healing. The total contact cast (TCC) is currently seen as the gold-standard treatment of neuropathic ulcers (1, 6,7), but the efficacy and safety of repeated treatment is unknown. For this reason, the present study was undertaken to determine whether repeated casting in patients with recurrent foot ulceration remains effective and is not associated with unwanted complications.

RESEARCH DESIGN AND METHODS — A prospective data collection study (from 1999 to 2003) was performed in which diabetic patients with polyneuropathy and a first or recurrent foot ulcer in whom off-loading was indicated but not possible with simple measures (e.g., felt) were included. All patients were evaluated and graded according to the PEDIS system and were treated with a TCC, as previously described by Nabuurs-Franssen and Schaper (8). Exclusion criteria were critical limb ischemia and infection greater than grade 2 in the PEDIS system (9). Cast treatment was terminated in case of lack of improvement of the wound during 4 consecutive weeks or infection greater than grade 2 or severe discomfort with the cast. These cases are defined as cast failure. Patients remained in the cast until healing, defined as an intact skin on examination. The time to heal was defined as the number of days from baseline until healing in the cast. Complications and “noncompliance,” defined as a patient reporting adhering to the off-loading regime <75% per day or if the clinician had the impression the patient was doing so, were scored on each visit.

Data are expressed as means ± SD or median and interquartile range where appropriate. Comparisons between two groups were performed using Fisher’s exact test and the Mann-Whitney U test, using the SPSS statistical package (version 11; SPSS, Chicago, IL). Multivariate analyses were performed to determine whether repeated ulceration on identical regions and repeated cast treatment on the same leg affects the percentage healed (logistic regression) and/or the time to heal (Cox hazard model with time-dependent variables) of an ulcer. In these analyses, peripheral arterial disease (PAD), infection, size, and duration of the ulcer at baseline were included.

RESULTS — A total of 104 patients were treated with a TCC (age 65 ± 13 years, 62% male), and all had peripheral neuropathy. Forty-one patients, with a total of 202 ulcers, were treated more than once with casting on the same foot during the 5-year period (Fig. 1). In comparison with patients who were treated only once with casting, patients with recurrent ulcers had foot deformities (90 vs. 74%) and PAD (69 vs. 44%) more often and were more noncompliant (20 vs. 2%, all P < 0.05). Seventy-five percent of the patients had recurrences on different locations of the foot (median = 2); 25% had only one region with recurrences, 90% of these recurrences were located on digit 1 and metatarsal head 1. The median number of cast treatments per patient was three (interquartile range 2–6, maximum 12), and in total, 88% of all ulcers healed with casting.

Recurrent foot ulceration was not associated with impaired healing. In comparison with the first ulcer episode, the percentage of patients who healed during the last episode was 94 vs. 91% (NS), and the difference in healing velocity of ulcers with more than four recurrences on the same area and treated repeatedly with TCC was –3 days (NS). In addition, fewer complications were found after repeated casting (15% [episode 1–3] vs. 6% [episode 4–12], P < 0.05).

CONCLUSIONS — Recurrent foot ulceration is a major health problem in diabetic patients (2–4). During 2-year follow-up, 39% of our patients had recurrent ulcers for which treatment with a TCC was indicated. We did not observe any difference in healing between the different ulcer periods, suggesting that the regenerative capacity of the skin remains intact after repeated episodes of biomechanical damage and ulceration. Surprisingly, the number of complications appeared to decrease with repetitive casting, suggesting that this treatment can be repeated without loss of safety. However, because each ulcer episode is a burden to the patient, with a risk for infection and amputation (10), our findings do not reduce the relevance of effective preventive measures. Our results are limited to patients with recurrent neuropathic or mild-

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Abbreviations: PAD, peripheral arterial disease; TCC, total contact cast.

A table elsewhere in this issue shows conventional and Système International (SI) units and conversion factors for many substances.

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to-moderate neuroischemic plantar foot ulcers without severe infection. In our clinic, all patients with such recurrences are candidates for a TCC. However, we cannot exclude that severe complications in an earlier TCC treatment influenced the choice of TCC or other off-loading modalities. This could have resulted in a selective loss of patients.

The majority of our patients with recurrent ulceration had PAD without signs of critical limb ischemia. Although PAD was a clear risk factor for recurrent ulceration, the ulcers healed with casting in almost 90% of the patients. Customized shoes with orthoses were prescribed to all patients, but they failed to prevent ulceration in a relatively large number of patients (11). Part of this lack of efficacy is probably related to poor compliance and partly to ineffective reduction of increased biomechanical stress in patients with foot deformities. Several surgical procedures, such as corrective foot surgery (12,13) and Achilles tendon lengthening (14), have been proposed to improve the altered biomechanics and to prevent reulceration. However, in our experience, the ulcer did not recur on the same area in most patients, suggesting that the whole foot, and not a specific area, is at risk. Exceptions could be the hallux and the metatarsal head 1 region, since we found that these areas were prone to reulceration, but the number of randomized controlled clinical trials on these procedures is scarce.

In conclusion, repetitive TCC treatment can be an effective and safe approach in diabetic patients with recurrent neuroischemic ulceration.

References