

OBSERVATIONS

The Biogun

A novel way of eradicating methicillin-resistant *Staphylococcus aureus* colonization in diabetic foot ulcers

Methicillin-resistant *Staphylococcus aureus* (MRSA) is an ever-increasing problem facing the health service in the U.K. There is a need to develop new methods of combating MRSA. In the Manchester diabetic foot clinic, the prevalence of MRSA is ~40% of staphylococcal cultures. MRSA has been demonstrated to double the foot ulcer healing time (1). While the pathogenetic relevance of MRSA colonization remains debatable, MRSA even in clinically noninfected ulcers may take >6 months to disappear (2). The Dentron Biogun has been shown to ionize molecular oxygen and generate superoxide radical anions (O_2^-) with a bactericidal effect against microorganisms. In vitro studies using the Biogun have shown it to be effective against a range of microorganisms, in particular MRSA.

In an open-label prospective pilot study, 15 consecutive diabetic patients without clinically infected foot ulcers but with MRSA colonization were treated with the Biogun. Treatment with the Biogun continued on a weekly basis until MRSA was eradicated or to a maximum of three treatments. Patients were considered to be clear of MRSA if they had three consecutive negative MRSA cultures, each at least 1 week apart. Of the 15 patients treated using the Dentron Biogun, we achieved successful eradication of MRSA colonization in 60%. There were no significant differences between the groups that had successful MRSA eradication and those that were unsuccessful in terms of age, type of diabetes, duration of diabetes, duration of foot ulceration, or the proportion with neuroischemic ulcers. The only factor that influenced the success of MRSA eradication was the ulcer size, which was significantly smaller (294.8 ± 104.6 vs. 843.3 ± 254.4 mm, $P < 0.05$) (2) in patients where MRSA eradication was successful. There was no significant

difference for the duration that the foot ulcers were colonized with MRSA and the success of MRSA eradication. There were no significant side effects, with only one patient noticing a mild tingling sensation.

The most important factor in determining the success of the Biogun appears to be the size of the foot ulcer. We believe that the success rate may be improved by increasing the length and frequency of treatment or by improving the efficiency of delivering the charged ions over a greater surface area. With the rise in the prevalence of MRSA in the diabetic foot clinic and the known increased risk of developing bacteremia with its implication on resources, additional methods of MRSA eradication need to be developed. We suggest that the Dentron Biogun might represent a simple, effective, and, because it can be used repeatedly, inexpensive method for eradicating MRSA. The promising pilot data warrant further assessment in a properly designed randomized controlled trial.

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Higher Levels of HDL Cholesterol Are Associated With a Decreased Likelihood of Albuminuria in Patients With Long-Standing Type 1 Diabetes

Response to Molitch et al.

We read with great interest the article by Molitch et al. (1), concerning the association between high levels of HDL cholesterol and albuminuria in type 1 diabetes. We have found similar results in a group of 157 patients with long-standing type 1 diabetes but in relation to retinopathy, which seems to be a more objective marker of microangiopathy than albuminuria in diabetes. Retinopathy was assessed by two experienced ophthalmologists using direct ophthalmoscopy on dilated pupils, followed, if necessary, by fluorescein angiography. Pictures of the eye fundus were collected. We divided our patients into two groups, one with ($n = 118$) and one without ($n = 39$) retinopathy. Two assessed groups were identical with respect to age (42.3 ± 12.6 vs. 39.9 ± 12.5 years, $P > 0.05$) and duration of diabetes (26.5 ± 6.9 vs. 25.7 ± 6.5 years, $P > 0.05$). Similarly to Molitch et al. (1), HDL cholesterol levels were significantly lower in patients with diabetic retinopathy than in those that did not have any changes at fundus of the eye (1.49 ± 0.4 vs. 1.65 ± 0.42 mmol/l, $P = 0.039$). Higher levels of HDL cholesterol (≥ 1.6 vs. < 1.6 mmol/l) were associated with a five-times-lower likelihood of diabetic retinopathy (OR 0.20 [95% CI 0.06-0.70], $P = 0.01$). Of patients with retinopathy, 55% had positive microalbuminuria. However, the majority of patients with retinopathy were treated with ACE inhibitors, which must have influenced this percentage.

Contrary to Molitch et al. (1), we have not found any differences in HbA_{1c} between patients with and without retinopathy (8.2 ± 1.4 vs. $8.1 \pm 1.3\%$, $P > 0.5$). Our study suggests that high HDL cholesterol may, independently of glycemic control, prevent the development of microvascular complications in type 1 dia-