

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 Dentrion Biogun has been shown to ionize molecular oxygen and generate superoxide radical anions ($O_2^{\cdot-}$) 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 Dentrion 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 Dentrion 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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References

1. Tentolouris N, Jude EB, Smirnov I, Knowles A, Boulton AJM: Methicillin-resistant *Staphylococcus aureus*: an increasing problem in diabetic foot clinic. *Diabet Med* 16:767–771, 1999
2. Dang CN, Prasad YDM, Boulton AJM, Jude EB: Methicillin-resistant *Staphylococcus aureus* in the diabetic foot clinic: a worsening problem. *Diabet Med* 20:159–161, 2003

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-

betes. These results could be related to antioxidant, antithrombotic, and anti-inflammatory properties of HDL particles (2). Interestingly, structural modifications of HDL mediated by various mechanisms, including glycation, oxidation, and enzymatic degradation, may affect their functional and atheroprotective properties (3). This may suggest that not only quantity but also quality of HDL particles play a role in the damage of endothelium.

Molitch et al. (1) and our studies confirm the hypothesis that the higher the levels of HDL cholesterol, the lower the risk of late diabetes complications.

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References

1. Molitch ME, Rupp D, Carnethon M: Higher levels of HDL cholesterol are associated with a decreased likelihood of albuminuria in patients with long-standing type 1 diabetes. *Diabetes Care* 29:78–82, 2006
2. O'Connell BJ, Genest J: High-density lipoproteins and endothelial function. *Circulation* 104:1978–1983, 2001
3. Ferretti G, Bacchewiti T, Negre-Salvayre A, Salvayre R, Dousset N, Curatola G: Structural modifications of HDL and functional consequences. *Atherosclerosis* 183:1–7, 2006

Integrating Pediatric Diabetes Education Into Routine Clinical Care

The Families, Adolescents and Children's Teamwork Study (FACTS)

The importance of optimal glycemic control for children and adolescents to prevent the long-term complications of diabetes is well recognized (1).

Educational interventions that increase parental involvement in blood glucose monitoring and insulin dose adjustment have demonstrated beneficial effects in specialist centers (2,3). The Families, Adolescents and Children's Teamwork Study (FACTS) was developed to evaluate a family-centered, structured education program for children and young people that can be integrated into routine clinical care. The small group setting facilitates increased peer group contact for both children and parents and improves cost efficiency, allowing the program to be delivered within existing service provision.

The program combines skills training with increased parent-adolescent teamwork and consists of four small group (three to five families) sessions over 12 months. The first two skill-based sessions cover carbohydrate counting, blood glucose monitoring, and insulin dose adjustment, with the last two focusing on sharing parental/child responsibility (4). Each session takes place on the same day as the regular 3-monthly age-banded clinic visits.

All health professionals involved received training in the delivery of group education by an experienced health psychologist. Sessions were monitored to ensure that they were patient centered and interactive, in order to engage children, adolescents, and parents in self-management. Written information to reinforce the main topics discussed was provided at the end of each session. Changes to insulin regimes were made only when requested by parents or health professionals but not as part of the program.

Families were randomly assigned to either the immediate (1st year) or delayed (2nd year) intervention. The delayed group acted as waiting list controls during the 1st year (i.e., attended only for routine clinical care) and attended the educational sessions in additional to routine clinical care during the 2nd year. Over the 2-year study period, 67 randomized subjects (55.5% male), mean (\pm SD) age 12.9 ± 2.1 years, attended the immediate ($n = 33$) or delayed ($n = 34$) intervention. The mean HbA_{1c} (A1C) at baseline was $9.1 \pm 1.25\%$ and mean duration of diabetes 4.9 ± 3.25 years. There were no significant differences between participants and nonparticipants in A1C, number of daily injections, or total daily dose of insulin at baseline.

Individuals attending the first two education sessions were more likely to increase their number of daily injections

(attendees 44%, nonattendees 14%; $P = 0.006$). Interim analysis of change in A1C indicates that individuals who attended the two group sessions showed a reduction in A1C (mean drop 0.27%), whereas those who did not attend showed an increase in A1C (mean increase 0.26%); this difference nearly reached statistical significance ($t = 1.60$, $df = 70$, $P = 0.058$).

This is the only pediatric educational intervention that has been tested by two independent research groups and that has been shown suitable for both individual and group delivery. Although the effects on A1C are small, the ability to deliver the intervention not only to individual families in specialist units but also to small groups in a routine clinical setting makes this program relevant to other centers providing pediatric diabetes care.

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References

1. Diabetes Control and Complications Trial Research Group: Effect of intensive diabetes treatment on the development and progression of long-term complications in adolescents with insulin-dependent diabetes mellitus: Diabetes Control and Complications Trial. *J Pediatr* 125:177–188, 1994
2. Anderson BJ, Brackett J, Ho J, Laffel LM: An office-based intervention to maintain parent-adolescent teamwork in diabetes management: impact on parent involvement, family conflict, and subsequent glycemic control. *Diabetes Care* 22:713–721, 1999
3. Laffel LM, Vangsness L, Connell A, Goebel-Fabbri A, Butler D, Anderson BJ: Impact of ambulatory, family-focused teamwork intervention on glycemic control in youth with type 1 diabetes. *J Pediatr* 142:409–416, 2003
4. Huws-Thomas M, Murphy HR, Skinner TC: Adolescents with diabetes. In *Psychology in Diabetes Care*. 2nd ed. Snoek F, Skinner TC, Eds. Chichester, U.K., John Wiley & Sons, 2005