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Letter –

Dietary reversal of type 2 diabetes motivated by research knowledge

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[626 words]

Reversal of type 2 diabetes in the context of bariatric surgery is currently of great interest. Discussion of the rapid and dramatic effects of bariatric surgery upon the pathophysiology of type 2 diabetes has concentrated almost exclusively on surgically induced change in the incretin hormones (1,2). Little consideration has been given to reversal of type 2 diabetes by the effects of caloric restriction alone. We report a person with type 2 diabetes who returned to normal fasting blood glucose and HbA_{1c} after reading a notice of grant award in *Balance* concerning effects of hypocaloric diet on glucose control.

A 46 year old woman was found to have diabetes on routine screening (OGTT January 2009: 8.1mmol/l fasting; 14.4mmol/l 2 hours). At the time of diagnosis HbA_{1c} was 6.9% and weight was 120.2kg, with body mass index of 42.6kg/m². On diagnosis of diabetes she joined Diabetes UK and read in *Balance* of a grant award for research on the mechanism of hypocaloric reversal of diabetes. She enquired about being a subject, but NHS ethics, NHS R&D, PCT R&D and Caldicott permissions had yet to be granted. She asked to participate in due course but set about losing weight. She attended weekly meetings of Overeaters Anonymous Great Britain for support. By the time the research permissions had been obtained 8 months later, weight had fallen to 108.9kg with fasting blood glucose of 4.8mM and HbA_{1c} 5.9%.

Motivation to bring about sustained weight loss was provided by the information that this would result in normalisation of blood glucose control. Although this may not appear remarkable to many diabetologists who have observed similar effects of weight loss in individual cases, this has rarely been described in the literature. The phenomenon was first described by Claude Bouchardet who observed that glucose disappeared from his patients urine during food shortage of the siege of Paris in 1870 (3). More recently, dietary therapy alone was reported to achieve normal glucose tolerance in 20% of people with type 2 diabetes (4). The key to response lies in compliance, and the longer term difficulty lies in sustaining the negative calorie balance.

Close examination of the hypotheses based upon unique changes of incretins following bariatric surgery suggests inconsistencies. The “hindgut hypothesis” postulates that expedited delivery of nutrients to the distal small intestine enhances GLP1 secretion possibly with other incretins. However, the absolute increase in GLP1 secretion reported is small (5)

and not observed in type 2 diabetes (6). High dose replacement by GLP1 agonists bring about only modest improvement in glucose control (7). The “foregut hypothesis” postulates that reversal due to exclusion of the duodenum and proximal duodenum from exposure to nutrients (2). This has been postulated to decrease postprandial GIP and decrease glucagon secretion (1). However, not all studies show GIP to be decreased and some show increased secretion in the weeks after gastric bypass (5,8).

Whereas the incretin hormones achieve fine regulation, substrate supply drives metabolism. The basic metabolic fact has been overlooked that the restriction of calorie intake which necessarily follows bariatric surgery will bring about rapid decrease in the fatty liver typical of type 2 diabetes. The degree of restriction relates to the extent of the surgical procedure. Even moderate dietary restriction has been shown to be associated with profound change in hepatic insulin sensitivity and marked fall in hepatic glucose output early during a hypocaloric diet (9). The associated time course of decrease in liver volume is over days (10). Conversely, the period before onset of type 2 diabetes is characterized by accumulation of liver fat (11).

The observation of reversal of type 2 diabetes, by diet rather than by surgery, is most important. This should inform advice given to people with type 2 diabetes at the time of diagnosis.

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The subject of this case report has given written consent to publication.

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