

Gastrointestinal motility in people with type 1 diabetes and peripheral neuropathy

Chinmay S. Marathe^{1,2} · Christopher K. Rayner^{1,2} · Karen L. Jones^{1,2} · Michael Horowitz^{1,2}

Received: 15 June 2017 / Accepted: 21 June 2017 / Published online: 12 August 2017
© Springer-Verlag GmbH Germany 2017

Keywords Gastric emptying · Gastrointestinal motility · Neuropathy · Postprandial glycaemia · Type 1 diabetes

Abbreviations

DSPN Diabetic sensorimotor polyneuropathy
WMC Wireless motility capsule

To the Editor: We read with interest the recent paper by Farmer et al [1]. These authors studied 48 individuals with type 1 diabetes (mean age 50 years and mean duration of diabetes, 32 years) with diabetic sensorimotor polyneuropathy (DSPN); they reported that, as assessed by a wireless motility capsule (WMC) test, gastric emptying, and small intestinal and colonic transit were delayed in this group when compared with age-matched healthy control participants. The paper raises several issues, specifically:

1. It is uncertain whether the abnormalities described relate to diabetes per se, autonomic neuropathy and/or hyperglycaemia. The inclusion of an appropriate ‘control’ group, perhaps individuals with type 1 dia-

betes without peripheral neuropathy, would have been highly desirable.

2. The rate of gastric emptying (as well as small intestinal motility) is known to be influenced by the acute glycaemic environment in health and diabetes. For example, acute hyperglycaemia slows gastric emptying substantially, while acute hypoglycaemia accelerates it [2]. The mean HbA_{1c} of the type 1 diabetic participants in the study was 8.1% (65.5 mmol/mol), and it is likely that the majority of these had hyperglycaemia during the measurement of transit, and that hyperglycaemia contributed to the high prevalence of delayed gastric emptying. Blood glucose was only measured immediately prior to the ingestion of the capsule and mean glucose was 8.4 mmol/l (range 4.9–12.1 mmol/l). Concurrent measurement of blood glucose would have been highly desirable, perhaps using continuous glucose monitoring. It would also be of interest to measure gastric emptying during euglycaemia in individuals with type 1 diabetes with proven DSPN.

3. Previous studies have established that gastric emptying may be delayed, normal or even accelerated in people with long-standing diabetes [2]. Inconsistencies in the literature likely reflect differences in populations studied and the techniques used to quantify gastric emptying (e.g. scintigraphy, stable isotope breath test, MRI, ultrasound or WMC test). Scintigraphy remains the ‘gold standard’ technique (with the stable isotope breath test being an acceptable alternative), and has inherent advantages over the WMC test employed by the authors. It should be appreciated that the diagnostic accuracy of the WMC test has not been established in individuals selected based on DSPN status, per se. We recently reported that gastric

✉ Chinmay S. Marathe
chinmay.marathe@adelaide.edu.au

¹ Discipline of Medicine, The University of Adelaide, Royal Adelaide Hospital, Level 6, Eleanor Harrauld Building, Adelaide, SA, 5000, Australia

² Centre of Research Excellence in Translating Nutritional Science to Good Health, The University of Adelaide, Adelaide, SA, Australia

emptying was more rapid in adolescent type 1 diabetic patients (mean age 14 years and mean duration of diabetes, 8 years) than in healthy control participants [3]. In the DCCT/Epidemiology of Diabetes Interventions and Complications (EDIC) study, delayed gastric emptying was common and associated with early and long-term hyperglycaemia [4].

4. The relationships of transit through different gastrointestinal regions (oesophagus, stomach, intestine) in diabetes, as well as associations between abnormal transit and peripheral neuropathy [5, 6], have been evaluated previously, albeit not as comprehensively as by Farmer et al [1]. These studies suggest that, in diabetes, the relationship of transit through any region of the gut relates only weakly to transit through other regions.
5. It is also important to appreciate that disordered motility is not synonymous with delayed transit. Furthermore, in the case of the small intestinal transit, caecal arrival correlates only weakly with mean transit [7].
6. Peripheral neuropathy, gastroparesis and gastrointestinal symptoms are common in long-standing type 1 diabetes. The authors conclude that there is an association between peripheral neuropathy ('stocking and glove' distribution) of diabetes and delayed gastrointestinal transit (an observation previously described), but a causal relationship remains to be established.

In conclusion, while we agree that the observations of Farmer et al [1] have clinical implications, we believe that

the issues outlined in this letter must be considered when interpreting them.

Funding This work received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

Duality of interest The authors declare that there is no duality of interest associated with this manuscript.

Contribution statement All authors were responsible for drafting the article, revising it critically and have approved the final version to be published.

References

1. Farmer AD, Pedersen AG, Brock B et al (2017) Type 1 diabetic patients with peripheral neuropathy have pan-enteric prolongation of gastrointestinal transit times and an altered caecal pH profile. *Diabetologia* 60:709–718
2. Marathe CS, Rayner CK, Jones KL, Horowitz M (2013) Relationships between gastric emptying, postprandial glycemia, and incretin hormones. *Diabetes Care* 36:1396–1405
3. Perano SJ, Rayner CK, Kritas S et al (2015) Gastric emptying is more rapid in adolescents with type 1 diabetes and impacts on postprandial glycemia. *J Clin Endocrinol Metab* 100:2248–2253
4. Bharucha AE, Batey-Schaefer B, Cleary PA et al (2015) Delayed gastric emptying is associated with early and long-term hyperglycemia in type 1 diabetes mellitus. *Gastroenterology* 149:330–339
5. Russell CO, Gannan R, Coatsworth J et al (1983) Relationship among esophageal dysfunction, diabetic gastroenteropathy, and peripheral neuropathy. *Dig Dis Sci* 28:289–293
6. Wegener M, Borsch G, Schaffstein J, Luerweg C, Leverkus F (1990) Gastrointestinal transit disorders in patients with insulin-treated diabetes mellitus. *Dig Dis* 8:23–36
7. Read NW, Al-Janabi MN, Holgate AM, Barber DC, Edwards CA (1986) Simultaneous measurement of gastric emptying, small bowel residence and colonic filling of a solid meal by the use of the gamma camera. *Gut* 27:300–308