Author's response to reviews

Title: Age- and sex-specific effects on weight loss outcomes in a comparison of sleeve gastrectomy and Roux-en-Y gastric bypass: a retrospective cohort study

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Author's response to reviews: see over
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Dear BMC Obesity Editorial team,

Re: Age- and sex-specific effects on weight loss outcomes in a comparison of sleeve gastrectomy and Roux-en-Y gastric bypass: a retrospective cohort study

We would like you to consider the attached manuscript for publication on BMC Obesity. Bariatric surgery is the most effective treatment for patients with severe obesity and positively life-changing for the vast majority of patients. Roux-en-Y gastric bypass (RYGBP) and sleeve gastrectomy (SG) are now the most common surgical procedures undertaken worldwide. Establishing an evidence-base comparing the effectiveness of this procedure relative to Roux-en-Y gastric bypass (RYGBP) is now a key priority. Furthermore, there are no evidenced-based criteria that inform the selection of one operation over the other.

Here we present a retrospective observational study, in which we addressed two important clinical questions:

- We compared weight loss outcomes between RYGBP and SG in the real-world setting of an academic tertiary referral centre.
- We investigated whether patient characteristics such as age and sex could impact upon outcome differently for each procedure, and thus provide an evidence-base for preferentially selecting one procedure over the other.

Our study, the largest single-centre comparison of weight loss outcomes following RYGBP and SG, shows that there is a role for both procedures in the management of severely obese patients. Moreover, our results demonstrate that patient sex and age significantly impact upon weight loss in a procedure-dependent manner and should be taken into account when choosing between SG and RYGBP. We show that in men under 40 and women over 50 years of age RYGBP leads to superior weight loss relative to SG. However, in men over 40 years and women under 50 years, RYGBP and SG lead to comparable weight loss outcomes.

In addition, we employed several novel analytic approaches which represent a methodological template for similar future bariatric studies:
• **Adjustment for preoperative BMI using a multilevel linear model:** Many studies comparing SG and RYGBP have reported outcomes without adjusting for baseline BMI, which is a key predictor of weight loss.

• **Incorporation of interaction analyses:** Our study is the first to employ time by procedure interaction analyses for bariatric outcome data. The interaction of outcome with time is often overlooked, and is important in estimating weight loss trajectories. The interaction analyses also allowed us to examine the effects of baseline clinical factors on procedure outcome.

• **Interpolation of weight data to a standard set of timepoints:** While postoperative clinic appointment dates are planned to follow a predefined follow-up schedule, these often vary considerably at each follow-up timepoint. Thus interpolation was an important methodological technique, in order to accommodate the staggered timing of postoperative visits.

We envisage that optimising procedure selection based on patient characteristics will enhance the effectiveness of bariatric surgery, thus further increasing the benefit to risk ratio of this highly effective intervention. Our results have international importance given the increasing demand for specialist bariatric services, in the face of the rapidly increasing prevalence of severe obesity. Our study findings are relevant to all those involved in caring for severely obese patients including bariatric surgery multidisciplinary teams, non-specialist consultant physicians, primary care physicians, community weight management providers, as well as funders, policy makers and patients who are considering bariatric surgery.

Best wishes,

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