

Fracture risk following bariatric surgery: a self-controlled case series and risk predictors detection

Characters: 3591/3600

Lines: 42/55

Authors: D. E. Robinson¹, I. Douglas², G. D. Tan^{3,4}, C. Cooper^{5,6}, A. Delmestri¹, M. K. Javaid⁶, A. Judge^{7,1}, V. Y Strauss¹ & D. Prieto-Alhambra¹

1. CSM, NDORMS, University of Oxford, Oxford, UK
2. Faculty of Epidemiology and Population Health, London School of Hygiene and Tropical Medicine, London, UK
3. Oxford Centre for Diabetes, Endocrinology & Metabolism, Oxford University Hospitals NHS Foundation Trust, Oxford, UK
4. NIHR Oxford BRC, John Radcliffe Hospital OX3 9DU
5. MRC Lifecourse Epidemiology Unit, University of Southampton, Southampton, UK
6. NDORMS, University of Oxford, Oxford, UK
7. Translational Health Sciences, Bristol Medical School, University of Bristol, UK

Background: Bariatric surgery is increasingly common due to the obesity epidemic. However, there is controversial evidence about the association between bariatric surgery and fracture risk. This may be due to the fundamental differences between patients undergoing bariatric surgery with patients who do not, raising the question: within patients who fracture, are they at increased risk of fracture after surgery? And if so, who is at risk of fracture?

Objective: 1. To investigate the association between bariatric surgery and risk of three fracture locations using a within person study design comparing a) the 5 year incidence post surgery to the 5 year pre surgery, b) splitting the 5 year post surgery risk into two windows 0-2 and 2.01 – 5 years. 2. To predict who is at risk of fracture following bariatric surgery.

Methods: A self-controlled case series analysis (SCCS) and Stepwise logistic regression (LR) were conducted. Patients undergoing bariatric surgery were identified in the clinical practice research datalink (CPRD) GOLD dataset and linked to hospital episode statistics (HES) data. Primary outcome was any fracture (any skeletal sites except skull and digits). Secondary outcomes were major (hip, spine, forearm and humerus) and peripheral fractures (forearm and lower leg). For the SCCS, Poisson models in those who fractured were fit to calculate Incidence Rate Ratios (IRR) for the aforementioned time windows. Potential predictors were selected with an exit p-value of 0.157 and their predictive performance was reported with C-statistic .

Results: Of 5,492 patients undergoing bariatric surgery, 252 patients had 272 any fractures, 75 (80) major fractures and 126 (135) peripheral fractures. Average BMI was 43.9. Major fracture risk increased nearly threefold following surgery: IRR (95% CI) 2.70 (1.31, 5.57). Conversely, the incidence of any and peripheral fractures did not change: IRRs 1.17 (0.86, 1.60) and 0.92 (0.60, 1.42) respectively. Any and major fracture risk increased in the 3rd to 5th year post-surgery: IRRs of 1.73 (1.08, 2.77), 4.98 (1.94, 12.78) respectively. 7 variables were identified which may predict major fracture with high c-statistic of 0.77 (0.71, 0.88).

Conclusions: Few patients had fractures (252 / 5492). The incidence of major osteoporotic fracture is increased after bariatric surgery by nearly 3 fold, to then increase to 5 fold in the 2-5 year window. Multiple factors were identified for patients at risk of major fracture post-operatively. External

validation is needed. Further research is needed on post-bariatric surgery care to minimise fracture risk.

Acknowledgements: This project was funded by the NIHR RfPB (project number PB-PG-1215-20017) and supported by the NIHR Oxford BRC. The views expressed are those of the author(s).