

Change in fracture risk and fracture pattern after bariatric surgery: nested case-control study

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Abstract

Objective To investigate whether bariatric surgery increases the risk of fracture.

Design Retrospective nested case-control study.

Setting Patients who underwent bariatric surgery in the province of Quebec, Canada, between 2001 and 2014, selected using healthcare administrative databases.

Participants 12 676 patients who underwent bariatric surgery, age and sex matched with 38 028 obese and 126 760 non-obese controls.

Main outcome measures Incidence and sites of fracture in patients who had undergone bariatric surgery compared with obese and non-obese controls. Fracture risk was also compared before and after surgery (index date) within each group and by type of surgery from 2006 to 2014. Multivariate conditional Poisson regression models were adjusted for fracture history, number of comorbidities, sociomaterial deprivation, and area of residence.

Results Before surgery, patients undergoing bariatric surgery (9169 (72.3%) women; mean age 42 (SD 11) years) were more likely to fracture (1326; 10.5%) than were obese (3065; 8.1%) or non-obese (8329; 6.6%) controls. A mean of 4.4 years after surgery, bariatric patients were more susceptible to fracture (514; 4.1%) than were obese (1013; 2.7%) and non-obese (3008; 2.4%) controls. Postoperative adjusted fracture risk was higher in the bariatric group than in the obese (relative risk 1.38, 95% confidence interval 1.23 to 1.55) and non-obese (1.44, 1.29 to 1.59) groups. Before surgery, the risk of distal lower limb fracture was higher, upper limb fracture risk was lower, and risk of clinical spine, hip, femur, or pelvic fractures was similar in the bariatric and obese groups compared with the non-obese group. After surgery, risk of distal lower limb fracture decreased (relative risk 0.66, 0.56 to 0.78), whereas risk of upper limb (1.64, 1.40 to 1.93), clinical spine (1.78, 1.08 to 2.93), pelvic, hip, or femur (2.52, 1.78 to 3.59) fractures increased. The increase in risk of fracture reached significance only for biliopancreatic diversion.

Conclusions Patients undergoing bariatric surgery were more likely to have fractures than were obese or non-obese controls, and this risk remained higher after surgery. Fracture risk was site specific, changing from a pattern associated with obesity to a pattern typical of osteoporosis after surgery. Only biliopancreatic diversion was clearly associated with fracture risk; however, results for Roux-en-Y gastric bypass and sleeve gastrectomy remain inconclusive. Fracture risk assessment and management should be part of bariatric care.

Reviewer: 2 - Patient and Public Reviewer

Comments: This is a carefully constructed retrospective database review that adds to the information on an important issue of interest: the specific nature of fracture risk before and after bariatric surgery. The authors are correct in noting that their work answers previously unknown, important questions about risk related to fracture site and comparison with controls.

This review is written from the patient perspective.

The authors correctly note that a limitation of the study is the inability to assess fracture risk by procedure. Data from ObesityWeek 2015 show that vertical sleeve gastrectomy (VSG) is now the most popular weight loss procedure, reflecting its rapid uptake. VSG is a purely restrictive (not malabsorptive) procedure. Data on the current study span 2001-2012, raising the possibility that the fracture rates cited may not be true at this time given the different proportion of procedures performed.

From patients' perspective, choice of procedure may be the most influential decision they can make on their long-term success and wellbeing. At a very broad, basic level, preoperative counseling generally characterizes VSG as more tolerable than gastric bypass, but with slightly less overall weight loss. If postoperative fracture risk is less with VSG than with bypass - and it is a reasonable hypothesis that merits study - then this is important information that could factor into a patient's decision.

The second limitation pertinent to patients, and one that the authors do not address, is the level of adherence to postoperative calcium and vitamin D supplementation, and its effect on fracture risk. This is obviously extremely difficult to accurately measure, and probably impossible from the source databases. Nevertheless, these findings should be used in patient education to reinforce the importance of adherence by communicating the risk of postsurgical osteoporotic fracture, in patient-friendly language.

The third limitation pertinent to patients, also unaddressed by the authors, is the potential for exercise, specifically strength training, to mitigate known fracture risk by stimulating osteoblastic activity. The value to a patient of fracture site information here is high: it suggests that core, hip, and upper body work might be particularly beneficial. The bariatric population is a difficult one to motivate to exercise; yet, the most successful bariatric patients are the ones who commit to regular, usually everyday exercise. Painting a long-term picture of strength at an advanced age with a decreased risk of osteoporosis could help tip the scale ... so to speak.

Thank you for the opportunity to review.

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