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FRACTURE RISK FOLLOWING BARIATRIC SURGERY: A SELF-CONTROLLED CASE SERIES AND RISK PREDICTION ALGORITHM

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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?

Objectives: 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 using a 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 three-fold 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 a high c-statistics of 0.77 (0.71, 0.88).

Conclusion: 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.

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TITLE: LUMBAR SPINE AND PROXIMAL FEMUR OSTEOPOROSIS DIAGNOSIS: REMS TECHNOLOGY IN A MULTICENTER CLINICAL STUDY

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Background: To date numerous quantitative methods to diagnose osteoporosis at peripheral sites have been developed. REMS (Radiofrequency Echographic Multi Spectrometry) is a non-ionizing instrument used to quantitatively evaluate bone mineral density at lumbar spine and femoral neck sites [1].

Objectives: To assess the accuracy of REMS in osteoporosis diagnosis at axial sites (lumbar spine and hip) compared with the gold standard, Dual-energy X-ray absorptiometry (DXA).

Methods: We enrolled patients aged from 50 to 75 years and performed a total of 1,699 and 1,794 lumbar spine and proximal femur scans with REMS and DXA. A quality checks on DXA and REMS acquired data were performed through direct examination of scans by experienced operators. We investigated the agreement between the two techniques calculating: Pearson's correlation coefficient (r), Standard Error of the Estimate (SEE) and efficiency (sensitivity and specificity) in identifying osteoporotic individuals (i.e. T-score ≤ -2.5).

Results: We found a good linear correlation between REMS and DXA BMD estimation, Pearson coefficient $r=0.938$ for lumbar spine and $r=0.933$ for proximal femur ($p<0.001$ for both). SEE values were 5.2% and 5.8% for lumbar spine and femoral site, respectively. In addition, REMS demonstrated a high sensitivity (92.9% and 92.3% for spine and femur) and specificity (93.5% for spine and 92.6% for femur) for the discrimination of osteoporotic patient. Moreover, considering together all the diagnostic classification categories (healthy, osteopenia and osteoporosis), the diagnostic agreement between REMS and DXA was 90.2% and 89.3% for lumbar spine and proximal femur sites, respectively.

Conclusion: REMS exhibited a high sensitivity and specificity in identifying osteoporotic patients at lumbar spine or proximal femur sites compared with gold-standard DXA. REMS accurately diagnosed osteoporotic patients in clinical routine, at both lumbar spine and proximal femur sites, without using ionizing radiation.

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[1] Di Paola M, Gatti D, Viapiana O, et al. Osteoporos Int, 2018

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