ABSTRACT

Introduction. Bariatric surgery, regardless the type of approach, has aggressively extended nowadays. The procedure saves lives due to substantial improvement of severe cardio-metabolic co-morbidities, but the influence of nutritional status might not be completely harmless including bone and muscle changes. Our purpose is to introduce data regarding skeleton after bariatric surgery. This is a narrative mini-review including papers from PubMed. A selection of 33 papers has been done.

General data. Longitudinal better than cross-sectional studies confirmed an annual rate of losing bone mineral density at lumbar and femoral neck of 3-10% starting with first year after surgery and continuing within the third year; low vitamin D and calcium absorption with associated secondary hyperparathyroidism is described; others anomalies include elevated bone remodelling markers, damage of bone microarchitecture, fracture healing disturbances and sarcopenia.

Conclusion. Overall, despite spectacular results after bariatric surgery, the bone and muscle are expected to suffer a level of deterioration, which should be taken into account for assuring an adequate quality of life and an immediate and distant good post-operatory prognosis.

Keywords: bariatric surgery, osteoporosis, bone

INTRODUCTION

Bariatric surgery, regardless the type of procedure, has aggressively extended nowadays not only to adults, but also to extreme ages (1-3). The procedure saves lives due to substantial improvement of severe co-morbidities as type 2 diabetes mellitus, obesity, high blood pressure, elevated uric acid and lipid profile disturbances, chronic inflammation, osteoarthritis, including the fact that it lowers the risk of some cancers and resets overall survival (4-6). Recent data, though, reflected that influence of nutritional status might not be completely harmless (like anaemia, vitamins and nutrients as copper, zinc, selenium that may be lost, hypoalbuminemia etc.) thus a connection with bone health in a negative way has been established (7-9). Moreover, some anaesthesia difficulties are presented from the begging during surgery and post-operatory (10).

OBJECTIVE

Our purpose is to introduce data regarding skeleton observations after bariatric surgery.

MATERIAL AND METHOD

This is a narrative mini-review including papers from PubMed. The area was restricted to English published manuscripts and humans. A selection of 33 papers has been done.

GENERAL DATA

The multidisciplinary team that will take care of a bariatric surgery patient also has to consider the metabolic and nutritional implications to skeleton
A rapid weight loss will aggravate the protein waste, including skeletal muscle damage accelerating sarcopenia, thus the need for progressive physical exercise to improve the general status of health (11). The two well known approaches, Roux-en-Y gastric bypass as well as sleeve gastrectomy cause lack of vitamin D, which is necessary to be replaced together with calcium supplements (11-13). The exact doses differs with approach, despite the general recognition of D-replacement (14). The target to treat when it comes to optimal levels of 25-hydroxyvitamin D in prior obese population is still controversial (15). A certain level of malabsorption is expected anyway and this might be the weak point in successful recovery after bariatric surgery without significant side effects (12,13). Endocrine anomalies that follows weight, inflammation, metabolic and nutritional changes involve fat – produced adipokines as leptin, adiponection, sexual hormones as estrogens and testosterone, inflammatory cytokines acting as autocrine agents and gut-derivate endocrine products as ghrelin, GLP-1 (glucagon-like peptide 1), GIP (gastric inhibitory peptide), 5-hydroxytryptamine etc (12,13,16). The bone deterioration correlated with severe weight loss after bariatric surgery includes micro-architecture disturbances, negative influence on fall, Bone Mineral Density (BMD) at central Dual-Energy X-Ray Absorptiometry (DXA) decrease, elevated bone turnover markers, hypovitaminosis D - related secondary hyperparathyroidism (17-19). One study on women after gastric by-pass revealed they had a significant loss of BMD at the lumbar spine and femoral neck and total body after 6, respective 12 months, while after sleeve gastrectomy the decrease was only for total body (20). BMD loss was correlated with ghrelin levels (20). Also, it seems that damage of DXA – BMD is higher if BMD is higher at baseline (20). Proposed mechanisms for skeleton anomalies after Roux-en-Y gastric bypass also includes intestinal loss of calcium and vitamin D, impairment of mechanical load etc (21). Artefacts of interpreting DXA and quantitative computer tomography are described related to adipose tissue amount changes (22). Other studies found no difference between the two procedures one year after (23-25). The rate of BMD decline seems more important that punctual value at some moment, that is why the diagnosis itself of osteoporosis is actually rare in most studies (23-25). All the mentioned disturbances are more intense in menopausal woman (23-25). The importance of longitudinal studies opposite to cross-sectional is revealed by annual rate of skeleton anomalies after surgery, for instance, a decline of 10% for femoral neck areal BMD and 8% for spine BMD has been found within 12 months after bariatric procedure was done (26). A pre-existing nutritional or bone damage represents supplementary risk factors for skeleton deterioration post-operative (27). Other observations referring to a population with a mean age of 46 years showed a femoral neck DXA- BMD loss of 10.2%, respective 3.2% at lumbar region after 12 months from surgery, while later on, during the third year after gastric procedure the decrease was plus 2.7%, respective 3.1% (28). Apart from menopausal status, the more advanced age is an additional risk factor for osteoporosis, but remarkably,
the diagnosis itself of newly discovered osteoporosis is rare in comparison to similar population without prior bariatric surgery (28-30). On the contrary, higher levels of remodeling markers and parathyroid hormone are expected, as well as a diminution of muscle mass (myopenia), while the changes in nutritional status may impair the recovery and healing process after a potential fragility fracture (31-33).

REFERENCES


CONCLUSION

Overall, despite spectacular results after bariatric surgery, the bone and muscle are expected to suffer a level of deterioration, which should be taken into account for assuring an adequate quality of life and an immediate and distant good post-operative prognosis.