Hypocalcemia and osteomalacia after bariatric surgery

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Summary

Introduction. Obesity has become a major health problem not only in industrialized societies but also in developing countries. Multiple studies have shown that bariatric surgery has been effective in reducing substantial amount of weight and also the comorbidities and is being performed more frequently as an established treatment. Due to anatomical and physiological alterations after surgery that impairs absorption of vitamin D and calcium, two fundamental factors in bone formation, their intestinal absorption is highly compromised.

Case report. We present a 48-year-old woman who was visited in emergency room for generalized bone pain, perioral paresthesia and carpopedal spasm. She had undergone bariatric surgery 15 years ago. Chvostek's sign and Trousseau's sign were positive. Examination of thoracic ribs elicited severe pain on palpation. Laboratory evaluation revealed: Ca = 6.1 mg/dL, P= 2.1 mg/dL, alkaline phosphatase = 432 (160-303), PTH= 541 pg/mL, and 25(OH)D 3= 3 ng/mL. X-rays of chest and pelvis were reported to be normal. The patient underwent whole body bone scan which showed increased uptake (Looser fractures) in the anterior arc of left 6th rib, posterior arc of left 6th and 12th ribs with increased uptake of costochondral joints (Figure 1 A).

After 1 year of treatment with high dose calcium and vitamin D, bone pain improved markedly. Laboratory evaluations showed: calcium=8.6 mg/dL, phosphorus=3.4 mg/dL, PTH=83 pg/mL and 25(OH)D 3=45 ng/mL. Whole body bone scan revealed healing of rib fractures and significant improvement in costochondral joints (Figure 1 B).

Discussion

According to World Health Organization, 39%(38% of men and 40% of women) and 13% (11% of men and 15% of women) of adults aged 18 years and older are overweight...
Figure 1 A, B - A) Whole body bone scan showing increased uptake (Looser fractures) in the anterior arc of left 6th rib, posterior arc of left 6th and 12th ribs with increased uptake of costochondral joints due to severe osteomalacia after bariatric surgery; B) Whole body bone scan revealed healing of rib fractures and significant improvement in costochondral joints after 1 year of treatment with high dose calcium and vitamin D.
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...and obese, respectively and prevalence of obesity has been doubled since 1980 (5). Vitamin D deficiency and insufficiency is another major problem that the modern world is confronting with (6). More than 75% of the US population has vitamin D insufficiency [serum 25(OH) vitamin D levels less than 30 ng/dL] (7, 8).

With increasing epidemics of obesity, the number of patients with morbid obesity and bariatric surgery as one of the established treatments of morbid obesity is also increasing. Nearly 1 in 7 American adults aged 20 years or older has a BMI ≥35 Kg/m² and 1 in 15 has a BMI ≥40 Kg/m² (9). According to the International Federation for the Surgery of Obesity and Metabolic Diseases (IFSO), the number of bariatric procedures reported worldwide has increased from 40000 in 1990 to 468609 in 2013 (10). There are several mechanisms predisposing patients undergoing bariatric surgery to severe vitamin D deficiency and osteomalacia. After surgery calcium and vitamin D absorption is compromised because of bypassing duodenum and proximal jejunum where normally they are absorbed. Mixing with biliopancreatic secretions in common channel and steatorrhea is another mechanism for calcium and vitamin D malabsorption (1-3, 11). In a study from Sweden, 65% of patients had serum 25(OH) vitamin D levels less than 20 ng/dL and 69% had elevated PTH levels after a median time of 11±2.8 years postsurgery (4). Similar results have been found in other studies despite replacement of vitamin D and calcium (12). As a result lifelong calcium and vitamin D supplements are mandatory for these patients. Daily consumption of 1200 to 1500 mg of elemental calcium and at least 3000 units of vitamin D is recommended by American Association of Clinical Endocrinologists, The Obesity Society, and American Society for Metabolic & Bariatric Surgery (13). Although it has been recommended that calcium citrate may be preferred over calcium carbonate salts for replacing calcium but in fact it may not be as effective in reducing elevated PTH after bariatric surgery as it was thought and potassium calcium citrate may be superior and having the possible advantage of reducing kidney stone formation after bariatric surgery (11). Also it has been mentioned that many patients need 6000 units of vitamin D to achieve the targeted 25(OH) D blood level of 30 ng/dL (13), however there are reports in literature that patients with osteomalacia may need to be treated with daily doses of up to 100000 units of vitamin D and 2500 mg of elemental calcium to correct established osteomalacia (14, 15). Endocrine Society recommends all patients undergoing bariatric surgery should be followed regularly and serum calcium, phosphorus, alkaline phosphatase, vitamin D, and PTH be measured every 6 months and vitamin and mineral deficiency replaced accordingly. Karefylikis et al. reported in their study that only 5.1% of patients had vitamin D supplementation 10.9 years after surgery (4). This is alarming and actually inadequate supplementation may be another cause of osteomalacia after bariatric surgery (14).

Patients may be treated inappropriately with assumption of other diagnoses like fibromyalgia, osteoarthritis, gout, intercostal neuralgia and even arthritis (14). Other than vitamin D deficiency and secondary hyperparathyroidism and osteomalacia, risk of osteoporosis, falls and fractures are also increased after bariatric surgery (1, 3, 11, 13).

Conclusion

In conclusion, our case highlights the possible consequences that bariatric surgery may have on bone and mineral health and the need for regular and proactive follow-up of the patients to prevent these complications and other catastrophes like hip fractures.

References