

CrossMark
click for updates

Bariatric surgery and secondary hyperparathyroidism; a mini-review

Ali Azarpey¹, Mahshid Imankhan², Sina Neshat^{3*}

Abstract

Bariatric surgery is a type of weight loss surgery that is commonly used to treat obesity. However, this surgery can also affect the body's calcium and PTH metabolism, leading to the development of secondary hyperparathyroidism (SHPT). Several factors contribute to the development of SHPT after bariatric surgery. Malabsorption of calcium due to reduced intestinal surface area, decreased intake of calcium-rich foods, and altered vitamin D metabolism play a significant role. The loss of weight-bearing adipose tissue can also disrupt the balance between bone formation and resorption, leading to increased bone turnover and calcium release from the skeleton. The management of SHPT after bariatric surgery involves a multidisciplinary approach. Calcium and vitamin D supplementation is essential to correct deficiency and maintain bone health. However, achieving optimal calcium and vitamin D levels can be challenging due to malabsorption issues and the need for higher supplementation doses. In some cases, pharmacological interventions such as calcimimetics or PTH analogs may be required to control PTH levels. However, these medications should be used cautiously due to limited data on their safety and efficacy in the bariatric surgery population. Prevention of SHPT is an important aspect of managing patients undergoing bariatric surgery. Nutritional counseling and regular monitoring of calcium, vitamin D, and PTH levels can help identify and address deficiencies early on. Additionally, using procedures that preserve the duodenum and proximal jejunum, such as duodenal switch or biliopancreatic diversion with duodenal switch, may reduce the risk of developing SHPT.

Keywords: Bariatric surgery, Sleeve gastrectomy, Osteomalacia, Osteoporosis, Secondary hyperparathyroidism, Gastric bypass, Vitamin D, Bone health, Parathormone

Please cite this paper as: Azarpey A, Imankhan M, Neshat S. Bariatric surgery and secondary hyperparathyroidism; a mini-review. *J Parathyroid Dis.* 2023;11:e11238. doi:10.34172/jpd.2023.11238.

Copyright © 2023 The Author(s); Published by Nickan Research Institute. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Introduction

Bariatric surgery, which includes the procedures like gastric bypass, sleeve gastrectomy, and adjustable gastric banding, has become increasingly popular as a treatment for obesity (1). While bariatric surgery is effective in achieving weight loss and improving overall health outcomes, it can also have negative effects on calcium and parathyroid hormone (PTH; parathormone) metabolism, leading to the development of secondary hyperparathyroidism (SHPT) (2-4). SHPT is a common complication following bariatric surgery, especially in procedures that bypass the duodenum and proximal jejunum, where calcium absorption predominantly occurs. The exact prevalence of SHPT after bariatric surgery varies depending on the procedure and the duration of follow-up, but studies have reported rates ranging from 13% to 71% (3,4).

Search strategy

For this review, we searched PubMed, Web of Science, EBSCO, Scopus, Google Scholar, Directory of Open Access

Journals (DOAJ), and Embase, using different keywords such as bariatric surgery, sleeve gastrectomy, osteomalacia, osteoporosis, secondary hyperparathyroidism, gastric bypass, vitamin D, bone health, calcium, malabsorption, and parathormone.,

Development of SHPT following bariatric surgery

Several factors contribute to developing SHPT after bariatric surgery. First, the surgery can cause a reduction in the surface area of the intestines, leading to decreased absorption of calcium (5,6). Additionally, patients may have decreased intake of calcium-rich foods after surgery. The surgery also alters vitamin D metabolism, which is important for calcium absorption. Lastly, losing weight-bearing adipose tissue can disrupt the bone formation and resorption balance, leading to increased bone turnover and calcium release from the skeleton (7,8). The symptoms of SHPT after bariatric surgery can include low levels of calcium in the blood, high levels of PTH, and increased markers of bone turnover. In severe cases,

Received: 17 July 2023, Accepted: 9 September 2023, ePublished: 23 September 2023

¹Emory University School of Medicine, Atlanta, Georgia, USA. ²Independent Researcher, 1514 Sheridan Rd NE apt 4014, Atlanta, Georgia, USA. ³Department of Biostatistics and Epidemiology, 550 16th St, University of California San Francisco, San Francisco, CA, USA

***Corresponding author:** Sina Neshat, Email: Seyedsinaneshat@ucsf.edu

■ Implication for health policy/practice/research/medical education

Secondary hyperparathyroidism (SHPT) is a common complication after bariatric surgery, particularly in procedures that bypass the duodenum and proximal jejunum. Managing SHPT requires a multidisciplinary approach, including appropriate supplementation, regular monitoring, and potential use of medications. Preventing SHPT through optimal surgical techniques and early identification of deficiencies is crucial for improving patient outcomes. Further research is needed to better understand the underlying mechanisms and optimal management strategies for SHPT after bariatric surgery.

it can lead to complications such as bone pain, fractures, and conditions like osteomalacia and osteoporosis (3,9). Treating SHPT after bariatric surgery involves a multidisciplinary approach. Calcium and vitamin D supplementation is crucial to correcting deficiencies and maintaining bone health. However, achieving optimal levels can be challenging due to issues with absorption and the need for higher doses of supplementation (10,11). In some cases, medications such as calcimimetics or PTH analogs may be used to control PTH levels. However, these medications should be used cautiously due to limited data on their safety and efficacy in the bariatric surgery population (12,13).

Prevention of SHPT after bariatric surgery

Prevention is an important aspect of managing SHPT after bariatric surgery. This involves nutritional counseling and regular monitoring of calcium, vitamin D, and PTH levels to identify deficiencies early on. Additionally, the use of surgical techniques that preserve the duodenum and proximal jejunum may help reduce the risk of developing SHPT (3,10).

Conclusion

SHPT is a common complication following bariatric surgery, especially in procedures that bypass the duodenum and proximal jejunum. The management of SHPT requires a multidisciplinary approach, including appropriate nutritional supplementation, regular monitoring, and potential pharmacological interventions. Prevention of SHPT through optimal surgical techniques and early identification of deficiencies is crucial for improving patient outcomes. Further research is needed to better understand the pathophysiology and optimal management strategies for SHPT after bariatric surgery.

Authors' contribution

Conceptualization: Ali Azarpey, Sina Neshat.

Data curation: Sina Neshat.

Funding acquisition: Sina Neshat.

Investigation: Sina Neshat.

Resources: Sina Neshat, Mahshid Imankhan.

Supervision: Sina Neshat.

Validation: Sina Neshat.

Visualization: Ali Azarpey, Sina Neshat.

Writing—original draft: Sina Neshat.

Writing—review and editing: Mahshid Imankhan, Ali Azarpey.

Conflicts of interest

The authors declare that they have no competing interests.

Ethical issues

Ethical issues (including plagiarism, data fabrication, double publication) have been completely observed by the authors.

Funding/Support

None.

References

1. Karmali S, Johnson Stoklossa C, Sharma A, Stadnyk J, Christiansen S, Cottreau D, Birch DW. Bariatric surgery: a primer. *Can Fam Physician*. 2010;56:873-9.
2. Franco JV, Ruiz PA, Palermo M, Gagner M. A review of studies comparing three laparoscopic procedures in bariatric surgery: sleeve gastrectomy, Roux-en-Y gastric bypass and adjustable gastric banding. *Obes Surg*. 2011 ;21:1458-68. doi: 10.1007/s11695-011-0390-5.
3. Baretta GA, Cambi MP, Rodrigues AL, Mendes SA. Secondary hyperparathyroidism after bariatric surgery: treatment is with calcium carbonate or calcium citrate? *Arq Bras Cir Dig*. 2015;28 Suppl 1:43-5. doi: 10.1590/S0102-6720201500S100013.
4. Wei JH, Lee WJ, Chong K, Lee YC, Chen SC, Huang PH, et al. High Incidence of Secondary Hyperparathyroidism in Bariatric Patients: Comparing Different Procedures. *Obes Surg*. 2018;28:798-804. doi: 10.1007/s11695-017-2932-y.
5. Alexandrou A, Tsoka E, Armeni E, Rizos D, Diamantis T, Augoulea A, et al. Determinants of Secondary Hyperparathyroidism in Bariatric Patients after Roux-en-Y Gastric Bypass or Sleeve Gastrectomy: A Pilot Study. *Int J Endocrinol*. 2015;2015:984935. doi: 10.1155/2015/984935.
6. Altawil E, Alkofide H, Alamri H, Alhassan N, Alsubaie H, Alqahtani A, et al. Secondary Hyperparathyroidism in Obese Patients Post Sleeve Gastrectomy. *Diabetes Metab Syndr Obes*. 2021;14:4059-4066. doi: 10.2147/DMSO.S325148.
7. Institute of Medicine (US) Committee to Review Dietary Reference Intakes for Vitamin D and Calcium; Ross AC, Taylor CL, Yaktine AL, et al, editors. *Overview of Calcium*. In: *Dietary Reference Intakes for Calcium and Vitamin D*. Washington (DC): National Academies Press (US); 2011. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK56060/>.
8. Ben-Porat T, Elazary R, Sherf-Dagan S, Goldenshluger A, Brodie R, Mintz Y, et al. Bone Health following Bariatric Surgery: Implications for Management Strategies to Attenuate Bone Loss. *Adv Nutr*. 2018;9:114-127. doi: 10.1093/advances/nmx024.
9. Williams SE. Metabolic bone disease in the bariatric surgery patient. *J Obes*. 2011;2011:634614. doi: 10.1155/2011/634614.
10. Corbeels K, Verlinden L, Lannoo M, Simoens C, Matthys C, Verstuyf A, et al. Thin bones: Vitamin D and calcium handling after bariatric surgery. *Bone Rep*. 2018 Feb 2;8:57-63. doi: 10.1016/j.bonr.2018.02.002.
11. Muschitz C, Kocijan R, Haschka J, Zendeli A, Pirker T, Geiger C, et al. The Impact of Vitamin D, Calcium, Protein Supplementation, and Physical Exercise on Bone Metabolism After Bariatric Surgery: The BABS Study. *J Bone Miner Res*. 2016;31:672-82. doi: 10.1002/jbmr.2707.
12. Hiramitsu T, Hasegawa Y, Futamura K, Okada M, Goto N, Narumi S, et al. Treatment for secondary hyperparathyroidism focusing on parathyroidectomy. *Front Endocrinol (Lausanne)*. 2023 Apr 20;14:1169793. doi: 10.3389/fendo.2023.1169793.
13. Islam AK. Advances in the diagnosis and the management of primary hyperparathyroidism. *Ther Adv Chronic Dis*. 2021;12:20406223211015965. doi:10.1177/20406223211015965.