

Hypocalcemia associated with thyroidectomy: experience in two private centers in Uruguay

Volume 14 Issue 6 - 2023

Guarneri C, Salada R, Parada U, Ramírez L, Elicegui V, Cazabán L

Facultad de Medicina, Universidad de la República, Uruguay

Correspondence: Ulises Parada, Assistant Surgeon of the Surgical Clinic "A", Hospital de Clínicas Universidad de la República, Montevideo, Uruguay, Tel 099313877, Email ulisesparada@montevideo.com.uy

Received: November 25, 2023 | **Published:** December 06, 2023

Introduction

Thyroid surgery is one of the most frequent procedures in the field of endocrine surgery. Postoperative complications include hypocalcemia, uni- or bilateral recurrent paralysis and asphyxial hematoma. Transient hypocalcemia due to hypoparathyroidism is the most frequent complication of cervical surgery, generally linked to the deficit of parathyroid hormone (PTH) secretion. In most cases it is asymptomatic (mild), although in more severe cases it may manifest with peribuccal paresis, spasms, tetany or convulsions.¹ The frequency with which this complication appears is difficult to establish and varies according to the parameters analyzed. A meta-analysis of observational studies in the United Kingdom shows an incidence after thyroidectomy of 27% for transient hypoparathyroidism and 1% (0-3%) for permanent hypoparathyroidism.²

Risk factors associated with post-thyroidectomy hypocalcemia are described: major procedures such as total thyroidectomy (TT), associated nodal emptying, reinterventions and the experience of the team involved. The number of identified and preserved parathyroids is an element of debate. Although the literature reflects the importance of identifying and respecting them, it is argued that the perception of indemnity is a subjective, technically dependent parameter with little prognostic value. The resection of one or more parathyroid glands, whether or not it is noticed, as well as partial or total devascularization, is responsible for transient or permanent hypoparathyroidism. It is for this reason that the need arises to generate protocols for its prevention, postoperative evaluation and treatment.³

Objectives

To evaluate the incidence of transient and permanent hypocalcemia in relation to thyroid surgery performed in two private centers under the responsibility of a trained team. Secondly, to know the relationship between hypocalcemia and surgical tactics, sex, age and nature of the thyroid disease to be treated.

Material and methods

A retrospective, observational and descriptive study was performed in which all patients with thyroid pathology operated on in two private centers in the period between June 2017 and April 2022 were included. The surgical team, pathologists and laboratory physicians were retained in all the cases included. The information was obtained from the pathologic anatomy database and review of laboratory results of each patient included. Population data such as age, sex and thyroid pathology, surgical procedure performed, postoperative pathologic anatomy, total calcium and albuminemia (if applicable) pre and postoperative were taken.

Inclusion and exclusion criteria were established:

Inclusion criteria:

- Over 18 years old
- The surgical team is the same

Exclusion criteria:

- Patient with previous hypoparathyroidism
- Patient with previous hypocalcemia
- Absence of required data

Total calcium values lower than 8.1 mg/dL were established as hypocalcemia by correcting total calcium (if applicable) according to albumin by the following formula $(4 - \text{albumin}) \times 0.8 + \text{calcemia (mg/dL)}$ to exclude pseudohypocalcemia.

Patients who persist under treatment for hypocalcemia one year after surgery were considered permanent hypoparathyroidism; and transient hypoparathyroidism was considered that which corrects in a period of less than 12 months.

Surgical procedures were classified:

- Total thyroidectomy: resection of the entire thyroid gland.
- Lobectomy with or without isthmectomy
- Neck re-intervention (complete thyroidectomy or lateral cervical evacuation)
- Lateral or central ganglionic emptying

The variables were crossed with the measurement in the first 72 hours of the postoperative period of the minimum plasma calcium value, which represents the minimum corrected calcemia record obtained in each patient. The data obtained were analyzed with the use of software jupyter-notebooks, with python 3.6 for the development of descriptive statistics. A statistical significance level $< 5\%$ (p-value < 0.05) was used.

Results

A total of 116 medical records were evaluated, 13 of which were excluded. The average age of the included patients was 47 years

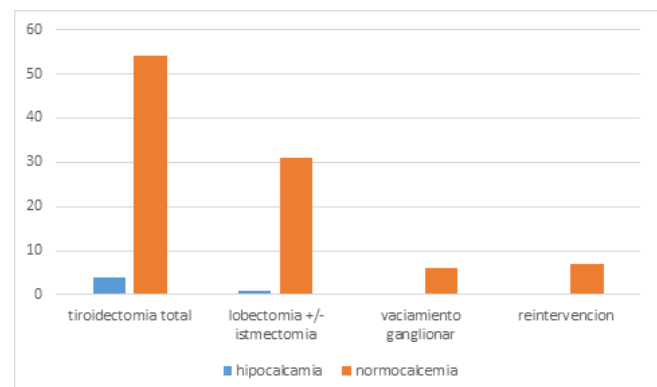
with a minimum of 20 and a maximum of 76. The variables studied are shown in Table 1. Hypocalcemia was found in the first 72hs in 5 patients (4.9%), while it persisted in the evolution (permanent hypoparathyroidism) in only one case (0.97%). When relating the presence of hypoparathyroidism with age (p 0.197), sex (p 0.319), finding of parathyroid in the specimen (p 0.087), procedure (p 0.627) (Graph 1) and nature of the disease ($p=1$), it is highlighted that there was no statistically significant relationship between these variables (Table 2).

Table 1 Distribution according to variables

Variable	N° patients	Percentage
Revised histories	116	100
Including	103	89
excluded	13	11
Age		
Under 45	46	45
Greater than or equal to 45	57	55
Sex		
Female	73	72
Male	30	28
Procedure		
Total thyroidectomy	58	56,3
Lobectomy +/- Isthmectomy	32	31,1
Reintervention	7	6,8
Nodal emptying	6	5,8
Disease		
Benigna	48	46,6
Maligna	55	53,4
Pathological anatomy		
Go parathyroid	11	10,7
Does not see parathyroid	92	89,3
Definitive hypoparathyroidism		
Yes	1	99,03
No	102	0,97

Table 2 Relationship between variables and hypocalcemia in the first 72hrs

Variable	Hypocalcemia (n)	p-value
Age		
Under 45	4	0,197
Greater than or equal to 45	1	
Sex		
Woman	5	0,319
Man	0	
AP piece with parathyroid		
Hypocalcemia	2	0,087
Normocalcemia	9	
Procedure		
Total thitoidectomy	4	0,627
Lobectomy +/- isthmectomy	1	
Emptying	0	
Reintervention	0	



Graph 1 Procedure vs. hypocalcemia in the first 72hrs.

Discussion

Hypocalcemia as a complication of thyroidectomies is an entity that should be taken into account by the surgical team.

The incidence of transient hypoparathyroidism varies between 16% and 71% and permanent hypoparathyroidism between 1% and 4%. In our setting, a university center has reported an incidence of definitive hypoparathyroidism of 6%,⁴ in agreement with other studies.⁵ Hypoparathyroidism in the first 72 hours was reported in 90% of the patients operated on. However, we emphasize that the cut-off point of the laboratory of this institution is 8.5mg/dL, which differs according to the reagent and the center where it is performed.

On the other hand, in the present study we highlight the presence of definitive hypoparathyroidism in 0.97% of the cases, while in the first 72hs it manifested itself in only 4.9% of the cases.

Several mechanisms are involved in post-surgical hypocalcemia:

- Direct injury to the gland(s): by devascularization, inadvertent partial or complete excision.
- Indirect injury: thermal or light injury.

After the surgical procedure it is usual that there is a “dulling” of the glandular function so we must control clinically and biochemically the parameters that reflect the same in the first hours, days and weeks. Generally speaking, the glands resume their activity and in some cases it can lead to a transitory or permanent hypoparathyroidism.⁶

The functionality of the parathyroids depends on the concentration of plasma calcium; its decrease stimulates the synthesis and secretion of PTH with its subsequent calcium homeostatic effect. The total calcium value is closely related to albuminemia, its decrease imposes the calculation of the real calcium according to established formulas for its correction.

With a view to early detection of hypocalcemia, it has been protocolized to obtain samples for calcemia with preoperative and postoperative albuminemia every 6 hours in the first 24 hours. Then every 12 hours and every 24 hours after the third day. Hypocalcemia is defined as total calcium values below the lower limit of the institutional laboratory, which in our center is 8.1 mg/dL. Another point to keep in mind is the recommendation to evaluate the vitamin D status prior to surgery, since several studies have related its deficit with transient hypocalcemia. It is also important to detect patients with malabsorptive problems and to request a magnesium determination prior to surgery.⁷

Multiple publications have reflected the usefulness of measuring rapid intraoperative PTH (iPTH) and intact PTH (iPTH) in the early postoperative period. The short half-life of PTH (3-5 minutes) allows postoperative decision making based on its levels. PTHiop is determined from blood samples drawn during or shortly after surgery. In many hospitals it provides a rapid result, whereas routine determination of intact PTH may not be fast enough to make therapeutic decisions postoperatively.⁸

Post-surgical PTH decreases greater than 80% as well as iPTH levels below 10-15 pg/ml in the first 24 hours postoperatively have demonstrated high sensitivity and specificity for predicting the development of hypocalcemia.⁹ Although we have not used PTH as a predictor, for reasons of cost and availability, we firmly believe that it is a useful tool to keep in mind for the postoperative management of these patients. Some factors identified as risk factors for post-surgical hypocalcemia have been described, such as: young age, female sex, the finding of parathyroid in the surgical specimen, neck reoperation and neck lymph node emptying as an associated procedure. In the present study we have not found a significant statistical relationship between these variables and the presence of postoperative hypocalcemia. However, we emphasize the importance of these procedures being performed by a trained team, in a systematized way and with strict clinical and biochemical postoperative control.

Conclusion

Thyroid surgery is a procedure not without risks, hypoparathyroidism being one of them. The presence of permanent hypoparathyroidism is less than 1%, an acceptable figure according to other bibliographies. It is essential to establish postoperative control protocols to detect this complication. We found no relationship between age, sex, procedure or nature of the disease and the presence of post-surgical hypoparathyroidism.

Acknowledgments

None.

Conflicts of interest

Authors declare that there is no conflict of interest.

References

1. Orloff LA, Wiseman SM, Bernet VJ, et al. American Thyroid Association statement on postoperative hypoparathyroidism: diagnosis, prevention, and management in adults. *Thyroid*. 2018;28(7):830–841.
2. Edafe O, Antakia R, Laskar N, et al. Systematic review and meta-analysis of predictors of post-thyroidectomy hypocalcaemia. *Br J Surg*. 2014;101(4):307–320.
3. Lorente-Poch L, Sancho JJ, Muñoz-Nova JL, et al. Defining the syndromes of parathyroid failure after total thyroidectomy. *Gland Surg*. 2015;4(1):82–90.
4. Gabriela M, Beatriz M. Incidence of postsurgical hypocalcemia in thyroidectomies at the Hospital de Clínicas. *Revista Médica del Uruguay*. 2020;36(3):134–156.
5. Wang W, Xia F, Meng C, et al. Prediction of permanent hypoparathyroidism by parathyroid hormone and serum calcium 24h after thyroidectomy. *Am J Otolaryngol*. 2018;39(6):746–750.
6. Méndez A, Chagcha L. Prevalence of post-surgical hypocalcemia and neuromuscular clinical manifestations in patients undergoing total thyroidectomy at Hospital Teodoro Maldonado Carbo from October 1, 2015 to March 31, 2016. Guayaquil: Universidad Católica de Santiago de Guayaquil; 2016. 54 p.
7. Huguet I, Muñoz M, Cortés M, et al. Protocol for the diagnosis and management of hypocalcemia in postoperative thyroid surgery. *Rev Osteoporos Metab Miner*. 2020;12(2):71–76.
8. Stack BC, Bimston DN, Bodenner DL, et al. American association of Clinical Endocrinologists and American College of Endocrinology disease state clinical review: postoperative hypoparathyroidism-definitions and management. *Endocr Pract*. 2015;21(6):674–685.
9. Huguet I, Muñoz M, Cortés M, et al. Protocol for the diagnosis and management of hypocalcemia in postoperative thyroid surgery. *Rev Osteoporos Metab Miner*. 2020;12(2):71–76.