SÃO PAULO MEDICAL JOURNAL

REVIEW & UPDATING

Antonio José Gonçalves, Laércio Martins, Tania Regina Bastos de Souza, Paulo Jorge Correia Alves, Alexandre Schiola, Oswaldo Angel Bellido Rios, Adriana Ribeiro dos Santos

Clinical and laboratorial correlation of postoperative hypocalcemia after extensive thyroidectomy

Departament of Surgery of Santa Casa School of Medicine - São Paulo, Brazil

The medical records of 84 patients submitted to extensive thyroidectomy from January 1991 to April 1995 were reviewed and the data was analyzed in order to verify a correlation between postoperative laboratories results and physical findings suggestive of hypocalcemia. It was verified that there was hypocalcemia in 51.2 percent of the patients, of which only 18.6 percent presented symptoms. It was concluded that asymptomatic hypocalcemia is frequent in extensive thyroidectomy and a routine screening for serum calcium in the postoperative period following thyroidectomy and calcium reposition must be systematic.

UNITERMS: Thyroid, hypocalcemia, thyroidectomy.

INTRODUCTION

The thyroid can be affected by many diseases which can be treated by surgery. The extent of surgical resection of the thyroid gland has been dictated by the pathology and the site of the disease. Thyroidectomy may cause various complications,[1-4] one of which is hypocalcemia. It is not unusual for patients undergoing operative procedures on the thyroid gland to experience a transient or permanent drop in serum calcium following operation.

The causal mechanism of this hypocalcemia has still not been completely elucidated; however, this metabolic disorder is attributed to surgical damage inflicted on the parathyroid glands during thyroidectomy; for example, devascularization, trauma or exeresis, or to local postoperative complications such as compromise of the blood supply of the parathyroid,[1,2,6-10] edema, hematomas, and infection.[9] Other causes such as parathyroid suppression due to reabsorption of bone calcium in hyperthyroidism patients, an increase in renal excretion of calcium due to postoperative hemodilution, an increase in the release of calcitonin resulting from thyroid gland manipulation, the loss of bone calcium in thyrotoxic osteodystrophy patients, and autoimmune fibrosis of the blood supply of the parathyroid gland are also implicated in the etiology of hypocalcemia, but need further confirmation.

Hypocalcemia is more frequent in extensive thyroidectomy when compared to minor resections of the thyroid gland, in the ligation of the inferior thyroid artery,[2] and has been related to the surgeon's experience. Cakmakli et al.,[11] in a prospective study, reported no difference with and without bilateral ligation of the inferior thyroid artery in subtotal thyroidectomy.

The objective of this paper is to verify if present physical findings are present in postoperative hypocalcemia and to analyze its incidence.

CASES AND METHOD

The medical records of 84 patients who underwent extensive thyroidectomy between January 1991 and April 1995 were reviewed and statistically analyzed in the Head

Address for correspondence:
Antonio José Gonçalves
Rua Tabapuã, 500 cj. 23 - Itaim-Bibi
São Paulo/SP - Brasil - CEP - 04533-001

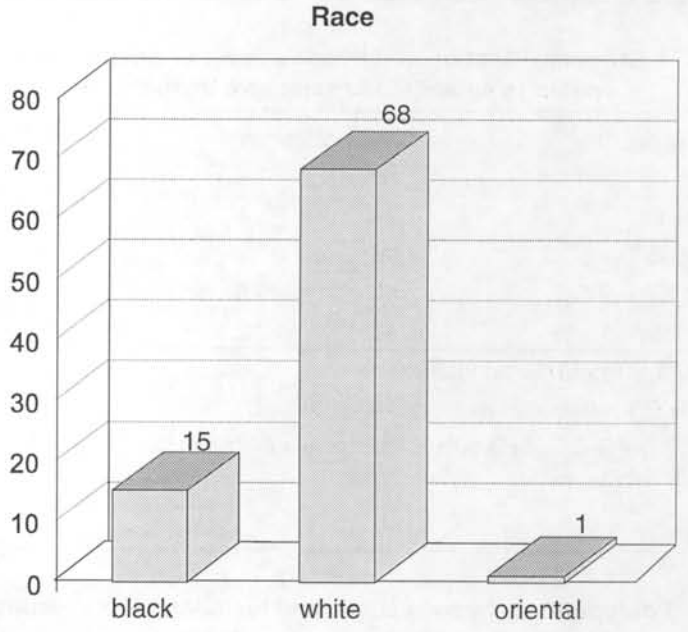
and Neck Discipline of the Department of Surgery of Santa Casa School of Medicine, São Paulo, Brazil.

It included only patients who underwent extensive thyroidectomies who had postoperative total serum calcium measure. Total thyroidectomy and bilateral and unilateral subtotal thyroidectomies associated with contralateral hemithyroidectomy were considered extensive thyroidectomies.

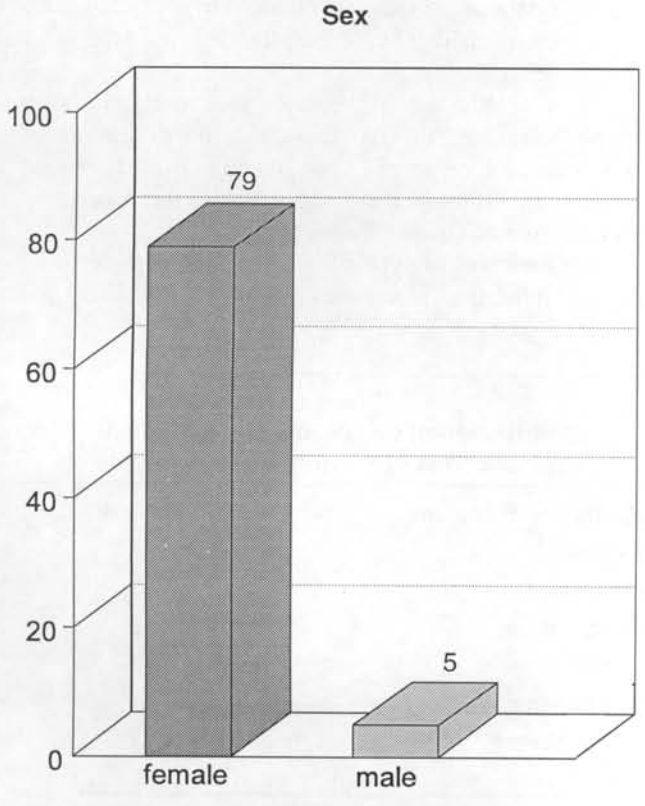
Total serum calcium was measured in the immediate postoperative period or on the first day. The measure of serum calcium was made using the ortocresoftalein-complexone method without deproteinzation by espectrophotometer. Hypocalcemia was deemed existent when total serum calcium was lower than 8.5 mg/dl.[12]

Seventy-nine patients were female (94.1 percent) and just 5 were male (5.9 percent), being 15 black, 68 white and 1 Asian. The medium age was 44 with a range of 15 to 73 years (Graphics 1 and 2).

Fifty-eight (69 percent) patients were submitted to total thyroidectomy, 17 (20.3 percent) underwent bilateral subtotal thyroidectomy, and nine (10.7 percent) unilateral subtotal associated with contralateral hemithyroidectomy (lobectomy + istmectomy) (Table 1).



Graphic 2 - Clinical and laboratorial correlation of postoperative hypocalcemia in extensive thyroidectomy



Graphic 1 - Clinical and laboratorial correlation of postoperative hypocalcemia after extensive thyroidectomy

Histopathologic results were shown in Graphic 4.

Statistical analysis was performed using the chi-square technique.

RESULTS

The unilateral subtotal thyroidectomy associated with contralateral hemithyroidectomy was the most prevalent surgical resection causing hypocalcemia. It occurred in 66.6 percent (6/9) of the cases, followed by total thyroidectomy in 53.4 percent (31/58) and by bilateral subtotal thyroidectomy in 35.3 percent (6/17). The statistical analysis performed showed no significant difference between the occurrence of hypocalcemia when compared to different surgical procedures ($p>0.05$) (Table 1).

Forty-three patients (51.2 percent) had hypocalcemia, but only 8 (18.6 percent) had signs and symptoms. Chvostek's sign was the most frequent, followed by paresthesia, Trousseau's sign, myalgia, and facial and carpopedal spasms (Chart 1).

Table 1
Surgery resection and hypocalcemia correlation in 84 patients submitted to extensive thyroidectomy.

Surgery	Hypocalcemia		Total
	N°	%	
T.T.	3	53.4	58
S.B.T.	06	35.3	17
H.T. + S.C.T.	06	66.6	09
Total	43	52.2	84

T.T.= Total Thyroidectomy

S.B.T.= Subtotal Bilateral Thyroidectomy

H.T. + S.C.T. = Hemithyroidectomy + Subtotal Contralateral Thyroidectomy

Table 2
Postoperatory hypocalcemia and histopathologic results in 84 patients submitted to extensive thyroidectomy.

Surgery	Hypocalcemia		Total
	N°	%	
Benign	26	46.4	56
Malign	17	60.7	28
Total	43	51.2	84

The incidence of hypocalcemia in patients with malignant disease was higher (60.7 percent) than those with benign disease (46.4 percent). An analysis of hypocalcemia revealed no statistically significant difference between these groups, p>0.05 (Table 2).

Hypocalcemia was treated in 14 patients (32.5 percent) with intravenous infusion of 10 percent calcium gluconate solution, oral calcium chloride, or both. In some patients, the laboratory results were obtained in the first ambulatory return wherein hypocalcemia was treated.

DISCUSSION

As the extent of the resection of the thyroid increases, the risk of complications such as hypocalcemia and vocal cord paralysis also increase. This is due to bruising, exeresis, and compromise of the blood supply of the parathyroid gland .[1]

Postoperative hypocalcemia can be classified as transient or permanent, the latter lasting more than 60 days[5] up to 6 months.[9] It should be noted that the classification of hypocalcemia as transient or permanent is difficult. Both have the same physical findings and the same treatment, the only difference is the time of evolution of more or less than 60 days. In the present paper, hypocalcemia was not divided into these two groups (permanent or transitory). We found a higher incidence of hypocalcemia than that described in the literature,[2,4,5,7,9,10,12-14] although the reported frequency varies from 0.2 to 83 percent.[5,6]

Hypocalcemia creates a great deal of apprehension on the part of the physician because of immediate and long-term complications.[15] Chronic complications are intracranial calcifications, particularly of the basal ganglia, various mental disturbances, such as irritability, depression, and even psychosis. Papilledema and other signs of increased intracranial pressure have been reported. Chronic hypocalcemia may lead to cataract formation, abnormalities of the skin, nails and hair, candida infections and dermatology anomalies. Cardiac effects of hypocalcemia include prolongation of the QT interval and, rarely, congestive heart failure. Dental anomalies depend on the age at onset; in children hypocalcemia can cause enamel hypoplasia and failure of the adult teeth to erupt.[16]

Murakami[13] reported that inorganic urine phosphate is a predictive factor in the diagnosis of immediate or long-term hypocalcemia. Low levels of inorganic urine phosphate are observed in the permanent hypocalcemia of Graves' Disease.

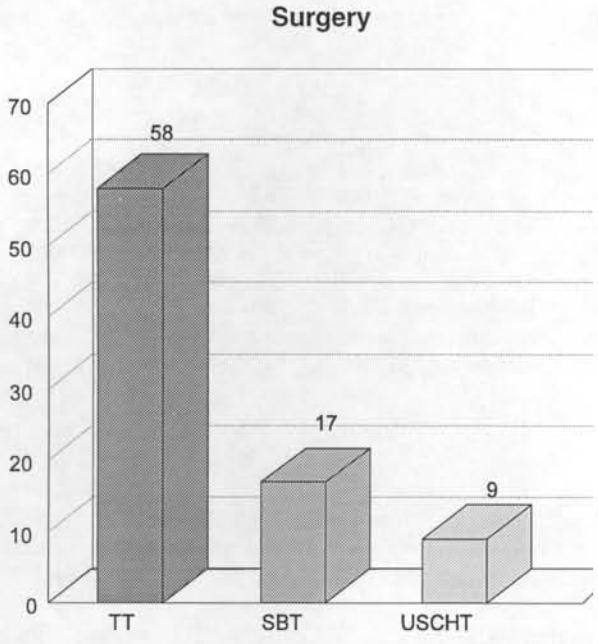
The incidence of hypocalcemia in total thyroidectomy was not higher than in subtotal thyroidectomy. This does

Chart 1
Distribution of symptoms and signals of hypocalcemia of 8 symptomatic patients

Signals and Symptoms	Patients
Chvostek	7
paresthesia	6
Trousseau	3
myalgia	2
facial spasms	1
carpal spasms	1
pedal spasms	1

Patients with hypocalcemia N=43

Symptomatic patients ¦ N=8(18.6%)



TT= total thyroidectomy; SBT= subtotal bilateral thyroidectomy; USCHT= unilateral subtotal + contralateral hemithyroidectomy

Graphic 3- Clinical and laboratorial correlation of postoperative hypocalcemia after extensive thyroidectomy

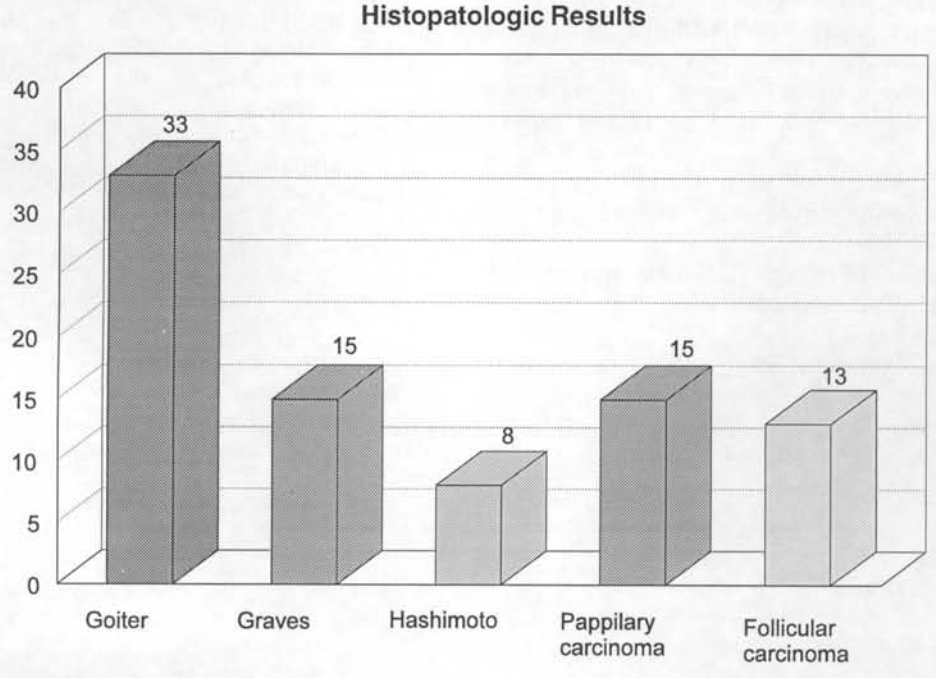
not agree with the literature.[1,7] Hemithyroidectomy plus subtotal contralateral thyroidectomy was the most frequent procedure associated with hypocalcemia in the present series. The occurrence of hypocalcemia was not influenced by the malignant potential of the disease.

La Gamma found 49 percent of asymptomatic hypocalcemia in his study, while McHenry found 67.9 percent. In this study, asymptomatic hypocalcemia was found in 81.4 percent. When the balance between ionized and protein-bound calcium is acutely altered, the symptoms may be precipitated.[13]

Hypocalcemia following extensive thyroidectomy must always be investigated because of the infrequent symptoms and grave complications if there is not adequate repositioning.

CONCLUSION

We concluded that hypocalcemia is frequent in the postoperative of extensive thyroidectomy but physical findings are uncommon, and thus following extensive thyroidectomy, serum calcium investigation is mandatory.



Graphic 4 - Clinical and laboratorial correlation of postoperative hypocalcemia after extensive thyroidectomy

RESUMO

Foram analisados os prontuários de 84 pacientes submetidos a tiroidectomias extensas no período de janeiro de 1991 a abril de 1995 correlacionando as dosagens pós-operatórias de cálcio sérico com o aparecimento de sinais e sintomas clínicos sugestivos de hipocalcemia. Constatou-se que houve hipocalcemia laboratorial em 51,2% dos pacientes e que apenas 18,6% deles apresentaram sintomas. Concluiu-se que nas tiroidectomias extensas o índice de hipocalcemia assintomática é elevado devendo ser sistemática a dosagem pós-operatória de cálcio e sua reposição quando diminuída, independente do tipo de cirurgia realizada, da indicação cirúrgica e do achado anatomopatológico. O seguimento destes pacientes deve ser rigoroso e periódico evitando-se as complicações de um possível hipoparatiroidismo permanente que na maioria das vezes é subclínico.

REFERENCES

1. Kahky MP, Weber RS. Complications of surgery of the thyroid and parathyroid glands. Surg Clin N Amer 993;73(2):307-21.
2. Lo Gerfo P, Gates R, Gazetas P. Outpatient and short-stay thyroid surgery. Head & Neck 1991;13(2):97-101.
3. Sugino K, Kure Y, Iwasaki H. Does total thyroidectomy induce metabolic bone disturbance? Intl Surg 1992;77(3):178-80.
4. Reeve T, Delbridge L, Brady P. Secondary thyroidectomy: A twenty-year experience. World J Sur 1988; 12(4):449-53.
5. Claussen MS, Pehling GB, Kisken WA. Delayed recovery from post-thyroidectomy hypoparathyroidism: A case report. Wisc Med J 1993;92(7):331-4.
6. Demeester-Mirkine N, Hooghe L, Van Geertruyden J, De Maertelaer V. Hypocalcemia after thyroidectomy. Arch Surg 1992; 127(7):854-8.
7. Elin RJ. Intervalos de referência e valores laboratoriais de importância clinica. In: Wingaarden JB, Smith LM, eds: Cecil Tratado de Medicina Interna, Vol. 2, Rio de Janeiro: Editora Guanabara Koogan, 1990:2103-14.
8. Lyerly HK. The thyroid gland. In: Sabiston Jr DC, ed. Textbook of Surgery: The biological basis of modern surgical practice. Philadelphia: W.B. Saunders Company, 1991:556-90.
9. McHenry CR, Speroff T, Wentworth D, Murphy T. Risk factors for post-thyroidectomy hypocalcemia. Surg 1994; 116(4):641-7.
10. Osime U, Ofili OP. Incidence of hypoparathyroidism following thyroidectomy in a prospective study of 108 consecutive African patients. Central African J Med 1992;38(8):343-5.
11. Cakmakli S, Aydintug S, Erdem E. Post-thyroidectomy hypocalcemia: Does arterial ligation play a significant role? Intl Surg 1992;**77**(04):284-6.
12. Herranz-Gonzalez J, Gavilan J, Matinez-Vidal J, Gavilan C. Complications following thyroid surgery. Arch Otolaryngol Head Neck Surg 1991;117(5):516-8.
13. Murakami T, Tajiri J, Noguchi S. Prediction of the outcome of postoperative hypocalcemia in Graves' Disease. Endocrinologia Japonica 1992; 39(1):103-7.
14. Smith MA, Jarosz H, Hessel P. Parathyroid autotransplantation in total thyroidectomy. American Surgeon 1990; 56(7):404-6.
15. Kalisnik M, Zorc-Pleskovic R, Pajer Z. The effect of chronic hypercalcemia or hypocalcemia on the follicular and parafollicular cells in rat thyroid gland. A J Anat 1990;189(3):201-6.
16. Attie M. Hypocalcemic symptoms following parathyroidectomy. JAMA 1991;265 (21):2888.