

CALCIUM LEVEL, A PREDICTIVE FACTOR OF HYPOCALCEMIA FOLLOWING TOTAL THYROIDECTOMY

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CALCIUM LEVEL, A PREDICTIVE FACTOR OF HYPOCALCEMIA FOLLOWING TOTAL THYROIDECTOMY (Abstract): The purpose of this research was made necessary by the progressive increase in costs for medical assistance, together with a decrease in the number of available hospital beds and therefore raising the necessity for a shorter stay in hospital and safe hospital discharge. *Methods:* This research is based on a study group of 206 patients, who had recently undergone total thyroidectomy surgery due to different pathologies (functional or non functional goiter, Basedow disease, differentiated carcinoma, medullar carcinoma). In order to discharge the patients safely within 24 hours after surgery, not well accepted by all the patients – the serum calcium level was postoperatively measured at regular intervals, after 6, 12 and 18 hours. We used the variance analysis of the 3 samples, utilizing the p-value to verify the possibility of reducing the necessary number of blood samples to two when calculating the risk factor of hypocalcemia. *Conclusion:* We can consider the evaluation of the calcium level at 6 and 18 hours, sufficient to establish a calcium trend. All the patients who had registered a positive or doubt trend of calcium levels can be discharged the day after surgery, with minimum risk of subsequent hypocalcemia. The cases that registered a negative trend of calcium levels during the recovery, can not be considered as certain indicator of late hypocalcemia and therefore it is necessary to measure the PTH level, which gives highly predictive values both in scientific literature and also in our research: in 93.5% of the cases, a correlation between the PTH levels and an eventual development of hypocalcemia was noted.

KEY WORDS: HYPOCALCEMIA; CALCIUM SLOPE; TOTAL THYROIDECTOMY

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INTRODUCTION

Total thyroidectomy, similar to hemithyroidectomy, is followed by a significant reduction in the plasmatic concentration of PTH [1]. It is associated with a parallel reduction in calcium levels, evident but transitory in a quarter of patients following surgery and permanent in 1% of patients [2]. The frequency of this phenomenon, which can occur during the successive hours after surgery, has recently been the subject of many research programmes, examining the definition of an algorithm that identifies patients with a high risk of postoperative hypocalcemia [3].

In the modern climate of increasing cost awareness, thyroid surgery has been considered for a 1 day-surgery regime with limiting factors for early discharge being postoperative bleeding (1-2%), bilateral recurrent laryngeal nerve palsy and symptomatic hypocalcemia [4,5]. Postoperative hypocalcemia after total thyroidectomy is a serious concern because it is the most frequent complication after thyroid surgery [6-8]. It is usually evident in the first 24 hours.

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A reliable method that could accurately identify patients who are at high risk for hypocalcemia may assist in the selection of patients suitable for early discharge [3]. The aim of the present work is to evaluate the risk of hypocalcemia following thyroid surgery and to determine whether early serial postoperative serum calcium levels after total thyroidectomy can be used to develop an algorithm identifying patients who are unlikely to develop significant hypocalcemia and can be safely discharged within 24 hours after surgery.

There is an open debate in scientific literature regarding the use of early parathyroid hormone (PTH) levels as a predictor of significant hypocalcemia [9]. The cost factor is the major limitation for its wider clinical use. A purpose of this research was to verify the predictability of the post operative dosages of calcium, to reduce costs.

MATERIALS AND METHODS

The study was comprised of 206 patients who had undergone surgery for various thyroid diseases (goiter, cancer, Basedow disease) (Table I). The following details were recorded: age, sex, pre-operative clinical diagnosis (Table II). The mean age of the patients was 47 (range 5-79), 164 of the patients were females and 42 were males.

Table I
Distribution of 206 patients who had undergone surgery according to various thyroid diseases and postoperative calcium levels

Pathology	Patients without hypocalcemia	Patients with hypocalcemia
Cancer	15	3
Adenoma	6	1
Inflammatory	65	16
Goiter	80	20

Table II
Distribution of 206 patients who had undergone surgery according to gender and postoperative calcium levels

Gender	Patients without hypocalcemia	Patients with hypocalcemia
Females	130	34
Males	36	6

Serum calcium measurements at 6, 12 and 18 hours postoperatively were evaluated for each patient. A calcium level of 8.2 mg/dL was considered as a threshold value of hypocalcemia, defining the following: a “negative trend” when the straight halfway line of the 3 values had a decreasing tendency, a “positive trend” when the straight halfway line of the 3 values had an increasing rise and a “doubt trend” when there was a decrease arriving near but over the threshold value of hypocalcemia (Fig. 1).

Hypocalcemia was defined as experiencing signs or symptoms of hypocalcemia perioral and digital paresthesias (Chvostek’s sign and Trousseau’s sign) and / or having a serum calcium level that was lower than 8.2 mg/dL. Patients were placed in a treatment algorithm based on the level of serum calcium and on the signs or symptoms of hypocalcemia (calcium gluconate 1-2 g/day and calcitrol 50-100 µg/day [10,11]).

According to the change in the serum calcium level among the 3 measurements, a variant analysis was performed, using p-values in order to identify the possibility of reducing the number of measurements necessary to evaluate the risk of hypocalcemia. The entire analysis was performed utilising Stat 2 software.

RESULTS

Thyroid pathologies, gender and age did not show any significant correlation to the development of significant post operative hypocalcemia.

From 206 patients studied, 81 (40%) showed a positive trend, only 3 of these (3.8%) successively developed hypocalcemia; from 64 patients with a negative trend 33 (51.6%) developed hypocalcemia and with a doubt trend only 4 (6.5%) of 61 patients (29%).

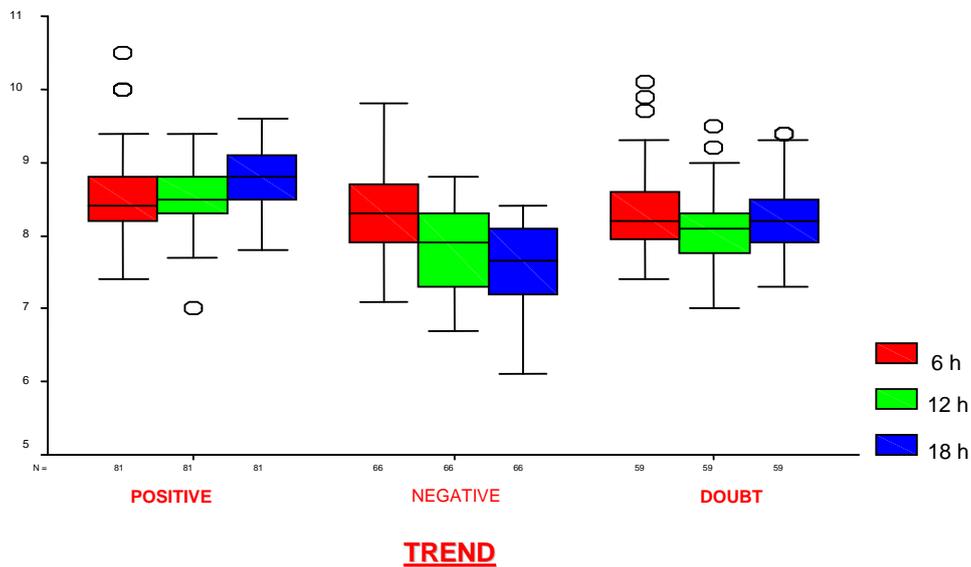


Fig. 1 Distribution of calcium levels according to dose and trend

Table III
Distribution of 206 patients according trend and postoperative calcium levels

Patients with trend		Normocalcemia	Hypocalcemia
Positive	81 (40%)	78 (96.2%)	3 (3.8%)
Negative	64 (31%)	31 (48.4%)	33 (51.6%)
Doubt	61 (29%)	57 (93.5%)	4 (6.5%)
Total	206	166 (81%)	40 (19%)

As expected, the incidence of hypocalcemia was moderate for patients with a doubt trend (6.5%) and maximal in patients with a negative trend (51.6%). On the other hand, the findings of a negative trend calcium level are not absolutely predictive for hypocalcemia, in fact it developed in only 33 patients (51.6%).

A positive slope predicted hypocalcemia 4.92% and a negative slope predicted 51,5% of the time with a 95,18% probability of remaining within normal calcium levels

(Table III). Patients were treated with oral calcium in the case of hypocalcemia. At three months after surgery 97.08% of patients had normal serum calcium levels.

This demonstrated that by solely relying on a positive or negative rise trend, there was still a significant risk of the development of hypocalcemia. In those cases, the measurement of the PTH level with a higher predictive value revealed that in 93.5% of the cases a correlation could be observed between the PTH levels and an eventual development of hypocalcemia.

We did not find any statistically significant differences in the plasma calcium level between the samples taken at 12 and 18 hours after surgery.

DICUSSIONS AND CONCLUSIONS

Improvement in surgical technique has led to a relevant decrease in severe postoperative complications after thyroid surgery and surgeons are considering whether one day hospital would be feasible after total thyroidectomy. In fact severe hypocalcemia continues to represent a limiting factor for such a short stay in hospital.

The incidence of hypocalcemia after total thyroidectomy – transient in the majority of cases – in literature oscillates between extremely large limits (from 11.2% to 35%) [6-8]. Regarding our investigation, we have observed a postoperative hypocalcemia in 20% of the cases.

There is no existing scoring method allowing the identification of patients who will not develop severe hypocalcemia. We used early serum calcium levels after total thyroidectomy to identify patients with a risk of developing significant hypocalcemia and allowing an early discharge.

The positive rise of the calcium level after total thyroidectomy is a reliable method in 96.2% of cases allowing the patient to be discharged with a risk of hypocalcemia of only 3.8%. Otherwise, the doubt trend gives a 6.5% margin of risk, making it necessary to conduct further haematic measurements in the consequent hours. In the case of negative trend, the risk of hypocalcemia is 51.6%. In this case, the decreasing tendency of serum calcium level remains an imperfect method but anyway the hospital discharge is delayed.

Regarding the serum calcium measurements used to evaluate the trend, we found no statistically significant calcium level at 12 hours after surgery.

Intra and postoperative intact parathyroid hormones has been embraced with enthusiasm by many surgeons as a means to detect patients with the highest risk of severe hypocalcemia, but its major limitation for wider clinical use is the cost factor.

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