



# Effect of early intravenous calcium replacement after total thyroidectomy

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## Abstract

**Aim:** This study was to evaluate the need for postoperative calcium replacement in patients undergoing total thyroidectomy, to evaluate the effect of intravenous calcium therapy given in the early postoperative period regardless of serum calcium level and physical examination on the length of stay of the patients, parathormone levels, and the need for oral calcium after discharge.

**Materials and Methods:** The files of 73 patients who underwent bilateral total thyroidectomy between January 2018 and July 2023 were retrospectively reviewed, and the demographic characteristics, anti-TG, anti-TPO, postoperative calcium, parathormone, thyroid gland weight of the patients were recorded. The effect of intravenous calcium replacement on calcium requirement, parathormone levels, and length of hospitalization was evaluated independently of calcium levels.

**Results:** It has been observed that replacement is associated with long-term calcium requirement in patients who underwent bilateral total thyroidectomy and received intravenous calcium in the early period. The length of stay was found to be longer in patients who underwent calcium replacement.

**Conclusion:** Various treatment methods are used to prevent hypocalcaemia. One of these treatment methods is early intravenous calcium replacement. In clinical practice, treatments given to prevent the development of complications and to discharge patients early may sometimes lead to the occurrence of complications that are tried to be prevented. The purpose of calcium replacement is to prevent the development of hypocalcaemia, to reduce the complication rate and to provide early discharge. It was evaluated that intravenous calcium replacement therapy, which was applied in the early period to prevent postoperative hypocalcaemia, caused patients to need longer-term calcium replacement and prolonged hospitalization. It is important to avoid calcium replacement in the early period and to evaluate the physical examination findings along with the serum calcium level of the patients for replacement.



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## Introduction

Hypocalcaemia is the most common complication after total thyroidectomy [1]. hypocalcaemia may develop due to involuntary removal of the parathyroid glands, impaired vascularity, edema or thermal damage caused by the energy devices used in the operation [2]. It has been reported that hypocalcaemia develops in 1.2-40% of patients undergoing total thyroidectomy, and approximately 3% of these patients have hypocalcaemia for more than one year [3]. In patients with hypocalcaemia, physical examination findings, serum calcium level and parathormone level are

important for calcium replacement [4]. Replacement in patients undergoing total thyroidectomy may prolong the length of stay of patients [5]. Monitoring the physical examination findings of hypocalcaemia and appropriate calcium management affect the length of stay and long-term calcium replacement [6]. Some of the surgeons tend to perform calcium replacement without considering the examination and physical examination findings of the patients, considering that hypocalcaemia findings may develop after thyroidectomy. In this study, the effect of intravenous calcium on length of stay and post-discharge calcium requirement were evaluated independently of physical examination findings and serum calcium levels.

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## Materials and Methods

Ethics committee approval was received from Malatya Turgut Özal University Rectorate on 13.10.2023 with the number E-30785963-020-180008.

The records of patients who underwent thyroidectomy were retrospectively reviewed, patients who underwent unilateral thyroidectomy and parathyroidectomy in the same session were excluded from the study, while patients who underwent bilateral total thyroidectomy were included in the study. Serum calcium and parathormone levels, physical examination findings of 73 patients who underwent bilateral total thyroidectomy, and findings of patients who underwent oral calcium replacement after discharge were recorded. The operations were performed by the same experienced surgical team and postoperative follow-up of the patients was performed by the same team. The group that received calcium replacement in the early period was randomly selected, no criteria were determined. It was decided to perform intravenous calcium replacement in case of development of symptoms of hypocalcaemia in the group that did not receive calcium replacement in the early period. In patients who underwent calcium replacement in the early postoperative period, it was observed that 3 pieces of calcium gluconate monohydrate 225 mg and calcium levulinate dihydrate 572 mg solution were replaced in ampoule form in 150 cc isotonic at 50 cc per hour at the 1st postoperative hour. The treatment information of other patients in the study was recorded. The effect of intravenous calcium replacement on the length of hospital stay and the need for postoperative oral calcium replacement was evaluated. At the 4th postoperative hour and the 1st postoperative day, serum calcium, parathormone levels and physical examination findings were followed by Chvostek finding, Trousseau finding, and numbness in the lips and fingers. In addition, patients who were given oral calcium replacement after discharge were evaluated. Serum corrected calcium (measured total Ca (mg/dL) + 0.8 (4.0 - serum albumin)) value <8.5mg/dL was evaluated as hypocalcaemia. Oral calcium replacement was performed in patients with serum calcium levels of <8.5mg/dL and physical examination findings of hypocalcaemia at discharge. Oral calcium requirement, length of hospitalization, thyroid gland weight, parathormone levels, anti-TPO and anti-TG levels were recorded.

### Statistical analysis

Descriptive statistics for continuous variables from the features emphasized; While the Mean is expressed as Standard Deviation, Minimum and Maximum values, it is expressed as number and percentage for Categorical variables. Independent groups t-test was performed to compare group means in terms of continuous variables. Pearson correlation coefficients were calculated to determine the relationship between these variables. Chi-square test was used to determine the relationship between categorical variables. In the calculations, the statistical significance level was taken as 5% and SPSS (ver: 21) statistical package program was used for the calculations.

## Results

The files of patients who underwent total thyroidectomy were scanned, and patients who underwent completion thyroidectomy, unilateral thyroidectomy, and parathyroidectomy in the same operation were excluded from the study. A total of 73 patients who underwent bilateral total thyroidectomy were included in the study. Of these patients, 56 (77%) were female. The mean age was 47 (26-65). It was determined that 33 (45%) of the patients received postoperative intravenous calcium replacement and 40 (55%) did not receive intravenous calcium replacement. It was determined that the group of patients who received intravenous calcium was replaced independently of serum calcium level and physical examination findings, and 22 (67%) of these patients were given oral calcium replacement after surgery. The number of patients who underwent intravenous calcium replacement and did not require oral calcium was 11 (33%). The number of patients who were not given intravenous calcium and needed oral calcium during their follow-up was 3 (4%), and the number of patients who were not given intravenous calcium and did not need oral calcium during follow-up was 37

**Table 1.** Evaluation between the group that received early postoperative calcium replacement and the group that needed oral calcium replacement after discharge.

		Early Postoperative Intravenous Calcium Replacement Status	
		-	+
The Need for Oral Calcium Replacement After Discharge	-	Number of Patients	37
		%	77.1%
	+	Number of Patients	11
		%	22.9%
Total		Number of Patients	40
		% Total	54.8%

**Table 2.** Demographic characteristics, length of hospitalization and evaluation of tests of patients.

	Intravenous calcium replacement group	Non-calcium replacement group	P
Age (Years)	46.12	48.25	0.404
Gender			
Woman	26	30	
Male	7	10	
Length of Stay	2.8	2.13	<0.001
Thyroid Gland Weight(gr)	50.81	52.36	0.888
Postoperative day 0 PTH	54	61.7	0.554
Postoperative day 1 PTH	31.8	59	<0.001
Postoperative day 0 calcium	8.33	10.7	0.352
Postoperative day 1 calcium	7.93	8.45	0.001
Anti-TG	8.79	352.5	0.336
Anti-TPO	58.8	486.8	0.125

(51%) (Table 1). While there was no significant difference in parathormone levels between the intravenous calcium replacement group and the non-intravenous calcium replacement group on the postoperative day 0 (54; 61.7), there was a significant difference on the 1<sup>st</sup> postoperative day (31.8; 59) ( $p < 0.001$ ). The reason for this finding was thought to be the suppression of the parathyroid glands due to calcium replacement. While there was no significant difference between the groups in terms of serum calcium levels on the 0<sup>th</sup> postoperative day, it was determined that the serum calcium level was lower on the 1st postoperative day and the calcium requirement was higher in the intravenous calcium replacement group, which was statistically significant. In the early postoperative period, the mean length of stay was 2.8 days in the intravenous calcium group and 2.13 days in the non-intravenous calcium group, which was statistically significant ( $p < 0.001$ ). Low calcium levels and long length of stay were also interpreted as due to increased calcium requirement due to suppression of parathyroid glands. Thyroid gland weight ( $p = 0.888$ ), anti-TG ( $p = 0.336$ ) and anti-TPO ( $p = 0.125$ ) were found to be associated with the need for long-term calcium replacement (Table 2).

## Discussion

Although the complications of thyroidectomy operations have decreased with the development of surgical techniques and technology, hypocalcaemia is still the most common complication [7]. Acute hypocalcaemia can cause tetany, seizures, papilledema, delirium and cognitive impairment, while persistent hypocalcaemia can cause serious conditions such as nephrocalcinosis, nephrolithiasis, renal failure, calcification of the basal ganglia [8]. The development of hypocalcaemia in patients also causes prolongation of hospitalization. For this reason, in the selection of patients who need calcium replacement, it is important to evaluate the physical examination findings together with serum calcium level for appropriate treatment and early discharge.

When the difference between the intravenous calcium replacement and non-replacement group was evaluated independently of serum calcium level and physical examination findings for the prevention of hypocalcaemia, it was observed that significantly better calcium levels were achieved in the non-replacement group. In addition, the need for long-term calcium replacement was lower and the length of stay was shorter. It was evaluated that calcium given intravenously in the early period also increased the long-term oral calcium requirement. Unlike our study, in a study conducted by Zhe Li et al. two groups that received routine calcium replacement and symptomatic patients were examined, and it was stated that the long-term results were the same as the group with routine replacement in case of replacement only for symptomatic patients, and it was reported that less hypocalcaemia was seen in the routine replacement group [9]. In the study conducted by Singer et al. it was stated that postoperative calcium replacement was effective in preventing the development of hypocalcaemia and calcium management, and also reduced the prolonged length of stay due to hypocalcaemia and reduced the cost [10]. In a study conducted by Järhult et

al. similar results were obtained to our study, and it was stated that calcium replacement in patients undergoing total thyroidectomy in case of asymptomatic calcium was not related to the improvement of serum calcium level of the patients, and the treatment applied to asymptomatic patients was unnecessary [11]. Again, Lee et al. reported in a study of 134 patients in 2019 that postoperative intravenous or oral calcium replacement did not reduce the risk of hypocalcaemia [12].

It was observed that serum calcium levels returned to normal levels later and parathormone levels were lower in patients who underwent intravenous early calcium replacement.

Although hypocalcaemia due to hypoparathyroidism is the most common complication after bilateral total thyroidectomy, it is one of the conditions that some surgeons approach cautiously [13]. For this reason, they have a therapeutic approach that calcium replacement should be performed in every patient postoperatively. In our study, patients who did not develop Chovastek and Trousseau findings despite low calcium levels were not given intravenous calcium, and serum calcium levels reached normal levels in a shorter time without calcium replacement in the follow-up of the patients.

## Conclusion

Hypocalcaemia after bilateral total thyroidectomy is one of the most common conditions. Although further studies are needed, in our study, we found that intravenous calcium replacement therapy applied in the early period to prevent postoperative hypocalcaemia caused patients to need longer-term calcium replacement and prolonged the length of hospitalization. For this reason, it is important to avoid calcium replacement in the early period and to evaluate the physical examination findings along with the serum calcium level of the patients for replacement.

## Ethical approval

Ethics committee approval was received from Malatya Turgut Özal University Rectorate on 13.10.2023 with the number E-30785963-020-180008.

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