



# Impact of Age on Postoperative Hypocalcemia after Thyroidectomy

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## Abstract

**Introduction:** Hypocalcaemia due to transient or definitive hypoparathyroidism is the most frequent complication after total thyroidectomy. We aimed to compare the impact of age on postoperative hypocalcemia and to determine which risk factors are important for hypocalcemia incidence.

**Methods:** Eight hundred seventy-one patients, who underwent total thyroidectomy, completion thyroidectomy, and central/lateral neck dissection, were evaluated retrospectively. Data were analyzed according to age, sex, surgery for hyperthyroidism, surgery for malignancy, presence or absence of neck dissection, and secondary procedures.

**Results:** Symptomatic hypocalcemia developed in 28.7% of patients. In logistic regression analysis, young age and female sex were found to be independent predictors of postoperative hypocalcemia.

**Conclusion:** Age is significantly associated with postoperative hypocalcemia. Younger patients should be more carefully evaluated before discharge.

**Keywords:** Hypocalcemia, thyroidectomy, age

## Introduction

Total thyroidectomy (TT) is the most preferred method for the treatment of malignant and benign thyroid diseases. The most common complication during the postoperative period is hypocalcemia, which is seen in approximately one-third of cases. Hypocalcemia may develop intraoperatively due to manipulation, injury, accidental removal, or impaired blood supply of the parathyroid glands, and it is the most important cause of prolonged hospitalization (1-3).

Hypocalcemia may be asymptomatic, and it may also progress with clinical signs that may be life threatening. It can be easily treated when detected, although the duration of hospitalization increases. Hypocalcemia after TT is usually non-permanent. The incidence of permanent hypocalcemia is reported to be between 0% and 13% in the literature, depending on the experience of the clinic (4).

Many reasons that can increase the incidence of hypocalcemia and hypoparathyroidism after thyroidectomy have been suggested. TT, secondary interventions, neck dissection, preoperative hyperthyroidism, vitamin D deficiency, and inexperience of the surgeon are the most common reasons (5, 6). We aimed to evaluate the association of patient age with the development of hypocalcemia in patients who underwent surgery due to thyroid gland disease.

## Methods

Eight-hundred seventy-one patients in whom TT, complementary thyroidectomy, and additional central and/or lateral neck dissection were performed between January 2010 and December 2016 were evaluated retrospectively by examining their demographic features, operations performed, postoperative hypocalcemia, and other complications that developed.

Patients with a postoperative calcium level <8 mg/dL were recorded as "biochemical hypocalcemia," and patients with Chvostek's and Trousseau's symptoms around the extremities and

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mouth, suggesting paresthesia, were recorded as “symptomatic hypocalcemia.” Patients who needed replacement therapy longer than 6 months and/or whose serum parathyroid hormone level was <15 pg/mL were evaluated as “permanent hypocalcemia.”

The effect of age on the development of hypocalcemia was evaluated. In addition, the effects of gender, hyperthyroidism, and surgery due to malignancy, central dissection, and secondary interventions on non-permanent hypocalcemia were investigated.

In all cases, recurrence was routinely explored. Written informed consent was obtained from the patients. The clinical trials ethics committee of our hospital approved the study.

### Statistical Analysis

Chi-square test and Fisher’s exact test were used for binary comparisons of groups in statistical evaluations. Logistic regression analysis was used for multivariate assessments. A  $p < 0.05$  was considered as statistically significant.

### Results

The mean age was  $47.9 \pm 12.2$  years. The female/male ratio was 723/148. In our series, 757 patients had TT, 45 had complementary thyroidectomy, 54 had TT and neck dissection, and 15 had complementary thyroidectomy and neck dissection. Nine patients (1.03%) underwent surgery due to hemorrhage for the second time in the postoperative period. Non-permanent dysphonia occurred in 38 patients (4.3%), and permanent dysphonia occurred in 12 patients (1.4%). Bilateral vocal cord paralysis developed in 2 patients. An emergency tracheostomy was performed in 1 patient. Since the rima glottidis opening of the other patient was sufficient, tracheostomy was not needed. Non-permanent hypocalcemia developed in 28.7% of the patients. Postoperative hypocalcemia was found to be significantly higher in younger patients and women (Table 1).

Low age and female gender were identified as independent risk factors for the development of hypocalcemia in multivariate analyses. It was found that the risk of the development of hypocalcemia was 1.52 times higher (CI: 1.09-2.11) in patients <40 years old, and this risk was 1.72 times higher (CI: 1.15-2.59) in female than in male patients. However, the presence of hyperthyroidism, surgery due to malignancy, neck dissection, and secondary interventions did not have any effects on the development of hypocalcemia in our series (Table 2).

### Discussion

Postoperative hypocalcemia is the most common complication that develops after TT and may develop due to many reasons (7). Some of these reasons include iatrogenic surgical trauma to the parathyroid glands, incidental parathyroidectomy, number of glands left, and extent of surgery, surgeon experience, hyperthyroidism, retrosternal goiter, neck dissection, and thyroid cancer (8, 9). In different studies, it has been reported to grow at a rate ranging from 1.6% to 50% (10, 11).

Total thyroidectomy is performed as a standard procedure in patients undergoing thyroid surgery in our clinic. We aimed to evaluate the rates of hypocalcemia developing after thyroid surgery in our clinic and the affecting factors. The rate of the development of non-permanent hypocalcemia was found to be 28.7% in our series. This ratio is in accordance with the literature (11-14).

The effects of age, gender, malignant to benign disease, central dissection, secondary interventions, and presence of preoperative hyperthyroidism on postoperative hypocalcemia were evaluated. Age was found to be associated with hypocalcemia after TT in our study. There was a positive correlation between age and calcium values. Age was found to be an independent risk factor for the development of hypocalcemia in logistic regression analysis. However, there are contradictory studies related to this issue in the literature. Tolone et al. (15) found that the risk of hypocalcemia is more frequent in patients >50 years old,

**Table 1. Rates of hypocalcemia**

Risk factor	Postoperative hypocalcemia	Postoperative normocalcemia	p (chi-square or Fisher’s exact test)
Gender			
Female	224 (31%)	499 (69%)	0.005
Male	26 (17.6%)	122 (82.4%)	
Age			
<40 years	76 (36.7%)	131 (63.3%)	0.007
>40 years	174 (26.2%)	490 (73.8%)	
Hyperthyroidism			
Yes	47 (29.9%)	110 (70.1%)	0.195
No	203 (28.4%)	511 (71.6%)	
Secondary intervention			
Yes	18 (30%)	42 (70%)	0.925
No	232 (28.6%)	579 (71.4%)	
Pathological diagnosis			
Benign	183 (28%)	469 (72%)	0.103
Malignant	67 (30.5%)	152 (69.5%)	
Neck dissection			
Yes	23 (33.3%)	46 (66.7%)	0.110
No	227 (28.3%)	575 (71.7%)	

**Table 2. Logistic regression analysis**

Risk factor	p	RR (95% CI)
Gender	0.008	1.72 (1.15-2.59)
Age	0.012	1.52 (1.09-2.11)
Hyperthyroidism	0.086	0.71 (0.49-1.04)
Secondary intervention	0.897	1.03 (0.58-1.86)
Pathological diagnosis	0.199	0.80 (0.57-1.12)
Neck dissection	0.192	0.68 (0.39-1.20)

RR: relative risk; CI: confidence interval

whereas Kalyoncu et al. (16) reported no significant relationship between age and the development of hypocalcemia. In our study, we found that the risk of postoperative hypocalcemia was significantly higher in patients <40 years old ( $p=0.007$ ).

Many studies have suggested that female gender is a risk factor for the development of hypocalcemia in the postoperative period. Thomusch et al. (5) reported in their study performed on 5846 patients that both non-permanent and permanent nerve damage as well as non-permanent and permanent hypoparathyroidism are more frequent in women. In our study, the female/male ratio was found to be 723/148, and both binary and multivariate analyses revealed that hypocalcemia was significantly more common in women ( $p=0.005$ ). This ratio was found to be 1.72 times higher in women than in men.

In many studies, central dissection added to TT performed for malignancy has been found to be an independent risk factor for the development of hypocalcemia (2-6, 8, 10). However, although the addition of neck dissection increased the rates of hypocalcemia to some extent, there was no statistically significant difference ( $p=0.110$ ) in our study. In our series, there was no significant increase in the risk of hypocalcemia in surgeries performed due to malignancy ( $p=0.100$ ).

There are studies reporting that hypocalcemia development is high after surgeries performed due to hyperthyroidism. Zambudio et al. (17) reported the risk of non-permanent hypocalcemia at a rate of 50% in patients with Basedow-Graves disease. However, a study also reported that antithyroid therapy administered in the preoperative period reduces the risk of hypocalcemia (6). In our study, patients who had hyperthyroidism were operated when they were euthyroid, and no significant difference was found in the development of hypocalcemia ( $p=0.195$ ).

There was no significant risk increase for hypocalcemia in the secondary intervention ( $p=0.925$ ), which is another factor examined in our study. There is different information about this in the literature. Secondary interventions performed due to recurrent goiter have been reported in some publications as a risk factor for hypocalcemia, but some studies have reported no significant difference (13, 18).

## Conclusion

The risk of the development of non-permanent hypocalcemia after TT in patients <40 years old in our clinic was found to be significantly higher than that in patients aged  $\geq 40$  years old. Similarly, the risk of hypocalcemia in female gender was significantly higher. Among these results, especially younger patients should be followed up more closely in terms of the risk of hypocalcemia in the postoperative period.

**Ethics Committee Approval:** The ethics committee approval was received for this study from the ethics committee of Bakırköy Dr. Sadi Konuk Training and Research Hospital.

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