ARAŞTIRMA MAKALESİ / *RESEARCH ARTICLE*

Iatrogenic Parathyroidectomy and Affecting Factors During Thyroid Surgery

Tiroid Cerrahisi Sırasında İatrojenik Paratiroidektomi ve Etki Eden Faktörler

Atakan Ozkan

Department of General Surgery, Esencan Hospital, Istanbul, Türkiye

ABSTRACT

Aim: *This study aimed to investigate cases of iatrogenic parathyroidectomy following thyroid surgery and to analyze the causes.*

Material and Methods: *A total of 287 patients diagnosed with thyroid-related disorders and surgically treated at various clinics of Private Esencan Hospital between 2019 and 2023 were included in the study. Preoperative ultrasound imaging results and data on patients with multinodular goiter presenting a dominant nodule larger than 4 cm in diameter were recorded, specifically noting the presence of thyroiditis. Thyroid tissues obtained during surgery were examined histopathologically in the pathology laboratory, and the presence of thyroid malignancy and parathyroid tissue was confirmed.*

Results: *The mean age of the patients was 55.6±17.3 years, ranging from 18 to 83 years, and 154 (55.4%) were male. Iatrogenic parathyroidectomy was identified in 26 (9.4%) of the patients. The rate of iatrogenic parathyroidectomy was significantly higher in patients with thyroid malignancy compared to those without (13.9% vs. 5.8%; p=0.02). Patients with thyroiditis also had a higher rate of iatrogenic parathyroidectomy than those without (18.2% vs. 7.2%; p=0.012). Additionally, patients with a dominant nodule diameter showed a significantly increased rate of iatrogenic parathyroidectomy compared to those without (27.0% vs. 6.6%; p<0.001). In the logistic regression analysis, the presence of thyroid malignancy (p=0.024), thyroiditis (p=0.015), and dominant nodule diameter (p<0.001) were identified as independent risk factors for developing iatrogenic parathyroidectomy.*

Conclusion: *Our study shows that the risk of iatrogenic parathyroidectomy is significantly higher, especially in patients with thyroiditis, thyroid malignancy, or large nodules. These patients should be handled more carefully during surgery and should be considered for surgical treatment.*

Key words: *thyroid surgery; thyroidectomy; iatrogenic parathyroidectomy; malignancy; thyroiditis; hypocalcemia*

ÖZET

Amaç: *Bu çalışmada tiroid cerrahisi sonrasında iatrojenik paratiroidektomi görülen olguların irdelenmesi ve buna yol açan faktörlerin analiz edilmesi amaçlanmıştır.*

Materyal ve Metot: *Çalışmaya 2019–2023 tarihleri arasında Özel Esencan Hastanesi hastanemiz çeşitli kliniklerinde tiroidle ilişkili bozukluk tanısı konulan ve tiroid cerrahisi kararı verilere opere edilen toplam 287 hasta dâhil edildi. Hastaların tiroidit varlığı açısından operasyon öncesi yapılan ultrason görüntüleme sonuçlar ve multinödül guatırları olan hastlarda en büyük 4 cm üstünde nodül saptananların nodül olanlar kaydedildi. Operasyon sırasında alınan tiroid dokuları patoloji laboratuvarında histopatolojik olarak incelendi ve tiroit malignitesi varlığı belirlendi. Ayrıca operasyon sonrası süreçte hipokalsemi gelişen hastalar iatrojenik paratiroidektomi olarak kabul edildi.*

Bulgular: *Hastaların ortalama yaşı 55,6±17,3 (Aralık: 18–83) yıl idi ve 154'ü (%55,4) erkekti. Hastaların 26'sında (%9,4) iatrojenik paratiroidektomi saptandı. Tiroid malignitesi olanlarda iatrojenik paratiroidektomi görülme oranı malignitesi olmayanlara göre anlamlı yüksek bulundu (%13,9 vs. %5,8; p=0,02). Tiroidit saptananlarda iatrojenik paratiroidektomi oranı tiroiditi olmayanlara göre anlamlı yüksekti (%18,2 vs. %7,2; p=0,012). Dominant nodül çapı bulunanlarda iatrojenik paratiroidektomi görülme oranı dominant nodül çapı olmayanlara göre anlamlı yüksek bulundu (%27,0 vs. %6,6; p<0,001). Yapılan lojistik regresyon analizlerinde tiroid malignitesi (p=0,024), tiroidit (p=0,015) ve dominant nodül çapı (p<0,001) varlığı iatrojenik paratiroidektomi gelişmesi açısından bağımsız risk faktörleri idi. Buna göre iatrojenik paratiroidektomi görülme riskini tiroid malignitesi varlığı 2,6 kat; tiroidit varlığı 2,9 kat; dominant nodül çapı varlığı ise 5,2 kat artırmaktaydı. Çoklu değişken analizinde ise malignite ile dominant nodül çapının birlikte bulunması iatrojenik paratiroidektomi gelişmesi açısından bağımsız risk faktörü olarak saptandı.*

Sonuç: *Çalışmamızdan elde edilen bulgular tiroid cerrahisinde iatrojenik paratiroidektomi görülme oranının %10 civarında olduğunu, özellikle tiroiditi, tiroid malignitesi ya da dominant nodül çapı olan hastalarda iatrojenik paratiroidektomi görülme riskinin belirgin olarak artmış olduğunu, bu hastalar opere edilirken çok daha dikkatli olunması ve bu hastaların cerrahi sonrasında daha yakından takip edilmesi gerektiğini göstermiştir.*

Anahtar kelimeler: *tiroid cerrahisi; tiroidektomi; iatrojenik paratiroidektomi; malignite; tiroidit; hipokalsemi*

İletişim/Contact: *Atakan Özkan, Department of General Surgery, Special Esencan Hospital, Istanbul, Türkiye* • ***Tel:*** *0532 273 38 37* • ***E-mail:*** *atakancerrah34@hotmail.com* • ***Geliş/Received:*** *13.03.2025* • ***Kabul/Accepted:*** *07.06.2025*

ORCID: *Atakan Özkan: 0000-0003-1729-3148*

Introduction

Thyroidectomy is one of the most frequently performed endocrine surgeries. It is considered safe due to its low rates of morbidity and mortality. Overall, complication rates after thyroid surgery are less than 5%. A common complication is damage to the parathyroids, which can decrease parathyroid hormone production and lead to hypoparathyroidism. Often, this damage does not cause noticeable symptoms but results in temporary hypocalcemia lasting several weeks. During this time, patients may experience numbness of varying severity in the extremities and around the mouth. In some cases, this condition worsens or becomes permanent, causing sustained hypocalcemia with clinical symptoms. Typically, this temporary hypocalcemia causes numbness that varies in severity in the extremities and perioral muscles. In some instances, the situation may become more severe or lead to permanent hypocalcemia[1–4].

The parathyroid gland is a delicate structure located very close to the thyroid gland. It receives blood supply from the inferior and superior thyroid arteries. Damage to these structures can cause parathyroid dysfunction and hypocalcemia, as well as damage to the parathyroid tissue. Additionally, parathyroid tissue is often found during histopathological examination after thyroid surgery. It has been reported that parathyroidectomy is more common in thyroid surgery, especially in patients with thyroiditis or thyroid cancer[3–8].

This study aimed to examine the cases of iatrogenic parathyroidectomy after thyroid surgery and analyze the factors that led to this.

Material and Method

A total of 287 patients diagnosed with thyroid-related disorders and operated on at various clinics of Private Esencan Hospital between 2019 and 2023 were included in the study. Preoperative ultrasound imaging results and patients diagnosed with multinodular goiter featuring a dominant nodule larger than 4 cm in diameter were recorded regarding the presence of thyroiditis. The possible inclusion criteria were defined as follows: patients undergoing total thyroidectomy, those operated on for benign or malignant thyroid conditions, patients with fully documented surgical and pathology reports, individuals who did or did not develop postoperative hypocalcemia, and adult patients (≥18 years of age).

Possible exclusion criteria included patients with a history of previous neck surgery, those with congenital parathyroid anomalies, or a known history of hypoparathyroidism. It also included patients who underwent intraoperative parathyroid autotransplantation or for whom such information was unavailable, individuals with incomplete biochemical data, pregnant women, and pediatric patients.

Thyroid tissues obtained during surgery were examined histopathologically in the pathology laboratory to confirm the presence of thyroid malignancy and parathyroid tissue. Patients with histopathological evidence of parathyroid tissue in the surgical specimen, along with postoperative laboratory-confirmed hypocalcemia, were classified as cases of iatrogenic parathyroidectomy.

Statistical Analysis

All statistical analyses in the study were performed using IBM Statistical Package for Social Sciences (SPSS) program version 25.0 software (IBM, Chicago, IL, USA). Descriptive data are presented as means and standard deviations; distributions of nominal or ordinal variables are given as numbers and percentages. Comparisons between groups for categorical variables were conducted with the Chi Square test. The normality of continuous variables was assessed with the Kolmogorov-Smirnov test. Differences between groups for continuous variables were analyzed using Student's t test. The risk coefficients for variables related to developing iatrogenic parathyroidectomy were determined through logistic regression analysis. Results were evaluated within a 95% confidence interval, and p-values <0.05 were considered statistically significant. Bonferroni correction was applied for the operation type in Table 2.

Results

The average age of the patients was 55.6±17.3 years (range: 18–83), with 154 patients (55.4%) being male. Iatrogenic parathyroidectomy was identified in 26 patients (9.4%). Histopathological examination confirmed thyroid-related malignancy in 122 patients (43.9%). Most surgeries, 86.7%, involved bilateral total thyroidectomy. Preoperative ultrasonic imaging detected thyroiditis in 55 patients (19.8%). A total of 37 patients (13.3%) had a dominant nodule diameter (see Table 1).

Table 1. *Distributions according to some variables*

	n	%
n	278	100.0
Gender		
Male	154	55.4
Female	124	44.6
Paraidectomy		
Absent	252	90.6
Present	26	9.4
Malignancy		
Absent	156	56.1
Present	122	43.9
Operation type		
Bilateral total thyroidectomy	241	86.7
Unilateral total thyroidectomy	29	10.4
Completion thyroidectomy	8	2.9
Thyroiditis on preoperative USG		
Absent	223	80.2
Present	55	19.8
Dominant nodule diameter		
Absent	241	86.7
Present	37	13.3
Age (Mean & SD) (years)	55.6	17.3

USG: ultrasound sonography, SD: standard deviation.

Table 2. *Comparison of iatrogenic paraidectomy distributions according to some variables*

	Paraidectomy none		Paraidectomy present		
	n	%	n	%	p
n	252	90.6	26	9.4	-
Gender					0.805
Male	139	90.3	15	9.7	
Female	113	91.1	11	8.9	
Malignancy					0.020
Absent	147	94.2	9	5.8	
Present	105	86.1	17	13.9	
Operation types *					0.643
Bilateral total thyroidectomy	221	91.7	21	8.7	
Unilateral total thyroidectomy	24	82.8	4	13.8	
Completion thyroidectomy	7	87.5	1	12.5	
Thyroiditis on preoperative USG					0.012
Absent	207	92.8	16	7.2	
Present	45	81.8	10	18.2	
Dominant nodule diameter					<0.001
Absent	225	93.4	16	6.6	
Present	27	73.0	10	27.0	
Age (mean & SD) (years)	56.2	17.3	50.7	16.3	0.124

USG: ultrasound sonography, SD: standard deviation, * Bonferroni correction.

The rate of iatrogenic parathyroidectomy in patients with thyroid malignancy was significantly higher than in those without malignancy (13.9% vs. 5.8%; p=0.02). Similarly, patients with thyroiditis experienced a higher rate of iatrogenic parathyroidectomy compared to those without thyroiditis (18.2% vs. 7.2%; p=0.012). Additionally, patients with a dominant nodule diameter had a significantly increased rate of iatrogenic parathyroidectomy compared to those without a dominant nodule (27.0% vs. 6.6%; p<0.001). The incidence rates of iatrogenic parathyroidectomy were comparable between genders (p=0.805) and operation types (p=0.643) (Table 2).

In the logistic regression analyses, the presence of thyroid malignancy (p=0.024), thyroiditis (p=0.015), and dominant nodule diameter (p<0.001) were independent risk factors for the development of iatrogenic parathyroidectomy. Accordingly, the risk of iatrogenic parathyroidectomy was 2.6 times higher with thyroid malignancy, 2.9 times higher with thyroiditis, and 5.2 times higher with a larger dominant nodule diameter. In multivariate analysis, the coexistence of malignancy and large nodule diameter was identified as an independent risk factor for developing iatrogenic parathyroidectomy (Table 3).

Table 3. *Logistic regression analyzes for iatrogenic paraidectomy*

	Univariate			Multivariate		
	p	Exp (B)	%95 CI (Lower-upper)	p	Exp (B)	%95 CI (Lower-upper)
Malignancy	0.024	2.6	1.1–6.2	0.002	6.1	1.9–19.1
Thyroiditis on preoperative USG	0.015	2.9	1.2–6.7	0.070	-	-
Dominant nodule diameter	<0.001	5.2	2.1–12.6	<0.001	12.0	3.6–40.8

Exp (B): exponential B coefficient, odds ratio, CI: confidence interval for Exp (B), USG: ultrasound sonography.

Discussion

Although thyroid surgery is generally considered a safe procedure, it can often lead to temporary or permanent hypocalcemia due to various factors. One significant cause of hypocalcemia is damage to or removal of the parathyroid tissue during surgery. This condition, known as iatrogenic parathyroidectomy, is commonly seen in thyroid surgeries[1–5]. The study demonstrated that iatrogenic parathyroidectomy is linked to malignancy, size of dominant lymph nodes, and thyroiditis.

Iatrogenic parathyroidectomy rates in patients undergoing thyroid surgery have been reported to range between 7.9% and 31% in studies. In these studies, median values seem to be around 15–17%[6–17]. In our study, iatrogenic parathyroidectomy was identified in 9.4% of patients. This rate is slightly lower than those found in other research. Therefore, about one in ten patients undergoing thyroid surgery experiences iatrogenic parathyroidectomy.

Many studies have shown that iatrogenic parathyroidectomy in thyroid surgery is significantly more common in patients with thyroid malignancy[6–12]. Caulley et al.[13] demonstrated in their large study that not only parathyroidectomy but all complications related to thyroid surgery were higher in patients with thyroid malignancy. However, Sakorafas et al.[6] reported that the presence of thyroiditis did not influence the rate of iatrogenic parathyroidectomy. In our study, the rate of iatrogenic parathyroidectomy was significantly higher in patients with thyroid malignancy, thyroiditis, and larger dominant nodule diameter. Additionally, logistic regression analysis showed that the presence of thyroid malignancy, thyroiditis, and larger nodule diameter were independent risk factors for developing iatrogenic parathyroidectomy. Specifically, the risk increased 2.6 times with thyroid malignancy, 2.9 times with thyroiditis, and 5.2 times with larger nodule diameter. In the multivariate analysis, the coexistence of malignancy and larger nodule size was identified as an independent risk factor for iatrogenic parathyroidectomy. These findings indicate that the likelihood of iatrogenic parathyroidectomy during thyroid surgery is closely associated with thyroid malignancy, thyroiditis, and larger nodule size, and the risk significantly increases in patients presenting these factors.

Sakorafas et al.[6] reported that the rate of iatrogenic parathyroidectomy in women was higher in thyroid surgery. However, Hone et al.,[9] MacGoldrick et al.,[11] and Özoğul et al.[8] found no difference in iatrogenic parathyroidectomy rates between genders and types of surgery in patients undergoing thyroid procedures. Sorgato et al.[7] also reported that gender did not influence iatrogenic parathyroidectomy, but the average age was lower in patients who experienced it, and the rate was higher in those who had lymph node dissection along with total thyroidectomy. Zheng et al.[10] noted that total thyroidectomy carries a greater risk of iatrogenic parathyroidectomy. In our study, the rates of iatrogenic parathyroidectomy were similar across genders and surgical types. Additionally, we found that the average age was comparable in patients who did and did not undergo iatrogenic parathyroidectomy. These findings suggest that factors such as age, gender, and type of operation may not be directly related to the occurrence of iatrogenic parathyroidectomy during thyroid surgery.

Study Limitations

Since the study focuses solely on iatrogenic parathyroidectomy in thyroid surgery and the factors influencing it, the fact that other thyroid surgery complications are not examined in detail can be seen as a limitation. A positive aspect of the study is that the number of patients is sufficient and does not negatively impact the analysis. In recent years, there have been significant advances in surgical techniques designed to preserve the parathyroid glands. One such technique is fluorescence imaging and autotransplantation. The fact that these methods were not used in our patients is a limitation of our study. Integrating these techniques into routine surgical practice is considered an important advancement for patient safety[18–20].

Conclusion

The findings from our study indicate that the rate of iatrogenic parathyroidectomy in thyroid surgery is about 10%, and the risk of iatrogenic parathyroidectomy is significantly higher, especially in patients with thyroiditis, thyroid malignancy, or larger nodules. Additionally, more caution should be exercised during surgery for these patients, and they should be more vigilant during the postoperative period.

Declaration of Interest

The author declares that there is no conflict of interest regarding the publication of this paper.

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Authors' Contributions

Study concept and design, Creation of experimental groups and experimental practices, Evaluating the results and writing the manuscript: AÖ

Ethical Approval

Study approval was obtained from Istanbul Training and Research Hospital, Istanbul, Local Board of Ethics (Decision no: 103 on: 18.10.2024).

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