



# Endocrine Surgery and Pediatric Surgery Partnership Reduces Complication Rate of Pediatric Thyroidectomy

## Endokrin Cerrahisi ile Çocuk Cerrahisi Ortaklığı Pediatrik Tiroidektomide Komplikasyon Oranını Azaltır

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### ABSTRACT

**Objective:** Thyroidectomy is not a common procedure performed in childhood. The aim of this study is to evaluate the clinical data and postoperative results of pediatric patients who underwent thyroidectomy in our center performed by a pediatric and an endocrine surgeon working in collaboration.

**Method:** Patients under the age of 18 who underwent thyroidectomy between 2008-2020 were included in this study. Demographic data, clinical data, preoperative evaluation results and postoperative complications were reviewed retrospectively.

**Results:** A total of 21 patients were included in the study. Postoperative bleeding, surgical site infection, transient and permanent recurrent nerve palsy, and permanent hypocalcemia were not detected in any patient. Transient hypocalcemia developed in only 2 patients (9.5%) in the postoperative period.

**Conclusion:** Small sample size and avoiding central neck dissection may also be effective in our low postoperative complication rate. However, it was thought that pediatric thyroidectomy procedure performed by a general surgeon and a pediatric surgeon experienced in endocrine surgery in collaboration may change the postoperative complication rate.

**Keywords:** Adolescent, fine needle aspiration biopsy, pediatric thyroid surgery, thyroid, thyroidectomy, thyroid nodule

### ÖZ

**Amaç:** Tiroidektomi çocukluk çağında sık uygulanan bir işlem değildir. Bu çalışmanın amacı bir çocuk cerrahi ve bir endokrin cerrahin birlikte çalıştığı merkezimizde tiroidektomi yapılan çocuk hastaların klinik verilerini ve ameliyat sonrası sonuçlarını değerlendirmektir.

**Yöntem:** Çalışmaya 2008-2020 yılları arasında tiroidektomi yapılan 18 yaş altı hastalar dahil edildi. Demografik veriler, klinik veriler, ameliyat öncesi değerlendirme sonuçları ve ameliyat sonrası komplikasyonlar geriye dönük olarak incelendi.

**Bulgular:** Çalışmaya 21 hasta dahil edildi. Hiçbir hastada postoperatif kanama, cerrahi alan enfeksiyonu, geçici veya kalıcı rekürren sinir felci ve kalıcı hipokalsemi saptanmadı. Postoperatif dönemde sadece 2 hastada (%9,5) geçici hipokalsemi gelişti.

**Sonuç:** Postoperatif komplikasyon oranının düşük olmasında örneklem büyüklüğünün küçük olması ve santral boyun diseksiyonunun olmaması da etkili olabilir. Ancak pediatrik tiroidektomi prosedürünün endokrin cerrahisi konusunda deneyimli bir genel cerrah ve çocuk cerrahi tarafından birlikte uygulanmasının postoperatif komplikasyon oranını değiştirebileceği kanısına varılmıştır.

**Anahtar kelimeler:** Adölesan, ince iğne biyopsisi, pediatrik tiroid cerrahisi, tiroid, tiroidektomi, tiroid nodülü

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## INTRODUCTION

Since the indications for thyroidectomy in children are more limited than in adults, thyroidectomy is not a frequently performed procedure in childhood<sup>(1)</sup>. Therefore, data in the literature on the pediatric thyroidectomy procedure are limited. When the literature is reviewed, the most common indication for thyroidectomy in children and adolescents is the presence of thyroid nodules<sup>(1,2)</sup>. The incidence of thyroid nodules in children and adolescents is lower than in adults, and the risk of malignancy in thyroid nodules in childhood is higher<sup>(3)</sup>. Although it is rarely seen in children, childhood thyroid nodules should be evaluated well because of the high risk of malignancy.

The 2016 guideline of the American Thyroid Association (ATA) recommends that more than 25 thyroid surgeries should be performed annually in order to be experienced in thyroid surgery<sup>(4)</sup>. It is difficult for a pediatric surgeon to reach these numbers and be experienced in thyroid surgery due to the small number of patients. Endocrine surgeons experienced in thyroidectomy have limited experience with pediatric patients.

The aim of this study is to evaluate the clinical findings and postoperative results of pediatric patients who underwent thyroidectomy performed by pediatric surgeon and an endocrine surgeon in collaboration in a tertiary center.

## MATERIALS and METHODS

### Ethics Committee Approval

The study was conducted after obtaining approval from University of Health Sciences Turkey, İzmir Tepecik Education and Research Hospital Non-Interventional Research Ethics Committee (decision no: 2021/12-15, date: 15.12.2021).

### Study Design

Patients under the age of 18 who underwent thyroidectomy in our center between 2008 and 2020 were included in the study. Demographic data, ultrasonographic (USG) nodule size (mm), fine needle aspiration biopsy (FNAB) results, surgical procedure (hemi/total/completion thyroidectomy), pathology results, operation time (minutes), postoperative hospitalization time (days), presence of postoperative bleeding, transient or permanent hypocalcemia and/or recurrent laryngeal nerve (*N. laryngeus recurrens*) (RLN)

paralysis, or a syndrome that constitutes prophylactic thyroidectomy indication were retrospectively analyzed. FNAB results were evaluated according to The Bethesda System for Reporting Thyroid Cytopathology (TBSRTC) criteria neuromonitoring is not performed in our center except for high-risk patients. Since the aim of this study was to evaluate the complication rates, the cases that underwent neuromonitorization were excluded from this study.

Postoperative serum calcium level below 8 mg/dL was defined as hypocalcemia. Hypocalcemia lasting less than six months was defined as transient, and hypocalcemia lasting longer as permanent hypocalcemia. Direct laryngoscopy was performed on the patient with dysphonia, dyspnea and swallowing disorder, and RLN function was evaluated. RLN palsy lasting more than 6 months and proven by laryngoscopy was considered permanent paralysis.

### Statistical Analysis

Statistical analysis was performed with IBM SPSS Statistics 25.0 (IBM Corp., Armonk, New York, USA).

## RESULTS

Seven (33.3%) male, and 14 (66.6%) female patients were enrolled in the study. The median interquartile range (IQR) age of the patients was 14 (11.5-16) (range 5-17) years. The median IQR thyroid nodule size was 30 (14-38) (range 0-46) mm. Total thyroidectomy was performed in 17 (81%), completion thyroidectomy in 2 (9.5%) and hemi-thyroidectomy in 2 (9.5%) patients. Two (9.5%) patients whose hemithyroidectomy specimens obtained were reported as having malignant histopathology, underwent completion thyroidectomy. Mean operation time was 116.7 [standard deviation (SD):  $\pm 21.4$ , range: 70-140] minutes. The mean duration of hospitalization in the postoperative period was 2 (SD:  $\pm 0.6$ , range: 1-4) days. Pathology specimen results and FNAB results are given in Table 1. The pathology result of one patient who underwent prophylactic total thyroidectomy due to the diagnosis of multiple endocrine neoplasia 2 (MEN 2) was reported as medullary microcarcinoma, and the pathology result of the other patient who was operated with the same indication was reported as C-cell hyperplasia. In addition, the pathology result of a patient who had no additional syndromic diagnosis and was operated for suspected malignancy was reported as medullary microcarcinoma. Demographic and clinical data of all patients are given in Table 2. Distant metastasis

**Table 1. Pathology specimen results and fine needle aspiration biopsy results**

FNAB results (according to TBSRTC)	Pathology specimen results	
	Benign	Malignant
1	1	0
2	6	2
3	0	1
4	3	2
5	1	2
6	0	1

FNAB: Fine needle aspiration biopsy, TBSRTC: The Bethesda System for Reporting Thyroid Cytopathology

or cervical lymph node metastasis was not detected in any patient who received histopathologic diagnosis of malignancy in the preoperative and peroperative period.

Postoperative complications as postoperative bleeding, surgical site infection, transient or permanent RLN paralysis, and permanent hypocalcemia were not detected in any of the patients. In total, 2 (9.5%) patients developed transient hypocalcemia in the postoperative period. None of the patients required parathyroid autotransplantation.

**Table 2. Demographic and clinical data of all patients**

	Number of patients		
Sex			
Male	7 (33.3%)		
Female	14 (66.7%)		
Age (mean ± SD)	13.3±3.5	min-max: 5-17	median (IQR): 14 (11.5-16)
Ultrasonographic nodule size (mm) (mean ± SD)	26.2±14.2	min-max: 0-46	median (IQR): 30 (14-38)
FNAB results (according to TBSRTC)			
Bethesda 1	1 (4.8%)		
Bethesda 2	8 (38.1%)		
Bethesda 3	1 (4.8%)		
Bethesda 4	5 (23.8%)		
Bethesda 5	3 (14.3%)		
Bethesda 6	1 (4.8%)		
Type of operation			
Hemithyroidectomy	2 (9.5%)		
Completion thyroidectomy	2 (9.5%)		
Total thyroidectomy	17 (81%)		
Operation time (min.) (mean ± SD)	116.7±21.4	min-max: 70-140	median (IQR): 125 (115-130)
Pathology results			
Bening	11 (52.4%)		
Papillary carcinoma clasical variant	3 (14.3%)		
Medullary microcarcinoma	2 (9.5%)		
Papillary microcarcinoma	1 (4.8%)		
Papillary carcinoma follicular variant	2 (9.5%)		
Papillary carcinoma oncocytic variant	1 (4.8%)		
C cell hyperplasia	1 (4.8%)		
Complications			
Transient hypoparathyroidism	2 (9.5%)		
Transient RLN paralysis	0		
Permanent hypoparathyroidism	0		
Permanent RLN paralysis	0		
Hospitalization day (mean ± SD)	2±0.6	min-max: 1-4	median (IQR): 2 (2-2)
	n=21 (100%)		

SD: Standard deviation, FNAB: Fine needle aspiration biopsy, TBSRTC: The Bethesda System for Reporting Thyroid Cytopathology, RLN: Recurrent laryngeal nerve (*N. laryngeus recurrence*), IQR: Interquartile range, min: Minimum, max: Maximum

## DISCUSSION

Although most thyroid nodules are benign, the thyroid gland is more susceptible to radiation and carcinogenesis in children. Therefore, although thyroid nodules are rarely seen in childhood, the risk of malignancy is higher <sup>(5,6)</sup>. Thyroid nodules are the most common indication for thyroidectomy. Literature data on preoperative evaluations and postoperative complications are limited, as thyroidectomy is not a frequently performed procedure due to the rarity of thyroid nodules in childhood and adolescence.

The most common endocrine complication after thyroidectomy, both in adults and children, is hypocalcemia. Hypocalcemia develops secondary to hypoparathyroidism that occurs due to trauma to the parathyroid glands during surgery or devascularization of the parathyroid gland <sup>(7,8)</sup>. de Jong et al. <sup>(9)</sup> investigated a case series consisting of 106 patients, and reported that although the incidence of postoperative hypocalcemia and hypoparathyroidism in children who underwent total thyroidectomy was higher compared to adults, it was not associated with age, indication for surgery, and extent of surgery. Radakrishnan et al. <sup>(10)</sup> reviewed 15 studies including 1552 cases, and reported that hypocalcemia developing after thyroidectomy in the pediatric population is particularly common in high-risk groups. Wu et al. <sup>(11)</sup> evaluated 184 patients whose FNAB results were classified in categories IV-V-VI according to TBSRTC criteria or who underwent early thyroidectomy for rearranged during transfection (RET) germline mutation (MEN2A, MEN2B, or familial medullary thyroidcarcinom), and reported that extrathyroidal involvement and central neck dissection are two independent risk factors for postoperative hypoparathyroidism. In addition, it was emphasized that surgeons operating in these patients should be aware of the relatively high risk of postoperative hypoparathyroidism, that they should master special intraoperative techniques, including liberal use of parathyroid autotransplantation for devascularized parathyroid glands, and exercise due care during surgery to preserve parathyroid functions <sup>(11)</sup>. In our study, as a postoperative complication transient hypocalcemia was observed in only 2 patients. These patients were operated for differentiated thyroid cancer and RET germline mutation (MEN2A) in line with the literature. Presumably, our lower postoperative complication rates were related to the small sample size, refraining from performing central neck dissection in any of the

patients, and intraoperative collaboration of a pediatric surgeon who is familiar with pediatric neck anatomy and a general surgeon (>30 thyroid surgeries per year) experienced in endocrine surgery.

Wood et al. <sup>(12)</sup> reported that optimal surgical results would be achieved in pediatric thyroidectomy with the cooperation of pediatric endocrinologists as well as high-volume endocrine surgeons and pediatric surgeons. Scheumann et al. <sup>(13)</sup> reported that high-volume endocrine surgeons had achieved better outcomes, shorter postoperative hospitalization time, and lower costs after thyroidectomy and parathyroidectomy in children compared to pediatric surgeons, general surgeons, or otolaryngologists. Considering the data in our study, it was thought that a collaborative approach between pediatric surgeons and endocrine surgeons would yield better results.

While evaluating pediatric thyroid nodules, decision to perform FNAB according to USG findings and clinical features is debatable. ATA recommends USG-guided FNAB for nodules larger than 1 cm. In addition, USG-guided FNAB is also recommended in case of ultrasonographically detected hypoechogenicity, irregular margin, increased intranodular blood flow, presence of microcalcifications, abnormal cervical lymph nodes (except for hyperfunctional nodules requiring direct surgery) that are smaller than 1 cm. FNAB results are evaluated according to TBSRTC <sup>(14,15)</sup> criteria. In the article reported by Partyka et al., <sup>(16)</sup> 186 FNAB results from 154 patients were evaluated and FNAB was found as a sensitive and highly specific modality for evaluating thyroid nodules in the pediatric patient group. In our study, FNAB results were similarly consistent with the pathology reports.

### Study Limitations

The limitations of the study are that it is based on retrospective data analysis and there is no control group.

### CONCLUSION

Thyroidectomy is a less common surgical procedure performed in childhood compared to adults. Thyroid nodules are the most common indication for pediatric thyroidectomies and FNAB is a safe method in the evaluation of thyroid nodules. Therefore, we believe that thyroidectomy performed by a general surgeon experienced in endocrine surgery and a pediatric surgeon in collaboration will reduce the possible postoperative complication rates.

## Ethics

**Ethics Committee Approval:** The study was conducted after obtaining approval from Health Sciences Turkey, İzmir Tepecik Education and Research Hospital Non-Interventional Research Ethics Committee (decision no: 2021/12-15, date: 15.12.2021).

**Informed Consent:** Since the study design was retrospective and data were collected anonymously, informed consent was waived.

**Peer-review:** Externally and internally peer-reviewed.

## Author Contributions

Surgical and Medical Practices: A.S., M.Ü., M.M., C.K., Concept: A.S., M.Ü., M.M., C.K., G.K., Design: A.S., M.Ü., M.M., C.K., Data Collection and/or Processing: A.S., M.M., Analysis and/or Interpretation: A.S., M.Ü., M.M., C.K., G.K., Literature Search: M.M., Writing: M.Ü., M.M.

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