

Histopathological Features of Intrathoracic Goitre are Important in Decision Making of Thoracal Approaches

Torakal Yaklaşımlara Karar Vermede İntratorasik Guatrın Histopatolojik Özellikleri Önemlidir

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ABSTRACT

AIM: The aim of the study is to examine the factors determining the need for thoracal approaches to remove an intrathoracic goitre.

MATERIAL AND METHOD: This retrospective study was conducted between 2011 and 2018. Patients were categorized into two groups; Group A consisted of patients who underwent surgery via the transcervical approach, and Group B consisted of patients who underwent surgery via the transcervical plus thoracic approaches. The extension, size, and localization of the intrathoracic goitre were measured on computed tomography scans. Histopathological examination results were recorded.

RESULTS: Group A consisted of 268 patients, and Group B consisted of 17 patients. There was a statistically significant difference in terms of recurrence between groups [Group A: 9 (3.4%) and Group B: 4 (23.5%), ($p < 0.001$)]. There was no statistically significant difference for the length of goitre in computed tomography, volume, and superior/inferior size of the specimen between groups (respectively; $p=0.389$, $p=0.679$, $p=0.129$). There was a statistically significant correlation between the choice of thoracotomy and the localization of the intrathoracic goitre ($p= 0.000$, $r= 0.208$). There was a statistically significant correlation between the choice of thoracotomy and pathological subtypes ($p= 0.000$, $r= 0.429$).

CONCLUSION: While dimensions of the goitre were not crucial in determining the necessity of thoracic approaches, recurrence, localization, and histopathological features were found to be determinants in removing an intrathoracic goitre.

Keywords: Intrathoracic, goitre, thoracotomy

ÖZET

AMAÇ: Çalışmanın amacı, intratorasik guatrın çıkarılması için torasik yaklaşımlara duyulan ihtiyacı belirleyen faktörleri incelemektir.

GEREÇ VE YÖNTEM: Bu retrospektif çalışma 2011-2018 yılları arasında gerçekleştirildi. Hastalar iki gruba ayrıldı; Grup A transservikal yaklaşımla ameliyat edilen hastalardan, Grup B transservikal ve torasik yaklaşımla ameliyat edilen hastalardan oluşuyordu. Bilgisayarlı tomografi incelemelerinde intratorasik guatrın uzunluğu, boyutu ve lokalizasyonu ölçüldü. Histopatolojik inceleme sonuçları kaydedildi.

BULGULAR: Grup A 268 hastadan, Grup B ise 17 hastadan oluşuyordu. Gruplar arasında nüks açısından istatistiksel olarak anlamlı fark vardı [Grup A: 9 (%3,4) ve Grup B: 4 (%23,5), ($p < 0,001$)]. Gruplar arasında bilgisayarlı tomografi, numune hacmi ve süperoinferior boyutunda guatr uzunluğu açısından istatistiksel olarak anlamlı bir fark yoktu (sırasıyla; $p=0,389$, $p=0,679$, $p=0,129$). Torakotomi seçimi ile intratorasik guatrın lokalizasyonu arasında istatistiksel olarak anlamlı bir ilişki vardı ($p= 0,000$, $r= 0,208$). Torakotomi seçimi ile patolojik alt tipler arasında istatistiksel olarak anlamlı bir ilişki vardı ($p= 0,000$, $r= 0,429$).

SONUÇ: Torasik yaklaşımların gerekliliğini belirlemede guatrın boyutları önemli değilken; intratorasik guatrın çıkarılmasında nüks, lokalizasyon ve histopatolojik özelliklerin belirleyici olduğu bulundu.

Anahtar Kelimeler: İntratorasik, guatr, torakotomi

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INTRODUCTION

Intrathoracic goitre is understood as a goitre that lies in the thorax, below the superior thoracic aperture¹. Most intrathoracic goitres can be removed through a cervical incision, but in an average of 2 to 8% of cases, a sternotomy or a thoracotomy is mandatory²⁻⁵.

There is no sufficient criteria to decide the need for additional thoracic approaches other than the transcervical approach to remove an intrathoracic goitre in the pre-operative period. Previous literature was focused on the localization of the intrathoracic goitre, recurrence, and the presence of ectopic intrathoracic goitre⁵⁻⁸. Topcu et al. claimed that the diameter of the goitre was another factor determining the need for thoracic approaches to remove an intrathoracic goitre⁵. Recently Casella et al. demonstrated the presence of the thyroiditis process was significantly correlated with the need to associate cervicotomy with sternotomy⁹.

In the present study, we examined the factors determining the need for thoracic approaches to remove an intrathoracic goitre.

MATERIAL AND METHOD

This retrospective study was conducted in Ankara City Hospital General Surgery Clinic, Department of Breast and Endocrine Surgery. Between 2011 and 2018, 285 intrathoracic goitres were operated on; additionally, thoracic approaches were necessary for 17 (5.9%) patients. This study was approved by the Institutional Review Board (E-19-2459). Informed consent was obtained from all individual participants included in the current study.

All patients were categorized into two groups; Group A consisted of patients who underwent surgery via the transcervical approach, and Group B consisted of patients who underwent surgery via the transcervical plus thoracic approaches (partial sternotomy or right-sided thoracotomy).

The goitre was defined as intrathoracic when extending (at least 3 cm) below the thoracic inlet⁶. Intrathoracic goitre was suspected when the lower pole of the cervical goitre was not visualized on ultrasonographic examination. This extension was confirmed by other pre-operative imaging methods and also intraoperatively. In all patients with clinical suspicion of intrathoracic goitre, thorax computed tomography (CT) scans were obtained. The superoinferior size of thyroid and the localization of the intrathoracic goitre were obtained by CT scans.

Before the operation, the patients were evaluated by a joint council consisting of the Thoracic Surgery and the General Surgery Clinics. The operative plans were discussed with the guidance of imaging studies due to the possibility of a pre-operative intrathoracic approach. Partial sternotomy was applied for the intrathoracic goitres located anterior to the mediastinum, and thoracotomy for the posterior intrathoracic goitres.

All patients were hospitalized preoperatively. All specimens were examined preoperatively by ultrasound-guided fine-needle aspiration cytology (FNAC) and postoperatively histologically to exclude malignancy. The routine calcium measurements were performed preoperatively and postoperatively. Voice and laryngeal functions were assessed through indirect laryngoscopy on the preoperatively and first postoperative day. The thyroid and parathyroid functions were evaluated before surgery and during follow-up.

All specimens were sent for histopathological examination after the surgical procedure, and the results were recorded. The superoinferior size and volume were measured using the dimensions of the thyroid obtained from the pathology report.

Surgical procedure:

All patients were positioned supine with the neck extended. The cervical thyroid was explored through a standard collar incision (Kocher's incision) in all cases. Primarily, the intrathoracic part of the thyroid was tried to be released by gentle traction and finger dissection in all patients. Transcervical thyroidectomy was completed in a standard method in case of the complete release of the intrathoracic part of the thyroid with this procedure. On the other hand, a right-sided thoracotomy or a partial sternotomy was performed in patients whose intrathoracic part of the thyroid could not be released by this method.

All patients underwent bilateral total or near-total thyroidectomy. Following complete resection, hemovac drains were inserted in the standard method, or partial sternotomy or chest tubes were inserted in right-sided thoracotomy.

Postoperative period:

After the standard method or partial sternotomy, the hemovac drains were removed when the daily drainage fell below 20cc. After right-sided thoracotomy, chest tubes were removed when the drainage was below 50cc, and there was no air leakage.

Statistical analysis:

Statistical analyses were performed using the SPSS software version 22. The variables were investigated using analytical methods (Kolmogorov- Smirnov) to determine whether or not they were normally distributed. Descriptive analyses were presented as means and standard deviations for normally distributed variables, as medians for the non-normally distributed, and as tables of frequency for the ordinal variables. The Mann-Whitney U test was used to compare parametric variables of the non-normally distributed data for between-group comparisons. The Chi-square or Fisher's exact test was used to compare these proportions in different groups. The Spearman correlation coefficient was used in investigating the correlation between ordinal data or the non-normally distributed variables. A p-value of less than 0.05 was considered to show a statistically significant result.

RESULTS

Two hundred and eighty-five patients were included in the study. Group A consisted of 268 patients, and Group B consisted of 17 patients. A partial sternotomy was required in 14 patients and a right-sided thoracotomy in 3 patients.

Table 1: Demographic parameters

	Group A transcervical approach (n=268)	Group B transcervical plus thoracic approaches (n=17)	P value
Age (years)	53.3± 11.7 (20 -85)	57.3± 15.7 (32 -80)	0,313
Gender			
Female	184 (68.7%)	8 (47.1%)	0,066
Male	84 (31.3%)	9 (52.9%)	
Operative time (minutes)	109.4 ± 21.7 (60-300)	171.1 ± 39.3 (120 -300)	0,000
Length of hospitalization (days)	4.2 ± 3.6 (2 -25)	13.1 ± 7.9 (5 -27)	0,000
Recurrence	9 (3.4%)	4 (23.5%)	0,000

There was a statistically significant difference in terms of recurrence between groups (p<0.001).

Dimensions of the thyroids are given in Table-2. There was no statistically significant difference in the superoinferior size of thyroid on CT, volume, and superoinferior size of the specimen between groups (respectively; p=0.389, p=0.679, p=0.129).

Table 2: Dimensions of thyroid

	Group A transcervical approach (n=268)	Group B transcervical plus thoracic approaches (n=17)	P value
Length of goitre on CT (cm)	7.7±2.6 (0 - 16)	6.5±4.6 (0 - 15)	0.389
Volume of goitre on the specimen (cm ³)	390.3 ± 268.9 (35 - 1560)	393.1 ± 336.4 (15 - 1143)	0.679
Length of goitre on the specimen (cm)	8.4 ± 2.1 (4.2 - 15.5)	9.2 ± 2.9 (3 - 14)	0.129

The localization of intrathoracic goitres is given in Table 3: Localization of intrathoracic section

	Group A transcervical approach (n=268)	Group B transcervical plus thoracic approaches (n=17)
Retrosternal	183 (68.3%)	5 (29.4%)
Retrotracheal	21 (7.8%)	1 (5.9%)
Trachea circumferential	-	2 (11.8%)
Below the major vascular structures	63 (23.5%)	7 (41.2%)
Retro -oesophageal	1 (0.4%)	2 (11.7%)

There was a statistically significant weak correlation between the choice of the thoracic approach and the localization of the intrathoracic section of the thyroid ($p=0.000$, $r=0.208$)

Table 4: Distribution of Histopathological Results (4a) and correlation between localization and pathology with thoracic approaches (4b)
Table 4a: Distribution of Histopathological Results

Histopathological Results	Group A transcervical approach (n=268)	Group B transcervical plus thoracic approaches (n=17)
MNG n (%)	245 (91.41 %)	5 (29.4 %)
LT n (%)	0 (0 %)	5 (29.4 %)
PTC n (%)	21 (7.83 %)	2 (11.7 %)
MTC n (%)	1 (0.37 %)	0 (0%)
FTC n (%)	1 (0.37 %)	1 (5.88 %)
ATC n (%)	0 (0 %)	4 (23.5 %)

Abbreviations: MNG, Multinodular goiter; LT, Lymphocytic thyroiditis; PTC, Papillary thyroid carcinoma; MTC, Medullary thyroid carcinoma; FTC, Follicular thyroid carcinoma; AC, Anaplastic thyroid carcinoma

Table 4b: Correlation between localization and pathology with thoracic approaches

	Localization of the intrathoracic section	Pathological subtypes
Thoracic approaches	$r=0,208$	$r=0,429$
P value	0,000	0,000

Trachea circumferential, below the major vascular structures, and retro-oesophageal localizations were associated with the need for thoracic approaches.

There were 23 (8.6%) patients with carcinoma in Group A and 5 (29.4%) in Group B. There was a statistically significant difference between groups in terms of multinodular goitre and carcinoma ($p=0.017$). There was a statistically significant positive correlation between the choice of thoracic approach and pathological subtypes ($p=0.000$, $r=0.429$) (Table-4). Multinodular goitre associated with thyroiditis and undifferentiated carcinoma were associated with the need for thoracic approaches.

There were recurrent laryngeal nerve injuries in 4 cases. While 3 (1.1%) of these patients were in group A (two of them were temporary, and one permanent), 1 (5.88%) patient was in group B. Transient hypoparathyroidism developed in 24 patients. Of these patients, 22 (8.2%) were in group A, while 2 (11.7%) were in group B. The patients' postoperative follow-up time was 16.85 (10.84-26.55) months.

DISCUSSION

Intrathoracic goitres have always been considered a challenge for surgeons because of difficulties that may be encountered during surgical removal and decision-making³. Intrathoracic goitres can be removed transcervically, but thoracic approaches are sometimes necessary²⁻⁵. Removing the intrathoracic goitres transcervically is minimally invasive with less potential for complications. However, transcervical plus thoracic approaches have a higher complication rate¹⁰⁻¹². There are insufficient criteria when deciding the need for additional thoracic approaches other than the transcervical approach to remove an intrathoracic goitre in the pre-operative period. In the current study, we demonstrated that the dimensions of the goitres were not important in determining the necessity of the thoracic approaches, which is similar to the observations of Casella et al.⁹. However, some authors concluded that the dimensions of the goitre were important in determining the necessity of thoracic approaches³⁻⁵. For goitres smaller than 10 cm, we observed that thoracic approaches were required; for much larger goitres this was not the case.

In the current study, recurrence and localization were found to be determinants of a thoracic approach to remove an intrathoracic goitre. Circumferential trachea, below the major vascular structures, and retro-oesophageal localizations were associated with the need for thoracic approaches, and this was consistent with the previous literature^{3,5-9,13-16}. In our case series, there were no ectopic nodules, which was demonstrated as a predictive factor for sternotomy by some authors^{3,5,7,15,16}.

The thyroiditis process was recognized as a possible cause of complex surgery and a contraindication for minimally invasive surgery¹⁷. Casella et al. demonstrated that the thyroiditis process was significantly correlated with the need to perform a cervicotomy plus sternotomy⁹. However, they concluded that the presence of malignancy was not predictive of a combined intervention, and their patient number was very low (total study cohort = 40 patients, and sternotomy = 4 patients)⁹. Cohen demonstrated that malignancy was a predictive factor for sternotomy in intrathoracic goitres¹⁶. However, the author did not give any information about the thyroiditis process, and the patient number in this study was very low (total study cohort = 113 patients, and sternotomy = 4 patients)¹⁶. The present study included a total of 285 intrathoracic goitres, 17 of whom operated using transcervical plus thoracic approaches. We found that thoracic surgery was indicated in patients who had carcinoma, especially non-differentiated carcinoma, and thyroiditis associated with multinodular goitre as per the histopathology results.

In light of our results, we could say that careful study of CT scans is needed in the pre-operative period of intrathoracic goitres¹. The relationship of the goitre to the trachea, oesophagus, and great vessels guides the surgical approach. Another important issue is the pre-operative ultrasound-guided FNAC; as seen in our study, histopathological features are of critical importance when planning the surgical removal of an intrathoracic goitre.

The retrospective nature and including single center's experience were the limitations of our study. The low number of patients who underwent thoracic intervention is another limitation of the study. This study can be considered of value as it was conducted at the reference center for endocrine surgery and defined the histopathological features, like carcinoma and thyroiditis, as determinants of thoracic approaches with many patients.

Intrathoracic goitres can be removed transcervically, but thoracic approaches are sometimes necessary. While dimensions of the goitre were not important in determining the necessity of thoracic approaches, recurrence, localization, and histopathological features were found to be determinants.

CONCLUSION

In light of the current study, we can say that while dimensions of the goitre were not important in determining the necessity of thoracic approaches, recurrence, localization, and histopathological features were found to be determinants in removing an intrathoracic goitre.

Conflict of Interest: The authors confirm that they have no conflicts of interest to disclose.

Funding: This research received no specific grant from any funding agency. Authorship Contributions: Concept - B.A.Ö, T.T; Design - B.A.Ö, E.M; Supervision- B.A.Ö, Y.A; Data collection &/or processing - B.Ç, Y.A; Analysis

and/or interpretation - E.M; Literature search - B.Ç, E.M; Writing - B.A.Ö, Y.A, H.A; Critical review - T.T, H.A
All authors discussed the results and commented on the manuscript.

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