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Anatomical study of thyroid pyramidal lobe among thyroidectomy patients in east Gezira, Sudan

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Abstract

Introduction: The thyroid pyramidal lobe (PL) is a remnant of the thyroglossal duct and is considered as normal component of the thyroid gland and may be affected by the diseases that affect the rest of the thyroid parenchyma. A practicing endocrine surgeon should keep the anatomical variations of the pyramidal lobe in mind to achieve a completely total thyroidectomy, when indicated.

Aim: Our aim is to study the presence and anatomical features of the pyramidal lobe of the thyroid gland in the patients undergoing total thyroidectomy.

Methods: This analytical cross sectional, hospital-based study was carried in Ruffaa teaching hospital. Including patients who underwent thyroidectomy during the period (January 2023 – December 2023) were selected to participate after they giving an informed consent. Data was entered and analysed.

Result: Seventy-six thyroidectomies were done, 94.6% of patients were female. Pyramidal lobe was found in 34.2% of patients, and it was originated commonly from the midline isthmus in 90.0%. The vast majority of patients (65.8%) were presented by symptoms and signs of neck swelling. Significant correlation was found between the presence of the pyramidal lobe and the coexistence of other thyroid congenital anomalies e.g. Retrosternal goiter and thyroid ima artery ($p = .000$) while no correlation was found to age and gender.

Conclusions: The presence of the pyramidal lobe is common in people of East Gezira and it is generally arising from the isthmus and tidily associated with compression symptoms.

Keywords: Thyroid gland; Thyroid disorders; Pyramidal lobe; Thyroidectomy

1. Introduction

The thyroid gland is the biggest endocrine gland and consists of two lobes (right and left) linked by an isthmus along the median line. Apart from these two lateral lobes, the pyramidal lobe extends superiorly from the thyroid glands isthmus, usually to the left of the median plane (Blumberg NA 1981). The pyramidal lobe is an additional thyroid tissue that can arise as a consequence of a residue of the thyroglossal duct in some people. The pyramidal lobe, which represents the inferior portion of the thyroglossal duct, is thought to be a functional thyroid gland component. The pyramidal lobe's volume (size) is increased by the persistence of an enlarged lower portion of the thyroglossal region. (Loevner, 2011) (Prakash, 2011). The thyroglossal duct, a tiny canal that connects the thyroid to the tongue during this

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migration, remains in place. Later, this duct vanishes, the thyroid gland eventually descends in front of the laryngeal cartilages and the hyoid bone as part of future growth. In the seventh week, it finally settles into place in front of the trachea. By that time, it had grown two lateral lobes and a small median isthmus. (Kim DW, 2015).

The pyramidal lobe is not present in each and every individual and varies widely in size, position, appearance, and form. The frequency of the pyramidal lobe varies between 15 and 75% in anatomical investigations (Sencar ME, 2021). In 50% of people, 12% have it on the right, and 28% have it in the middle of the isthmus (Drake,2018). The thyroglossal duct often develops in a left caudal direction, which may account for the most frequent placement to the left of the midline (Loevner, 2011). There have been numerous described morphological variations, such as pyramidal, triangular, thread, or flat shapes. Pyramidal lobe if present may increase thyroid tissue and may lead to serious complications during thyroid diseases. The location of the pyramidal lobe may cause additional regional problems such as pressure symptoms on the under lying tissues like laryngeal nerve. Pyramidal lobe if present may be accompanied by other developmental abnormality.

The purpose of this study was to assess the prevalence and position of the pyramidal lobe among patients underwent total thyroidectomy and to compare frequency rates by using the published surgical findings as the reference standards in patients undergoing thyroidectomy.

2. Material and Method

This Analytic Cross-sectional hospital-based study took place at Rufaa Teaching Hospital which is the central hospital in East of Gezira State in the period from January 2023 to December 2023 including all patients who underwent total thyroidectomy for benign diseases and malignant pathologies. Ethical approval was obtained from ethical review committee of faculty of medicine, Gezira University and Hospital administration office. Informed consent was obtained from patients who agreed were then studied. Exclusion criteria include patients underwent pervious neck surgery and those who refuse to participate in the study. Data was collected through direct patients interviewing, using standardized, structured questionnaire compose of both open and close ended questions, as well as observation section filled by the researcher during surgical operations including: presence or absence, anatomic delineation and point of origin of the PL were identified.

After collection, the data was entered, encoded and analysed using Statistical Package for Social Sciences (SPSS) version 23. Chi-square test was used to check the statistical significance between study variables at (P. value < 0.05)

3. Results

During the study period, a total of 76 thyroid surgical operations were done. The majority of patients 72(94.7%) were female, while 4(5.3%) of them were males and 33(43.4%) of them were in the age group between 30 – 45 year.

The pyramidal lobe was found in 26(34.2%) of 76 patients [Table 1]. In 90.8% of them the PL originated from the isthmus followed by 7.9% originated from the right lobe, whereas 1.3% originated from the left lobe [Table 2]. Vast majority of participants 50 (65.8%) were presented by symptoms and signs of neck swelling, 15(19.7%) presented with dysphagia, 7(9.2%) shortness of breathing and 4(5.3%) presented with hoarseness of voice [Table 3]. The pyramidal lobe was seen in 24 out of 72(33.3%) of the females and in two out of four (50%) of the males. However, the difference in gender was not statistically significant (p = 0.603) [Table 4]. A significant number of patients 24(92.3%) with pyramidal lobe were presented with enlarged thyroid (p value 0.000). [Table 5]. Moreover, a significant correlation was found between the presence of the pyramidal lobe and the coexistence of other thyroid congenital anomalies (p = 0.000) [Table 6] .

Table 1 Detection of pyramidal lobe during surgery among the study population

Pyramidal lobe	Frequency	Percent
Present	26	34.2
not present	50	65.8
Total	76	100.0

Table 2 Frequencies of points of origin of the pyramidal lobe

Location	Frequency	Percent
Isthmus	19	90.8
Rt lobe	6	7.9
Lt lobe	1	1.3
Total	26	100.0

Table 3 Type of presenting complain among study population

Complain	Frequency	Percent
Dysphagia	15	19.7
shortness of breathing	7	9.2
neck swelling	50	65.8
hoarseness of voice	4	5.3
Total	76	100.0

Table 4 Relationship between gender and presence of pyramidal lobe

Gender	Pyramidal lobe		P value
	Presents	Not present	
Female	24	48	0.603
	33.3%	66.7%	
Male	2	2	
	50%	50%	

Table 5 Relationship between presence of pyramidal lobe and swelling

Pyramidal lobe	Swelling		X2	P value
	Yes	No		
Present	24	2	14.432	.000
	92.3%	7.7%		
Absent	24	26		
	48%	26%		

Table 6 Presence of pyramidal lobe to the coexistence of other thyroid congenital anomalies

Pyramidal lobe	Congenital anomaly		X2	P value
	Yes	No		
Presents	11	15	20.9	.000
	42.3%	57.7%		
Not present	1	49		
	2%	98%		

4. Discussion

This study tried to discuss presence and clinical presentation of thyroid pyramidal lobe among patients undergoing total thyroidectomy in Ruffaa teaching hospital. The Pyramidal lobe is known as an ancillary lobe of the thyroid gland, correlating with the caudal end of the embryologic thyroglossal duct. (Fancy T, 2010). The pyramidal lobe, which represents the inferior portion of the thyroglossal duct, is thought to be a functional thyroid gland component. The pyramidal lobe's volume (size) is increased by the persistence of an enlarged lower portion of the thyroglossal region. (Loevner, 2011) (Prakash, 2011) The foramen cecum later serves as a landmark for the location of the thyroid gland, which initially manifests as an epithelial growth in the pharynx's floor between the tuberculum impar and the copula. The thyroid then descends as a bilobed diverticulum in front of the pharyngeal gut. The thyroglossal duct, a tiny canal that connects the thyroid to the tongue during this migration, remains in place. Later, this duct vanishes the thyroid gland eventually descends in front of the laryngeal cartilages and the hyoid bone as part of future growth. In the seventh week, it finally settles into place in front of the trachea. By that time, it had grown two lateral lobes and a small median isthmus.

The actual prevalence of this anatomical entity has been a topic of great debate in the past, with studies presenting frequencies that range from 0% to 80% (Akudu et al., 2018; Freilinger et al., 2022; Ryu et al., 2014). The said studies oftentimes base their results on US and CT findings, cadaveric analysis, and intraoperative observations.

The prevalence (34.2%) of the PL in our series of 76 total thyroidectomy cases agrees with Irawati et al finding who reported 36.89% in 103 Indian patients. Other surgical based studies reported higher than our findings; Mangalgiri et al 2018 reported a prevalence of 41.46% in 42 Indian patients underwent total thyroidectomy. Ayandipo et al 2022 conducted study in 160 Nigerian patients, pyramidal lobes were observed intraoperatively in 44%. A Turkish study conducted by Gurleyik et al 2015, reveals that the prevalence of the pyramidal lobe was 65.7%. Kim et al. reported a prevalence of 59.8% in 132 patients who underwent thyroid surgery It appears that these studies had been done in different ethnic groups and population and so it points toward an inconsistency in the prevalence of PL among patients with thyroid swelling, however, the presence of pyramidal lobes was far more in the present study (34.2%) than the study conducted by (Ryu JH, 2014) (Sturniolo G, 2008). In 2014 Mortensen et al conducted US based study in 416 patients, he reported prevalence of 21% for the presence of pyramidal lobe which is low compared to the figures quoted from the literature and our finding (34.2%). This differences may be due to fact that PL is unlikely to be missed by imaging modalities (CT and US).

From our results, we deduce that the PL predominately originates from the isthmus, followed by origin from the right side of the midline and least from the left side. In approximately 90% of our series the pyramidal lobe was located from the midline isthmus. Many authors assert that the most common point of origin is from the isthmus. [Ayandio et al 2022, Gurleyik et al 2015, and Zivic et al 2011)] This is consistent with this study's findings. Ostrowki et al 2023, reported in his statistical results of meta-analysis that the PL originates from most frequently from the left side followed by the right side and less frequent from midline which contradicts with our finding. In case of occurrence outside the isthmus there is right predominance in this study unlike the left predominance reported in the literature. (Gaikwad, 2016) (Ozgur, 2011), Further study may be of help in confirmation.

The most typical presentation for most patients is a neck mass, which leads to frequent pressure symptoms from the enlargement as well as hoarseness of voice from adhesions with or without inflammation or infiltration remote co-morbidity of tumor progression (Sturniolo G, 2008).

Regarding gender specification, in the current study the pyramidal lobe was seen in 24 out of 72(33.3%) of the females and in two out of four (50%) of the males. However, gender was not correlated with the presence of pyramidal lobe (p = 0.603), so no gender differences for the PL incidence, this goes with literature reported by Gurleyik et al 2015 and Moore eat al 2019. While it differs from other reports that mentioned female predominance, (Sturniolo G, 2008). In this study the male sample is too small, thus a further study with larger male sample may be need.

A significant number of the patients with enlarged thyroid were found to be having pyramidal lobe (p value 0.000). this gives a clue that pyramidal lobe may be a risk factor for thyroid enlargement or it may lead to early experience of symptoms since it may increase the volume of the thyroid tissue leading to early symptomatology. Similar findings were reported by. (Sturniolo G, 2008). The current study was found to be not different from others since p .value of neck swelling was found to be 0.00, compared to other presenting symptoms i.e dysphagia and hoarseness of voice.

The most obvious finding to emerge from the analysis was that, as most of the congenital anomalies were coexist. With regards to presence of other congenital anomaly with pyramidal lobe although the prevalence is expected to be high, this is because presence of any anomaly may indicate presence of other (Gurleyik, 2015). The significance of congenital comorbidity in the current study necessitates tracing the pyramidal tract during thyroidectomy to look for asymptomatic another anomaly.

5. Conclusion

Although the sample size among male is small yet the pyramidal lobe has male predominance over female, similar to literature. It is almost always originating from the isthmus and presented with neck swelling. Moreover, it is associated with another congenital anomaly.

Recommendations

Tracing to developmental line of thyroid should be a routine in thyroidectomy.

Compliance with ethical standards

Disclosure of conflict of interest

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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