Pyramidal Artery: An Artery to Pyramidal Lobe—A New Nomenclature

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Abstract Thyroid lobes are supplied by superior and inferior thyroid arteries. We dissected out a specific arterial pattern always present along with a well developed pyramidal lobe. Authors named this as “Pyramidal Artery”. This may be a common unnoticed bleeding site during surgery. Thyroid anomalies are commonly observed as incidental finding during surgery. Presence of pyramidal lobe is the most common finding among other thyroid anomalies due to persistence of thyroglossal duct. Present study reported incidence of pyramidal lobe in 41.46% cases and pyramidal lobe branches off more frequently from left lobe than right. Special attention has to be paid during total thyroidectomy in order not to leave the thyroid tissue. Few such anatomical variations and surgical importance of vascular pattern in such cases is discussed in paper.

Keywords Pyramidal lobe · Anomalies · Pyramidal Artery · Thyroid gland

Introduction

The two lateral lobes of thyroid are connected by an isthmus. Some times a pyramidal lobe persists in the caudal part of thyroglossal duct, extending from isthmus or one of the lobes of thyroid to the hyoid. Pyramidal lobe may be connected to hyoid by connective tissue or by a muscle levator glandulae thyroidae (LGT). Presence of pyramidal lobe, whether to be considered as a normal variant or not was always been a debatable question. Few studies have observed very low percentage of pyramidal lobe while few observed this in more than 50% cases.

Thyroid gland is supplied by superior thyroid artery, a branch of external carotid artery and inferior thyroid artery, a branch from thyrocervical trunk. Some times thyroidea ima artery when present supply thyroid.

Superior thyroid artery after branching from the external carotid artery runs towards the apex of the lateral thyroid lobe and divides into anterior and posterior branch. Posterior branch anastomose with ascending branch of the inferior thyroid artery. Anterior branch runs over the isthmus and anastomose with its fellow on the other side. In addition STA gives infrahyoid branch, Sternomastoid branch, Superior laryngeal artery, Cricothyroid artery.

It has been mentioned in literature that if pyramidal lobe is well developed it receives a separate branch from superior thyroid artery [1]. The study was aimed to elucidate the frequency of pyramidal lobe and to study whether specific arterial pattern exists in relation to the pyramidal lobe and to discuss its surgical importance.

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Material and Method

Study was conducted on 40 cadavers from the Chirayu Medical College and Hospital, Bhopal and data from 42 thyroidectomies were collected from the Neeti Clinics, Nagpur. Dissection was performed and pyramidal lobe was identified. A specific artery was distinctly identified supplying pyramidal lobe. Following observations were made.

Observation

Data was collected from cadaveric dissections and thyroidectomies. Out of 40 cadavers pyramidal lobe was identified in 18 cases. Out of 42 thyroidectomy surgeries pyramidal lobe was identified in 16 cases.

The incidence of pyramidal lobe was seen in 34 cases out of total 82 cases (41.46%). Pyramidal Lobe was arising from right lobe in 11 cases, from left lobe in 17 cases, from isthmus in 5 cases and bilaterally in single case.

A branch from superior thyroid artery was identified supplying separately to the pyramidal lobe in 32 out of 34 cases (94.11%). We termed this as “Pyramidal Artery”. This artery was identified during cadaveric dissection as well as during thyroidectomies also.

The Pyramidal Artery

The Pyramidal artery, was seen arising higher up from the superior thyroid artery proximal to the bifurcation of STA into anterior and posterior branches. It runs between sternothyroid and thyrohyoid muscle. It runs downwards and medially up to the level of lower border of thyroid cartilage. It runs higher than the anterior branch and then turns upwards and medially to accompany the pyramidal lobe posterolaterally and ascends up to the hyoid.

Pyramidal artery arises from right side if pyramidal lobe is from right lobe of thyroid gland and from left side if pyramidal lobe is from left side. In case of pyramidal lobe arising from isthmus, right pyramidal artery was supplying in 2 cases and left pyramidal artery in one case. In one case incomplete pyramidal lobe was identified as a knob like structure, in this case no separate pyramidal artery was identified.

Pyramidal lobe can be identified without cutting the strap muscles. A triangular intermuscular gap is present between the sternohyoid muscles and the base is formed by hyoid (Pyramidal Triangle). The pyramidal lobe can be identified within this triangular gap.

Another way to identify the pyramidal lobe is the presence of pyramidal branch as it could be identified much

before cutting the straps, between the sternothyroid and thyrohyoid. Types of cases are described below.

Bilateral Pyramidal Lobes

Pyramidal lobes were present bilaterally. Each pyramidal lobe was arising from the right and left lobe. Both pyramidal lobes were attached to the hyoid by levator glandulae thyroideae and both related to the left thyroid cartilage. Isthmus was absent in this case. Pyramidal artery was identified supplying separately to pyramidal lobes of respective side (Fig. 1). Each pyramidal artery was descending as a branch of superior thyroid artery and ascends posterolateral to the pyramidal lobe of corresponding side.

On left side ‘lateral levator’, a unique variant of levator glandulae thyroideae was observed, extending from the lower border of thyroid cartilage to the apex of the left pyramidal lobe, and few of its fibres are continuing with the levator glandulae thyroideae of the left side (Fig. 2). This could be a lateral glandulae thyroideae. A separate nerve supplying this muscle could not be identified.

Fig. 1 Illustration shows bilateral pyramidal lobes. Both pyramidal lobes are supplied by Pyramidal Artery originating from superior thyroid artery (Marked by arrows). Isthmus is absent

Fig. 2 Illustration shows origin of Pyramidal Artery from superior thyroid artery. Course of Pyramidal artery marked by arrows. Lateral levator a variant of levator glandulae thyroidae is also seen

Pyramidal Lobe from Right Lobe

Pyramidal lobe was arising from the right lobe of thyroid gland and attached above to the hyoid. Pyramidal artery branches from superior thyroid artery was seen supplying the pyramidal lobe (Figs. 3, 4).

Pyramidal Lobe from Left Lobe

Pyramidal lobe was arising from the left lobe of thyroid and attached to hyoid. A separate pyramidal artery was observed supplying the pyramidal lobe (Figs. 5, 6).

Pyramidal Lobe from Isthmus

In these cases pyramidal lobe was arising from the isthmus. Pyramidal artery from right side was supplying the pyramidal lobe (Figs. 7, 8).

Incomplete Pyramidal Lobe

A small knob like projection of incompletely developed pyramidal lobe was seen arising from the isthmus. Isthmus was very short. No separate arterial branch observed in this case (Fig. 9).

Fig. 3 Illustration shows origin of right Pyramidal Artery (Marked by arrows) from superior thyroid artery supplying pyramidal lobe arising from right lobe of thyroid

Double Pyramidal Lobe

Two pyramidal lobes branch off from left side. Both the lobes were arising from the left lobe. Only medial pyramidal lobe was connected to the hyoid by levator glandulae thyroidae (Fig. 10). This was also a unique case not described in the literature earlier. An arterial branch was observed running along the pyramidal lobe connected above to the levator glandulae thyroidae.

Discussion

Thyroid gland is unique for its blood supply. It has rich blood supply from the arteries of both sides. Each lobe of thyroid gland is independently supplied by Superior thyroid artery and inferior thyroid artery of that side. Presence of pyramidal lobe is considered as a normal variant of thyroid gland. Literature never mentioned about specific blood supply exists for pyramidal lobe or not. Long back in 1964 Romanes [1] mentioned that if the pyramidal lobe is well developed it receives an additional branch from the superior thyroid artery. In present study we tried to highlight the blood supply for the pyramidal lobe. We observed

Fig. 4 Illustration shows intra operative Pyramidal Artery (Marked by arrows) supplying pyramidal lobe

pyramidal lobe in 41.46% cases. During fine dissection we came across a branch from superior thyroid artery supplying the pyramidal lobe. Presence of Pyramidal lobe demands increased blood supply, to meet this additional demand a separate branch for pyramidal lobe is supplied. Authors have termed this as “Pyramidal Artery”. In 94.11% cases presence of pyramidal artery is a constant finding associated with the presence of well developed pyramidal lobe.

Incidence of pyramidal lobe is very high. Pyramidal branch is always seen wherever there is presence of pyramidal lobe and therefore its incidence is also very high. Therefore necessity was felt to include literature of this branch in regular text books. If compared with the incidence of the Thyroidea Ima artery its incidence is much higher and is artery therefore it must be included in the text books. The knowledge of this artery is of great importance to the surgeon who is operating on thyroid.

A new triangle has been defined bounded on either side by sternohyoid muscles, apex pointing below and base is formed by hyoid bone. A pyramidal lobe with LGT can be identified early and easily thorough this triangular gap. At the same time the pyramidal branch can be ligated at this location much earlier preventing loss of blood and LGT can be resected at this position so that early mobilization of the gland can be possible during surgery.

Fig. 5 Illustration shows Pyramidal artery on left near left pyramidal lobe marked by arrows

Fig. 6 Illustration of fetal thyroid. Pyramidal artery marked by arrows. Pyramidal lobe arising from left and supplying

Fig. 7 Illustration shows pyramidal lobe arising from Isthmus and receives Pyramidal artery from right (marked by arrows)

Fig. 8 Illustration shows intra operative pyramidal lobe and pyramidal artery (ligated)

Fig. 9 Illustration shows knob like pyramidal lobe (marked by star) arising from Isthmus

Fig. 10 Illustration shows double pyramidal lobe from Left. Lateral Pyramidal lobe not connected to hyoid (Marked by single arrow). Medial Pyramidal lobe connected through levator glandulae thyroideae (Marked by two arrows)

The thyroid gland is the first endocrine gland to appear during embryonic development. Pyramidal lobe develops

as a remnant of thyroglossal duct. In present study we observed Pyramidal lobe was arising from right lobe, left lobe and isthmus also. Partially developed pyramidal lobe in the form of knob like structure was also seen in one case.

Present study shows unilateral pyramidal lobe was arising in 28 cases. Unilateral pyramidal lobe was described by Blumberg [2], Levy et al. [3], Yuksel et al. [4], Braun et al. [5], Savage et al. [6] and Siraj et al. [7], reported pyramidal lobe of thyroid on thyroid scintigraphy.

Present study reported 41.43% of incidence of pyramidal lobe. Blumberg [2] documented the incidence of the pyramidal lobe in 60–65% and therefore should be regarded as normal component. Levy et al. [3] noted incidence of pyramidal lobe, 10% in normal and 17% in patients with thyroid diseases when reviewed with gamma camera pertechnetate and radioiodine thyroid scans. Percentage of pyramidal lobe was found to be more associated with diffuse toxic goitre almost in 43% cases. Braun et al. [7] observed Pyramidal lobe in 55% cadavers (32/58) and also stressed that the pyramidal lobe should be regarded as normal component of thyroid.

Geraci et al. [8] reported incidence of intraoperative pyramidal lobe in 12% cases. Park et al. reported incidence of pyramidal lobe in 41.3% cases. Marshall [9] reported processus pyramidalis in 43% cases. Cicekcibasi et al. [10] reported incidence of pyramidal lobe in fetuses is 18.3%. Siraj et al. [7], reported the incidence of pyramidal lobe on scintigraphic detection in 41% cases. Won and Chung [11] reported frequency of pyramidal lobe as high as 76.8%.

Present study shows unilateral pyramidal lobe branch off more frequently from left lobe (17 cases), right lobe (11 cases). Braun et al. [5] reported Pyramidal lobe branched off more frequently from left part of isthmus (16) than from right (7) or the midline (9). Won and Chung [11] reported the location of pyramidal lobe on left in 48.8%, on right in 26.4% and from middle of the isthmus 21.7%.

Pyramidal lobe branch off more frequently from the left side of isthmus than right side. Park et al. [12] and Geraci et al. [8] also reported pyramidal lobe predominantly arising from left of the gland.

Present study also documented rare two cases of presence of double pyramidal lobe. In one case bilateral pyramidal lobes were arising from both lobes and isthmus was absent in this case. In second case both pyramidal lobes were arising from the left lobe, medial one attached to hyoid. Park et al. [12] reported presence of bilateral pyramidal lobes in 2 cases. Ignjatović [13] documented double pyramidal lobe in one case. Park et al. [12] reported 2 cases of bilateral pyramidal lobe. Marshall [9] also reported a case of double pyramidal lobe. Mangalgi et al. [14] reported a case of inverted U shaped thyroid gland in which two lobes were joined by isthmus above cricoid cartilage. In complete exposure in such may be mistaken for bilateral pyramidal lobe.

Conclusion

Thyroglossal duct persists in the form of pyramidal lobe. It is present in a very high percentage and therefore should be regarded as a normal variant. Surgeon must be well acquainted with the various forms of thyroid anomalies so that no tissue is left behind during surgery. A new nomenclature “Pyramidal Artery” branch from superior thyroid artery should be included as it is constantly present along with a well developed pyramidal lobe. Pyramidal artery may be source of bleeding during surgery if unnoticed. Therefore a sound knowledge of vascular anatomy is important for the operating surgeon.

Compliance with Ethical Standards

Conflict of interest Authors have no conflicts of interest to disclose.

Ethical Approval This study was approved by institutional ethical committee.

Ethical Statement Obtained informed consent.

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