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Case Report

Aberrant branching pattern and uncommon origin of inferior thyroid artery - dual rarity

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ABSTRACT

Thyroid surgery is one of the most common neck procedures, and surgeons need to have a thorough understanding of the blood supply to this gland to prevent significant haemorrhage. In this report, we describe an aberrant branching pattern of the inferior thyroid artery (ITA) on the right side during a total thyroidectomy performed for papillary carcinoma of the thyroid with retrosternal extension at the ENT-HNS department of Command Hospital (Eastern Command). The left inferior thyroid artery appeared normal. The aberrant ITA originated from the right common carotid artery (CCA). Shortly after its origin, the aberrant branch ascended alongside the middle thyroid vein and entered the thyroid gland near the tubercle of Zuckerkandl. The superior thyroid arteries showed no unusual distribution. This uncommon origin and aberrant branching pattern is extremely rare, and PubMed review found no articles on this specific variation. Understanding such dual rarities and aberrant arterial patterns related to the thyroid gland is invaluable for surgeons, helping to prevent unnecessary haemorrhage.

Keywords: Aberrant branching pattern, Inferior thyroid artery, Thyroid gland, Uncommon origin

INTRODUCTION

Anatomical findings regarding the origin, course, and distribution of the inferior thyroid artery (ITA) are often thought to maintain a consistent relationship. However, the literature reveals numerous variations and anomalies. Typically, the ITA originates from the thyrocervical trunk, which is a branch of the subclavian artery. It may also arise from the subclavian artery (10%), the carotid artery (4.3%), or the vertebral artery (2.9%).[1] The artery reaches the thyroid gland at the junction of the superior two-thirds and the inferior one-third of the gland. The ITA divides into three terminal branches: the posterior, deep, and inferior branches. The posterior branch anastomoses with the posterior branch of the superior thyroid artery; the deep branch connects with its contralateral counterpart; and the inferior branch anastomoses with its counter partner along the inferior border of the isthmus. The small vessels that branch off the ITA include the oesophagal, tracheal, inferior laryngeal, and muscular branches, with the ascending cervical branch being the largest. The ITA follows a curved course to the thyroid, passing behind the prevertebral fascia, anterior to the anterior scalene muscle, and posterior to the common carotid artery (CCA) and the internal jugular vein (IJV). It serves as the primary blood supply to the thyroid gland as well as the four parathyroid glands. In this discussion, we will focus on an unusual origin and aberrant branching pattern of the ITA.

CASE REPORT

During a routine total thyroidectomy for a case of papillary carcinoma of the thyroid with retrosternal extension, an aberrant branching pattern of the right ITA was observed. After dissecting the superior pole of the thyroid, the middle thyroid vein was identified and ligated. Following this, an artery was noted beneath the middle thyroid vein, travelling above the right recurrent laryngeal nerve (RLN) and inserted near the tubercle of Zuckerkandl (Figure 1). With further dissection, the inferior pole of the thyroid was

located, along with the inferior thyroid artery, which originated from the common carotid artery (Figure 2). Shortly after its origin, the artery divided and exhibited an aberrant branching pattern that supplied the middle region of the right thyroid.

Figure 1: Aberrant branch of right inferior thyroid artery (ITA); middle thyroid vein (MTV) clipped.

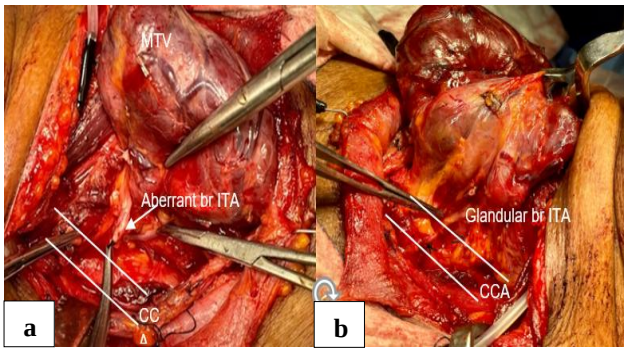

Figure 2: (a) Aberrant branch of right inferior thyroid artery originating from common carotid artery, and (b) glandular branch of right inferior thyroid artery after incising aberrant branch of right inferior thyroid artery.

All branches of the inferior thyroid artery were identified, including the inferior laryngeal branch, which travelled beneath the right RLN, the glandular branch supplying the area behind the inferior pole of the thyroid, and additional branches: ascending cervical, pharyngeal, tracheal, oesophagal, and muscular, which supplied their respective structures deeper to the thyroid gland (Figure 3). No aberrant pattern was noted in the right superior thyroid artery, and the left inferior thyroid artery appeared completely normal, without unusual origins or aberrant branches (Figure 4).

Typically, the middle region of right thyroid lobe is drained by middle thyroid vein and lacks direct arterial supply. This type of aberrant branching pattern is extremely rare. Awareness of such variant vasculature is crucial for surgeons performing thyroid surgeries, radical neck dissections, aneurysm reconstructions, and interventional radiology.

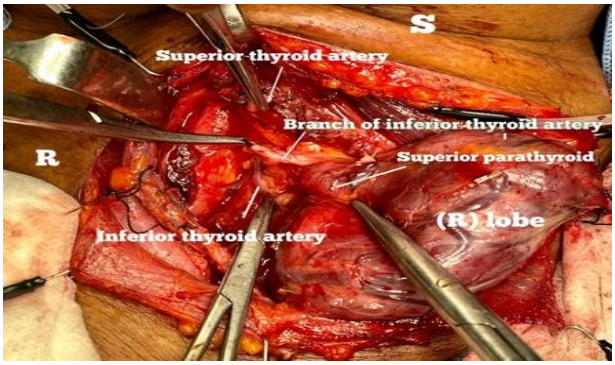

Figure 3: Branch of right inferior thyroid artery.

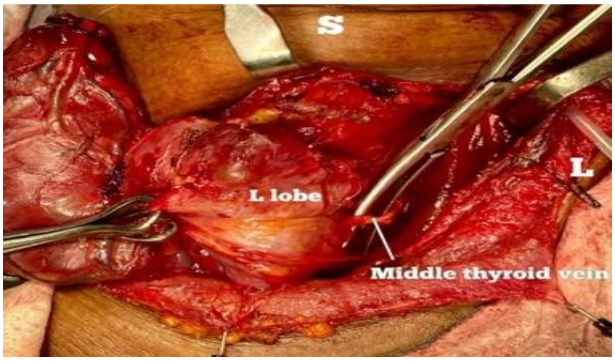

Figure 4: Left lobe of thyroid.

DISCUSSION

The thyroid gland is a highly vascular endocrine organ, with the inferior thyroid artery serving as its main blood supply. Therefore, ligating this vessel during thyroid surgeries is essential. Numerous studies have documented variations in the origin and branching patterns of the inferior thyroid artery.[1-7]

The inferior thyroid artery, known as the artery of the hilus, enters the gland posteriorly at approximately the junction of the upper two-thirds and lower one-third of the lateral border of the thyroid. Quain notes that the inferior thyroid artery may arise from the common carotid, vertebral, or subclavian arteries as an independent trunk. In older anatomical texts, the transverse cervical and suprascapular arteries were considered branches of the inferior thyroid artery, but it is now more common to classify them as two of the three divisions of the thyroid axis, with the inferior thyroid forming the third.

Originating from the thyrocervical trunk at the inner border of the anterior scalene muscle, the inferior thyroid artery ascends while resting on the longus colli muscle. At the highest point of its ascent, it gives rise to the ascending cervical branch. Then, at the level of Chassaignac's tubercle, the artery turns inward, still lying on the longus colli and passing behind the carotid sheath, and often the middle cervical ganglion of the sympathetic trunk, before entering the hilus of the lateral lobe of the thyroid, either as a single trunk or as a series of diverging branches. This

point of entry corresponds to a location at or just above the junction of the upper two-thirds and lower third of the lobe's outer border but is situated on its posterior surface. The recurrent laryngeal nerve may pass either in front of or behind the vessel.

The oesophagal, tracheal, inferior laryngeal and muscular branches of the inferior thyroid artery are relatively small, while the ascending cervical branch is the largest. Care must be taken during ligation to ensure that this branch is not mistaken for the inferior thyroid artery itself.

Graves et al describes the anatomical variation of the inferior thyroid artery during cadaveric dissection bilaterally in 34 cadavers and unilaterally in 2 cadavers, 82.9% of cases it originates from the thyrocervical trunk followed by the subclavian artery (10%), carotid artery (4.3%) and vertebral artery (2.9%).[1]

Toniato et al has two cases (49-year-old and 60-year-old women), each with a large multinodular mediastinal goitre in whom, during total thyroidectomy, an aberrant ITA was found on the right side arising from the common carotid artery.[2] Mariolis-Sapsakos describes about bilateral aberrant origin of the inferior thyroid artery from the common carotid artery.[3]

Novakov et al reported two cases of variations in inferior thyroid arterial pattern and their clinical implications. The first case was a 61-year-old man with a middle thymothyroid artery arising from the common carotid on the right side and inferior thyroid as a branch of the common carotid on the left. The second case was an 85-year-old female without inferior thyroid arteries bilaterally, replaced by thyroid ima arising from the brachiocephalic artery.[4]

Motwani et al reported a case of a variant branching pattern of the superior thyroid artery.[5] Chandrakala described variations in the origin of the inferior thyroid artery and the relation of the artery with recurrent laryngeal nerve.[6]

Rogers reported a case, where on one side two inferior thyroid arteries arose from the thyrocervical trunk.[7] Daseler and Anson states that the inferior thyroid artery usually arises from the thyrocervical trunk, a branch from the subclavian artery. Here in about 15% of the individuals, it arose directly from the subclavian artery.[8]

In this discussion, we present a case of dual rarity involving the right inferior thyroid artery, which originated from the right common carotid artery. After its origin, the artery divided into two branches, one of which was an aberrant branch that travelled alongside the middle thyroid vein, entering the thyroid gland near the tubercle of Zuckerkandl. This branching pattern is quite unusual and resembles the aberrant glandular branch of the inferior thyroid artery.

CONCLUSION

Understanding the aberrant variations of the ITA is crucial for surgeons to avoid iatrogenic injuries and potential complications during procedures such as thyroidectomy, neck dissection, aneurysm reconstruction, and interventional radiology. Awareness of these rare arterial variations is essential for effective surgical planning and minimizing complications.

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