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CASE REPORT

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Two cases of variations in inferior thyroid arterial pattern and their clinical implications

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Vascular variations are the most common ones in humans. Inferior thyroid artery arises from the thyrocervical trunk in 90.5%, from subclavian in 7.5%, and very rarely from the common carotid, aortic arch, brachiocephalic, internal thoracic, pericardiacophrenic, or vertebral. Thyroid ima artery is more common variety found in up to12.2% of the population. Two cadavers dissected in the anatomy department are presented with variations in the blood supply of the thyroid gland. The first case was a 61-year-old man with 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 brachiocephalic artery. The awareness of such arterial pattern is crucial for the specialists in imaging and preoperative diagnosing and escaping eventual iatrogenic complications of thyroid gland. (Folia Morphol 2023; 82, 2: 396–399)

Key words: middle thymothyroid artery, thyroid ima artery, human anatomy variations

INTRODUCTION

The human anatomy variations are part of the human anatomy science from its dawn till nowadays and are still an essential part of the gross anatomy research. The main significance of that type of evidence is for the invasive medical procedures and especially surgery [5]. The thyroid gland is an endocrine cervical gland which is well vascularised. Arterial supply comprises 2 superior thyroid arteries (STAs) originating from the external carotid arteries and 2 inferior thyroid arteries (ITAs) originating from the thyrocervical trunk, branch of the subclavian arteries [3, 6, 9]. Occasionally there is an accessory artery termed thyroid ima (TIA), which when present (0.4––12.2%), originates from the brachiocephalic trunk (43.3–86.7%), from the common carotid artery (CCA) (2–50%) or aortic arch (0–66.7%) [11, 13]. Though rare in humans, middle thyroid artery is found in some animals, such as guinea pig and rabbit [10] and avian species like budgerigar [8]. The awareness of the anatomic variations in the blood supply of thyroid gland are of crucial significance when planning a surgical approach in the infrahyoid region. Knowledge of variability in thyroid vascularisation will facilitate the surgical procedure itself, make it safer and minimise the risk of haemorrhage [5].

CASE REPORT

Case 1

Formalin/ethanol-embalmed cadavers were used for dissection during the anatomy lessons. The length and diameter of the structures were measured by callipers.

A 61-year-old male cadaver was dissected in the department of anatomy and multiple variations in

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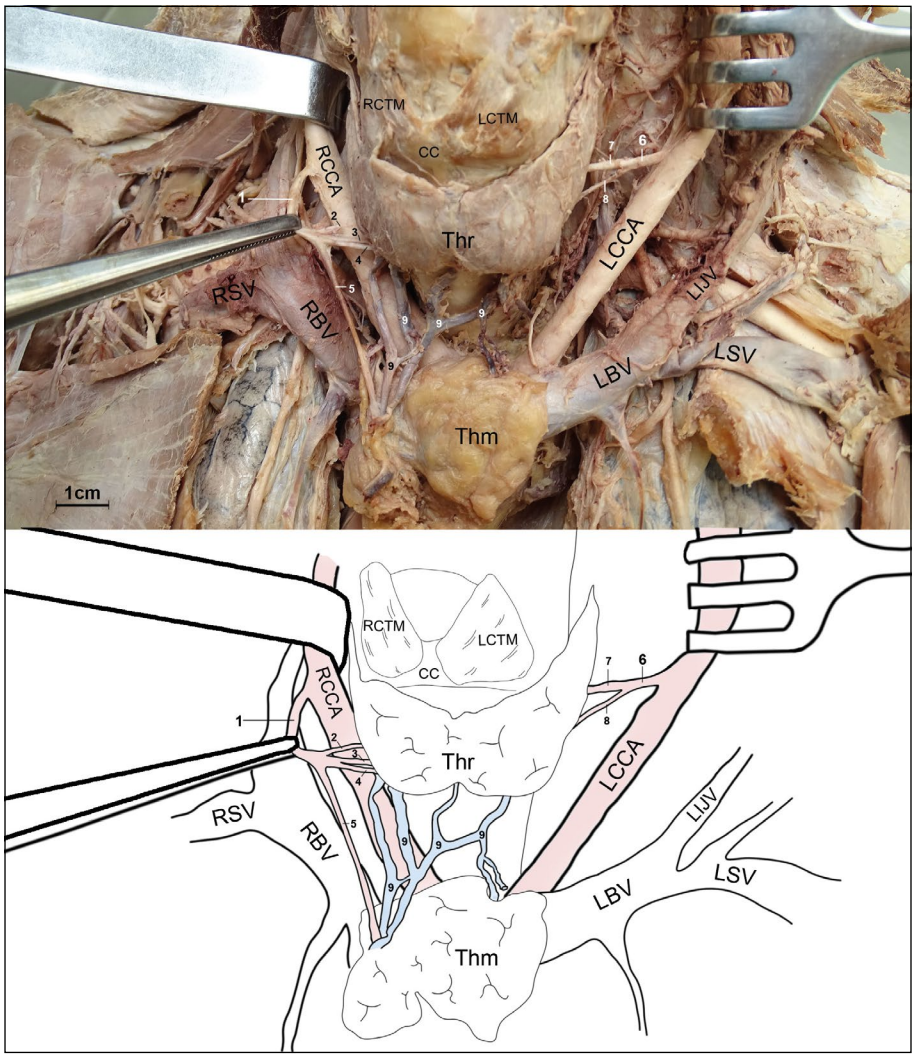

Figure 1. Middle thymothyroid artery on the right side and atypical origin of inferior thyroid artery on the left side; RCTM/LCTM — right/left cricothyroid muscle; CC — cricoid cartilage; Thr — thyroid gland; Thm — thymus; RCCA/LCCA — right/left common carotid artery; RBV/LBV — right/left brachiocephalic vein; RSV/LSV — right/left subclavian vein; LIJV — left internal jugular vein; 1 — middle thymothyroid artery; 2 — upper thyroid branch; 3 — middle thyroid branch; 4 — lower thyroid branch; 5 — thymic branch; 6 — inferior thyroid artery; 7 — superior branch of inferior thyroid artery; 8 — inferior branch of inferior thyroid artery; 9 — inferior thyroid veins.

the bilateral arterial blood supply of the thyroid gland were registered. An accessory artery supplying both thyroid and thymic glands was found on the right side. We agreed with previous authors and named it middle thymothyroid artery [1]. That was a spatial variation also belonging to the category of consistency [12]. It originated from the CCA 48 mm proximal to its bifurcation. The diameter of the CCA was 8 mm and the length of the unusual branch was 17 mm till its division into 3 thyroid branches (upper, middle and lower). The diameter of the middle thymothyroid artery was 2.5 mm and its length with its longest branch as it enters thyroid gland was 63 mm. The continuation of the artery to the thymus (thymic branch) was 1.5 mm in diameter. The STA and ITA had their standard origin and position. On the left side of the same cadaver the ITA had rare origin from the CCA. The former started at 50 mm from the bifurcation of CCA, which was 6 mm wide. The length of the variable ITA to the release of its branches was 8 mm and its superior branch, which directly continued to the gland was 10 mm long and 1.5 mm wide, while the inferior one was 16 mm long and 0.8 mm wide. The diameter of the ITA was 2.5 mm. The rest of the structures on this side were with standard topography (Fig. 1).

Case 2

During the same semester another variation was found in 85-year-old female cadaver. The routine

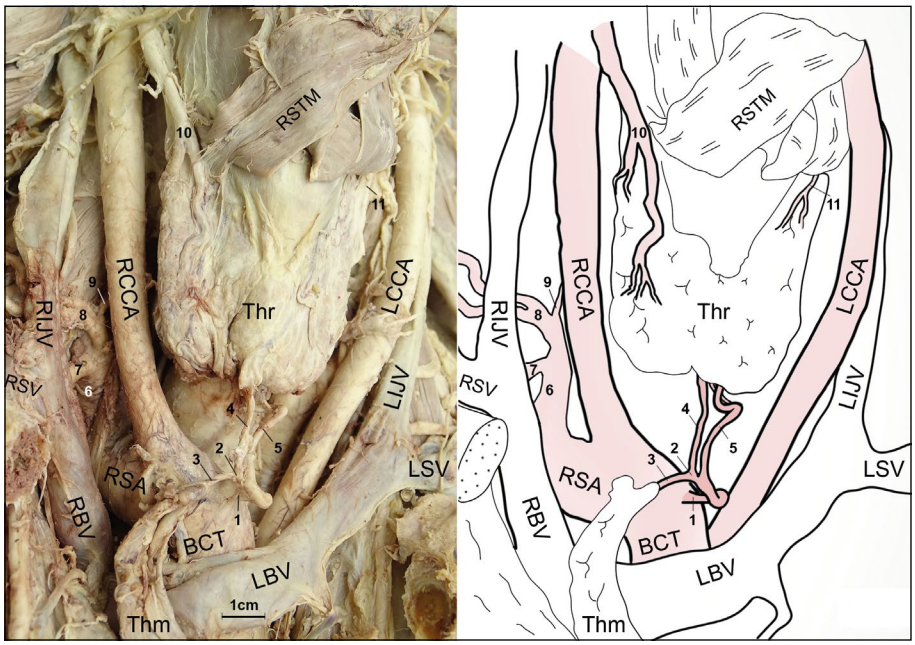

Figure 2. Thyroid ima artery replacing missing inferior thyroid arteries; RSTM — right sternothyroid muscle; Thr — thyroid gland; Thm — thymus; RCCA/LCCA — right/left common carotid artery; RSA — right subclavian artery; BCT — brachiocephalic trunk; RIJV/LIJV — right/ /left internal jugular vein; RSV/LSV — right/left subclavian vein; RBV/LBV — right/left brachiocephalic vein; 1 — thyroid ima artery; 2 — right branch; 3 — thymic artery; 4 — right inferior thyroid branch; 5 — left inferior thyroid branch; 6 — thyrocervical trunk; 7 — suprascapular artery; 8 — transverse cervical artery; 9 — ascending cervical artery; 10 — right superior thyroid artery; 11 — left superior thyroid artery.

dissection of the neck exposed bilateral absence of the ITAs. The arterial blood supply was compensated by the presence of relatively larger STAs, especially the one on the right side, and prominent TIA arising from the innominate artery. The TIA emerged in the midline 28 mm from the origin of the brachiocephalic trunk measured along its left border. It had a spiral course and diameter of 4 mm as well as a length of 21 mm to its division into: 1. Right branch — 3 mm long and 2 mm wide common trunk, which divides into thymic artery and right ITA; 2. Left branch — it was a continuation of the main artery as left ITA (2 mm in width), which climbed to the left lobe of the thyroid gland and before reaching it released a small branch for the isthmus of the gland. The rest of the topographical anatomy of the neck was standard (Fig. 2).

DISCUSSION

The origin of the ITA from CCA is very rare. Therefore, finding it in the gross anatomy dissecting lab is worth presenting it. The Case 1 of this report describes bilateral variants of the blood supply of the thyroid gland, which are both rare aberrant origins of ITA from CCA (about 1%) [5]. There is an embryological basis of such variations as they are associated with time and stages of the development of the neck arteries by the aortic arches and the appearance and migration of the thyroid gland. That period between the 3rd and 7th week of development is when the formation of the aortic arch branches and the synchronous descend of the thyroid gland occur and it is not unreasonable to presume that the vascularisation of the gland would occasionally come from other vessels such as the subclavian, the vertebral or the CCA [4, 5]. The thyroid ima found in Case 2 is more common (up to 12.2%) but not usual which makes it an obstacle in thyroid surgery. Phylogenetically, the origin of this variable artery is supposed to appear from the original vascular network which connects brachiocephalic, aortic arch and carotids. During the later development the primary vessels disappearing by fusion may either supplement or substitute the regular blood supply of the thyroid gland, namely the superior and inferior thyroid arteries as the thyroid ima [7].

Though very rare the ITA arising from CCA exposes two major risks for surgical intervention in the area: haemorrhage by injuring this artery when on unusual position and increased possibility of injuring recurrent laryngeal nerve [2, 6].

Carotid endarterectomy as an established procedure for stroke prevention is also related to the

above-mentioned arterial pattern of the CCA, which uniqueness could be crucial for successful removal of the atherosclerotic plaque and the avoidance of postoperative complications [5].

Interventional radiology procedures like endovascular aneurysm reconstruction, chemoembolisation techniques like tumour embolisation, and arterial embolisation for the treatment of thyroid conditions requiring ablation might be affected in case of such variations [2, 5].

CONCLUSIONS

The role of anatomy science on variations and especially those of the vascular system and in the neck region is essential. Surgeons and interventional radiologists might come upon such rare variations during procedures in the neck area and any preceding awareness will be valuable to limit the incidence of possible iatrogenic complications.

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Conflict of interest: None declared

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