

Aberrant origin of the inferior thyroid artery from the common carotid artery: a rare anatomical variation

Adèle-Rose Ngo Nyeki¹, Giuseppe Peloni^{1,2}, Wolfram Karenovics¹, Frédéric Triponez¹, Samira Mercedes Sadowski¹

¹Thoracic and Endocrine Surgery Unit, Surgery Department, University Hospitals of Geneva, 4 Rue Gabrielle Perret Gentil, 1211 Geneva, Switzerland; ²Ospedale Regionale di Mendrisio, Via Turconi 23, 6850 Mendrisio, Switzerland

Correspondence to: Samira Mercedes Sadowski. Thoracic and Endocrine Surgery Department, University Hospitals of Geneva, 4 Rue Gabrielle Perret-Gentil, 1211 Geneva, Switzerland. Email: samira.sadowski@hcuge.ch.

Abstract: We describe the case of a rare anatomical variant of the inferior thyroid artery (ITA) taking its origin directly from the common carotid artery (CCA) instead of the thyrocervical trunk (TCT). This anatomical feature exposes to risks of perioperative bleeding and nerve injuries when it is unrecognized by the surgeons. Knowledge of its existence may be helpful to reduce risks for the patient.

Keywords: Anatomical variation; common carotid artery (CCA); inferior thyroid artery (ITA)

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Introduction

The thyroid gland is an endocrine cervical gland richly vascularized by major arterial and venous networks. Arterial supply comprises 4 pedicles, 2 superior thyroid arteries originating from the external carotid arteries, usually as their 1st branch and 2 inferior thyroid arteries originating from the thyrocervical trunk (TCT), branch of the subclavian arteries (SCA). There is one accessory middle thyroid artery called thyroidea ima, which when present, originates from the brachiocephalic trunk or directly from the aortic arch. Good knowledge of thyroid blood supply is imperative for surgeons, as it helps to avoid hemorrhagic complications and nerve injuries for patients (1). We report a case of an inferior thyroid artery (ITA) taking its origin directly from the common carotid artery (CCA).

Case presentation

A 46-year-old male patient without any specific past history was referred to our department after discovering a large substernal goiter on a cervico-thoraco-abdominal CT (Figures 1,2) performed for investigation of retrosternal oppression. This goiter was almost invisible in the cervical

region but enclosed mediastinal vessels and the trachea and extended into the anterior upper mediastinum, explaining the patients' symptoms of retrosternal discomfort and oppression.

Total thyroidectomy through collar neck incision and complementary mediastinoscopy were performed for extraction of right latero-tracheal and substernal part of the goiter; Surgery was performed using continuous neuromonitoring (NIM[®] 3.0 Medtronic) of the recurrent laryngeal nerves (RLN). During right lobectomy and after section of the middle thyroid veins, an arterial trunk originating directly from the right CCA was discovered (Figure 3). This artery moved towards the lower third of the right thyroid lobe where it divided into 3 branches. After identification and preservation of the RLN, which ran posterior to the ITA, arterial branches were controlled meticulously using harmonic scalpel.

The contralateral ITA originated from the left TCT and the superior thyroid arteries from the external carotid arteries, as expected. No other anatomical abnormalities of the two CCA trunks were visualized. The substernal goiter was entirely removed through mediastinoscopy and the patient left the hospital 2 days after his surgery without any postoperative complications (drain was removed 24 hours



Figure 1 Cervico-thoracic CT scanner showing substernal goiter, sagittal view.

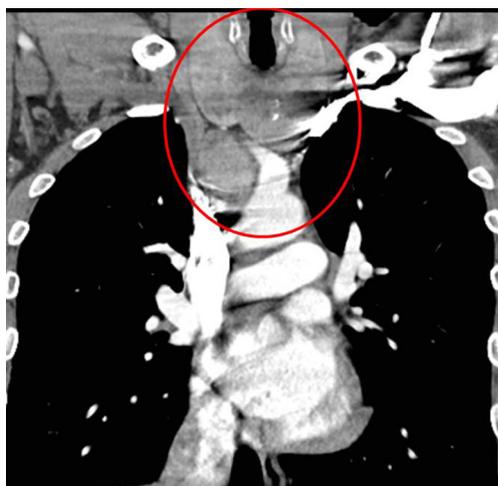


Figure 2 Cervico-thoracic CT scanner showing substernal goiter, frontal view.

after surgery, calcium and parathyroid hormone serum levels were normal and no voice changes were noted).

Discussion

The ITA originates from the TCT, branch of the SCA. It follows a curved route anterior to the medial border of the anterior scalene muscle behind the prevertebral fascia and turns posteriorly to the CCA and the internal jugular vein, then passing the anterior surface of the longus colli muscle to reach the thyroid. It then divides into several branches at

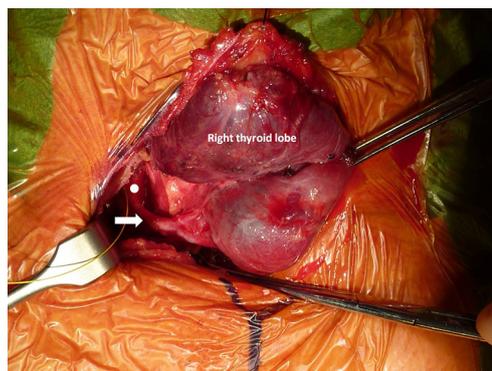


Figure 3 Intra-operative images of the right inferior thyroid artery (white arrow) originating from the right common carotid artery (white dot).

the level of the middle third of the lateral side of the thyroid lobe. Usually, there are no arterial branches from the CCA before it divides into external and internal carotid artery at the top edge of the thyroid cartilage (2).

The ITA has variable relationship with the RLN, nerve that is important for vocal cords mobility and breathing. Hence, visualization of the anatomical relationship of the RLN with branches of the ITA is essential for its preservation. It can be deep or superficial, or even passing in between arterial branches. Therefore, knowledge of its anatomy requires special attention (3).

Very few cases have been published about this specific type of anatomical abnormalities of the ITA. For Toni *et al.*, the ITA can originate from the TCT and less frequently from the SCA directly, but origin from the CCA remains extremely rare, no matter the ethnicity of patients (4). In their report, it originated from the TCT in 90% of cases, in 10% from the SCA, in 0.6% from vertebral artery and only in 0.2% from the CCA. It is therefore a rare anatomical variation (5). Only two cases of an ITA originating from the CCA in a series of over 8,000 thyroidectomies were reported in Italy (6). From a surgical perspective, this anomaly exposes to two major risks: the first one is hemorrhagic by injuring this artery when on aberrant course; the second risk is increased injury to the RLN. This might be due to the fact that when an ITA directly originates from the CCA, goiters develop in a more retrovascular position such as present in our patient. Thus, the goiters tend to push the RLN anteriorly, exposing it to per-operative injuries (6).

Our patient presented with a unilateral variation. In literature, a similar case affecting both sides was reported

and according to the authors, it would be unreasonable to presume that the thyroid blood supply cannot have other origins than from the SCA or the CCA; those variations might be explained by anatomical changes occurring between the 29th day and the 7th week of embryological development of the aortic arches and the synchronous descent of the thyroid gland (7).

Conclusions

Anatomical variations of the arterial pedicles of the thyroid gland are usually discovered incidentally during operative procedures. They must be known by thyroid surgeons, especially by the trainees in order to avoid major complications such as bleeding and nerve injuries.

Acknowledgements

None.

Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

Informed Consent: Written informed consent was obtained from the patient for publication of this case report and any

accompanying images. A copy of the written consent is available.

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