

Case Report

An analysis of a cadaver with a rare anatomical variation of thyrocervical trunk

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ABSTRACT

Introduction: The course of the branches of the thyrocervical trunk (TT) such as the inferior thyroid artery (ITA), suprascapular artery (SSA), transverse cervical artery (TCA) and ascending cervical artery (ACA) has a range of anatomical variations. The available literature distinguishes between 4 to 9 types of TT variation and its branches.

Aim: The following paper presents an anatomical variation that was not included in any known classifications.

Case study: During routine dissection of a body of a 84-year-old woman located in the Department of Anatomy of the University of Warmia and Mazury in Olsztyn, a following course of TT was observed. In the described case the SSA derives directly from the subclavian artery (SA), while the TT gives away ITA, ACA and TCA, which further bifurcates into two dorsal scapular arteries (DSA).

Results and discussion: The analysis of the described cadaver showed that this anatomical variation of TT cannot be included in any known classification. This indicates, that it is a very rare anatomical variation of the TT.

Conclusions: Knowledge of the course of the branches of TT has some significant clinical importance, inter alia during endovascular procedures, during which any mistakes may result in serious consequences for the operated patient. The most accurate understanding of the course of TT vessels and the dissemination of knowledge on this subject may reduce the risk of complications after the treatment.

1. INTRODUCTION

Thyrocervical trunk (TT) is one of the arteries of the neck, which arises from the upper anterior part of the ascending part of subclavian artery (SA) in a close proximity to the medial border of anterior scalene muscle (ASM).^{1,2} It divides after its origin into four branches. The first one is known as the inferior thyroid artery (ITA) – it runs upwards on the surface of longus colli muscle (LCM) passing through the fascia, after which it divides into two terminal branches and supplies the lateral lobe of the thyroid gland. The second one is the suprascapular artery (SSA), which runs laterally and downwards from anterior scalene muscle (ASM) and the phrenic nerve (PN) under the sternocleidomastoid muscle, then enters the greater supraclavicular fossa, then runs under the trapezius muscle and the inferior belly of the omohyoid muscle towards the superior edge of scapula; it ascends below the transverse scapular ligament to the supraspinous fossa, giving off numerous muscular branches and a terminal branch ascending further into the infraspinous fossa, where it participates in the formation of the scapular anastomosis. The third one is the transverse cervical artery (TCA) – it runs laterally from the TT, crosses the lateral triangle of the neck and reaches the anterior edge of the trapezius muscle, then divides into a superficial and lateral branches. The fourth one is the ascending cervical artery (ACA) – it usually departs from the ITA as its branch, however, sometimes it departs directly from the TT; it runs along the PN and then ascends, covered with the prevertebral lamina of the neck fascia, and runs on the surface of the ASM; further, it anastomoses with the vertebral artery and gives spinal branches and muscle branches to the ASM, middle scalene muscle and the LCM as well as a deep branch to the deep muscles of the neck.³

2. AIM

The following paper presents an anatomical variation that was not included in any known classifications and broadens the general anatomical knowledge about TT variations.

3. CASE STUDY

During the routine dissection of the body of a 84-year-old woman in the Department of Anatomy, School of Medicine, Collegium Medicum, University of Warmia and Mazury in Olsztyn, Poland in order to create a cadaver for educational purposes a very rare anatomical variation of TT was observed.

4. RESULTS

In the described case the SSA originates directly from the SA in close proximity to TT. The first branch of the TT is the ITA followed by ACA and TCA that further bifurcates

into double dorsal scapular artery (DSA), which is a rare arrangement, because most frequently DSA arises directly from SA. The course of SSA finds its place on top of the anterior scalene muscle and gives off several branches that supply sternocleidomastoid and subclavius muscles. The

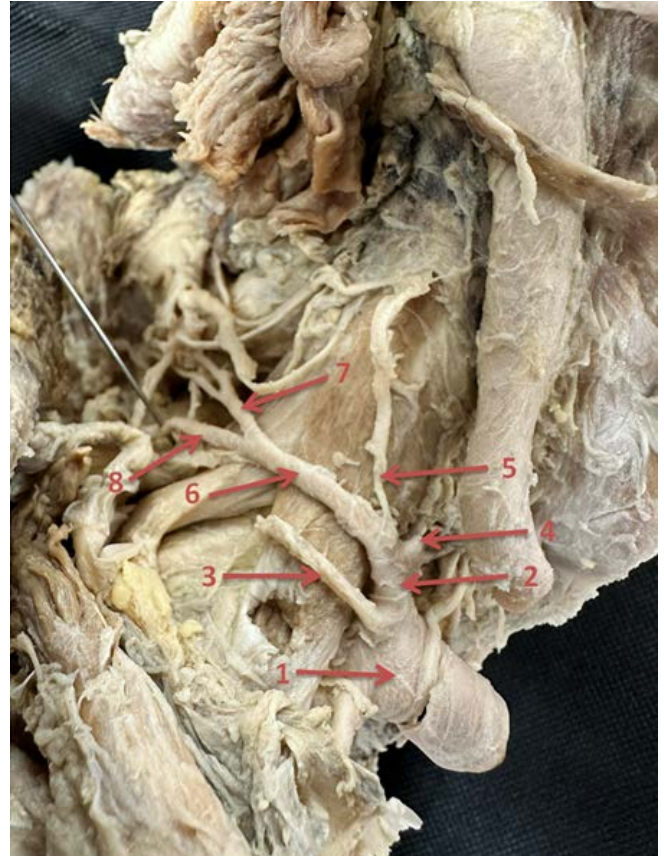


Figure 1. Photography of the TT during dissection. Comments: (1) SA, (2) TT, (3) SSA, (4) ITA, (5) ACA, (6) TCA, (7) DSA 1, (8) DSA 2.

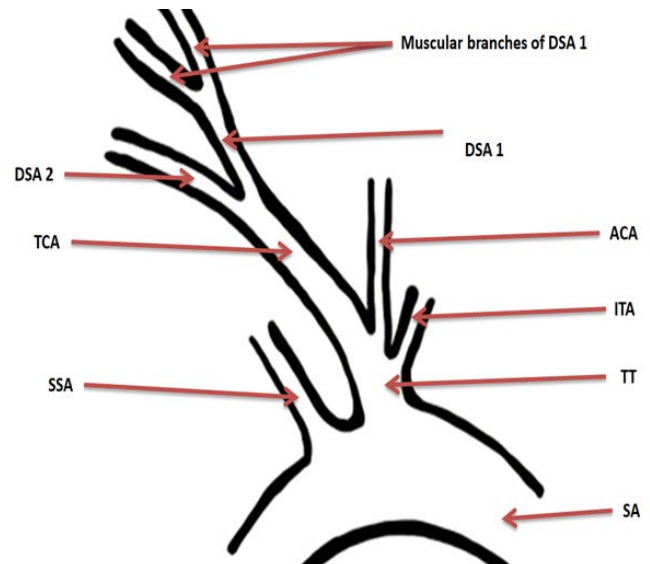


Figure 2. Schematic representation of the morphology of the described TT.

TCA bifurcates into double DSA in close proximity to brachial plexus and passes on the surface of scalene hiatus and further on top of the middle scalene muscle. Although the DSA is doubled, both of the arteries (DSA 1 and DSA 2) supply the levator scapulae, rhomboids and trapezius muscles as usual. DSA 1 bifurcates further into two muscular branches that go alongside each other to their final destination, which are the muscles mentioned before. This kind of arrangement of arteries of the TT is very unusual and rare. In result, it cannot be included in any available classification (Figures 1 and 2).

We have measured the diameters of TT and its branches, which are as follows: TT – 5.5 mm at its base, SSA – 2.5 mm, ITA – 4.5 mm, TCA – 3.5 mm, ACA – 1.5 mm, DSA 1 – 3.0 mm, DSA 2 – 2.5 mm.

5. DISCUSSION

As mentioned above, the TT is one of the arteries of the neck, which arises from the upper anterior part of the ascending part of the SA in close proximity to the medial border of ASM. Its structure is known to be observed in many types of anatomical variations.^{4,5} In embryonal life the TT derives from the union of the SSA, the TCA, the ACA, and the ITA plexus.³ The TT provides vascular supply through its branches to many important organs of the neck, such as thyroid gland, muscles and the brachial plexus.³ As the TT is found in a tightly-packed space, which is the neck, its presence and significance needs to be considered while conducting various surgical and cardiovascular procedures, such as the percutaneous coronary intervention (PCI) via radial access, in which the TT, or the procedure of placing a central venous catheter (CVC). In both cases the TT can be perforated, especially during the CVC due to its close proximity to the internal jugular vein (IJV).⁶ Knowledge of its branches can also be important while transplanting an adipocutaneous flap in patients with tissue defects in the neck region, for example after the removal of tumours when making an anastomosis of the blood vessels of the flap with those present in the neck region is required in order to prevent ischemic necrosis of the transplanted flap. Moreover, in case of the presence of neoplastic tumors in the neck such as paragangliomas, hemangioblastomas or metastases, one of the methods of their treatment is the surgical closure of some of the branches of the TT in order to cut off the blood supply to the tumour and inhibit its growth, as well as to prevent further dissemination of cancer cells through these blood vessels.^{7,8} Pre-operative identification of the variations of TT is possible thanks to imaging using computed tomography (CT) and/or magnetic resonance imaging (MRI) with possible vascular evaluation and magnetic resonance angiography (MRA) or CT scan methods of the site of the tumour.⁸

Several classifications of anatomical variations of TT can be found in scientific literature, among which the broadest we found was made by Thomson in 1891 and included 9 types from A to I (Figure 3).⁹

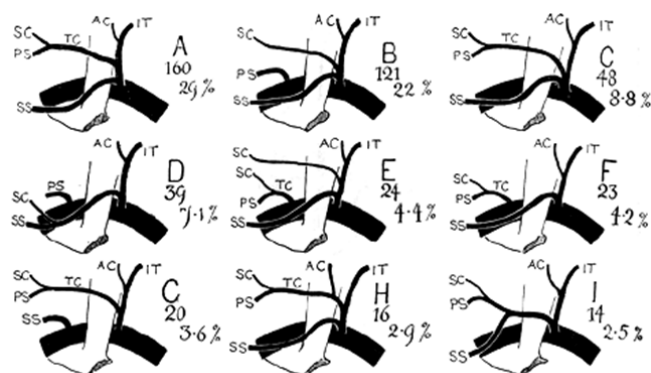


Figure 3. Variations in the branches of the thyrocervical trunk according to Thomson. The various arteries are lettered as follows: inferior thyroid (IT); ascending cervical (AC); transverse cervical (TC); suprascapular (SS); superficial cervical (SC); posterior dorsal scapular (PS).⁹

In the presented case the SSA arises from SA as in type C, however in that type ACA and ITA arise from a common trunk, unlike in our case where they arise from TT separately (like in type H). Moreover we cannot find the double DSA in any types presented in the classification above. Another classification that has a similar but not identical type of TT was published by Ostrowski et al. in 2023 and features 4 types from A to D. Our case has most similar characteristics with type D.¹⁰ In our case the SSA arises from SA as in type D. However ACA doesn't arise from TT and there is no double DSA.¹⁰

It is difficult to tell which of known variations of TT is morphologically closest to the presented case, since none of the existing classifications include a case of a TCA that further bifurcates into double DSA.

The anatomical variation we described has no clinical significance, as it does not cause any disturbances in the blood supply to the organs served by its branches. The significance of our discovery broadens the general anatomical knowledge, as we were able to demonstrate the existence of this type of anatomical variation, that was not known before, and opens a possibility for future research. At present, we do not know what percentage of the population has this type of anatomical variant of the TT – this creates an opportunity to conduct population studies to determine the prevalence of this variation.

6. CONCLUSIONS

- (1) In the presented case we described an unusual anatomical variations of the TT, which does not resemble any type of the TT that was described in available literature.
- (2) Knowledge of this possible variant may find its use during several clinical scenarios and surgical procedures.
- (3) This very rare variant of the TT makes an addition to the general anatomical knowledge.

Conflict of interest

None declared.

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