



A rare case of the thyrocervical trunk piercing the anterior scalene muscle bilaterally

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Abstract

A rare case of the thyrocervical trunk passing through the anterior scalene muscle bilaterally was found during dissection of a cadaver in a medical student gross anatomy course. The thyrocervical trunk also gave rise to the internal thoracic artery bilaterally. Previous reports and possible clinical implications are presented and discussed.

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Key words (thyrocervical trunk| anterior scalene muscle| anatomical variant|)

Introduction

The thyrocervical trunk has been described as the most variable of the branches of the subclavian artery, but most of the recorded variability involves the pattern of its branches, as summarized by Bergman and colleagues [1]. Penetration through the anterior scalene muscle by arteries anatomically related to it, mainly the subclavian artery, has received less attention [2,3]. With specific reference to the present report, we found only six cases in the available literature in which the thyrocervical trunk or some of its branches are described as passing through the anterior scalene muscle [4-8]. All these previous cases have been unilateral, while the current report represents an apparent first bilateral finding.

Case Report

We report here the bilateral passage of the thyrocervical trunk through the anterior scalene muscle in an 89-year-old female whose body was being dissected by first-year medical students. The cause of death was Alzheimer disease, and, except for bilateral origin of the internal thoracic artery from the thyrocervical trunk, no other notable anatomical variations were found in this body.

After emerging through the anterior scalene muscle on the right side (Figure 1a), the thyrocervical trunk bifurcated. One branch coursed inferolaterally for a short distance and divided into the suprascapular artery and the internal thoracic artery. The other branch ascended on the anterior scalene muscle for approximately 2cm before dividing into the inferior thyroid artery and a common stem for the transverse cervical artery and the ascending cervical artery, which separated about 2cm superior to the origin of their common stem.

Upon completion of the passage of the thyrocervical trunk through the belly of the anterior scalene muscle on the left side (Figure 1b), the internal thoracic artery arose from the inferior aspect of the trunk and descended into the thorax. Approximately 2cm beyond the origin of the internal thoracic artery, the thyrocervical trunk ended by trifurcating into the suprascapular artery, transverse cervical artery, and ascending cervical artery. The inferior thyroid artery on the left side was quite small and unfortunately had been removed by the students, leaving only a small lumen marking the origin of the vessel.

The subclavian artery followed an S-shaped curving path bilaterally from its origin to pass over the first rib posterior to the anterior scalene muscle, thus appearing longer than

commonly seen. The diagonal course of the right phrenic nerve across the anterior surface of the anterior scalene muscle was unremarkable, whereas the left phrenic nerve followed an angular path to pass lateral to the variant thyrocervical trunk.

Discussion

Variations of the Thyrocervical Trunk

Variations of branches from the thyrocervical trunk are common, including the internal thoracic artery originating from the thyrocervical trunk in approximately 10% of cases [1,8,9] and the trifurcation of the thyrocervical trunk into suprascapular, transverse cervical, and ascending cervical arteries in almost half of all cases [1]. These variations were also observed in the case reported here.

Nervous structures of the brachial plexus piercing the anterior scalene muscle have been reported numerous times [2,10]. However, vessels piercing the anterior scalene muscle are rare. Several cases of the subclavian artery piercing the anterior scalene have been reported [2,3,10,11], but our literature search revealed only six cases in which the thyrocervical trunk or some of its branches pierced the anterior scalene muscle, all six being unilateral cases, three on the right side and three on the left [4-8].

Quain and Maclise [4] described one case in which the left inferior thyroid artery branched directly from the first part of the subclavian artery. The remaining components of the left "thyrocervical" artery arose as a common trunk from the second part of the subclavian artery, passed through the anterior scalene muscle and then trifurcated into the internal thoracic, transverse cervical and suprascapular branches. There was no mention of an ascending cervical artery.

Gruber [5] reported one case in which the left thyrocervical trunk arose from the third part of the subclavian artery, passed posterior to the anterior scalene and then pierced the muscle anteriorly. The trunk immediately gave off three branches, the internal thoracic, suprascapular and superficial cervical, that coursed inferiorly and laterally. The remaining component coursed superiorly and divided into two arteries, the inferior thyroid and the ascending cervical.

Delitzin [6] described one case on the right side of the body in which the thyrocervical trunk passed through the anterior scalene muscle and its branches coursed anterior to the muscle. A common trunk divided to form the inferior thyroid, transverse cervical and suprascapular arteries with the ascending cervical artery then branching from the inferior thyroid. The diameters of the inferior thyroid and transverse cervical arteries were notably enlarged. The phrenic nerve was diverted in its course over the belly of the anterior scalene muscle due to the position of the thyrocervical trunk piercing the muscle.

Röhlich [7] described one case in which the right "thyrocervical" trunk arose from the second part of the subclavian artery. The branches pierced the anterior scalene muscle in two places, the common stem of the transverse cervical and

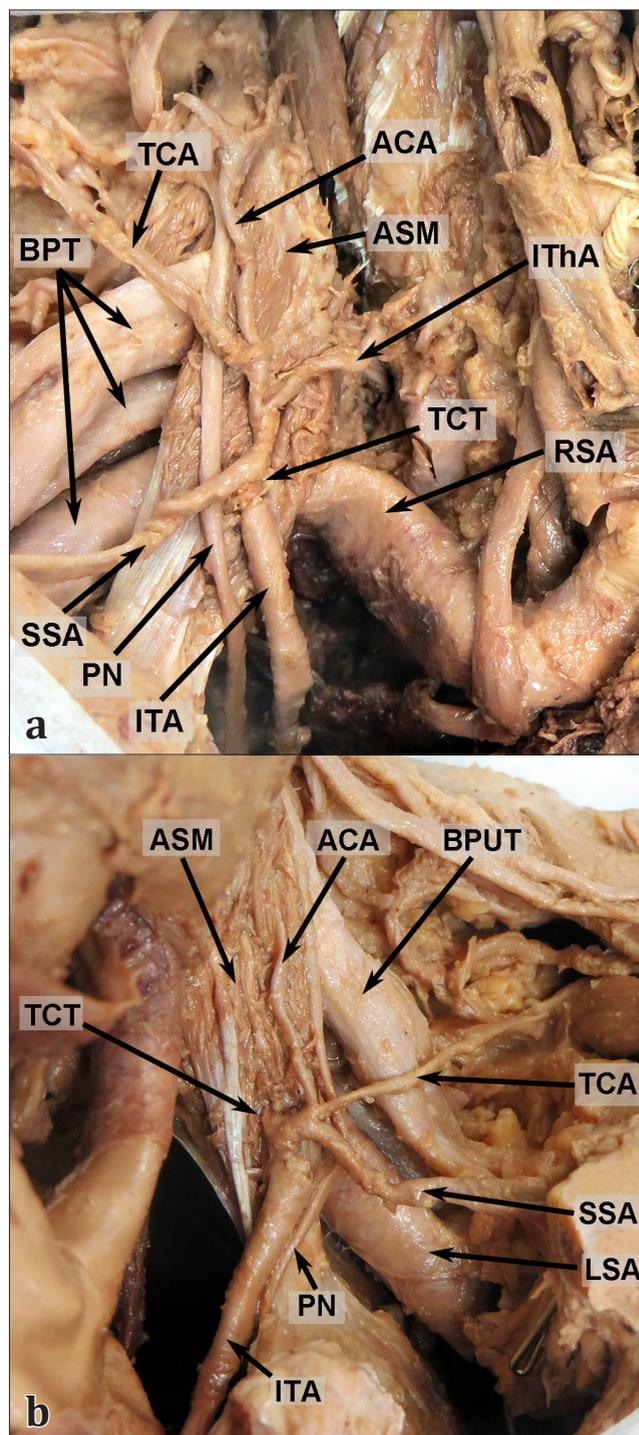


Figure 1. a) Right thyrocervical trunk piercing anterior scalene muscle. Note tortuous subclavian artery. **b)** Left thyrocervical trunk piercing anterior scalene muscle. Note displacement of phrenic nerve from its usual path. (ACA: ascending cervical artery; ASM: anterior scalene muscle; BPT: brachial plexus trunks; ITA: internal thoracic artery; IThA: inferior thyroid artery; PN: phrenic nerve; RSA: right subclavian artery; SSA: suprascapular artery; TCA: transverse cervical artery; TCT: thyrocervical trunk; BPUT: brachial plexus upper trunk; LSA: left subclavian artery)

ascending cervical superiorly and the suprascapular and internal thoracic inferiorly. The inferior thyroid artery, which was referred to as a thyroidea ima by Röhlich, arose at the bifurcation of the brachiocephalic trunk. The path of the phrenic nerve was displaced laterally, passing inferior to the suprascapular artery.

Lischka et al. [8] described two cases where arteries passed through the anterior scalene muscle, one on the left side and one on the right. The opening in the anterior scalene muscle in both cases was a tendinous arch through which the thyrocervical trunk or its branches passed.

The case on the left side had the internal thoracic artery arising separately from the second part of the subclavian artery, passing through the anterior scalene muscle and then giving off the ascending cervical artery. The remaining components of the “thyrocervical” trunk arose independently from the second part of the subclavian artery by a common stem that did not penetrate the anterior scalene but passed inferior to the third part of the subclavian and divided into the suprascapular and the transverse cervical arteries, the latter subsequently separating into superficial and deep (dorsal scapular) branches.

The case on the right side was similar to the one that Quain and Maclise [4] reported in that the inferior thyroid artery was an isolated branch from the first part of the subclavian artery, arising medial to the origin of the vertebral artery, and remaining medial to the anterior scalene muscle throughout its course. The remaining components of the “thyrocervical” trunk arose from the second part of the subclavian through a common stem with the internal thoracic artery. The trunk passed through the anterior scalene muscle and subsequently divided into the internal thoracic, suprascapular and transverse cervical arteries. Beyond the bifurcation of the transverse cervical artery into superficial and deep (dorsal

scapular) branches, the ascending cervical artery arose from the superficial branch.

Possible Difficulties and Surgical Considerations

Because of the importance of the neck region in surgical and diagnostic procedures, particularly in the area surrounding the anterior scalene muscle, it is imperative for surgeons and other medical personnel to be aware of the great anatomical variability in this region that can affect these procedures. Branches of the brachial plexus as well as branches of the thyrocervical trunk and the subclavian artery can pierce the anterior scalene muscle, which can become potential entrapment sites [2,10,11]. Muscle impingement on these structures can produce upper limb paresthesias and cause loss of blood flow.

While passage of the subclavian artery through the anterior scalene muscle may produce thoracic outlet syndrome with significant reduction of blood flow to the upper limb [11], compression and restricted blood flow through the thyrocervical trunk may be less important clinically, since the extensive collateral arterial connections that typify this region can usually replace blood normally supplied from branches of the thyrocervical trunk. An exception to this, however, may occur if the internal thoracic artery that is used frequently in cardiac procedures has a common origin with other arteries. The internal thoracic artery originates from the thyrocervical trunk in approximately 10% of cases [1,8,9] as it did in the case reported here. When this occurs on the left side, it makes the use of the internal thoracic artery in coronary artery bypass surgery risky in that severe blood flow diversion could occur that can result in a symptomatic coronary steal phenomenon leading to pain, limitation of shoulder movements, and ultimately, even additional surgery [12].

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