



SURGICAL IMPORTANCE OF VARIABLE BRANCHING PATTERN OF THYROCERVICAL TRUNK IN NECK ROOT SURGERIES

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ABSTRACT **Objectives:** Variations in the arteries of human body are important clinically as well as anatomically. Accurate knowledge and understanding of anomalous variations in the origin and course of arteries have serious implications in angiographic and surgical procedures hence it is of great importance to be aware of such possibilities of variations.

Background and Results: Thyrocervical Trunk is short wide vessel arising from first part of subclavian artery and divides into its three terminal branches i.e. Suprascapular, Inferior Thyroid and Transverse cervical artery. 30 formalin fixed cadavers were dissected to study variations in Thyrocervical Trunk and its branches if any.

Conclusion: Awareness of variations in the origin and branching pattern is of utmost importance during Doppler scanning of blood vessels for clinical diagnosis and surgical management and to avoid major complications in head and neck surgeries.

KEYWORDS : Thyrocervical Trunk, Anomalous variations, Doppler scanning, Head and neck surgeries.

INTRODUCTION

Subclavian artery is the artery of upper limb, but it supplies a considerable part of thoracic wall, neck and brain through its branches. On right side it arises from brachiocephalic trunk behind the sternoclavicular joint while on left side it arises from the arch of aorta and ascends on pleura to enter the neck behind the left sternoclavicular joint. The artery is divided into three parts by scalenus anterior muscle, the second part of which lies posterior to the muscle.

First part - On the right side, this part extends superolaterally to a point just above the level of the clavicle at the medial edge of scalenus anterior. It lies deeply, at first posterior to sternocleidomastoid, sternohyoid, and sternothyroid, to the vagus nerve (which sends the recurrent laryngeal nerve hooking around it), to a loop from sympathetic trunk (ansa subclavia), and occasionally to the cardiac branches of the vagus and sympathetic trunk. Near the medial border of scalenus anterior, the internal jugular and vertebral veins are anterior to it. It lies on suprpleural membrane covering the anterior surface of cervical pleura.

On the left side, the first part ascends vertically from the aortic arch, with the vagus, phrenic and cardiac nerves anterior to it, to lie behind the left brachiocephalic vein at the sternoclavicular joint. Thereafter, the course is same as on the right side except that the thoracic duct and phrenic nerve also descend anterior to it. The left recurrent laryngeal nerve is medial to the artery because it ascends from the aortic arch in the groove between trachea and oesophagus.

Branches from the first part of subclavian artery are as follows:

1. Vertebral artery.
2. Internal Thoracic artery.
3. Thyrocervical Trunk.^[1]

Thyrocervical trunk is a short wide artery arising from front of the first part of subclavian artery near the medial border of scalenus anterior and divides almost at once into its three branches.

- Suprascapular artery
- Inferior Thyroid artery
- Transverse cervical artery.^[2]

Suprascapular artery passes laterally across the phrenic nerve, scalenus anterior muscle and in front of third part of subclavian artery and cords of brachial plexus. On reaching the dorsal surface of scapula it forms scapular plexus by anastomosing with circumflex scapular and dorsal scapular artery.

Inferior thyroid artery ascends in front of the medial border of scalenus

anterior muscle and then arches medially at the level of C7 vertebra between the vertebral vessels behind and carotid sheath in front. On reaching the lower pole of the thyroid gland the artery divides into ascending and descending branches which supply posterior and inferior parts of thyroid gland.

Transverse cervical artery runs laterally and posteriorly across the front of the scalenus anterior muscle and the brachial plexus. At the posterior border of the posterior triangle, it disappears deep to the trapezius, it may divide into branches running superficial and a deep to the rhomboid muscles respectively.^[3]

MATERIALS AND METHODS

30 cadavers which comprise the material for the present study were procured from the department of Anatomy of Dr. D. Y. Patil Medical College, Pimpri, Pune. These cadavers were embalmed with 10 per cent formalin and fixed. Subclavian artery was exposed following the dissection procedure as per Grant's dissector.^[4]

The steps of dissection were as follows:

- Cadavers on which superficial dissection of Head, Neck and Thorax was done, were cut at the level of sixth thoracic vertebra then investing layer of cervical fascia was removed from the lower part of roof of posterior triangle.
- The specimens were labelled with number and side.
- Sternocleidomastoid, Sternothyroid and Sternohyoid muscles were exposed, cut and reflected superiorly.
- Fascial sling of intermediate tendon of Omohyoid muscle was cut and reflected.
- Clavicle was cut at its mid-length.
- Blood vessels were exposed; internal jugular vein (IJV) was identified and traced till its opening in subclavian vein.
- IJV was displaced medially to expose subclavian artery, which was identified as a branch of brachiocephalic trunk on right side and from arch of aorta on the left side.
- Branches from 1st, 2nd and 3rd part of subclavian artery were exposed and identified.
- Thyrocervical trunk from the first part with its branches was cleaned meticulously.
- Variations if any in the origin and branching pattern of Thyrocervical Trunk were observed and noted according to side.
- Photographs of variations were taken.

OBSERVATIONS AND RESULTS

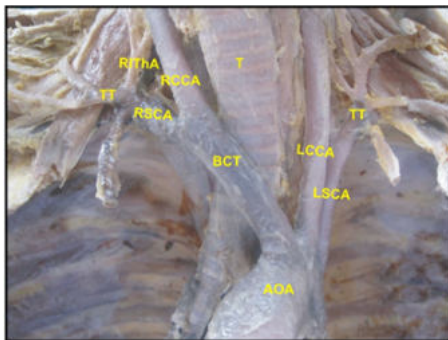
Variations in the branching pattern of Thyrocervical Trunk were observed, noted and photographed. All the findings were recorded and assembled are shown table below (Table no. 1)

Name of the Vessel	Variations	Side	
Suprascapular artery	Was originating from common stem with transverse cervical artery	Right side	Left side
		2 cases	1 case
Transverse cervical artery	Was originating from common stem with suprascapular artery	2 cases	1 case
Inferior thyroid artery	Was directly arising from first part of subclavian artery	1 case	-

Inferior Thyroid artery

Right Inferior thyroid artery was seen arising directly from first part of right subclavian artery in one case. (Figure 1)

Figure 1: Right Inferior thyroid artery arising directly from first part of right Subclavian artery and common stem of origin of Transverse cervical & Suprascapular artery on right side



T- Trachea, AOA- Arch of Aorta, BCT- Brachiocephalic Trunk, LCCA- Left common carotid artery, LSCA- Left subclavian artery, RCCA- Right common carotid artery, RSCA- Right subclavian artery, TT- Thyrocervical Trunk, RITHA- Right inferior thyroid artery.

Suprascapular artery and Transverse cervical artery

Both Suprascapular artery and Transverse cervical artery were arising from a common stem from thyrocervical trunk on right and left side in one case while only on left side in another case. (Figure 2)

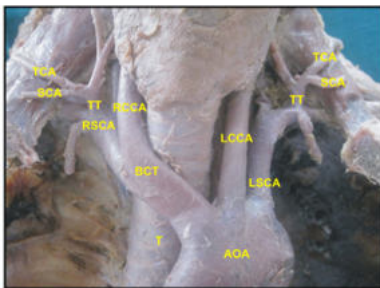


Figure 2: Common stem of origin of Transverse cervical and Suprascapular artery on both right and left sides

T- Trachea, AOA- Arch of Aorta, BCT- Brachiocephalic Trunk, LCCA- Left common carotid artery, LSCA- Left subclavian artery, RCCA- Right common carotid artery, RSCA- Right subclavian artery, TT- Thyrocervical Trunk, SCA- Suprascapular artery, TCA- Transverse cervical artery.

DISCUSSION

Considering the surgical importance of variations in the vessels of head and neck region, an attempt was made in the present study to observe and verify variations in the origin of branches of Thyrocervical trunk.

Suprascapular Artery

It arises from thyrocervical trunk, passes behind the clavicle, subclavius muscle and inferior belly of omohyoid and appears in the suprascapular fossa. On reaching the dorsal surface of scapula it forms

scapular anastomosis with the circumflex scapular and dorsal scapular arteries.^[3]

Suprascapular artery has a major contribution of blood supply to the tendinous rotator cuff of the shoulder joint mainly the supraspinatus muscle.^[5]

In a large number of cases an abnormal origin of the suprascapular artery has been described. The suprascapular artery was observed to arise from the axillary artery on the left side while on the right side it was a branch of the thyrocervical trunk.^[6]

Saadeh (1979) made an interesting observation on the branching pattern of the subclavian artery, where in a single case the suprascapular artery arose from the dorsal scapular artery.^[7]

The passage of both the suprascapular nerve and artery below the transverse scapular ligament was observed in three cadavers and is reported also by various workers as a frequent anomaly.^[8]

Damage to the suprascapular artery or axillary artery can lead to microemboli in the vasa nervosum of the suprascapular nerve.^[9]

Secondary spasmodic torticollis may also result from vascular haemangioma of the cervical and scapular branches as reported by Duran and Chacon(2001).^[10]

Havet et al (2008) observed the suprascapular artery gives off nutrient arteries which supply the majority of blood to the proximal 4/5th of the clavicle^[11]. Hence the origin and branches of suprascapular are clinically important because clavicular fracture account for 5-15% of all adult bone fractures.^[12]

Additionally, ligation of suprascapular artery is required for surgeries in the anterior neck and supraclavicular region, specifically during radical and modified neck dissections.^[13]

Therefore knowledge of the course of the suprascapular artery and its variant origin off the internal thoracic artery is crucial for clinicians performing coronary bypass, radical and modified neck or shoulder surgeries.^[14]

Suprascapular artery was observed to be a branch from first part of subclavian artery by Mishra.S et al 6 (30), as branch from transverse cervical artery, internal thoracic artery, and also from third part of subclavian artery by Ronald A. Bergman et al.^[15]

However no such variations were seen in the present study.

Inferior Thyroid Artery

According to the literature the inferior thyroid artery may originate from the vertebral artery in 0.7% of individuals^[16]. No certain clinical impact of this variation is described. However it should be known by neck surgeons in order to avoid implications during thyroidectomy, while trying to ligate the regional vessels. Vascular interventionalists and angiographers should also bear in mind that this variation during inferior thyroid artery catheterization either diagnostic or therapeutic in case of an aneurysm or a rupture at the thyroid region^[17]

Inferior thyroid artery was reported as a direct branch from the third part of subclavian artery and it was also seen as a direct branch from the first part of subclavian artery by Ronald A. Bergman et al^[15]. Similar variation where it was found as a direct branch from first part of subclavian artery was observed in the present study in one case (fig no.41).

Transverse Cervical Artery

Variations in the origin of transverse cervical artery have been reported by many investigators, although in majority of the cases it originate from the thyrocervical trunk.^[18]

The transverse cervical artery was seen arising as a direct branch from first part of subclavian artery, as a branch from internal thoracic artery, as a branch from dorsal scapular artery as reported by Donald F. Huelk^[18]. And it was also seen as a direct branch arising from all the three parts of subclavian artery by Ronald A. Bergman et al.^[15]

In the present study none of these variations of transverse cervical artery was seen.

CONCLUSION

The knowledge of anatomical variations of vessels in the head and neck region is of immense importance. Considering that vascular variations have been always a subject of controversy, more detailed knowledge about anatomical structures in the neck region is required especially while performing procedures such as MRI, CT and other surgical procedure.

Unusual origin of suprascapular artery has been the causative factor for suprascapular neuropathy causing compression of the suprascapular nerve beneath the transverse scapular ligament and also damage to suprascapular artery may lead to microemboli in vasa nervosum of the suprascapular nerve. Hence knowledge of the origin and branching pattern of suprascapular artery would help in the management of the diseases of shoulder region which could be of vascular origin.

Since inferior thyroid artery is closely associated with recurrent laryngeal nerve surgeons should be aware of variant origin of inferior thyroid artery to avoid complications during thyroidectomy.

Variant origin of transverse cervical artery does not have clinical significance as such. However since it is seen in supra-clavicular region and this region is one such site where many operative procedures are performed, surgeons should be aware of variant origin of the vessel to avoid vascular complications.

Unusual or rarely seen anatomical variations are required to be reported constantly so that we can add them to knowledge of physicians and anatomists who can ensure forward progress scientifically.

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