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Anatomical Study of Thyrocervical Trunk and Its Variations

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ABSTRACT

With recent increase in the use of CT, MRI and Angiography, it has been pointed out that an accurate understanding of morphology of thyrocervical trunk and detailed information about thyrocervical trunk are essential pre-requisites for accurate diagnosis. Four Present study was aimed to conduct anatomical study of thyrocervical trunk and its variations. Present study was prospective, observational study, conducted in cadavers in Department of Anatomy. Thyrocervical trunk dissected and exposed according to methods described in Cunningham's manual of practical Anatomy. In present study, out of 60 cadavers examined 57 (95%) were male and 3 (5%) were female. Thyrocervical trunk was not present on right side in 5 cases (11.9%) In 98.33% left internal thoracic artery was originating from first part of subclavian artery, 1.66% was originating from thyrocervical trunk (TCT) Out of 60 cadavers, in 91.66% of cases the right inferior thyroid artery had its origin from thyrocervical trunk itself. In 8.33% of cases. Right Inferior thyroid artery had its origin directly from the first part of Subclavian artery, Right suprascapular artery had its origin from thyrocervical trunk in 85% of cases, origin from the first part of subclavian artery from a common trunk in 6.66%, not present in 5% of cases, origin from third part in 1.66% of cases and origin from right dorsal scapular artery in 1.66% of cases. Left suprascapular artery had its origin from Thyrocervical trunk in 96.66% of cases, from third part of subclavian artery in 1.66% of cases and in1.66% cases origin from left dorsal scapular artery. Present study showed clinically significant variations as, internal thoracic artery from thyrocervical trunk, Inferior thyroid artery separately from first part of subclavian artery, absence of suprascapular artery and variant origin of dorsal scapular, suprascapular arteries and costocervical trunk.

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Key Words

Thyrocervical trunk, inferior thyroid artery, subclavian artery, suprascapular artery

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INTRODUCTION

Subclavian artery is the artery of upper limb but it supplies a considerable part of the thoracic wall, neck and brain through its branches. Thyrocervical trunk arises from first part of subclavian artery. Thyrocervical trunk giving Inferior thyroid, Transverse cervical, Suprascapular branches[1,2].

Many variations are noted in the gross anatomy of thyrocervical trunk Absence of thyrocervical trunk and therefore the 2 branches which are normally originating from thyrocervical trunk had a different origin. The inferior thyroid artery and vertebral artery arise directly from first part[2,3]. Internal thoracic artery may arise from thyrocervical trunk. its increased use in CABG (coronary artery bypass grafting) highlights the need to understand its variations.

Many variations are asymptomatic and may be uncovered as a sudden finding in imaging studies or other investigating procedures and are of great importance to the surgeon. With recent increase in the use of CT, MRI and Angiography, it has been pointed out that an accurate understanding of morphology of thyrocervical trunk and detailed information about ramification and course of arteries that branch from the thyrocervical trunk are essential pre-requisites for accurate diagnosis[4]. Present study was aimed to conduct anatomical study of thyrocervical trunk and its variations.

MATERIAL AND METHODS

Present study was single-center, prospective, observational study, conducted in department of Anatomy, Government Medical College, Trivandrum, Kottayam and Alleppey. Study duration was from January-June 2016-2017. Study approval was obtained from institutional ethical committee.

Inclusion criteria: All cadavers in Department of Anatomy Govt Medical College Alappuzha, Kottayam, Trivandrum.

Exclusion criteria: Cadavers with pathological lesion, Traumatic lesions and after surgical procedures. The study was conducted in 60 embalmed cadavers. Gender of the cadavers were noted, right and left sides were labelled. Thyrocervical trunk dissected and exposed according to methods described in Cunningham's manual of practical Anatomy (Romanes 1992) taking care to preserve all arteries, sacrificing venae commitantes and by resecting scalenus anterior muscle for a better view. The middle portion of clavicle was cut for better visualisation of branches. The branches were identified and studied its gross anatomy. The branches were identified, painted and photographs were taken for recording. The normal anatomy, origin, three parts, branching pattern, variations and relations of the thyrocervical trunk were studied. The variations were noted in right and left sides separately and compared. The instruments used were dissection forceps, scalpel, blade, chisel and hammer. Acrylic paints were used, yellow for nerves, red for artery and brown for muscles. After preparing master chart in Microsoft Excel the observations were analyzed statistically using SPSS version 16. Chi-Square test used.

RESULTS

In present study, out of 60 cadavers examined 57 (95%) were male and 3 (5%) were female. There was no significant association between presence of variation in the cadaver and its sex with a Chi-square value of 2.285 and p-value 0.131. Each subscript letter denotes a subset of SEX categories whose column proportions do not differ significantly from each other at the .05 level.

Out of the 67 variation found in the subclavian artery, 42 (62.69%) was in right side and 25 (37.31%) was in the left side. Thyrocervical trunk was not present on right side in 5 cases (11.9%) Out of 60 cadavers, 59 (98.33%) left internal thoracic artery was originating from first part of subclavian artery, 1(1.66%) was originating from thyrocervical trunk (TCT). Out of 60 cadavers, in 91.66% of cases (frequency-55) the right inferior thyroid artery had its origin from thyrocervical trunk itself. In 8.33% of cases (frequency-5) Right Inferior thyroid artery had its origin directly from the first part of Subclavian artery. Out of 60 cadavers, Right suprascapular artery had its origin from thyrocervical trunk in 85% of cases (frequency-51) origin from the first part of subclavian artery from a common trunk in 6.66% (frequency-4) not present in 5% of cases (frequency-3) origin from third part in 1.66% of cases (frequency-1) and origin from right dorsal scapular artery in 1.66% of cases (frequency-1).

Out of 60 cadavers, Left suprascapular artery had its origin from Thyrocervical trunk in 96.66% of cases (frequency-58) from third part of subclavian artery in 1.66% of cases (frequency-1) and in1.66% cases origin from left dorsal scapular artery (frequency-1).

DISCUSSION

Subclavian arteries are a pair of large arteries supplying the upper extremity and head. The sites of origin of the branches of the subclavian artery depict numerous anatomical variations. The thyrocervical trunk (TCT) is a branch of the subclavian artery arising from the first part as a short thick stump. it is also called as thyrobicervicoscapular trunk of faraboeuf with three components arising from it inferior thyroid, suprascapular and transverse cervical artery.

The inferior thyroid artery is considered as the principal branch of thyrocervical trunk. Without inferior thyroid artery we cannot name it as thyrocervical trunk. However, in general, this segment

1. Thyrocervical trunk
2. Inferior thyroid artery
3. Superficial cervical artery
4. Suprascapular artery
5. Left subclavian artery
6. Arch of aorta
7. Dorsal scapular artery

Fig. 1: Neck region of left sided male cadaver showing normal Thyrocervical trunk

1. Thyrocervical trunk
2. Internal thoracic artery
3. Inferior thyroid artery
4.Transverse cervical artery
5. Common trunk
6. Suprascapular artery
7. Scalenus anterior
8. Clavicle cut end

Fig. 2: Neck region of left sided male cadaver showing uncommon origin of internal thoracic artery from thyrocervical trunk

of the subclavian, which constitutes the transition zone from the dorsal inter segmental to the limb artery (HUMBERTO)[5] and supplies such heterogeneous elements as the thyroid gland and the omocervical region, may be considered as prone to variability. According to the Nomina anatomica[6] the branches of the thyrocervical trunk are inferior thyroid, transverse cervical (distributing branches to the superior part of the trapezius) and suprascapular artery. In the present

1. Right subclavian artery
2. Vertebral artery
3. Transverse cervical artery
4. Inferior thyroid artery
5. Common trunk
6. Right common carotid artery
7. Scalenus anterior

Fig. 3: Neck region of right sided male cadaver Suprascapular artery absent

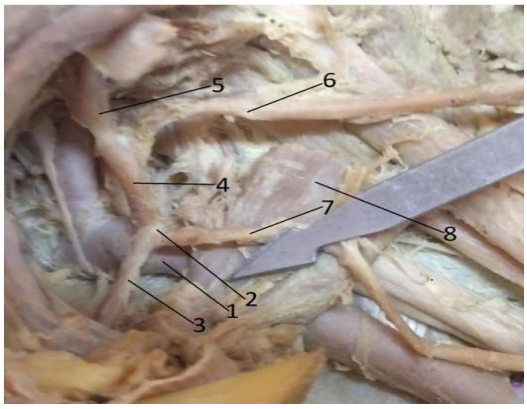
1. Right Subclavian Artery First part
2. Inferior thyroid artery direct origin
3. Suprascapular artery
4. Transverse cervical artery
5. Common trunk (cervico-scapular trunk)
6. Vertebral artery

Fig. 4: Neck region right side showing direct origin of inferior thyroid artery from first part of subclavian artery

study this normal pattern of TCT was found in 50 cadavers out of 60 cadavers dissected. In the present study six different patterns of thyrocervical trunk was found. Among the 60 cadavers dissected, Inferior thyroid artery was found to originate as a direct branch from the first part of subclavian artery in 5 cadavers unilaterally. As inferior thyroid artery has a separate

1. Thyrocervical trunk
2. Left subclavian artery
3. Inferior thyroid artery
4. Common arterial trunk for TCA and SSA
5. Transverse cervical artery (TCA)
6. Suprascapular artery (SSA)

Fig. 5: Neck region left side subclavian artery showing thyrocervical trunk as a short thick stump



1. Left subclavian artery
2. Thyrocervical trunk
3. Internal thoracic artery
4. Common arterial trunk
5. Inferior thyroid artery
6. Transverse cervical artery
7. Suprascapular artery
8. Scalenus anterior muscle

Fig. 6: Left subclavian artery first part showing thyrocervical trunk with an unusual branching pattern

origin the remaining branches suprascapular and transverse cervical artery originated from a common trunk named as cervico- scapular trunk otherwise thyrocervical trunk with 3 component arteries was not present there in 5 cadavers.

According to Ronald Bergman[7] When the thyrocervical trunk is absent the inferior thyroid is absent or arises from another source, usually as a branch from the first part of the subclavian. The other branches may form a combined "cervico-scapular" trunk (10%) giving rise to the transverse cervical and suprascapular arteries. They also noted the inferior thyroid arising from the thyrocervical trunk in 90.5%, subclavian in 7.5% and very rarely from the common carotid, aortic arch, brachiocephalic, internal thoracic, pericardiophrenic or vertebral or arose as a common stem with the contralateral inferior thyroid. This supports the present study. In the present study the right inferior thyroid artery originated directly from the first part right subclavian artery in 8.33% (frequency-5) and other branches form a combined cervico-scapular trunk out of 60 cadavers. The left inferior thyroid artery was found to be normal, originating from thyrocervical trunk in all 60 cadavers. In the present study 91.66% of cases showed origin of inferior thyroid artery from thyrocervical trunk itself. 8.33% of cases showed origin of inferior thyroid artery directly from first part of the subclavian artery unilaterally.

Daseler *et al.*[1] stated that the Inferior Thyroid Artery usually arises from the thyrocervical trunk but in about 15% of individuals, it arose from SCA or its branches. The same observation was also made by Tzinas *et al.*[8] and Takkallapalli Anitha *et al.*[9] Toni *et al.*[10] reported that the Inferior thyroid artery can originate from the Thyrocervical trunk and less frequently from the Subclavian artery directly. In their report, it originated from the TCT in 90% of cases, in 10% from the Subclavian Artery, in 0.6% from vertebral artery and only in 0.2% from the Common carotid artery also. In the present study origin of inferior thyroid artery was found from thyrocervical trunk and from first part of subclavian artery only.

Kanta Roy Rimi *et al.*[11] presented a study performed on 57 cadavers. Inferior thyroid artery most commonly originated from thyrocervical trunk, on right 87% and left 90.2%, followed by subclavian artery, right 13% and left 9.80% . Ronald A Bergman *et al.*[7] found that the inferior thyroid artery arose from the thyrocervical trunk in 90.5%, subclavian in 7.5% and very rarely from rarely from the common carotid, aortic arch, brachiocephalic or vertebral. Inferior thyroid artery was absent on right side in 2 cases and on left side in 5 cases.

In a study by Roshan *et al.*[12] it was found that inferior Thyroid Artery originated from the thyrocervical trunk in 100% cases (50 sides) on left side, whereas on the right side 96% (48 sides) from the thyrocervical trunk and in 4% (2 sides) directly from the subclavian artery which supports the present study. In the present study, out of 60 cadavers the inferior thyroid artery was present on all cadavers. 91.66% of cases (frequency-55) showed origin of right inferior thyroid artery from right thyrocervical trunk itself. 8.33% of cases (frequency-5) showed origin of right

Table 1: Sex wise distribution of variation

	Sex		
Variation	Female	Male	Total
Absent			
Count	1_a	42_a	43
% within VARIATION	2.3%	97.7%	100.0%
Present			
Count	2_a	15_a	17
% within VARIATION	11.8%	88.2%	100.0%
Total			
Count	3	57	60
% within VARIATION	5.0%	95.0%	100.0%

Table 2: Distribution of variations

Variation	Frequency	Percent
Right side-right thyrocervical trunk (RTCT) not present	5	11.9
Left side-left inferior thyroid artery (LITA) origin from thyrocervical trunk (TCT)	1	1.66

Table 3: Variation of origin of Right Inferior thyroid artery

Right Inferior thyroid artery	Frequency	Percent
Origin from thyrocervical trunk (TCT)	55	91.66
Origin directly from subclavian	5	8.33

Table 4: Right suprascapular artery (RSSA) variation

Right suprascapular artery (RSSA) variation	Frequency	Percent
Origin from thyrocervical trunk (TCT)	51	85
Origin from 1st part from a common trunk	4	6.66
Not present	3	5
Origin from 3rd part of subclavian artery	1	1.66
Origin from dorsal scapular artery (DSA)	1	1.66

Table 5: Variations of left suprascapular artery (LSSA)

Variations of left suprascapular artery (LSSA)	Frequency	Percent
Origin from thyrocervical trunk (TCT)	58	96.66
Origin from 3rd part of subclavian artery	1	1.66
Origin from dorsal scapular artery (DSA)	1	1.66

inferior thyroid artery directly from first part of the right subclavian artery. It is a well-known fact that most of the blood supply to the thyroid and four parathyroid glands that is, about 80-86% of superior parathyroids and 90-95% of inferior parathyroids comes from Inferior thyroid artery. The knowledge of variations in the ramifications of arteries is of essential importance for the surgical and diagnostic procedures in the region of the neck. For this reason the variations of the inferior thyroid artery requires special attention.

Thyrocervical trunk had many infrequent branches, internal thoracic artery is one among them. The present study showed the origin of internal thoracic artery from thyrocervical trunk in one case unilaterally which was already discussed above. There was a common trunk for inferior thyroid artery and transverse cervical artery. Suprascapular artery originated from the thyrocervical trunk. Total there were 4 branches from thyrocervical trunk unilaterally. In the present study one cadaver showed absence of thyrocervical trunk. On the right side, no thyrocervical trunk was found. The inferior thyroid artery originated as the first branch of subclavian artery first part. Superficial cervical artery originated from the first part of subclavian artery. The suprascapular had an uncommon origin from dorsal scapular artery. Left thyrocervical trunk was found to be normal. An awareness of this rare variation is important because this area is used for diagnostic and surgical procedures. Ronald Bergman *et al.*[7] said that when the thyrocervical trunk is absent the inferior thyroid is absent or arises from another source, usually as a branch from the first part of the subclavian. The other branches may form a combined “cervico- scapular” trunk (10%) giving rise to the transverse cervical and suprascapular arteries. This type of variation was observed in present study in 4 cadavers right side out of 60.

Weiglein *et al.*[13] reported the suprascapular artery as arising from trunks called the “cervico-scapular, dorsoscapular and cervico-dorso-scapular trunks”. In the present study this type of variation was found. Suprascapular artery and transverse cervical artery with its superficial (superficial cervical) and deep (dorsal scapular artery) branches arising from a common trunk. Inferior thyroid originated as a separate branch from subclavian artery. In the present study suprascapular artery originating from cervico-scapular trunk was found and inferior thyroid artery had a separate origin from the subclavian artery.

The suprascapular artery has been reported to be absent in some studies. In the present study suprascapular artery was found to be absent (right side) in 5% of cases out of 60 cadavers. Saadeh *et al.*[14] Unusual origins of the suprascapular artery, such as arising from the dorsal scapular have been attributed

to the absence of a thyrocervical trunk. In the present study out 0f 60 cadavers, 1.66% of cases right side and 1.66% left showed origin of SSA with DSA. According to Drake *et al.*[15] and Moore *et al.*[16] the suprascapular artery may originate from third part of subclavian artery. This supports the present study. From the above discussion, it is evident that there is a possibility of a wide range of variations in the subclavian artery and its branches. Variations observed in present study will help to widen the medical field and could help to avoid serious implications during radiological examination, anaesthetic procedures like stellate ganglion block, thyroid surgeries and micro vascular surgeries. Thus the big horizon of procedures in the medical field opens new avenues for the study of subclavian artery and its variations.

CONCLUSION

Present study showed some clinically significant variations such as, internal thoracic artery from thyrocervical trunk, Inferior thyroid artery separately from first part of subclavian artery, absence of suprascapular artery and variant origin of dorsal scapular, suprascapular arteries and costocervical trunk. Six different patterns of thyrocervical trunk were also found. All these data help to widen the medical records regarding this important arterial system and give a broader idea to the clinicians about the possible variations during surgical and interventional procedures.

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