



## VARIATIONS IN PATTERNS OF BRANCHING OF THE THYROCERVICAL TRUNK.

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### ABSTRACT

The thyrocervical trunk or thyrobicervicoscapular trunk of faraboeuf is a branch most commonly arises from the upper portion of the first segment of the subclavian artery. Trunk branches can show many variant. In view of this significance a total of 13 human bodies (26 sides) were used for this study. The lateral region of the neck was dissected carefully and photographed in the Morphology Laboratory at the University of Pamplona. Unilateral anatomical variations was found in a 75-year-old male cadaver with presence of the double suprascapular artery; the first suprascapular artery and dorsal scapular artery has its origin by a common stem arising from the thyrocervical trunk, the second suprascapular artery has its origin directly from subclavian artery. Other branches exhibited high variations. Variability of the thyrocervical trunk and its branches must be considered of interest given the frequency with this region is involved in both diagnostic and therapeutic procedures.

**KEYWORDS:** Anatomical variations, thyrocervical trunk, dorsal scapular artery, transverse cervical artery, suprascapular artery.



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## INTRODUCTION

The thyrocervical trunk (TT) or thyrobicervicoscapular trunk of faraboeuf is a branch most commonly arises from the upper portion of the first segment of the subclavian artery (the anterosuperior side), distal to the vertebral artery and close to the medial edge of the scalenus anterior muscle. The branches of the thyrocervical trunk are 1) inferior thyroid (ITA) with cervical ascending, 2) transverse cervical artery (TCA), distributing branches to the superior part of the trapezius, and 3) suprascapular artery (SSA). The dorsal scapular artery (DSA), which mainly supplies the rhomboid muscle, may have two sites of origin: Either directly from the subclavian artery (third or second segment) or from the thyrocervical trunk via the transverse cervical artery<sup>1</sup>. Clinical interest in the subclavian artery and its branches is justified by their considerable anatomical variability (Kadir, 1991)<sup>2</sup>, which is seen equally in males and females, both on the right and left side. Of the branches of the subclavian, the thyrocervical trunk is the one most subject to variations. It is important to bear in mind these variants due to the high frequency with which this region is involved in diagnostic and surgical procedures<sup>3</sup>. Unusual origin of the suprascapular artery has been implicated as the causative factor for suprascapular neuropathy causing compression of the suprascapular nerve beneath the transverse scapular ligament. Suprascapular nerve injuries have become increasingly recognized as a cause of shoulder pain and dysfunction. Damage to suprascapular artery may lead to microemboli in vasa nervosum of the suprascapular nerve. Hence knowing the origin and branching pattern of suprascapular artery would help in the management of the diseases of the cervical and shoulder region, which could be of vascular origin<sup>4</sup>. Aims and objective of present study is to observe and describe variations in patterns of branching of the thyrocervical trunk in human cadavers, not found anywhere in literature.

## MATERIALS AND METHODS

A total of 13 cadavers of both sexes (12 men and 1 women) with different age group were

used for the study. Neck region (26 sides) of the cadavers were carefully dissected as per the standard dissection procedure in the Morphology Laboratory at the University of Pamplona. The described anatomic variations were dissected in the left side of a male cadaver of 75 years of age. The topographic details were examined and the variations were recorded and photographed. The history of the individual and the cause of death are not known.

## RESULTS

In 88,47 % (23 sides) of the specimens the inferior thyroid artery is a constituent of the thyrocervical trunk, in 11,53% (3 sides) of the cases it arises directly from the subclavian artery. In 88,47% (23 sides) of the specimens the cervicalis ascendens artery predominantly arises from the inferior thyroid artery, in (2 sides) 7,69% its origin from the transverse cervical, in 3,84% (1 side) it branches off from a common trunk of suprascapular and transverse cervical artery, this common trunk its origin from thyrocervical trunk. In 92,31% (24 sides) the origin of the transverse cervical artery is from a common trunk with the suprascapular, in 3,84% (1 sides) it arises a direct branch from the inferior thyroid, in 3,84% (1 side) the transverse cervical artery it arises a direct branch from thyrocervical trunk (figure 1). In 92,31% (24 sides) the suprascapularis artery origin in common with the transverse cervical, in 3,84% (1 side) is its direct origin from the inferior thyroid, in the 3,84% unilateral anatomical variations was found in a 75-year-old male cadaver with presence of the double suprascapular artery, the first suprascapular artery (medial branch or accessory) passed over the superior transverse suprascapular ligament. This branches off from a common trunk with dorsal scapular artery, common trunk present transverse arterial connection with the transverse cervical artery and the common trunk its origin from thyrocervical trunk in the first part of the subclavian artery and divides at a distance of 5,4 cms, this variation is not known since it is the first case reported so far in the available literature. The second

suprascapular artery (lateral branch) has its origin directly from subclavian artery. Figure 1. Where it ran inferior to the superior trunk of the brachial plexus and passed under the superior transverse suprascapular ligament, through the spinoglenoid notch to the infraglenoid fossa deep to infraspinatus, where it contributed to the anastomosis around the scapula. During its course gave muscular branches to supraspinatus, infraspinatus, trapezius and a small branch before passing through the suprascapular notch to the subscapular fossa to ramify in subscapularis. In addition, 2 to 3 articular

branches were given to the shoulder joint within the supraspinatus fossa. Both suprascapular arteries passed to the supraspinatus fossa deep to supraspinatus muscle. The suprascapular arteries (lateral branch) and accessory (medial branch) anastomosed in the supraspinatus fossa under cover of supraspinatus. In 32,053% (8 sides) of the cases the dorsal scapular artery arises from the second part of the subclavian artery, in 32,053% (8 sides) arises from the third part of the subclavian artery and in 32,053% (8 sides) arises from the transverse cervical artery.

**Figure 1**  
**Lateral view of neck. Left site.**



SA: subclavian artery; PN: phrenic nerve; TCT: Thyrocervical trunk; CT: common trunk; SSA: suprascapular artery giving rise from common trunk; DSA: dorsal scapular artery; SSA-1: suprascapular artery; TCA: Transverse cervical artery; SSN: suprascapular nerve, Asterisk: transverse arterial connection.

## DISCUSSION

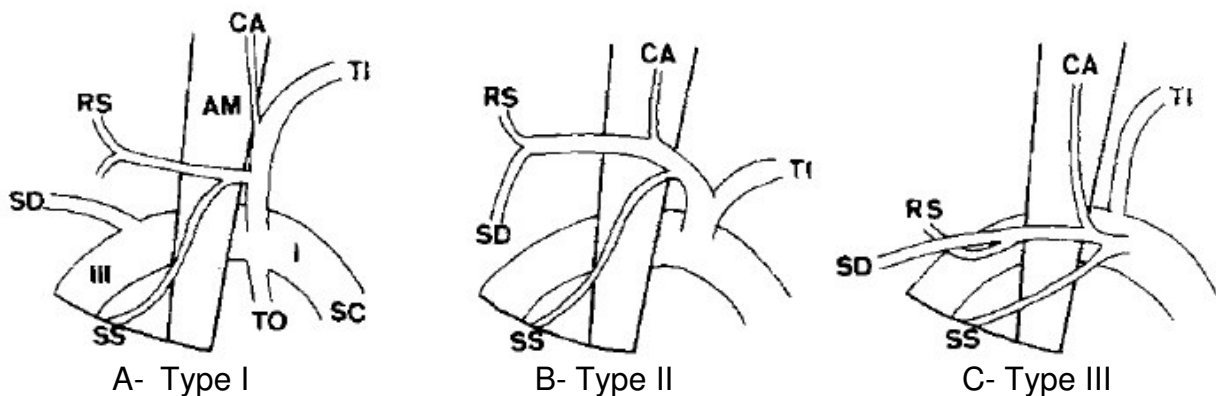
Except for the vertebral artery, detailed investigations on the development of the subclavian branches in man are scant. However, in general, this segment of the subclavian, which constitutes the transition zone from the dorsal intersegmental to the limb artery and supplies such heterogeneous

elements as the thyroid gland and the omocervical region, may be considered as prone to variability<sup>5</sup>. The omocervical vessels comprise longitudinal anastomoses (cervical ascending artery) and transversal vessels (transverse cervical, suprascapular artery and dorsal scapular artery). The first channels to the median primordium of the thyroid gland come from the aortic arch, the innominate and

the carotids. Secondly, they are substituted by a lateral source from the subclavian<sup>6</sup>. The classification of the thyrocervical trunk according to the variable formation of its main constituents reflects varying degrees of fusion. The inferior thyroid may be dominant (type I), or the shape of the thyrocervical trunk gives a true account of the dual origin (type II). Furthermore, not infrequently the union of the component is lacking (type III). Thus, the

thyrocervical trunk turn out to be a late acquisition in comparative anatomy, which is typical only for man; furthermore, it is the result of more or less complete fusion of different components, which occurs relatively late in individual development. Therefore, a very general explanation of the variability may be found in the late phylogenetic and ontogenetic appearance of the thyrocervical trunk<sup>1</sup>. Figure 2.

**Figure 2**  
**Configuration and variability of the thyrocervical trunk<sup>1</sup>.**



*TI: thyroidea inferior; CA: cervicalis ascendens; RS: ramus superficialis of A. transverse colli; SD: scapularis dorsalis; SS: suprascapularis; SC: subclavia with I: first part, and III: third part (second part behind scalenus anterior muscle, AM); TO: thoracica interna.*

The dorsal scapular artery almost always arise from the second or third part of the subclavian artery or from the transverse cervical artery; it arise from each one of these sites in approximately 33%. When the dorsal scapular artery comes from the second or third part of the subclavian artery it is usually a separate branch, rather than from a stem common to it and to either the costocervical trunk or the

suprascapular artery. It is rare for the dorsal scapular artery to arise, as a direct branch, from the first part of the subclavian artery, the axillary artery, or the thyrocervical trunk. Thus, the dorsal scapular artery, traditionally considered a branch of the transverse cervical artery (its deep branch), actually has an origin more frequently (69,7%) from some other source<sup>7</sup>. Table 1. Figure 3.

TABLE 1

*The number and frequency of occurrence of the various sites of origin of the dorsal scapular artery*

ORIGIN	NUMBER	PER CENT
A. From the transverse cervical artery	54	30.3
B. From subelavian II <sup>1</sup>		
1. directly	54	30.3
2. with the costocervical trunk	2	1.1
3. With the suprascapular artery	4	2.2
C. From subelavian III		
1. directly	55	30.9
2. with the costocervical trunk	1	0.6
3. with the suprascapular artery	3	1.7
D. Directly from:		
1. thyrocervical trunk	1	0.6
2. subelavian I	1	0.6
3. axillary I	2	1.2
4. axillary II	1	0.6

<sup>1</sup>The subelavian artery was considered to be divided into three parts by the anterior scalene muscle. The segment of the artery medial to the muscle is subelavian I; the portion behind it is subelavian II, and the part of the artery lateral to the muscle is subelavian III.

Table 1  
*The number and frequency of occurrence of the various sites of origin of the dorsal scapular artery<sup>7</sup>.*

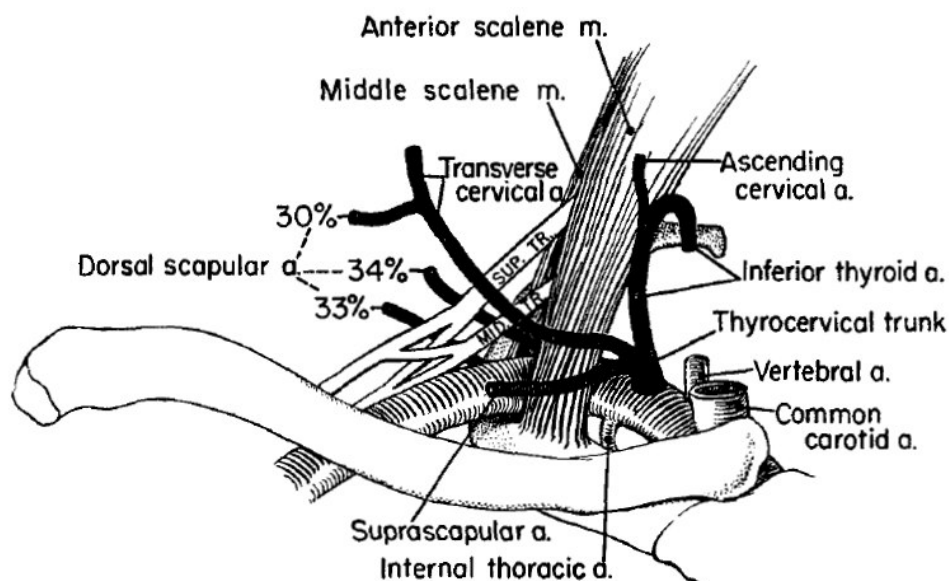
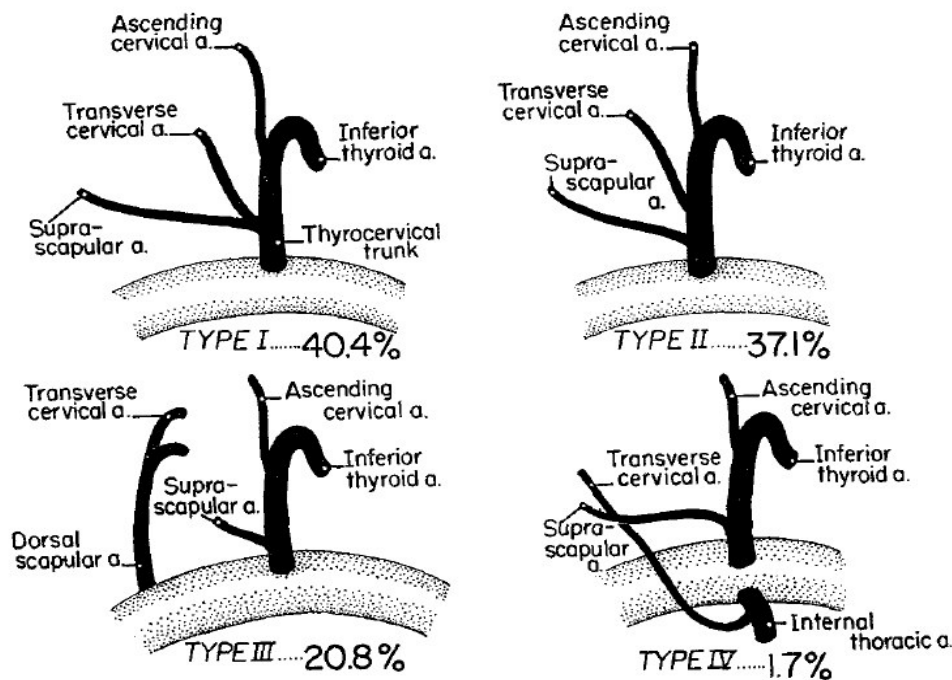


Figure 3  
*The three major sites of origin of the dorsal scapular artery<sup>7</sup>.*

The transverse cervical artery exhibits variations in its origin: Type I: The artery has its origin with the suprascapular artery by a common stem arising from the thyrocervical trunk. Type II: The artery arise directly from

the thyrocervical trunk. Type III: The artery arises from the dorsal scapular artery. Type IV: The artery arise from the internal thoracic artery<sup>7</sup>. Figure 4.



**Figure 4**  
**The variations in the origin of the transverse cervical artery<sup>7</sup>.**

The suprascapular artery usually arises from the thyrocervical trunk of the subclavian artery, although it may arise from the third part of the subclavian artery. It later descends laterally across scalenus anterior, phrenic nerve, brachial plexus and subclavian artery. On reaching the superior border of the scapula, it passes above the superior transverse ligament, which separates it from suprascapular nerve passing below the ligament. Numerous variations in the origin of the branches of the subclavian artery have been reported. Earlier authors have described about the variant origin of the suprascapular artery from the third part of subclavian artery or axillary artery<sup>4,9-14</sup>. Chen and Adds (2011) reported the case of a 94 year old female with an accessory suprascapular artery arising from the third part of the subclavian artery at the outer border of scalenus anterior, where it ran inferior to the inferior trunk of the brachial plexus and deep to the transverse scapular ligament with the suprascapular nerve, while the classic suprascapular artery took its ordinary course to pass over the transverse

scapular ligament. The suprascapular and accessory suprascapular arteries anastomosed in the suprascapular fossa undercover of suprascapular. The suprascapular artery may originate from the 3rd part of the subclavian artery<sup>15</sup>. Atsas et al (2011) also reported a case of a 68 year old male in which on the left side the suprascapular artery originated from the internal mammary (thoracic) artery just after it arose from the subclavian artery. It passed backwards posterior to the medial third of the clavicle and then accompanied the suprascapular nerve where it bridged the transverse scapular ligament, while the suprascapular nerve passed beneath<sup>16</sup>. Yang et al dissected 103 cadaveric shoulders and found a single suprascapular artery that passed under the superior transverse suprascapular ligament in 26.2% of the shoulder specimens. They noted that the venous anatomy was more variable, with 21.3% having multiple veins, and all of the vessels passing superior to the ligament only 59.4% of the time and demonstrated that the



presence of the suprascapular artery can be classified into three types, type I: the suprascapular vessels pass over the transverse scapular ligament, observed in 59.4% of cases; type II: the suprascapular vessels pass over and beneath the scapular ligament, observed in 29.7%; type III: all the suprascapular vessels pass below the scapular ligament, observed in 10.9% of specimens<sup>17</sup>. Although venous compression at the suprascapular notch has not been reported, venous compression at the spinoglenoid notch has been reported. Carroll et al (2003)<sup>18</sup> were the first to report enlarged spinoglenoid notch veins as a cause of compression leading to pain and infraspinatus weakness. They identified 6 patients, 3 of whom underwent surgery, and all showed clinical improvement. The inferior transverse scapular ligament was divided in all patients, and 1 also had a varicosity ligated. Not all fluid signal seen in the notch on magnetic resonance imaging is a ganglion, and they stressed the importance of recognizing this entity when considering percutaneous aspiration. This has also been described in a patient with varicose veins in the lower extremity who developed a large varix in the spinoglenoid notch resulting in nerve compression. The patient underwent an open vessel ligation and resection with good clinical improvement. They noted that the addition of intravenous contrast when performing magnetic resonance imaging may help to differentiate this from the more common

ganglion cyst<sup>19</sup>. Awareness of the anatomical variations may help to guide treatment decisions due to underlying circulation problems and prevent unwanted vascular injuries in repair operations and diagnostic procedures.

## CONCLUSION

The arterial variations of thyrocervical been implicated in different clinical situations. The variations in the origin and course of arterial branches are clinically important for surgeons, orthopaedicians and radiologists performing angiographic studies on the neck and upper limb. Therefore both the normal and abnormal anatomy of the region should be well known for accurate diagnostic interpretation and therapeutic intervention.

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## CONFLICT OF INTEREST

Conflict of interest declared none

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