

ANATOMICAL VARIATIONS IN THE ORIGIN OF SUPERIOR THYROID ARTERY AND ITS CLINICAL SIGNIFICANCE

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ABSTRACT

Background: The thyroid gland has rich blood supply because of its endocrine nature and the blood vessels are prone to variations with respect to the source of origin. The aim of this study was to describe the variations in the pattern of origin of the superior thyroid artery so as to minimize the vascular complications associated with thyroid surgeries.

Materials and Methods: Neck region of fifteen adult cadavers (30 sides) fixed in formalin, were dissected methodically. The pattern of origin of superior thyroid artery was studied. The common carotid artery bifurcation was used as landmark and the distance of superior thyroid artery origin from the bifurcation was noted.

Results: The site of origin of the STA was from the ECA in 60% cases, from the common carotid artery bifurcation in 23.3% and from the CCA itself in 16.66%.

Conclusion: This study provides data regarding the prevalence of possible sources of origin of the STA and the average distance between the origin of the STA and the CCA bifurcation.

KEY WORDS: thyroid gland, common carotid artery, bifurcation, variations.

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INTRODUCTION

The superior thyroid artery (STA) is the main source of arterial supply for the thyroid gland and also the upper part of larynx and hence the anatomical features of the STA is important in surgical procedures of the thyroid and the surrounding regions [1]. STA usually arises from the anterior surface of the external carotid artery (ECA), occasionally from the common carotid artery. The STA descends vertically to reach the upper pole of the thyroid gland where

it divides into anterior and posterior branches [2]. Various anatomical studies have reported wide variations in the origin and location of the STA [3]. Studies in the past have defined the prevalence of origin of STA from the common carotid artery (CCA) to be 6-47%, from the CCA bifurcation in 22-49% and from the ECA in 23-66% [4].

Various surgical procedures are carried out in thyroid pathology and each surgical procedure has its own risks and complications. Hence

surgical procedures of the thyroid require a sound knowledge of the normal and variant arterial anatomy [5].

Aim of this anatomical study was to study the variations in the origin of the STA and to measure the distance between the point of origin of STA and the CCA bifurcation. The data obtained is believed to assist the surgeons in minimizing the risks and complications associated with the thyroid surgeries.

MATERIALS AND METHODS

The dissection was approved by the institutional ethical committees. The dissection was carried out on 15 formalin fixed cadavers, 4 from the Department of Anatomy, Hassan Institute of Medical Sciences, Hassan and 11 from the Department of Anatomy, Adichunchanagiri Institute of Medical Sciences, BG Nagara. Age, gender and racial information was unknown.

The neck region of all the cadavers were dissected methodically. We focused mainly of the origin of the STA and measuring the distance between the origin of the STA and the CCA bifurcation. All measurements were made using a digital sliding calipers. The specimens were photographed. The data was analyzed using descriptive statistics. We also did a literature survey about the possible variations in the origin of the STA and the clinical implications associated with the variations.

RESULTS

The site of origin of the STA was from the ECA in 60% cases, from the common carotid artery bifurcation in 23.3% (Figure 1) and from the CCA (Figure 2) itself in 16.66%. Side wise distribution of the site of origin is shown in Table 1.

Table 1: Origin of the superior thyroid artery.

Source of origin	Right side. n=15 Number (percentage)	Left Side n=15 Number (percentage)	Total n=30 Number (percentage)
External carotid artery	9 (60)	9 (60%)	18 (60)
Common carotid artery Bifurcation	5 (33.34%)	2 (13.34%)	7 (23.34%)
Common carotid artery	1 (6.66%)	4 (27.7%)	5 (16.66%)



Fig. 1: Superior thyroid artery (STA) arising from the common carotid artery bifurcation (CCAB).



Fig. 2: Superior thyroid artery (STA) arising from the common carotid artery (CCA)

Regarding the distance between the origin of the STA from the CCA and the CCA bifurcation, the STA origin was located at a distance of 1.2 mm- 25 mm below the level of the CCA bifurcation. When the STA was arising from the ECA the distance from the CCA bifurcation ranged from 4.5 mm to 8.1 mm on the left side and on the right side it was 4-9 mm.

DISCUSSION

The STA is usually the first anterior branch arising from the ECA, but can also take its origin from the CCA bifurcation and the CCA itself [2]. The CCA and the internal carotid arteries (ICA) are the derivatives of the 3rd aortic arch and the ECA develops from the ventral aorta [6-9]. Hence the STA origin can be expected from CCA, CCA bifurcation and the ECA. Since ICA is the continuation of the CCA and the ECA can be considered as an anterior branch from the CCA. This has been one of the proposed embryological reason why the STA commonly arises from the CCA and its bifurcation [10].

In the present study STA was originating from the CCA and CCA bifurcation in 16.66% 23.34% respectively (a total of 40% combined) and from the ECA in 60% of the cases. The prevalence of the variations of the STA according to previous studies is shown below in Table 2.

Table 2: Showing the prevalence of the variations of STA as per literature.

Author and year of study	Type of study	No. of specimens studied	Origin from ECA	Origin from CCA	Origin from CCA bifurcation
Adachi, 1928[11]	Cadaveric	300	60%	16.66%	23.34%
Kitagawa, 1993 [12]	Cadaveric	74	54.50%	19%	26.50%
Nastis K et al, 2001 [10]	Cadaveric	100	39%	12%	49%
Klosek and Rungrunag, 2008 [8]	cadaveric	72	66.60%	33.3% (combined CCA+CCA bifurcation)	
Shivaleela ^a et al. 2016 [13]	Cadaveric	64	76.20%	2.38%	21.43%
Joshi A ^b et al 2104 [14]	Cadaver	66	66.67%	2.51%	31.81%
Present study	Cadaveric	30	60%	16.66%	23.34%

^{a,b} Indian studies

Compared to majority of the other studies and even the studies conducted in Indian population (including the south Indian population), the present study reveals that the prevalence of origin the STA from the CCA is much higher than reported.

According to Nastis K et al., since STA relatively commonly arises from the CCA and CCA bifurcation, STA and ECA can be considered as anterior branches of the CCA [10].

Rarely the STA takes origin from the subclavian artery and the completely absent on even rarer occasions [15,16].

CONCLUSION

This study provides data regarding the prevalence of possible sources of origin of the STA and the average distance between the origin of the STA and the CCA bifurcation. Normal anatomy and variations of the STA is not only important in the surgical procedures in this region but also due to the diagnostic implications. Awareness of these variations might help in minimizing the risks and complications associated with thyroid surgeries.

Conflicts of Interests: None

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