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A Systematic Review and Meta-Analysis: A New Insight into The Variations of Origin Site of The Superior Thyroid Artery

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ABSTRACT

Objectives: The purpose of this review was to perform a search that noted where the superior thyroid artery (STA) originated.

Methods: The indexing databases PubMed and Google Scholar were used for the literature search and the articles that evaluated the origin site of the STA were included.

Results: Seventy-one studies were analyzed, yielding a total of 6837 samples. Our findings revealed that STA commonly originated from the external carotid artery (58.17%), followed by carotid bifurcation (23.50%), common carotid (15.83%), and internal carotid (0.04%), lingual (0.01%), occipital (0.01%) and ascending pharyngeal (0.01%) arteries. It arises as a shared trunk (arising from external, internal or common carotid or carotid bifurcation arteries) with other arteries including thyro-lingual (1.45%), thyro-linguo-facial (0.54%), thyro-occipital(0.01%), thyro-linguo-laryngeal (0.01%), and thyro-hyo-laryngo-cricothyro-sternocleidomastoid (0.01%) trunks or absent (0.38%).

Conclusion: We created a novel, simple classification based on our outcome. Attention to this anatomical variation is critical for surgeons and radiologists to achieve preferable anterior neck operations.

Keywords: Variations, origin site, superior thyroid artery

INTRODUCTION

The location of the thyroid gland is in the upper anterior cervical region and wraps at the area of the cricoid cartilage and tracheal rings, posterior to the sternothyroid and sternohyoid muscles. On the anatomical and physiological side, the thyroid gland possesses right and left lobes, which are joined by the isthmus and are responsible for producing hormones in its surrounding capillaries, which are important for body growth and metabolic rate [1, 2]. The arterial supply to the head and cervical regions is provided by the common carotid artery (CCA), internal carotid artery (ICA), and external carotid artery (ECA). The right CCA comes from the brachiocephalic artery behind to the right sternoclavicular joint. The left CCA originates from the aortic arch in the superior mediastinum. Both CCAs ascend cranially through the neck below the front edge of the sternocleidomastoid muscle, from the sternoclavicular joint to the upper border of the thyroid cartilage. Here, it splits off into the ECA and ICA; this bifurcation region is called the carotid bifurcation (CB). One of the thyroid gland's primary arteries is the STA, which originates from the same side of the ECA and runs downward and is divided into numerous glandular branches: anterior, which descends on the posterior border to supply the medial and lateral surfaces and anastomoses with the inferior thyroid artery; posterior, which runs along the medial side of the upper part of the lateral lobe to supply primarily the anterior surface; and a branch that crosses above the isthmus to anastomose with its fellow on the opposite side. The lateral surface was occasionally supplied by a lateral branch. The infrahoid, superior laryngeal, sternocleidomastoid, and cricothyroid are non-glandular branches of the STA. The superior laryngeal nerve's external branch is frequently runs parallel to the STA. Since this nerve supplies the cricothyroid muscle, care should be taken to maintain it after surgery to avoid iatrogenic damage that could impair vocal cord function [2].

The aberrant origin of STA is very prevalent and has been repeatedly reported. Human cadavers, arterial angiography, and accidental detection during neck surgery are the sources of detected variations [4, 5, 6]. In an important number of studies, the STA originates from the CCA, CB, and ICA, or is absent [7, 8].

Most studies conducted on variances in the origin of the STA are simple case reports and original articles; hence, the information is scattered. The overall purpose of this review is to collect data and provide a valuable, solid, and critical summary about the variations in the STA concerning its origin, and to form an idea review without having to read all published works in the field such that this review data can be applied by surgeons in general, and a radiologist to decrease accidental complications that may lead to death in patients who undergo thyroidectomy or other anterior neck procedures.

MATERIALS AND METHODS

The study was conducted in the Anatomy Department, Medical College, Najran University, KSA, between September 2023 and March 2024. Systematic and meta-analysis reviews were managed in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [9] using indexed databases, including PubMed and Google Scholar. The English terms used in the search strategy were ' variation in the origin of the superior thyroid artery “AND (aberrant) OR 'abnormal pattern of the superior thyroid artery” AND (unusual).

Relevant articles describing the aberrant in the origin of the STA in cadaveric, angiographic, and surgical specimens were included in our systematic review. Duplicated studies, animal studies, incomplete information articles about our research question, and studies that carry other factors (pathological disease or high of bias) about abnormal in the origin of the STA were our systematic review exclusion criteria. No research limitations regarding the year of publication, age, ethnicity, and nation for the study population were set. The first study was conducted in December 1974, while the last study was conducted in October 2023.

Before any analysis, an Excel sheet was used to extract data from eligible articles. The study basic features that were collected including the first author, year of publication, country or region of research, population, age, gender, investigative technique, type of specimens, number of specimens, inclusion criteria, exclusion criteria, firsthand study, and end result.

The eligible studies were evaluated using the Anatomical Quality Assessment (AQUA) method [10], which consists of 25 items that were stated as marking questions and arranged into five domains: 1. purpose and subject characteristics, and 2. study design, 3. characterization of the methods and 4. descriptive anatomy, and 5. result reporting. Each cross-question for each item in each domain could be replied as "Yes,” or "No”. If all or more than half of the items questions in each of domain answered "Yes" that means the domains have a low risk of bias, if all or more than half of the answer is "No" the domain judged have a high risk of bias. Regarding the number of the domains that have a risk of bias: if there is 1 of the total five domains that have a high risk of bias, the study is considered to have a low risk of bias, and if there are 2 to 3 domains that have a high risk of bias, then it is felt that the study has moderate risk of bias, and if there is 4 to 5 domains has high risk of bias, so study is considered to have a high risk of bias.

RESULTS

In the first literature search, a total of 38969 records were identified, and 12 records were discovered via the reference citation of the recognized sources (Figure 1). A total of 38928 records were identified after the removal of duplicates. A total of 38928 records were screened and 38742 records were rejected based on the exclusion criteria. A total of 186 reports were assessed for eligibility, of which 74 were excluded because they did not match the research question, 28 because of incomplete information about where STA take origin, 9 because they were animal studies, and 4 because they had a significant bias risk. A total of 71 articles were included in this systematic review [11-81].

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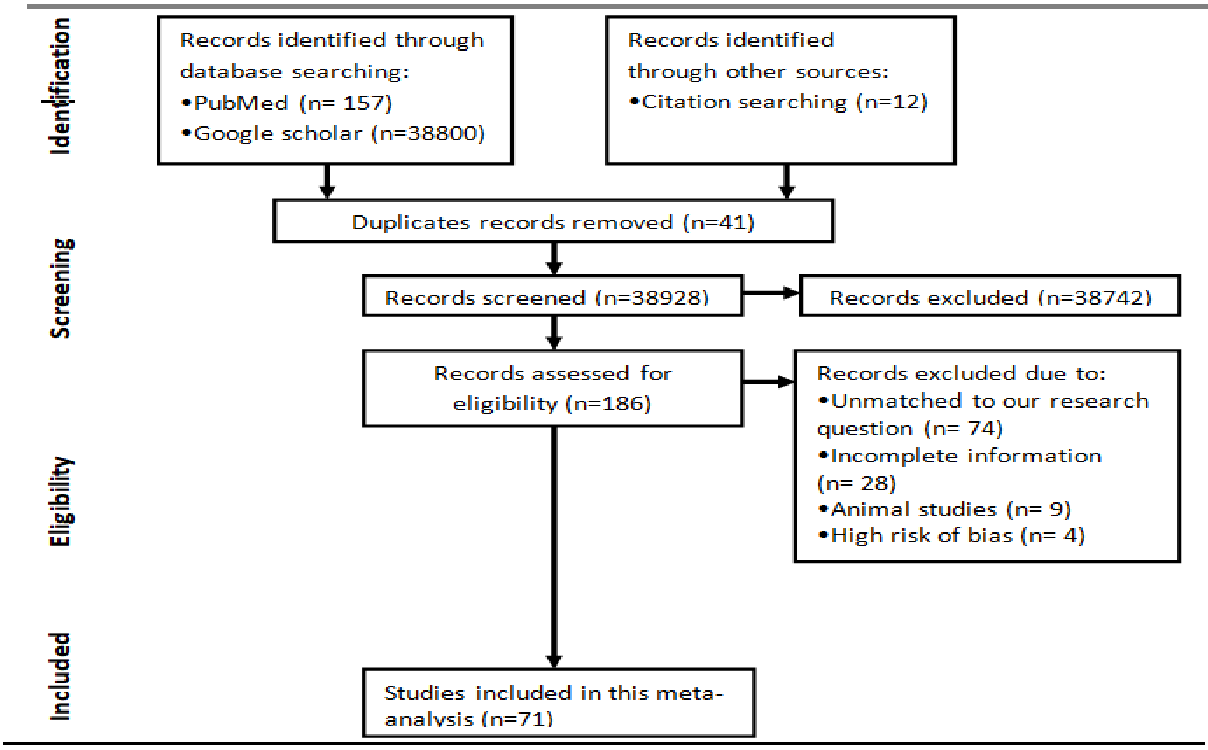

Figure 1: PRISMA follow diagram of our systematic review

A total of seventy-one included studies had data collected from cadaveric dissection and surgical and angiographic imaging applied to patients. 15 studies among 71 were reported number of neck-halves instead of cadaver or patient, in this study we recorded number neck-halves instead of patients or cadavers, resulting in a total of 6837 neck-half investigations. The current study included the most races and ethnic groups around the world. The anthropological features of the included articles are listed in Table 1. 6837 samples tested to find out how the STA origins. The STA originated as separate trunk from ECA in 58.17%, CB in 23.50% and CCA in 15.83%. In very uncommon cases, it arises as a single branch from the ICA (0.04%), lingual artery (0.01%), occipital artery (0.01%), or ascending pharyngeal artery (0.01). The STA originates as a common stem (arose from the ECA, or CB, or CCA or ICA) with the lingual artery (thyro-lingual trunk) in 1.45% of cases, with the lingual and facial arteries (thyro-linguo-facial trunk) in 0.54% of cases, with the occipital artery (thyro-occipital trunk) in 0.01% of cases, with the lingual and superior laryngeal arteries (thyro-linguo-laryngeal trunk) in 0.01% and with the infrahyoid, superior laryngeal, cricothyroid, and sternocleidomastoid arteries (thyro-hyo-laryngo-cricothyro-sternocleidomastoid trunk) in 0.01% of cases. STA was absent in 0.38% of cases. The results of this systematic review are presented in Table 2 and Figure 2. In Figure 2, the author presents a new simple categorization with thirteen types. The quality of our eligible studies was detected using AQUA tools, and four articles were excluded because they presented a high risk of bias (4-5 domain with high risk) in most of the five domains, whereas the included articles presented low (0-1 domain with high risk) to moderates (2-3 domains with high risk) risk of bias. The table 3 presented the included studies were assessed by AQUA tools.

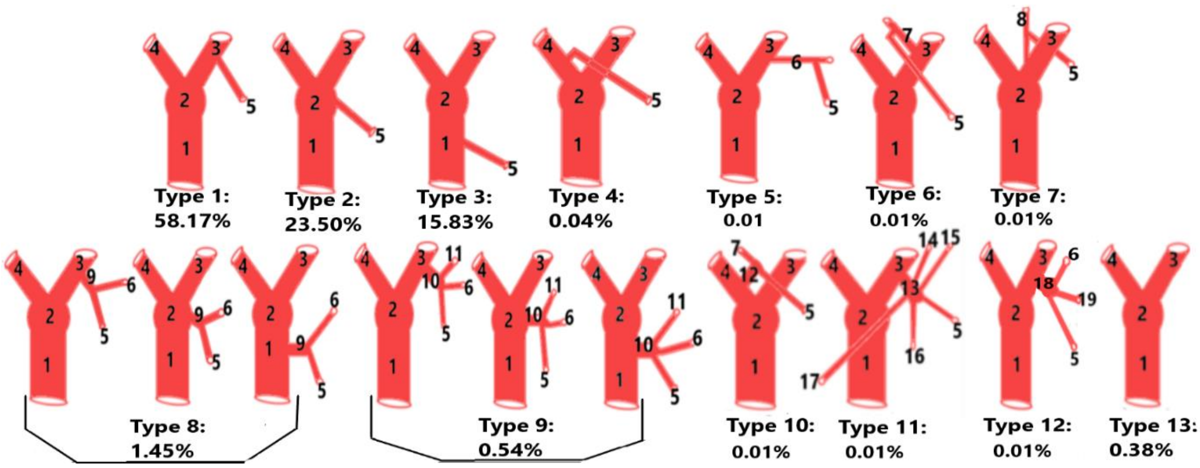

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Figure 2: Schematic description shows the new categorization where the superior thyroid artery originated with thirteen types (1-13) and their rate of occurrence. **1**, common carotid artery; **2**, common carotid bifurcation; **3**, external carotid artery; **4**, internal carotid artery; **5**, superior thyroid artery; **6**, lingual artery; **7**, occipital artery; **8**, ascending pharyngeal artery; **9**, thyro-lingual trunk; **10**, thyro-linguo-facial trunk; **11**, facial artery; **12**, thyro-occipital trunk; **13**, thyro-hyo-laryngo-cricothyro-sternocleidomastoid trunk; **14**, infrahyoid artery; **15**, superior laryngeal artery; **16**, cricothyroid artery; **17**, sternocleidomastoid artery; **18**, thyro-linguo-laryngeal trunk; **19**, superior laryngeal artery.

Table 1. Anthropologic aspects of included studies

Author	**Year**	**Country/ population**	**Type of investigation**	**Type of specimen (patient/ cadaver)**	**Sex (male/female)**
Fujimoto et al.	1974	Japan /adult	Cadaveric dissection	0/1	1/0
Smith and Benton	1978	USA/adult	Cadaveric dissection	0/1nh	1/0
Espalieu et al.	1986	France/adults	Cadaveric dissection & angiographic	50ns/36nh	UD
Banna and Lasjaunias	1990	KSA/adult	Angiographic	1/0	1/0
Itezerote et al.	1990	Brazil/UD	Cadaveric dissection	0/110nh	UR
Kitagawa et al.	1993	Japan/ fetuses	UD	74nh	UD
Moriggl and Sturm	1996	Austria/adult	Cadaveric dissection	1	0/1
Shintani et al.	1999	Japan /adults	Cadaveric dissection	0/29	UR
Gluncic et al.	2001	Croatia/ adult	Cadaveric dissection	0/1	1/0
Hayashi et al.	2005	Japan/UD	Cadaveric dissection	0/98nh	UD
Zumre et al.	2005	Turkey/fetuses	Cadaveric dissection	0/20	9/11
Lo et al.	2006	New Zealand/adults	Cadaveric dissection	0/65nh	UD
Aggarwal et al.	2006	India/adult	Cadaveric dissection	1/0	1/0
Terayama et al.	2006	Japan/UD	Angiographic	96nh/0	UD
Ozgur et al.	2009	Turkey/adults	Cadaveric dissection	0/20	17/3
Rimi et al.	2009	Bangladesh/ UR	Cadaveric dissection	0/57	34/23
Mehta et al.	2010	India/adult	Cadaveric dissection	0/1	1/0
Mamatha et al.	2010	India/UD	Cadaveric dissection	0/1	1/0
Sanjeev et al.	2010	India/adults	Cadaveric dissection	0/37nh	25/12
Al-Rafiah et al.	2011	KSA/adults	Cadaveric dissection	0/30	UD
Natsis et al.	2011	Greece/UD	Cadaveric dissection	0/50	44/6

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Ongeti and Ogeng'o	2011	Kenya/adults	Cadaveric dissection	0/46	36/10
Iwai et al.	2012	Japan/adult	Angiographic	1/0	1/0
Magoma et al.	2012	Kenya/UD	Cadaveric dissection	0/50	UD
Cappabianca et al.	2012	Italy/adults	Angiographic	97/0	68/29
Acar et al.	2013	Turkey/UD	Angiographic	200nh/0	UD
Gavrilidou et al.	2013	Romania/UD	Surgery & Angiographic	88nh/0	UD
Patel et al.	2013	India/adults	Cadaveric dissection	0/50	UD
Ozguner and Sulak	2014	Turkey/fetuses	Cadaveric dissection	0/200	100/100
Anagnostopoulou and Mavridis	2014	Greece/adults	Cadaveric dissection	0/68	UD
Gupta et al.	2014	India/adults	Angiographic	15/0	13/2
Joshi et al.	2014	India/adults	Cadaveric dissection	0/33	UD
Motwani and Jhajhria	2015	India/adult	Cadaveric dissection	0/1	1/0
Pushpalatha and Vidhya	2015	India/UD	Cadaveric dissection	0/50nh	UD
Manjunath and Lokanathan	2016	India/UD	Cadaveric dissection	0/15	UD
Shivaleela et al.	2016	India/UD	Cadaveric dissection	0/42	UD
Ovhal et al.	2016	India/UD	Cadaveric dissection	0/60	52/8
Shankar et al.	2017	India/UD	Cadaveric dissection	0/80nh	UD
Rajapriya et al.	2017	India/adults	Cadaveric dissection	0/25	18/7

Table 1. Anthropologic aspects of included studies (continued 1)

Author	**Year**	**Country/ population**	**Type of investigation**	**Type of specimen (patient/cadaver)**	**Sex (male/female)**
Laxmi et al.	2017	India/UD	Cadaveric dissection	0/30	UD
Sakkiiammal et al.	2017	India/UD	Cadaveric dissection	0/26	UD
Sreedharan et al.	2018	India/adults	Cadaveric dissection	0/60nh	UD
Esen et al.	2018	Turkey/adults	Angiographic	640/0	379/261
Dessie	2018	Ethiopia/UD	Cadaveric dissection	0/43	37/6
Amarttayakong et al.	2018	Thailand/adults	Cadaveric dissection & angiographic	55/55	72/38
Alzahrani et al.	2018	UK/adults	Cadaveric dissection	0/22	9/13
Sharma et al.	2018	India/UD	Cadaveric dissection	0/30	UD
Dakare and Bhuiyan	2018	India/UD	Cadaveric dissection	0/20	UD
Sharma	2019	India/UD	Cadaveric dissection	0/50	UD

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Ghosh et al	2019	St Kitts & Nevis/adults	Cadaveric dissection	0/49	22/27
Arjun and Shishirkumar	2019	India/UD	Cadaveric dissection	0/16	13/3
Bordei et al.	2019	Romania/adults & fetuses	Cadaveric dissection & angiographic	83/61	UD
Tsegay et al	2019	Ethiopia/UD	Cadaveric dissection	0/16	UD
Herrera-Nunez et al.	2020	Mexico/adults	Angiographic	76/0	50/26
Elsllabi et al	2020	UK/UD	Cadaveric dissection	0/15	7/8
Sharma et al.	2021	Nepal/UD	Cadaveric dissection	0/30	UD
Pandit et al.	2021	Nepal/UD	Cadaveric dissection	0/40	UD
Fakoya	2021	St Kitts & Nevis/adult	Cadaveric dissection	0/1	0/1
Shyamala and Akhilandeswari	2021	India/adults	Cadaveric dissection	0/60	41/19
Al-Azzawi and Takahashi	2021	UK/UD	Cadaveric dissection	0/20	10/10
Sudhakaran et al.	2021	India/adults	Cadaveric dissection	0/22	UR
Saha and Nandy	2022	Bengal/adults	Cadaveric dissection	0/60	38/22
Sinha et al.	2022	India/adults	Angiographic	44/0	31/13
Bunea et al.	2022	Romania/UD	Angiographic	36/0	16/20
Demirtas et al.	2022	Turkey/adults	Angiographic	288/0	169/119
Anand et al.	2022	India/UD	Cadaveric dissection	0/40	27/13
Bhardwaj et al.	2023	India/adults	Angiographic	210nh/0	UD
Toure et al.	2023	Mali/adult	Cadaveric dissection	0/1	1/0
Sasikumar et al.	2023	India/adults	Angiographic	100/0	68/32
Gwunireama et al.	2023	Nigeria/adults	Cadaveric dissection	0/25nh	UD
Bozhikova et al.	2023	USA/adult	Cadaveric dissection	0/1	1/0

UD= undefined**; nh**= revealed number of neck halves instead patients and cadaver

Table 2. Incidence of variant origin of superior thyroid artery

Study	**NH**	**n (ECA %)**	**n (CB %)**	**n (CCA%)**	**n (ICA%)**	**n (LA %)**	**n (OA %)**	**n (APA%)**	**n (TLT%)**	**n (TLFT %)**	**n (TOT%)**	**n (TLLT)**	**n (TISCST)**	**n (Ab %)**
Fujimoto et al.	2	0 (0)	1 (50)	1 (50)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Smith and Benton	1	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Espalieu et al.	86	39 (45)	47 (55)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Banna and Lasjaunias	2	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (100)

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Itezerote et al.	110	74 (67.3)	17 (15.4)	18 (16.4)	0 (0)	0 (0)	0 (0)	0 (0)	1(0.9)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Kitagawa et al.	74	40 (54.1)	18 (24.3)	14 (18.9)	0 (0)	0 (0)	0 (0)	0 (0)	2(2.7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Moriggl and Sturm	2	0 (0)	0 (0)	1 (50)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (50)
Shintani et al.	58	56 (96.55)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (3.45)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gluncic et al.	1	0 (0)	1 (100)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Hayashi et al.	98	68 (69.4)	0 (0)	29 (29.6)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Zumre et al.	40	10 (25)	28 (70)	2 (5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lo et al.	65	30 (46.2)	34 (52)	1 (1.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Aggarwal et al.	1	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	0 (0)
Terayama et al.	96	44 (45.8)	42 (43.8)	9 (9.4)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1)
Ozgur et al.	40	10 (25)	16 (40)	14 (35)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rimi et al.	114	90 (79)	15 (13)	9 (8)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mehta et al.	2	0 (0)	0 (0)	1 (50)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (50)
Mamatha et al.	1	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Sanjeev et al.	37	23 (62.16)	0 (0)	13 (35.14)	0 (0)	0 (0)	0 (0)	0 (0)	1 (2.7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Al-Rafiah et al.	60	2 (3.3)	46 (76.7)	11 (18.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1.7)	0 (0)	0 (0)	0 (0)	0 (0)
Natsis et al.	100	38 (38)	48 (48)	11 (11)	0 (0)	0 (0)	0 (0)	0 (0)	3 (3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

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Ongeti and Ogeng'o	92	74 (80.4)	2 (2.2)	10 (10.9)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	6 (6.5)	0 (0)	0 (0)	0 (0)	0 (0)
Iwai et al.	1	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	0 (0)	0 (0)
Magoma et al.	82	61 (74.4)	0 (0)	21 (25.6)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Cappabianca et al.	165	74 (44.8)	65 (39.4)	17 (10.3)	0 (0)	0 (0)	0 (0)	0 (0)	6 (3.6)	3 (1.8)	0 (0)	0 (0)	0 (0)	0 (0)
Acar et at.	200	98 (49)	62 (31)	36 (18)	0 (0)	0 (0)	0 (0)	0 (0)	4 (2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gavrilidou et al.	64	34 (53.125)	12 (18.75)	18 (28.125)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Patel et al.	100	73 (73)	23 (23)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3 (3%)	1 (1)	0 (0)	0 (0)	0 (0)	0 (0)
Ozguner and Sulak	400	385 (96.25)	0 (0)	11 (2.75)	0 (0)	0 (0)	0 (0)	0 (0)	4 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Anagnostopoulou and Mavridis	136	22 (16.2)	34 (25)	54 (39.7)	0 (0)	0 (0)	0 (0)	0 (0)	10 (7.4)	16 (12)	0 (0)	0 (0)	0 (0)	0 (0)
Gupta et al.	25	18 (72)	5 (20)	1 (4)	1 (4)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Joshi et al.	66	44 (66.67)	21 (31.81)	1 (1.51)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Motwani and Jhajhria	1	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (100)	0 (0)
Pushpalatha and Vidhya	50	34 (68)	4 (8)	12 (24)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Manjunath and	30	18 (60)	7 (23.34)	5 (16.66)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

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Lokanathan														
Shivaleela et al.	84	64 (76.19)	18 (21.43)	2 (2.38)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Ovhal et al.	120	107 (89.17)	0 (0)	7 (5.83)	0 (0)	0 (0)	0 (0)	0 (0)	5 (4.2)	1 (0.8)	0 (0)	0 (0)	0 (0)	0 (0)
Shankar et al.	80	43 (53.75)	12 (15)	25 (31.25)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rajapriya et al.	50	24 (48)	22 (44)	2 (4)	0 (0)	0 (0)	0 (0)	0 (0)	1 (2)	1 (2)	0 (0)	0 (0)	0 (0)	0 (0)

Table 2. Incidence of variant origin of superior thyroid artery (continued 1)

Study	**NH**	**n (ECA%)**	**n (CB%)**	**n (CCA%)**	**n (ICA%)**	**n (LA%)**	**n (OA%)**	**n (APA%)**	**n (TLT%)**	**n (TLFT%)**	**n (TOT%)**	**n (TLLT%)**	**n (TISCST)**	**n (Ab%)**
Laxmi et al.	60	29 (48.33)	21 (35)	9 (15)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1.67)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Sakkiiammal et al.	52	35 (67.3)	14 (26.9)	3 (5.8)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Sreedharan et al.	60	53 (88.33)	5 (8.33)	2 (3.33)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Esen et al.	1280	667 (52.1)	279 (21.8)	316 (24.7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	18 (1.4)
Dessie	86	38 (44.2)	24 (27.9)	23 (26.7)	0 (0)	1 (1.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Amarttayakong et al.	220	56 (25.5)	62 (28.2)	99 (45)	0 (0)	0 (0)	0 (0)	0 (0)	3 (1.4)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

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Alzahrani et al.	44	31 (71)	0 (0)	12 (27)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (2)
Sharma et al.	60	60 (100)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Dakare and Bhuiyan	39	7 (17.94)	30 (76.92)	1 (2.5)	0 (0)	0 (0)	0 (0)	0 (0)	1 (2.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Sharma	100	66 (66)	33 (33)	1 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Ghosh et al	98	82 (83.7)	0 (0)	10 (10.2)	1 (1)	0 (0)	0 (0)	0 (0)	5 (5.1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Arjun and Shishirkumar	32	19 (59.3)	12 (37.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (3.13)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Bordei et al.	144	89 (61.80)	21 (14.58)	31 (21.53)	0 (0)	0 (0)	0 (0)	0 (0)	2 (1.39)	1 (0.69)	0 (0)	0 (0)	0 (0)	0 (0)
Tsegay et al	32	27 (84.375)	3 (9.375)	2 (6.25)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Herrera-Nunez et al.	152	77 (50.7)	31 (20.4)	26 (17.1)	0 (0)	0 (0)	0 (0)	0 (0)	16 (10.5)	0 (0)	0 (0)	0 (0)	0 (0)	2 (1.3)
Elsllabi et al	30	18 (60)	0 (0)	12 (40)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

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Sharma et al.	30	27 (90)	2 (6.67)	1 (3.33)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Pandit et al.	80	22 (27.5)	4 (5)	50 (62.5)	0 (0)	0 (0)	0 (0)	0 (0)	4 (5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fakoya	1	0 (0)	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Shyamala and Akhilandeswari	60	28 (46.7)	28 (46.7)	3 (5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1.7)	0 (0)	0 (0)	0 (0)	0 (0)
Al-Azzawi and Takahashi	40	26 (65)	10 (25)	4 (10)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Sudhakaran et al.	44	14 (31.8)	26 (59)	3 (7)	0 (0)	0 (0)	1 (2.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Saha and Nandy	120	93 (77.5)	14 (11.67)	9 (7.5)	0 (0)	0 (0)	0 (0)	0 (0)	2 (1.67)	2 (1.67)	0 (0)	0 (0)	0 (0)	0 (0)
Sinha et al.	88	34 (38.64)	48 (54.54)	5 (5.68)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1.14)	0 (0)	0 (0)	0 (0)	0 (0)
Bunea et al.	72	62 (86.11)	6 (8.33)	4 (5.56)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Demirtas et al.	563	273 (48.49)	248 (44.05)	31 (5.51)	0 (0)	0 (0)	0 (0)	0 (0)	11 (1.95)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Anand et al.	80	32 (40)	32 (40)	16 (20)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Bhardwaj et al.	210	162 (77.1)	30 (14.3)	18 (8.6)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Toure et al.	1	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Sasikumar et al.	200	144 (72)	16 (8)	30 (15)	0 (0)	0 (0)	0 (0)	0 (0)	8 (4)	2 (1)	0 (0)	0 (0)	0 (0)	0 (0)
Gwunireama et al.	22	9 (40.91)	8 (36.36)	4 (18.18)	0 (0)	0 (0)	0 (0)	0 (0)	1 (4.54)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Bozhikova et al.	1	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)
Total	**6837**	**3977 (58.17%)**	**1607 (23.50%)**	**1082 (15.83%)**	**3 (0.04%)**	**1 (0.01%)**	**1 (0.01%)**	**1 (0.01)**	**99 (1.45%)**	**37 (0.54%)**	**1 (0.01%)**	**1 (0.01%)**	**1 (0.01)**	**26 (0.38%)**

NH, neck halves; **n,** number of specimens; **ECA**, external carotid artery; **CB**, common carotid artery bifurcation; **CCA**, common carotid artery; **ICA**, internal carotid artery; **LA**, lingual artery; **OA**, occipital artery; **APA**, ascending pharyngeal artery; **TLT**, thyro-lingual trunk; **TLFT**, thyro-linguo-facial trunk; **TOT**, thyro-occipital trunk; **TLLT**, thyro-linguo-laryngeal trunk; **TISCST**, thyro-hyo-laryngo-crico-mastoid trunk; **Ab**, absent.

Table 3. The eligible studies were evaluated using the Anatomical Quality Assessment (AQUA) method

Study	**Domain 1**				**Domain 2**					**Domain 3**						**Domain 4**					**Domain 5**					**Risk of bias**
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	

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Fujimoto et al.	N	Y	Y	Y	Y	N	N	Y	Y	N	N	N	N	N	Y	Y	Y	N	N	Y	N	Y	Y	N	Y	Low
Smith and Benton	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Low
Espalieu et al.	Y	Y	N	N	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	N	Y	Low
Banna and Lasjaunias	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Low
Itezerote et al.	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	N	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	N	Low
Kitagawa et al.	N	Y	N	Y	Y	N	N	Y	Y	N	N	N	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	N	Moderate
Moriggl and Sturm	N	Y	Y	Y	Y	N	N	Y	Y	Y	Y	N	Y	Y	Y	Y	N	Y	Y	Y	N	Y	Y	Y	N	Low
Shintani et al.	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Low
Gluncic et al.	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Low
Hayashi et al.	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Low
Zumre et al.	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Low
Lo et al.	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Low
Aggarwal et al.	N	Y	Y	Y	Y	N	N	Y	Y	Y	N	N	Y	Y	Y	Y	N	N	Y	Y	N	Y	Y	Y	Y	Low
Terayama et al.	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Low
Ozgur et al.	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Low
Rimi et al.	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	N	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Low
Mehta et al.	Y	Y	N	Y	Y	Y	Y	Y	Y	N	N	N	Y	N	Y	Y	Y	N	Y	Y	N	Y	Y	Y	Y	Low
Mamatha et al.	N	Y	N	Y	Y	N	N	Y	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Moderate

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Sanjeev et al.	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Low
Al-Rafiah et al.	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Low
Natsis et al.	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Low
Ongeti and Ogeng'o	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Low
Iwai et al.	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Low
Magoma et al.	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Low
Cappabianca et al.	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Low
Acar et at.	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Low
Gavrilidou et al.	N	Y	N	Y	Y	N	N	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Low
Patel et al.	N	Y	N	Y	Y	N	N	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Low
Ozguner and Sulak	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Low
Anagnostopoulou and Mavridis	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Low
Gupta et al.	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Low
Joshi et al.	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Low
Motwani and Jhajhria	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Low
Pushpalatha and Vidhya	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	N	N	Y	N	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Low

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Manjunath and Lokanathan	Y	Y	N	Y	Y	Y	Y	Y	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Low
Shivaleela et al.	N	Y	N	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Low
Ovhal et al.	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	N	N	Y	N	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Low
Shankar et al.	Y	Y	N	Y	Y	Y	N	Y	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Low
Rajappriya et al.	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Low

Table 3. The eligible studies were evaluated using the Anatomical Quality Assessment (AQUA) method (continued 1)

Study	Domain 1				Domain 2					Domain 3						Domain 4					Domain 5					Result
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
Laxmi et al.	Y	Y	N	Y	Y	Y	Y	N	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Low
Esakkiammal et al.	N	Y	N	Y	Y	Y	N	Y	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Moderate
Sreedharan et al.	Y	Y	N	Y	Y	Y	Y	Y	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Low
Esen et al.	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Low
Dessie	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Low
Amarttayakong et al.	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Low
Alzahrani et al.	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Low
Sharma et al.	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Low
Dakare and Bhuiyan	N	Y	N	Y	Y	N	N	Y	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Moderate
Sharma	N	Y	N	Y	Y	N	N	Y	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Moderate
Ghosh et al	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Low
Arjun and Shishirkumar	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Low
Bordei et al.	N	Y	N	Y	Y	N	N	Y	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Moderate
Tsegay et al	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Low
Herrera-Nunez et al.	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Low
Elsllabi et al	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Low
Sharma et al.	Y	Y	N	Y	Y	Y	Y	Y	Y	N	N	N	Y	N	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Low
Pandit et al.	N	Y	N	Y	Y	N	N	Y	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Moderate
Fakoya	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Low

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Shyamala and Akhilandeswari	Y	Y	N	Y	Y	Y	Y	Y	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Low
Al-Azzawi and Takahashi	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Low
Sudhakaran et al.	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Low
Saha and Nandy	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Low
Sinha et al.	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Low
Bunea et al.	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Low
Demirtas et al.	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Low
Anand et al.	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Low
Bhardwaj et al.	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Low
Toure et al.	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Low
Sasikumar et al.	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Low
Gwunireama et al.	Y	Y	N	Y	Y	Y	Y	Y	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Low
Bozhikova et al.	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Low

Note1. Domain 1: OBJECTIVE (S) AND SUBJECT CHARACTARISTICS. (1) Was (Were) the objective(s) of the study clearly defined? (2) Was (Were) the chosen subject sample(s)? (3) Are the baseline and demographic characteristics of the subjects (age, sex, ethnicity, health or disease, etc.) appropriate and clearly defined? (4) Could the method of subject selection have in any way introduced bias into the study? Domain 2: STUDY DESIGN. (5) Does the study design appropriately address the research question(s)? (6) Were the materials used in the study appropriate for given objective(s) of the study? (7) Were the methods used in the study appropriate for the given objective(s) of the study? (8) Was the study design including methods/techniques applied in the study, widely accepted or standard in the literature? If "no" are the novel features of the study design clearly described? (9) Could the study design have in any way introduced bias into the study? Domain 3: METHODOLOGY CHARACTERIZATION. (10) Are the methods/techniques applied in the study described in enough detail for them to be reproduced? (11) Was the specialty and the experience of the individual(s) performing each part of the study (such as cadaveric dissection or image assessment) clearly defined? (12) Are all the materials and methods used in the study clearly described, including details of manufacturers, suppliers etc.? (13) Were appropriate measures taken to reduce inter- and intra-observer variability? (14) Do the images presented in the study indicate an accurate reflection of the methods/techniques (imaging, cadaveric, intraoperative, etc.) applied in the study? (15) Could the characterization of methods have in any way introduced bias into the study? Domain 4: DISCRIPTIVE ANATOMY. (16) Were the anatomical definition(s) (normal anatomy, variations, classifications, etc.) clearly and accurately described? (17) Were the outcomes and parameters assessed in the study (variations, length, diameter, etc.) appropriate and clearly defined? (18) Were the figures (images, illustrations, diagrams, etc.) presented in the study clear and understandable? (19) Were any ambiguous anatomical observations (i.e., those likely to be classified as "others") clearly described/depicted? (20) Could the description of anatomy have any way introduced bias into the study? Domain 5: REPORTING OF RESULTS. (21) Was the statistical analysis appropriate? (22) Are the reported results as presented in the study clear and comprehensible, and are the reported values consistent throughout the manuscript? (23) Do the reported numbers or results always correspond to the numbers of subjects in the study? If not, do the authors clearly explain the reason(s) for subject exclusion? (24) Are all potential confounders reported in the study, and subsequently measured and evaluated, if appropriate? (25) Could the reporting of results have in any way introduced bias into the study?

Note 2. Domains highlighted in red have high risk of bias.

DISCUSSION

This systematic review revealed the importance of variances when the STA first originated. In accordance with the information of all included studies, the most prevalent site of origin was the ECA, followed by the CB and CCA. Its origin is always associated with the embryonic principle (aortic or branchial arches) of the great vessels of the neck during the third week of gestation. The CCA and proximal part of the ICA are derived from the third aortic arch while the distal part of the ICA developed from the dorsal aorta and from the third aortic arch, the ECA sprout [85]. In this study, we proposed that the STA commonly grows from the third aortic arch and rarely from the dorsal aorta.

Knowledge of STA anatomy is clinically crucial for surgeons and radiologists who operate on the head and neck regions to minimize the occurrence of complications. Maximum attention must be kept in mind during various operations on the anterior neck, such as thyroid and parathyroid surgeries, larynx and tracheal surgical entrances, carotid artery operations, and radiological investigations [82]. Throughout the thyroidectomy, the STA has to be ligated, in case it is carelessly severed, considering that it can cause hemorrhage that is difficult to manage [84]. Postoperative neck hematoma due to the STA injury has been reported after anterior cervical discectomy and fusion [89]. During larynx surgery, the STA must also be ligated, it is possible for the external laryngeal nerve branch to sustain damage, and if the superior laryngeal nerve is damaged accidentally during working on STA, hoarseness, difficult in swallowing or breathing or the loss of voice are the clinical symptoms expected to occur [84]. In extremely rare conditions, an STA pseudoaneurysm caused by tangential injury of this artery can appear during anterior neck surgeries, and its clinical implications include pulsating pain on the neck, difficulty in swallowing or breathing, and oral cavity hemorrhage [87, 88]. The STA plays an important and useful role in some surgical and therapeutic interventions, such as in cases of CCA occlusion used as collateral circulation between ECAs [90], angioembolization for treatment of neoplasms or large toxic goitre of the thyroid gland [91, 92], and as a recipient vessel for reconstruction of chest and upper back defects, as well as in microvascular anastomosis [93].

Regarding race and ethnicity, the STA where arose was detected in 3543 Caucasian and 931 East Asian specimens obtained from cadaveric dissection and angiographic images. The authors reported that site origin of STA from the ECA was more frequent among Caucasians, but East Asians were revealed to have a greater prevalence of STA arising from the CCA [86]. The results of our study are different; Caucasians showed that the most common site origin of STA is the CB, whereas East Asians presented a higher prevalence of the site origin of STA is the ECA [11-81]. The current study is accurate because it contains a larger number of specimens and proposes that there are meaningful changes through race and ethnicity.

CONCLUSION

STA is the main source of arterial supply to the thyroid gland, and this systematic review revealed variations in its origin, which was suggested in a new classification. Knowledge of the anatomical origin sites of the STA is important for surgeons and radiologists to achieve better outcomes during head and neck surgery.

Author contributions

The author design and implementation of the research, analysis of the result, and writing of the manuscript

Conflict of interest declaration

The author declares that there is no involvement in any organization or entity with any financial interests in this manuscript.

REFERENCES:

1. Khurana I, Khurana A. Concise textbook of physiology. 3th ed. New Delhi: Elsevier; 2018: 314-320
2. Standring S. Gray's Anatomy: the anatomical basis of clinical practice. 42 ed. London: Elsevier; 2021: 583-85

3. Lucev N, Bobinac D, Maric I, Drescik I. Variations of the great arteries in the carotid triangle. Otolaryngol Head Neck Surg. 2000; 122(4): 590-1. DOI: 10.1067/mhn.2000.97982.
4. Cobiella R, Quinones S, Aragones P, Leon X, Abramovic A, Vazquez T, Ramon Sanudo J, Maranillo E, Olewnik L, Simon de Blas C, Parkin I, Konschake M. Anatomic mapping of the collateral branches of the external carotid artery with regard to daily clinical practice. Ann Anat. 2021; 238: 151789. 10.1016/j.aanat.2021.151789.
5. Jitpun E, Wattanasen Y, Tirakotai W. Do Asian have higher carotid bifurcation? A computed tomographic angiogram study of the common carotid artery bifurcation and external carotid artery branching patterns. Asian J Neurosurg. 2019; 14(4): 1082-1088. DOI: 10.4103/ajns.AJNS_162_19
6. Du E, Pecoriello JM, Dos Reis LL, Spaulding SL, Sharif KF, Urken ML. Aberrant course of the dominant superior thyroid artery in a patient undergoing a total thyroidectomy. Otolaryngology Case Reports. 2019; 10: 5-7. DOI: 10.1016/J.xocr.2018.12.006
7. Issing PR, Kempf HG, Lenarz T. A clinically relevant variation of the superior thyroid artery. Laryngorhinootoloqie. 1994; 73(10): 536-537. DOI: 10.1055/s-2007-997189.
8. Poyraz M, Calguner E. Bilateral investigation of the anatomical relationships of the external branch of the superior laryngeal nerve and superior thyroid artery. and also the recurrent laryngeal nerve and inferior thyroid artery. Okajimas Folia Anat Jpn. 2001; 78(2-3): 65-74. DOI: 10.2535/ofaj1936.78.2-3_65.
9. Liberati A, Altman DG, Tetzlaff J, Mulrow C, Gotzsche PC, Ioannidis JP, Clarke M, Devereaux PJ, Kleijnen J, Moher D. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration. Med. 2009; 6(7):e1000100. DOI: 10.1371/journal.pmed.1000100.
10. Henry BM, Tomaszewski KA, Ramakrishnan PK, Roy J, Loukas M, Tubbs RS, Walocha JA. Development of the anatomical quality assessment (AQUA) tool for the quality assessment of anatomical studies included in meta-analyses and systematic review. Clin Anat. 2017; 30(1):6-13. DOI: 10.1002/ca.22799.
11. Bhardwaj Y, Singh B, Bhadoria P, Malhotra R, Tarafdar S, Bisht K. Computed tomography angiographic study of surgical anatomy of thyroid arteries: clinical implications in neck dissection. World J Radiol. 2023; 15(6): 182-190. DOI: 10.4329/wjr.v15.i6.182
12. Al-Rafiah A, El-Haggagy AA, Aal IH, Zaki AI. Anatomical study of the carotid bifurcation and origin variations of the ascending pharyngeal and superior thyroid arteries. Folia Morphol (Warsz). 2011; 70(1): 47-55. PMID: 21604253
13. Manjunath CS, Lokanathan TH. Anatomical variations in the origin of superior thyroid artery and its clinical significance. Int J Anat Res. 2016; 4(3): 2656-8. DOI: 10.16965/ijar.2016.295
14. Lo A, Oehley M, Bartlett A, Adams D, Blyth P, Al-Ali S. Anatomical variations of the common carotid artery bifurcation. ANZ J Surg. 2006; 76(11): 970-972. 10.1111/j.1445-2197.2006.03913.x
15. Mehta V, Suri RK, Arora J, Rath G, Das S. Anomalous superior thyroid artery. Kathmandu Univ Med J (KUMJ). 2010; 8(32): 429-431. DOI: 10.3126/kumj.v8i4.6246
16. Kitagawa W. Arterial supply of the thyroid gland in the human fetuses. Nihon Ika Daigaku Zasshi. 1993; 60(3): 140-155. DOI: 10.1272/jnms1923.140
17. Ozguner G, Sulak O. Arterial supply to the thyroid gland and the relationship between the recurrent laryngeal nerve and the inferior thyroid artery in human fetal cadavers. Clin Anat. 2014; 27(8): 1185-92. DOI: 10.1002/ca.22448
18. Ozgur Z, Govsa F, Celik S, Ozgur T. Clinical relevant variations of the superior thyroid artery: an anatomic guide for surgical neck dissection. Surg Radiol Anat. 2009; 31(3): 151-159. DOI: 10.1007/s00276-008-0405-7
19. Anagnostopoulou S, Mavridis I. Emerging pattern of the human superior thyroid artery and review of its clinical anatomy. Surg Radiol Anat. 2014; 36(1): 33-8. DOI: 10.1007/s00276-013-1149-6
20. Sreedharan R, Krishna L, Shetty A. Origin of superior thyroid artery: under the surgeon's khife. J Vasc Bras. 2018; 17(4): 290-5. DOI: 10.1590/1677-5449.004218
21. Herrera-Nunez M, Menchaca-Gutierrez JL, Pinales-Razo R, Elizondo-Riojas G, Quirog-Garza A, Fernadez-Rodarte BA, Elizondo-Omana RE, Guzman-Lopez S. Origin variations of the superior thyroid, lingual, and facial arteries: A computed tomography angiography study. Surg Radiol Anat. 2020; 42(9): DOI: 1085-93. 10.1007/s00276-020-02507-6

22. Espalieu P, Cottier M, Relave M, Youvarlakis P, Cuillert J. Radio-anatomic study of the carotid axis with regard to the implantation of microsurgical vascular anastomoses. Surg Radiol Anat. 1986; 8(4): 257-263. DOI: 10.1007/BF02425076
23. Sharma N, Pandit R, Neupane B, Sah RP, Bhattarai L, Yadav PK. Right external carotid artery originated right superior thyroid artery in cadavers of a medical college in Nepal: Descriptive cross-sectional study. JNMA J Nepal Med Assoc. 2021; 59(241): 906-9. DOI: 10.31729/jnma.6419
24. Natsis K, Raikos A, Foundos I, Noussios G, Lazaridis N, Njau SN. Superior thyroid artery origin in Caucasian Greeks: a new classification proposal and review of the literature. Clin Anat. 2011; 24(6): 699-705. DOI: 10.1002/ca.21181
25. Banna M, Lasjaunias P. The arteries of the lingual thyroid: angiographic findings and anatomic variations. AJNR Am J Neuroradiol. 1990; 11(4): 730-732. PMCID: PMC8331643
26. Acar M, Salbacak A, Sakarya ME, Zarariz I, Ulusoy M. The morphometric analysis of the external carotid artery and its branches with multidetector computerized tomography angiography technique. International Journal of Morphology. 2013; 3(4): 1407-14. DOI: 10.4067/S0717-95022013000400042
27. Iwai T, Izumi T, Inoue T, Maegawa J, Fuwa N, Mitsudo K, Tohnai I. Thyrolingual trunk arising from the common carotid artery identified by three-dimensional computed tomography angiography. Surg Radiol Anat. 2012; 34(1): 85-8
28. Motwani R, Jhajhria SK. Variant branching pattern of superior thyroid artery and its clinical relevance: A case report. J Clin Diagn Res. 2015; 9(5): AD05-AD06. DOI: 10.7860/JCDR/2015/12956.6065
29. Ongeti KW, Ogeng'o JA. Variant origin of the superior thyroid artery in a Kenyan population. Clin Anat. 2012; 25(2):198-202. DOI: 10.1002/ca.21207.
30. Gupta P, Bhalla AS, Thulkar S, Kumar A, Mohanti BK, Thakar A, Sharma A. Variations in superior thyroid artery: A selective angiographic study. Indian J Radiol Imaging. 2014; 24(1): 66-71. DOI: 10.4103/0971-3026.130701
31. Esen K, Ozgur A, Balci Y, Tok S, Kara E. Variations in the origins of the thyroid arteries on CT angiography. Jpn J Radiol. 2018; 36(2): 96-102. DOI: 10.1007/s11604-017-0710-3
32. Dessie MA. Variations of the origin of superior thyroid artery and its relationship with the external branch of superior laryngeal nerve. PLos One. 2018; 13(5): e0197075. DOI: 10.1371/journal.pone.0197075.
33. Joshi A, Gupta S, Vaniya VH. Anatomical variation in the origin of superior thyroid artery and its relation with external laryngeal nerve. National journal of medical research. 2014; 4(02): 138-141
34. Hayashi N, Hori E, Ohtani O, Kuwayama N, Endo S. Surgical anatomy of the cervical carotid artery for carotid endarterectomy. Neurol Med Chir (Tokyo). 2005; 45 (1): 25-29. DOI: 10.2176/nmc.45.25
35. Fujimoto Y, Suwa F, Kimura K. A case of the left superior thyroid artery arising from the left common carotid artery and A. thyroidea ima. Okajimas Folia Anat Jpn. 1974; 51(5): 219-230. DOI: 10.2535/ofaj1936.51.5_219
36. Moriggl B, Sturm W. Absence of three regular thyroid arteries replaced by an unusual lowest thyroid artery (A. thyroidea ima): a case report. Surg Radiol Anat. 1996; 18(2): 147-150. DOI: 10.1007/BF01795238
37. Mamatha T, Rai R, Prabhu LV, Hadimani GA, Jiji PJ, Prameela MD. Anomalous branching pattern of the external carotid artery: a case report. Rom J Morphol Embryol. 2010; 51(3): 593-5. PMID: 20809046
38. Gluncic V, Petanjek Z, Marusic A, Gluncic I. High bifurcation of common carotid artery, anomalous origin of ascending pharyngeal artery and anomalous branching pattern of external carotid artery. Surg Radiol Anat. 2001; 23(2): 123-5. 10.1007/s00276-001-0123-x
39. Zumre O, Salbacak A, Cicekcibasi AE, Tuncer I, Seker M. Investigation of the bifurcation level of the common carotid artery and variations of the branches of the external carotid artery in human fetuses. Ann Anat. 2005; 187(4): 361-9. DOI: 10.1016/j.aanat.2005.03.007
40. Aggarwal NR, Krishnamoorthy T, Devasia B, Menon G, Chandrasekhar K. Variant origin of superior thyroid artery, occipital artery and ascending pharyngeal artery from a common trunk from the cervical segment of internal carotid artery. Surg Radiol Anat. 2006; 28(6): 650-3. DOI: 10.1007/s00276-006-0145-5

41. Pandit R. Anatomical variations in the origin of superior thyroid artery and its relation with external laryngeal nerve and their clinical importance a cadaveric study. Journal of Universal College of Medicine Sciences. 2021. 9(1). DOI: 10.3126/jucms.v9i01.37964
42. Fakoya AO, Subedi N, Martir JB, Carreras BC, Afolabi AG, McCracken T. Anomalous origin of the superior thyroid from the internal carotid artery. Open Access Macedonian Journal of Medical Sciences. 2021; 9(A): 95-7. DOI: 10.3889/oamjms.2021.4549
43. Pushpalatha M, Vidhya KS. Study on variations in origin of superior thyroid artery. J Evid Based Med Healthc. 2015; 2(59): 8968-70. DOI: 10.18410/jebmh/2015/1268
44. Shivaleela C, Anupama D, Lakshmi Prabha Subhash R. Study of anatomical variations in the origin of superior thyroid artery. Int J Anat Res. 2016; 4(1): 1765-8. DOI: 10.16965/ijar.2015.327
45. Sharma A. Variation in the origin of superior thyroid artery and its relation with external laryngeal nerve. A cadaveric study. Acad Anat Int. 2019; 5(1): 6-9. DOI: 10.21276/aanat.2019.5.1.2
46. Smith SD, Benton RS. A rare origin of the superior thyroid artery. Acta Anat (Basel). 1978; 101(1): 91-3. DOI: 10.1159/000144952
47. Sanjeev IK, Anita H, Ashwini M, Mahesh U, Rairam GB. Branching pattern of external carotid artery in human cadavers. J Clin Diagn Res. 2010; 4(5): 3128-3. DOI: 10.7860/JCDR/2010/.978
48. Gavrilidou P, IIiescu DM, Baz R, Rusali LM, Bordei P. Anatomical peculiarities of the origin and traject of the superior thyroid artery. ARS Medica Tomitana. 2013; 19(3): 124-9. DOI: 10.2478/arsm-2013-0022
49. Saha A, Nandy S. Cross sectional study on thyroid arteries with clinical correlations. Bengal Journal of Otolaryngology and Head and Neck Surgery. 2022; 30(3): 305-12. DOI: 10.47210/bjohns.2022.v30i3.875
50. Shyamala BY, Akhilandeswari B. Cadaveric study on variations in the source and level of origin of superior thyroid artery. J Anat Soc India. 2021; 70(4): 251-4. DOI: 10.4103/JASI_231_19
51. Magoma G, Saidi H, Kaisha WO. Origin of thyroid arteries in a Kenyan population. Annals of African Surgery. 2012; 9: 50-4.
52. Amarttayakong P, Woraputtaporn W, Munkong W, Sangkhano S. Cadaveric and angiographic studies of superior thyroid artery: anatomical variations in origin and distance to carotid bifurcation. Asia Pacific Journal of Science and Technology. 2018; 23(4): 1-7. DOI: 10.14456/apst.2018.14
53. Alzahrani RE, Alashkham A, Soames R. Observations on the superior thyroid artery and its relationship with the external laryngeal nerve. Anat Physiol. 2018; 8(292): 1-5. DOI: 10.4172/2161-0940.1000292
54. Ghosh A, Chaudhury S, Datta A. Variations, relations and clinical significance of carotid arterial system in anterior neck: a cadaveric study. Int J Res Med Sci. 2019; 7(4): 1127-32. DOI: 10.18203/2320-6012.ijrms20191311
55. Patel JP, Dave RV, Shah RK, Kanani SD, Nirvan AB. A study of superior thyroid artery in 50 cadavers. International Journal of Biological Medicine Research. 2013; 4: 2875-878.
56. Sharma A, Kaur H, Chhabra U. Morphological variations in the arterial & nerve supply of thyroid gland-a cadaveric study. Int J Anat Res. 2018; 6(1.3): 5024-29. DOI: 10.16965/ijar.2018.103
57. Sinha MB, Gupta G, Kolhe N, Sinha H, Gautam N. Variation in common carotid artery, with special reference to superior thyroid artery: A retrospective angiographic study from central India. Al Am een J Med Sci. 2022; 15(2): 92-100.
58. Rimi KR, Ara S, Hossain M, Shefyetullah KM, Naushaba H, Bose BK. Postmortem study of thyroid arteries in Bangladeshi people. Bangladesh Journal of Anatomy. 2009; 7(1): 26-33. DOI: 10.3329/bja.v7i14
59. Shankar VV, Komala N, Shetty S. A cross-sectional study of superior thyroid artery in human cadavers. Int J Anat Res. 2017; 5(4.3): 4751-55. DOI: 10.16965/ijar.2017.463
60. Rajapriya V, Ramya TP, Anjana TS. An anatomical study on the origin and length of the superior thyroid artery in adult human cadavers with its clinical significance. Internal Journal of Anatomy and Research. 2017; 5: 342-5. DOI: 10.16965/ijar.2016.493
61. Laxmi V, Kaur K, Chhabra P. Superior thyroid artery: its origin, length, relations and branches. Int Ann Med. 2017; 1(4). 10.24087/IAM.2017.1.4.110
62. Bordei P, IIiescu DM, Rusali LM, Hainarosie R, Jecan RC, Popa CC, Ardeleanu V. Resin based materials used to observing the variations of the origin of the superior thyroid artery with importance

in cervical and cranial pathology. MATERIALE PLASTICE. 2019; 56(1): 115-9. DOI: 10.37358/MP.19.1.5134

63. Tsegay AT, Berhe T, Amdeslase F, Hayelom H. Variations on arterial supply of thyroid gland and its clinical significance in selected universities of North Ethiopia. Int J Anat Res. 2019; 7(3.2): 6830-4. DOI: 10.16965/ijar.2019.237
64. Terayama N, Sanada J, Matsui O, Kobayashi S, Yamashiro M, Takanaka T, Kumano T, Yoshizaki T, Furukawa M. Feeding artery of laryngeal and hypopharyngeal cancers: role of the superior thyroid artery in superselective intraarterial chemotherapy. Cardiovasc Intervent Radiol. 2006; 29(4):536-43. DOI: 10.1007/s00270-005-0094-0.
65. Cappabianca S, Scuotto A, Iaselli F, Pignatelli di Spinazzola N, Urraro F, Sarti G, Montermarano M, Gassi R, Rotondo A. Computed tomography and magnetic resonance angiography in the evaluation of aberrant origin of the external carotid artery branches. Surg Radiol Anat. 2012; 34(5):393-9. DOI: 10.1007/s00276-011-0926-3.
66. Arjun R, Shishirkumar. Origin of superior thyroid artery and superior laryngeal artery- A cadaveric study. MedPulse International Journal of Anatomy. 2019; 12(3): 87-90. DOI: 10.26611/10011237
67. Al-Azzawi A, Takahashi T. Anatomical variations of thyroid gland: An experimental cadaveric study. Ann Med Surg (Lond). 2021; 70:102823. DOI: 10.1016/j.amsu.2021.102823
68. Itezerote A, Rodrigues C, Prates JC. Superior thyroid artery: origin, collateral and glandular branches. Rev Chil Anat. 1999; 17(1):47-50. DOI: 10.4067/S0716-98681999000100007
69. Sasikumar N, SV, Raghunath G, et al. Morphometric study and branching pattern of external carotid artery using computed tomography among the south Indian population: A retrospective study. Cureus. 2023; 15(2):e35624. DOI: 10.7759/cureus.35624
70. Elsllabi M, Garoushi S, Aneiba OA. Variation in the branching pattern of the anterior branches of external carotid artery. Libyan J Med Sci. 2020; 4:184-7. DOI: 10.4103/LJMS.LJMS_53_20
71. Esakkiammal N, Chauhan R, Sharma R. Clinical implications of the variable origin of external carotid branches and high level bifurcation of common carotid artery. Int J Anat Res. 2017; 5(2.3):3958-63. DOI: 10.16965/ijar.2017.228
72. Dakare SH, Bhuiyan PS. A morphological study of branches of external carotid artery in adult human cadavers. Journal of the Anatomical Society of India. 2018; 7(2): 162-5. DOI: 10.1016/j.jasi.2018.11.011
73. Demirtas I, Ayyildiz B, Demirbas AT, Ayyildiz S, Sonmez Topcu F, Kus KC, Kurt MA. Geometric morphometric study of anterior branches of external carotid artery and carotid bifurcation by 3D-CT angiography. Surgical and Radiologic Anatomy. 2022; 44(7):1029-36. DOI: 10.1007/s00276-022-02985-w.
74. Sudhakaran M, Alikunju M, Raveendran VL, Govindapillai UK. Variations in the branching pattern of external carotid artery in south Kerala population-A cadaveric study. J Evid Based Med Healthc. 2021; 8(22):1780-85. DOI: 10.18410/jebmh/2021/336
75. Shintani S, Terakado N, Alcalde RE, Tomizawa K, Nakayama S, Ueyama Y, Ichikawa H, Sugimoto T, Matsumura T. An anatomical study of the arteries for intraarterial chemotherapy of head and neck cancer. International Journal of Clinical Oncology. 1999; 4:327-30. DOI: 10.1007/s101470050079
76. Ovhal AG, Ansari MM, Rajgopal L. A cross sectional study of variations in the external carotid artery in cadavers. Indian Journal of Clinical Anatomy and Physiology. 2016; 3(3):282-6. DOI: 10.5958/2394-2126.2016.0006.3
77. Toure T, Ba B, Kante A, Gadji GD, Simpara G, Kante S, Ongoiba N. Superior thyroid artery originating from the ascending pharyngeal artery: Case report. SSRN [Preprint]. Posted 17 Apr2023. [Cited 2023 November 21]. DOI: 10.2139/ssrn.4409087
78. Gwunireama IU, Bob-Manuel IF, Collins GU. A study of morphological variations of carotid bifurcation and branching pattern of external carotid artery in adult Nigerian cadavers. Archives of Current Research International. 2023; 23(5):40-8. DOI: 10.9734/ACRI/2023/v23i5574
79. Bunea MC, Chiriloaie C, Rusali LM, Bordei P. Morphological considerations on the origin of the superior thyroid artery. Romanian Journal of Functional and Clinical, Macro- and Microscopical Anatomy and of Anthropology. 2022; 21(3): 82-6

80. Anand A, Metgudmath RB, Belaldavar BP. Topographic evaluation of superior thyroid artery- A Terrain to be well versed for Surgeon's Knife. Indian J Otolaryngol Head Neck Surg. 2022; 74(Suppl 3): 5994-6000. DOI: 10.1007/s12070-021-02643-4.
81. Bozhikova E, Novakov S, Uzunov N. A rare variation in the origin of the lingual artery: thyro-linguo-laryngeal trunk. Folia Morphol (Warsz). 2023. DOI: 10.5603/fm.95862.
82. Ray B, Pugazhandhi B, D'Souza AS, Saran S, Fasil M, Srinvasa RS. Analysis of the arterial anatomical variations of the thyroid gland: anatomic guide for surgical dissection. Bratisl Lek Listy. 2012; 113(11):669-72. DOI: 10.4149/BII_2012_151.
83. Lu WT, Sun SQ, Huang J, Zhong Y, Xu J, Gan SW, Guo L, Mo TT. An applied anatomical study on the external laryngeal nerve loop and the superior thyroid artery in the neck surgical region. Anat Sci Int. 2015; 90(4): 209-15. DOI: 10.1007/s12565-014-0246-x.
84. Orestes MI, Chhetri DK. Superior laryngeal nerve injury: effects, clinical findings, prognosis, and management options. Curr Opin Otolaryngol Head Neck Surg. 2014; 22(6): 439-43. DOI: 10.1097/MOO.0000000000000097.
85. Sadler TW. Langman's Medical Embryology. 12th edition. Philadelphia: Lippincott Williams & Wilkins, Wolters Kluwer; 2012: 207-209
86. Toni R, Della Casa C, Castorina S, Malaguti A, Mosca S, Roti E, Valenti G. A meta-analysis of superior thyroid artery variations in different human groups and their clinical implications. Ann Anat. 2004; 186:255-62. DOI: 10.1016/s0940-9602(04)80013-x.
87. Tilahun ZB, Teklesilassie H, Addisie A, Leykun D, Kebede T. Iatrogenic pseudoaneurysm of the superior thyroid artery after thyroidectomy. Int J Surg Case Rep. 2023; 113:109005. DOI: 10.1016/j.ijscr.2023.109005.
88. Ernemann U, Herrmann C, Plontke S, Schafer J, Plasswilm L, Skalej M. Pseudoaneurysm of the superior thyroid artery following radiotherapy for hypopharyngeal cancer. Ann Otol Rhinol Laryngol. 2003; 112(2):188-90. DOI: 10.1177/000348940311200215.
89. Yu NH, Jahng TA, Kim CH, Chung CK. Life-threatening late hemorrhage due to superior thyroid artery dissection after anterior cervical siscectomy and fusion. Spine (Phila Pa 1976). 2010; 35(15):E739-42. DOI: 10.1097/BRS.0b013e3181cf46b4.
90. Wang J, Zheng C, Hou B, Huang A, Zhang X, Du B. Four collateral circulation pathways were observed after common carotid artery occlusion. BMC Neurol. 2019; 19(1): 201. DOI: 10.1186/s12883-019-1425-0.
91. Dedecjus M, Tazbir J, Kaurzel Z, Lewinski A, Strozyk G, Brzezinski J. Selective embolization of thyroid arteries as a preresective and palliative treatment of thyroid cancer. Endocr Relat Cancer. 2007; 14(3):847-52. DOI: 10.1617/ERC-07-0011.
92. Dedecjus M, Tazbir J, Kaurzel Z, Strozyk G, Zygmunt A, Lewinski A, Brzezinski J. Evaluation of selective embolization of thyroid arteries (SETA) as a preresective treatment in selected cases of toxic goiter. Thyroid Res. 2009; 2(1):7. DOI: 10.1186/1756-6614-2-7.
93. EhrI D, Broer PN, Ninkovic M, Giunta RE, Moellhoff N. Extending the indication of the superior thyroid artery as a recipient vessel for complex upper body defects. Ann Plast Surg. 2021; 86(5): 551-6. DOI: 10.1097/SAP.0000000000002581.