

CADAVERIC STUDY OF THYROIDEA IMA ARTERY VARIATIONS IN SOUTH INDIAN POPULATION

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Abstract

Thyroid surgery being a major surgery and quite often performed, a thorough knowledge of variations in arterial supply is very essential for surgeons to prevent alarming number of table deaths in patients with thyroid disease due to excessive and uncontrollable bleeding. It also helps the physicians for proper physical examination and treatment of the patients. The study also helps anatomists for learning the variant patterns. 100 human cadavers (75 males, 25 females) aged between 25 to 60 years were studied by gross dissection. In the present study, thyroidea ima artery arising from brachiocephalic trunk in 2% of cases, from subclavian artery in 1% of cases. In all these cases inferior thyroid artery was found to be absent. Its frequent location anterior to the trachea makes it an artery of major importance in tracheostomy. The knowledge of variations of the arterial supply can be used during thyroidectomy where ligation of all the thyroid vessels is highly essential to ensure proper homeostasis.

INTRODUCTION

Although investigations of anatomical variation have fallen into something of eclipse in recent years, it would seem apparent that establishment of the limits of variations is of considerable importance in formulating intelligent surgical approaches to a given area and in alerting prospective and practising physician to possible source of trouble.

Neubauer first described the ARTERIA THYROIDEA IMA in 1772, which is named after him.^[1] Beaumanoir states that he has seen cases in which, +[2] with all the thyroid arteries of a normal size, thyroidea ima was of a large caliber and divides into 3 branches, the upper two ascending and taking up their positions, the one lateral to trachea, the other lying in the midline and terminating in ramifications and anastomosing with other arteries in the thyroid gland.

Anson has found in 10% people a small, unpaired thyroidea ima artery usually arising from brachiocephalic trunk,^[3] however it may arise from arch of aorta or from right common carotid artery, subclavian or internal thoracic artery. This small artery ascends on the anterior surface of trachea to which it supplies and continues to the isthmus of thyroid gland, where it divides into branches that supply it. The possible presence of thyroidea ima artery while performing procedures in midline of neck, inferior to the isthmus and as it runs to the trachea, is a potential source of bleeding. Thus a good knowledge of the variations in thyroidea ima artery will be helpful to surgeons for perfect ligation of

blood vessels and excision of thyroid gland in thyroid disease, thereby ensuring proper treatment and relief to the patient. This study is undertaken in an attempt to know the relative frequency of variations in arterial pattern and to compare similar work done by other anatomists.

MATERIALS AND METHODS

100 human cadavers (75 males, 25 females) aged between 25 to 60 years, obtained from department of anatomy Chamarajanagara Institute of Medical Sciences, Chamarajanagara, KVG Medical college, Sullia. Ethical committee permission was taken for the present study.

After embalming all the specimens were preserved in 10% formalin solution. The specimens were studied by gross anatomical dissection. Following reflection of infrahyoid group of muscles, sternocleidomastoid muscle was displaced laterally and thyroid gland was exposed. The lobes of thyroid gland and its arteries and veins were exposed by cleaning away the fascia on their surfaces. The thyroidea ima artery was traced to its origin and associated variations like absence of inferior thyroid artery was also noted.

RESULTS

The thyroidea ima is a small and inconstant artery, ascends in front of trachea to reach isthmus of the thyroid gland where it ends. Sometimes it may replace inferior thyroid artery.

Pratt concluded that thyroidea ima artery would never have received a special name,^[4] but for its importance in tracheostomy, it would have been regarded simply as an aberrant inferior thyroid.

IT arises from brachiocephalic artery or right common carotid artery (2%), or aortic arch or subclavian artery or internal thoracic artery. Origin from one of the first three is most common.

The variations observed in the present study are summarized in [Table 1].

The variation observed in present study is being correlated with the similar work done by other author in [Table 2].

[Figure 1] shows arteria thyroidea ima(ATI) arising from arch of aorta. The same cadaver inferior thyroid artery was absent on left side.



Figure 1: Arteria Thyroidea Ima (ATI) arising from arch of aorta.

Table 1: Variations in the origin of thyroidea ima artery

S. No	Origin	No of cadavers	Percentage observed
1	Brachiocephalic trunk	2	2%
2	Arch of aorta	1	1%
3	Inferior thyroid artery	Nil	-

Table 2: Comparison between similar studies of various Authors with present study

S.NO	Origin	Authors/year	Percentage observed
1	Brachiocephalic trunk	Pratt (1916), ^[4] Stewart (1932), ^[5] Present study	4% 3% 2%
2	Arch of aorta	Henle (1868), ^[6] Stewart (1932), ^[5] Present study	4% 0.36% 1%
3	Inferior thyroid artery	Henle (1868), ^[6] Faller and Sharrer (1947), ^[7] Present study	4-10% 4% Nil

DISCUSSION

Thyroid gland is the largest endocrine gland and plays an important role in the maintenance of the basal metabolic rate of the body and is a highly vascular endocrine gland. Thyroidea ima artery has been found to be present in human beings serving as a collateral blood supply. This artery may be in the form of a large trunk and in this condition, it replaces the inferior thyroid artery or it may occur just as an accessory vascular twig. Faller and Sharrer,^[7] observed that thyroidea ima may be a large trunk fully capable of replacing an inferior thyroid artery or merely an accessory twig. They also stated when inferior thyroid artery is absent, its place is usually taken by a branch from the superior thyroid artery of the same side or inferior thyroid artery of the other side or less frequently its place is taken by a thyroidea ima artery. Goss states that thyroidea ima artery is described in human,^[8] it supplies isthmus of thyroid and is believed to function also as a collateral blood supply in pathological conditions. Taylor and Grell,^[9] stated that associated with the origin of an inferior thyroid artery of normal caliber, a small thyroidea ima was arising from the innominate artery. Kimmel,^[10] states that he found a variation in the thyroidea ima artery arising from an anterior

mediastinal vessel or subclavian artery. Fakhruddin and Kolte,^[11] reported a case in which inferior thyroid artery of both sides were absent. Their place was taken by thyroidea ima artery which is of a considerable size and was arising from brachiocephalic trunk. IT ascends up to isthmus, then divides into two branches for right and left lobes. Romanes,^[12] states that in 10% of cases a fifth artery, thyroidea ima, normally present in embryo, persist in the adult as a branch of the brachiocephalic trunk. Lippert and Pabst,^[13] states that in 6% of individuals an aberrant thyroidea ima artery arises from one of the major vessels in the superior mediastinum- the brachiocephalic trunk, right common carotid artery or the aortic arch. Hollinshead and Rosse,^[14] observed that sometimes an abnormal artery to the thyroid gland arises from the arch of aorta, brachiocephalic trunk, or the lower end of common carotid and supplements or replaces inferior thyroid artery. This is called thyroidea ima artery or the lowest thyroid artery. It is normally present in the embryo and persists in 10% of adults. Ranganathan,^[15] states that arteria thyroidea ima is an occasional artery and usually arises from the arch of aorta. It may also arise from brachiocephalic artery and ascends in front of trachea to enter the lower border of isthmus. Last,^[16] states that thyroidea ima artery enters the lower part

of the isthmus in 3% of individuals. It arises from brachiocephalic trunk, arch of aorta or right common carotid artery. Booth and Goshal,^[17] states that thyroidea ima artery may be a large trunk fully capable of replacing an inferior thyroid artery or merely an accessory twig. Its frequent location anterior to trachea makes it an artery of major importance in tracheostomy. This artery is traced in canine thyroid gland. In a study done by Keith,^[18] by dissecting one gorilla, four gibbons, three semnopithecus and two macaques, that in some of the last two genera thyroidea ima arose from the carotid artery in the neck, while in other cases it arose from the aortic arch. From this fact it would seem that thyroidea ima is just as variable in higher primates as it is in man and that it has no definite position which can be made a precept. Yilmaz et al,^[19] reported a case of thyroidea ima arising from the brachiocephalic trunk with absence of inferior thyroid artery on both sides. They also stated that the possible existence of this anomaly is important for parathyroid localization studies, in neck surgery and especially in tracheostomy. Faysal et al,^[20] reported a case of thyroidea ima artery. On right side the thyrocervical trunk was identified with its usual 3 branches. On the left side inferior thyroid artery was absent. Instead, arteria thyroidea ima was present with medial origin from the distal part of brachiocephalic artery 4mm proximal to its bifurcation. Steckelisen,^[21] also states that thyroidea ima artery arising from brachiocephalic trunk in 4% of cases. Gruber,^[22] found the origin of thyroidea ima artery from brachiocephalic v artery (1.9%-10.6%), from right common carotid artery (1.4%-1.7%). He also described the presence of bilateral thyroidea ima artery. Yamasaki,^[23] studied the arterial system of thyroid gland and thymus states that the supreme thymic artery and thyroidea ima artery arising from internal thoracic artery were extremely rare. Justin et al,^[24] in his study of 94 cadavers found only 1 case of thyroidea ima artery which was arising from left common carotid artery suggesting a prevalence of 1.06%. Nyeki et al,^[25] have identified in their study a relation between the presence of thyroidea ima artery in parathyroid adenomas and goiter. Krudy et al,^[26] in his angiographic study of 3 cases of parathyroid adenomas, thyroidea ima artery can also supply trachea, parathyroid gland and thymus as a single branch or as multiple branched anastomoses.

CONCLUSION

Thyroid gland has been studied extensively ever since it was discovered and is the subject of curiosity to anatomist, physiologist, pathologist, physician, surgeon and obstetrician as well. Thyroid arteries are of much importance in providing blood supply to the gland. In case of thyroidectomy ligation of all the thyroid arteries is highly essential to ensure proper homeostasis. From the above literature review it is

evident that there is possibility of a wide range of variations in the thyroidea ima artery. Variations observed in our study could help to avoid serious implications during radiological examination, thyroid surgeries, tracheostomy, surgeries of larynx and microvascular surgeries. Emergency and surgical considerations of thyroidea ima artery are critical in hemostasis and preventing hemorrhage into the mediastinal cavity. The analysis by angiographic study is still the best way to understand the normal vascular anatomy and to confirm minute anatomical variations.

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