Original Article

Medicine

Incidence of Thyroid IMA Artery in our Population

1. Shafiq Ullah 2. Shahid Mansoor Nizami 3. Ilyas Anjum

1.Asstt. Prof. of Anatomy 2. Asstt. Prof. of Anatomy 3. Assoc.Prof. of Anatomy, NMC, Multan

ABSTRACT

Objective: To find out the incidence of thyroid ima artery in our population

Study Design: An exploratory study.

Place and Duration of Study: This study was conducted in a private hospital and Nishtar Hospital Multan.Study was conducted from 15 Jan to 25 september 2012.

Materials and Methods: All the patients with the goiter and who were euthyroid presenting to the Nishatr Hospital and private hospital (Khursheed Rafiq Hospital) in Multan were included in study.Patients with tumors and huge retrosternal goiter were excluded from the study.During surgery of thyroid, meticulous dissection was done to identify the thyroid ima artery and incidence was recorded.

Results: A total no of 87 patients were included in the study. Out these 7 were excluded due to the huge goiter with difficult surgery. Out of remaining 80 pts,65(80%) were females on 15(20%) were females.(ratio of female to male (4.3 : 1).The mean age of the patients was 45 years (from 70 years to 20 years) The thyroid ima artery was found in 4 pts only (5%).All the patients were females It means that incidence of this artery in females is more than males.It may be due to the more incidence of goiter in females (80%) than males as this study was conducted only patients suffering from goiter. In both patients this artery was supplying the isthmus of the thyroid gland. This was of adequate size. Inferior thyroid artery was also present in both cases.

Conclusion: The incidence of thyroid ima artery was recorded to be 4% in our population.

Key Words: Thyroid IMA Artery, Goiter, Population, Retrosternal, Brachiocephalic.

INTRODUCTION

The thyroid gland is a butterfly-shaped organ and is composed of two cone-like lobes or wings, lobus dexter (right lobe) and lobus sinister (left lobe), connected via the isthmus. The organ is situated on the anterior side of the neck, lying against and around the larynx and trachea, reaching posteriorly to the oesophagus and carotid sheath. It starts cranially at the oblique line on the thyroid cartilage (just below the laryngeal prominence, or 'Adam's Apple'), and extends inferiorly to 5th or 6th tracheal ring[1]. The thyroid isthmus is variable in size, can change shape and size, and can encompass a cranially extending pyramid lobe (lobus pyramidalis or processus pyramidalis), remnant of the thyroglossal duct. There is thickening of fascia posteriorly to form the posterior ligament of Berry.[2,3].Its firm attachment to the underlying trachea is the reason behind its movement with swallowing[4]. The thyroid is one of the larger endocrine glands weighing 2-3 grams in neonates and 18-60 grams in adults, and is increased in pregnancy. The parathyroid glands are usually found at the posterolateral borders of the thyroid lobes and in 80% of cases, their blood supply is via the inferior thyroid artery. Lymphatic drainage passes frequently to the lateral deep cervical lymph nodes and the pre- and parathracheal lymph nodes. The gland is supplied by parasympathetic nerve input from the superior laryngeal nerve and the recurrent laryngeal nerve.

Blood supply of thyroid glandL

The blood flow to the thyroid has been estimated to be approximately 5ml/gram of tissue. This makes the blood supply almost twice as rich as that of the kidney. When the thyroid is very large, the massive blood flow to the gland is audible as a noise (bruit). There are three main arteries supplying the thyroid gland:

1) Superior thyroid artery
2) Inferior thyroid artery
3) Thyroidea Ima (Artery of Neubauer)

The major blood supply to the thyroid is from the paired superior and inferior thyroid arteries. The superior thyroid is a branch of the external carotid artery and enters the thyroid at the upper pole of each lobe. The artery is a accompanied by the external branch of the superior laryngeal nerve. The inferior thyroid artery is a branch of the thyrocervical trunk and it runs behind the gland to the level of the cricoid cartilage. It then turns medially and downwards to supply the posterior of the gland. Apart from the usual blood supply of the thyroid by the superior and the inferior thyroid artery sometimes another artery also supplies it and is called as the thyroidea ima artery. Krudy et al[5] (1980) cited that an additional midline artery to the thyroid posing a threat in cervico surgical operations was first described by Neubauer[6] in 1772 and so was named Neubauers artery. Hollinshead[7] (1962), also described an accessory to or replacing the inferior thyroid artery as the thyroidea ima artery. However, an artery from internal mammary reaching

midline and then bifurcating into ascending branch supplying the thyroid and a descending branch supplying the thymus and pericardium was described by Kimmel[8] (1949) and was named the thyrothymic trunk.

The Thyroidea Ima Artery of Neubauer[6] (first described by Nicolai in 1725 - quoted by Neubauer, Op Anatom.collecta 1786) is a lower thyroid artery (the thyroid ima) that may may arise from the brachiocephalic artery ,the arch of the aorta, or internal mammary arteries. It climbs up to the thyroid in front of the trachea and runs over the thyroid isthmus. Its liable to be cut when performing a tracheostomy. The vessel is usually single but can be a paired structure, it is said to be more common on the right and if very large is may be associated with absent inferior thyroid arteries. It is said to occur in 10% of patients. It can supply the parathyroids and division can cause hypopara-thyroidism. All the arteries anastomose with each other over the surface of the gland. It is often associated with absent inferior thyroid arteries. When an anomalous artery arises from the subclavian artery directly, rather than from the thyrocervical trunk, it is referred to as an accessory inferior thyroid artery, rather than a thyroidea ima artery. Its clinical significance is that during surgery either on the thyroid or in the thoracic inlet, if unrecognized it can be a source of brisk haemorrhage and potentially difficult to control bleeding, as the cut vessel may retract behind the manubrium.

Recognition of the Thyroidea IMA Artery:

Neubauer[6] recognized the thyroidea ima, and after him it was called the thyroid artery of Neubauer. Sappey[9] notes that the thyroidea ima is a supernumerary inferior thyroid, that it springs from the innominate arch, and adds that it has been very rarely observed. Beaumanoir[10] states that he has seen cases in which, with all the thyroid arteries of a normal size, the thyroidea ima was of a large calibre and divided into three branches, the upper two ascending and taking up their positions, the one lateral to the trachea, the other lying in the middle line and terminating in ramifications and anastomoses with the other thyroid arteries in the thyroid gland. The descending branch divided into two twigs, the ascending one passing upwards to terminate in the thyroid gland, while the other descending limb passed downwards to the region of the aortic arch and terminated in the surrounding tissue.'He noticed also in another case[11] the origin of the thyroidea ima from the innominate artery, in the form of a branch of 2 mm in diameter which terminated in the sterno-thyroid muscles and subjacent tissue, and had no connection with the thyroid gland. Taylor and Grell[12] described a case in which, associated with the origin of an inferior thyroid artery of normal calibre, a small thyroidea ima was evolved from the innominate artery. Testut[13] states that the thyroidea ima may spring either from the arch of the aorta or from the innominate artery. He goes on to state that its presence is solely connected with the lack of a sufficient blood-supply for the thyroid gland from its normal sources. Theile[14] remarked that the thyroidea ima was either a displacement or a reduplication of the inferior thyroid artery. Macalister[15] states that a middle thyroid artery is sometimes seen to arise from the innominate artery and ascend on the trachea to supply the thyroid gland. Deaver[16], Morris[17], and Young and Robinson[18] all state that the thyroidea ima is given off by the innominate artery, and that its sole object is the arterial supply of the thyroid body. M'Murrich[19] lays down the definite precept that the presence of the thyroidea ima is "associated with a more or less extensive reduction of the size of one or other of the thyroid arteries."

There are three main veins draining the thyroid gland:

1) Superior thyroid vein
2) Middle thyroid vein
3) Inferior thyroid vein

The superior and middle thyroid veins drain into the internal jugular vein. The inferior thyroid veins anastomose with each other and drain into the left brachiocephalic vein in the thorax.

We have have read a case report and related study of neck vessel anatomy by Shlugman and colleagues[20]. This is a case report of fatal haemrrhege during tracheastomy. The vessel responsible was identified as a ‘thyroid ima’ artery which exists in 2–12% of the population. This normal variant of neck anatomy may, if not identified, lead to significant morbidity. The importance of considering this vessel is increased in the Asian population, in whom anatomical studies have identified a higher incidence[21] It is now practice to scan for vessels before percutaneous dilatational tracheastomy and specifically exclude a thyroid ima artery.

MATERIALS AND METHODS

All the patients with the goiter and who were euthyroid presenting to the Nishatr Hospital and private hospital (Khurshid Rafiq Hospital) in Multan were included in study .Patients with tumors and huge retrosternal goiter were excluded from the study. During surgery of thyroid, meticulous dissection was done to identify the thyroid ima artery. Superior pole was ligated first followed by ligation of the middle thyroid vein. Then inferior pole was dissected to identify the thyroid ima artery and incidence was recorded .It was not possible to find the origin of the thyroid ima artery as it arises from the larger vessels in the thorax.

RESULTS

A total no of 87 patients were included in the study. Out of these, 5 were excluded due to the huge goiter with difficult surgery. Two patients were excluded from the study due to the malignancy of the thyroid gland. Out of remaining 80 pts,65(81.25%) were females and

15(18.75%) were males (ratio of female to male (4.33 : 1).The mean age of the patients was 45 years (from 70 years to 20 years) The thyroid ima artery was found in 4 patients (5%).All the patients were females It means that incidence of thyroid ima artery in females is more than males. It may be due to the more incidence of goiter in females (80%) than males as this study was conducted only in patients suffering from goiter. In all the patients this artery was supplying the isthmus of the thyroid gland. This was of adequate size. Inferior thyroid artery was also present in all the cases.

DISCUSSION

The thyroid gland, a highly vascular organ, is supplied by a pair of superior thyroid, inferior thyroid and occasionally a thyroidea ima artery, either accessory to or replacing the inferior thyroid artery (Hollinshead 1962)[7].The thyroidea ima artery enjoys a varied description but by and large an anomalous vessel, arising from the innominate, common carotid, aortic arch or internal mammary artery to supply the thyroid, is considered as the thyroidea ima artery. The thyroidea ima artery is an uncommon variant of the blood supply to the inferior aspect of the thyroid gland. It is reported in up to 12% (1.5 - 12.2%) of individuals and can arise from:

- (right) brachiocephalic artery- most common - (1.9 - 10.6%)
- right common carotid artery - (1.4 - 1.7%)
- aortic arch – (0.36%)
- internal mammary artery

Kimmel (1949)[8] described the anterior mediastinal artery named as thyrothymic trunk which bifurcated to supply the thyroid, the thymus and the pericardium. However, Krudy et al[5](1980) reported some cases showing similar course of the artery but adhered to the more common nomenclature of the thyroidea ima artery. Adachi[22] has reported the incidence of thyroid ima artery to 1 in 271 cadavers(0.4%). Ymasaki[23] reported this incidence to 20.8%.

A review of literature shows marked degree of variability in the frequency, the site of origin and the size of the thyroidea ima artery. The incidence varies from 1.5 to 12.2% (Faller & Scharer, 1947)[24]. This incidence correlates with our incidence of 5%. The commonest site of origin of the thyroidea ima artery is from the innominate artery (1.9% to 10.6%) followed by right common carotid artery in 1.4% to 1.7% (Gruber, 1872)[25]; from the Arch of aorta on left side in 0.36% (Hollinshed, 1962)[7]. Bilateral thyroidea ima arteries have been reported by Gruber (1872).He also repoeted that usually it has large caliber. This is in contrast to the findings of Wolpert (1969)[26] who reported that the size of the artery is not definable angiographically until disease causes its enlargement. This artery may be present as an accessory artery along with the normal blood supply of the gland or the inferior thyroid artery may be reciprocally reduced in size or missing on the same or both sides.

CONCLUSION

The incidence of thyroid ima artery was recorded to be 4% in our population.

REFERENCES

1. Clinical Case - Anterior Triangle of the Neck.(http://anatomy.med.umich.edu/nervous_system/antneck_case.html)
2. Yalçin B, Ozan H. Detailed investigation of the relationship between the inferior laryngeal nerve including laryngeal branches and ligament of Berry. J Am College of Surg 2006;202(2):291-6.
3. Lemaire, David. (2005-05-27). eMedicine - Thyroid anatomy (http://www.emedicine.com/ent/topic532.htm). . Retrieved 2008-01-19.
4. Kamath, Aroon M. Are the ligaments of Berry the only reason why the thyroid moves up with deglutition?" (http://www.doctorslounge.com/index.php/blogs/page/13485). Doctors Lounge Website. Retrieved August 24, 2010
5. Krudy AG, Doppman JL, Brennan F. The significance of the thyroidea ima artery in angiographic localization of parathyroid adenomas. Radiol 1980;136: 51-55.
6. Neubauer, Op. Anatomn. collecta, 1786.
7. Hollinsheads WH. Head & Neck. In: Hober, Harper, editors. Anatomy for Surgeons. 1st ed. New York;1962. People's J Sci Res 2009;32(2): 520-533.
8. Kimmel DL. Anterior mediastinal origin of the Thyroidea ima artery. Anatomical Records 1949; 103:544 (Abst No. 270).
9. Sappey, Traite d'Anatomnie, 1869.
10. Beau-Manoir, Bull. de la Soc. Anat. tome VII., 4e sdr 316, 1882.
11. Beaumanoir, Ibidemn, 317, 1882.
12. Taylor and Grell. J Anat and Phys Vol. xxxvi. 288, 1902.
13. Testut, Traite' d' Anatonwie fl Humaine, tome 2m', 151, 1900.
14. Heile, ibidem, 151.
15. Macalister, Human Anatomy. 631, 1890.
16. Deaver, Surtgcal Anatomy, vol. ii. 126, 1900.
17. MORRIs, Human Anatomy 1915;533.
18. Young and Robinson, Cunning/ham's Text-book of Anatomy1913;888.
19. M'MuRRI CH, Piersol's Humnan Anatomy, 729, 1907.
20. Shlugman D, Satya Krishna R, Loh L. Acute fatal haemorrhage during percutaneous dilatational tracheostomy. Br J Anaesth 2003; 90: 517–20
21. Toni R, Della Casa C, Mosca S, Malaguti A, Castorina S, Roti E. Anthropological variations

in the anatomy of the human thyroid arteries. Thyroid 2003;13: 183–92
22. Adachi B. Das Arterien system der Japaner. Kenkyusha Press, Kyoto 1928.
23. Yamasaki M. Studies on thyroid and thymic arteries of Japanese adults and fetuses. Anat Anz Jena 1989;169;213-221.
24. Faller A, Scharer O: Uber die variabilitat der arteriae thyroideae. Acta Anatomica 1947;4: 119-122.
25. Gruber W. Ueber die thyroidea ima. Archives of Pathology Anatomie und Physiologie u Klin Medicine, 1872; 54: 445-484. Cited by Krudy et al (1980) vide infra.
26. Wolpert SM. The thyroidea ima artery: an unusual Collateral vessel. Radiol 1969;92:333-334. People's J Sci Res 33 (2):2009.

Address for Corresponding Author:
Dr. Shafiq Ullah,
Asstt. Prof. of Anatomy,
National Medical College,
Multan.