Section: Anatomy

Original Research Article

ASSESSMENT OF PREVALENCE OF THYROIDEA IMA ARTERY & VARIATIONS IN AORTIC ARCH BRANCHES

Anurag[1], Shilpa Gupta[1]

[1]Associate Professor, Department of Anatomy, National Capital Regional Institute of Medical Sciences, Meerut, Uttar Pradesh, India

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Corresponding Author:
Dr. Anurag,
Email: dranusingh24@gmail.com

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Abstract

Background: To assess prevalence of thyroidea Ima artery & variations in aortic arch branches. **Materials and Methods:** Five hundred twenty human hearts were subjected to CECT. The presence of the thyroid Ima artery with its origin was identified and the branching patterns of the aortic arch were assessed. **Result:** Out of 520 human hearts, Thyroidea Ima artery was detected in 4 (7.6%) cases. Out of 520 human hearts, normal branching pattern was seen in 385 (74%), bovine-type arch in 55 (10.5%), left vertebral arteries in 32 (6.1%), aberrant right subclavian arteries in 26 (5%), right-sided aortic arch in 17 (3.2%) and double aortic arch in 5 (9.6%) cases. A significant difference was observed (P< 0.05). **Conclusion:** Identification of TIA and differences in aortic arch branching is essential since they can lead to issues with neck and thoracic surgeries as well as endovascular procedures.

INTRODUCTION

The aortic arches that make up the human artery system in the head, neck, and upper thoracic regions first form in the fourth and fifth weeks of foetal development. These arches begin in the dorsal aortae and emerge from the ventrally situated aortic sac. The pharyngeal arches are supplied by six pairs of developed aortic arches. The distinctive morphology and asymmetry of the human vascular system are produced by the evolution of some pairs and continued development of others. As a result of the abnormal development of some aortic arches, variations in the branches of the aortic arch are likely to arise.[1]

The thyroid IMA artery (TIA) is a vascular variation that can be found ascending the anterior trachea and traversing the superior mediastinum and neck to reach the thyroid.[2] Due to its rarity, erratic nomenclature, and uncertain presentation, it has been challenging to quantify the prevalence of TIA in the general population, which ranges between 1–15%. On occasion, the thyroidea ima artery gives rise to thymic branches that supply the thymus gland and oesophageal branches that supply the cervical region of the oesophagus. It has also been claimed that the thyroidea ima irrigates the isthmus, the inferior portion, or the gland altogether.[3] If the thyroidea ima artery is the only blood vessel supplying the thymus, branches of the oesophagus to supply the cervical portion of the oesophagus. It has also been claimed that the thyroidea ima irrigates the isthmus, the inferior portion, or the gland altogether.[4] If the thyroidea ima artery is the only source of blood flow to the thymus and the oesophagus, then injury to this artery could result in ischemia, which could lead to complications if this variation related to the thyroidea ima artery is not known.[5]

The thyoidea Ima artery can be seen on radiological scans if it is there, but if its alternate option is not known, iatrogenic injury caused by emergency or surgical treatments can have both short-term and long-term problems.[6] The TIA is a significant factor for several medical specialities, including emergency medicine, endocrinology, otolaryngology, and radiology, because to its course and relationship to the thyroid.[7] Considering this, the present study was undertaken with the aim to assess prevalence of thyroidea Ima artery & variations in aortic arch branches.

MATERIALS AND METHODS

This prospective, observation study was performed on five hundred twenty human hearts after considering the utility of the study and obtaining approval from ethical review committee in the department of Anatomy.

Data pertaining to patients such as name, age, gender etc. was recorded. All were subjected to CECT. The presence of the thyroid Ima artery with its origin was identified and the branching patterns of the aortic arch were assessed. The results were compiled and subjected for statistical analysis using

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Mann Whitney U test. P value less than 0.05 was set significant.

RESULTS

Out of 520 human hearts, 290 (55.7%) were of males and 230 (44.3%) were of females [Table 1].
Out of 520 human hearts, Thyroidea Ima artery was detected in 4 (7.6%) cases [Table 2].
Out of 520 human hearts, normal branching pattern was seen in 385 (74%), bovine-type arch in 55 (10.5%), left vertebral arteries in 32 (6.1%), aberrant right subclavian arteries in 26 (5%), right-sided aortic arch in 17 (3.2%) and double aortic arch in 5 (9.6%) cases. A significant difference was observed (P< 0.05) [Table 3, Figure 1].

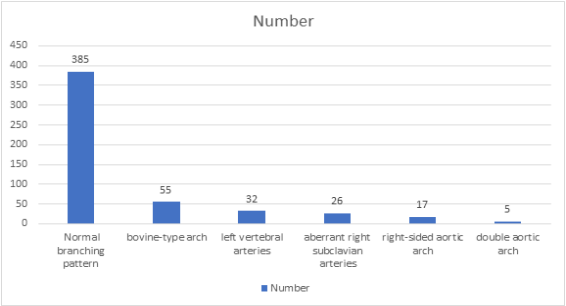

Figure 1: Variations in aortic arch

Table 1: Patients distribution

Total- 520		
Gender	**Males**	**Females**
Number (%)	290 (55.7%)	230 (44.3%)

Table 2: Prevalence of thyroidea Ima artery

Total	**Thyroidea Ima artery (n)**	**Prevalence (%)**
520	4	7.6%

Table 3: Variations in aortic arch

Parameters	**Number**	**Percentage**
Normal branching pattern	385	74%
bovine-type arch	55	10.5%
left vertebral arteries	32	6.1%
aberrant right subclavian arteries	26	5%
right-sided aortic arch	17	3.2%
double aortic arch	5	9.6%

DISCUSSION

The present study was undertaken with the aim to assess prevalence of thyroidea Ima artery & variations in aortic arch branches.[8] As it grows from the left 4th aortic arch, the left dorsal aorta, and the aortic sac, the aortic arch has a composite origin.[9] In the fourth and fifth embryonic weeks, the aortic arch develops functional ascendancy. The fifth and sixth weeks of pregnancy are when the aortic arch's branches begin to form.[10] Thus, research into the head, neck, and thorax's vascular pattern sheds light on the alterations that take place during the fourth and sixth weeks of pregnancy.[11] The adult arterial system develops during the sixth to eighth week as a result of the aortic arch arteries' metamorphosis. Understanding these areas' vascular patterns and any differences is crucial for practise.[12]
In our study, out of 520 human hearts, thyroidea Ima artery was detected in 4 (7.6%) cases. Bhatia et al,[13] conducted a study in which 81 cadavers were selected and their aortic arch branch patterns examined. Two main variances were identified. The left vertebral artery first emerged directly from the aortic arch in six cadavers, between the left common carotid and left subclavian arteries. The 6 participants were part of the subgroup resulting in a substantially higher frequency of 13.95% than in earlier findings. When applied to the entire group, the total incidence of 7.41% is similarly greater than incidences observed in other populations. The existence of this variant shows that in some people, the left 7th inter-segmental artery contributes to the formation of a portion of the aortic arch. Second, in contrast to previously reported rates that ranged between 4% and 10%, none of the investigated cadavers possessed the thyroidea ima artery.
Our results showed that out of 520 human hearts, normal branching pattern was seen in 385 (74%), bovine-type arch in 55 (10.5%), left vertebral arteries in 32 (6.1%), aberrant right subclavian arteries in 26 (5%), right-sided aortic arch in 17 (3.2%) and double aortic arch in 5 (9.6%) cases. Chin et al,[14] in their study 94 subjects were examined to identify thyroid vasculature and to determine the presence of a thyroid ima artery. Of the 94 cadavers, only one was found to have a thyroid ima artery present, suggesting a prevalence of 1.06 percentage.
Budhiraja V et al,[13] found that the left common carotid artery, left subclavian artery, and brachiocephalic trunk were all present in the aortic arch of the thirty-three (63.5%) cadavers. Nineteen (36.5%) cadavers had different branching patterns, with the left subclavian artery and a common trunk showing up in 19.2% of cases, the brachiocephalic trunk, left common carotid artery, left vertebral artery, and left subclavian artery showing up in 15.3% of cases, and the three branches of the

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common trunk, left vertebral artery, and left subclavian artery showing up in 1.9% of cases.

Gopinath Periaswamy et al,[15] studied 2000 patients who received CECT of the aortic arch and branches. The thyroid ima artery's presence and the location of its origin were determined, and the aortic arch's branching patterns were evaluated. A prevalence of 1.15% for TIA was found in 23 patients. In 1493 patients, the aortic arch's normal branching pattern was seen, while in 507 patients, the pattern was different. The variations comprised 162 left vertebral arteries and 342 occurrences of the bovine-type arch.

Karacan A et al,[16] in their study observed that the average aortic arch branching pattern among the 1000 patients was type 1, with deviations occurring in 20.8% of cases. The frequency of type 2 variation, which involves the brachiocephalic and left common carotid arteries arising from the aortic arch in a common trunk, was 14.1%; type 3 variation, which involves the left vertebral artery originating from the aortic arch; type 4 variation, which involves the coexistence of types 2 and 3; type 5 variation, which involves the aberrant right subclavian artery; type 6 variation, which involves the coexistence of the aberrant right Males and females saw similar rates of the aortic arch branching variants (20% versus 22.1%). The incidence of an aberrant right subclavian artery - type 5 and type 6 - was higher among females compared with males (2.5% versus 0.5), whereas the frequencies of the other variations were either equal or similar in both genders.

Considered a tiny artery vessel, the TIA has 3 to 5 millimetres on average in diameter. It frequently originates from a huge, high-pressure artery where there is considerable haemorrhage. Significant blood loss might happen if hemostasis is not accomplished right away.[17] The TIA can sustain injury during emergency airway operations like cricoidectomies and tracheostomies because of its general relationship to the trachea. In some cases, radiological diagnosis of the TIA may be impossible due to the situation's urgency and probable repercussions from treatment delay. In addition to open haemorrhage, dissection of the artery during surgery is another possibility.[18] This can cause retraction into the superior mediastinum and the development of blood clots in the thoracic cavity that are challenging to access.

CONCLUSION

Identification of TIA and differences in aortic arch branching is essential since they can lead to issues with neck and thoracic surgeries as well as endovascular procedures.

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