A Case of the Left Superior Thyroid Artery Arising from the Left Common Carotid Artery and the A. Thyroidea Ima

By

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(With 5 figures in 2 plates)

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Findings


In this case, the thyroid gland is supplied with the superior and the inferior thyroid arteries and the a. thyroidea ima.

1) The left superior thyroid artery (Figs. 1, 2 and 3)
This artery (ca. 2.7 mm in diameter) arises from the anterior wall of the left common carotid artery about 30 mm proximal to the point of the bifurcation (inbetween the roots of the external and the internal carotid arteries) (Fig. 3) in the height of about 18 mm inferior to the posterior margin of the greater cornu of the hyoid bone, that is, the superior margin of the vertebral corpus of CV, and about 5 mm lower than the origin of the right superior thyroid artery. This vessel arches slightly anteroinferiorly, then descends along the lateral margin of the thyrohyoid muscle. It finally supplies the thyroid gland.

a) A small branch to the thyrohyoid muscle (ca. 0.5 mm in diameter).

b) The sternocleidomastoid branch
This vessel (ca. 0.5 mm in diameter) arises about 5 mm distal to the origin of the parent artery and supplies the venter of the muscle.

c) The superior laryngeal artery (Figs. 1 and 2)
This vessel (ca. 1.3 mm in diameter) arises about 18 mm distal to the origin of the parent artery, and runs anteroinferiorly on the
anterior surface of the sternothyroid muscle. This gives off the branch to the thyrohyoid and the sternothyroid muscles. It also gives off the r. cricothyroideus (ca. 0.5 mm in diameter) which penetrates the cricothyroid ligament, then turns upward from the inferior margin of the thyroid cartilage onto its medial surface, and supplies the larynx.

d) R. anterior

The ramus (ca. 1.3 mm in diameter) runs along the superior border of the thyroid gland from its superior pole up to the median part. It on the way gives off five branches; three of them supply the anterior surface of the gland and the other two supply the upper part of its posterior surface. In particular, a thick twig (ca. 0.8 mm in diameter) extends downward to the inferior border of the gland and turns to the posterior surface, anastomosing with the r. posterior.

e) R. posterior

The vessel (ca. 0.9 mm in diameter) descends on the posterior surface from the left superior pole to the lower part of the left lobe.

2) The right superior thyroid artery (Figs. 1, 2 and 5)

This artery (ca. 3.3 mm in diameter) arises from the anterior wall of the bifurcating region of the right common carotid artery about at a right angle, that is, about 4.5 mm proximal to the point of the bifurcation, also about 11 mm inferior to the posterior margin of the greater cornu of the hyoid bone as well as the inferior margin of the vertebral corpus of CVI. This vessel makes an anteroinferior arch as usual, then descends along the posterior margin of the sternothyroid muscle, giving off the r. posterior and a branch to the jugular notch about 19 mm inferior to the origin of the parent artery. It curves suddenly anteroinferiorly at the lower margin of the thyrohyoid muscle, then continues as the r. anterior.

a) The sternocleidomastoid branch

This vessel (ca. 1.5 mm in diameter) leaves the parent artery about 12.5 mm distal to its origin and gives off two branches supplying this muscle and the omohyoid.

b) R. posterior

This vessel (ca. 1.8 mm in diameter) leaves the parent artery about 6 mm inferior to the origin of the sternocleidomastoid branch and extends downward to the right superior pole of the thyroid gland, where it spreads into four twigs. They are distributed to the posterior, the anterior and the lateral parts of the gland. One of them, thicker (ca. 1.2 mm in diameter), runs inferomedially up to the median part of the gland on its posterior surface.

c) A branch to the jugular notch (Figs. 1 and 2)

This vessel (ca. 1.0 mm in diameter) descends straight along the posterior margin of the sternothyroid muscle, and is distributed to the
Superior Thyroid Artery from Common Carotid & A. Thyroidea Ima

subcutaneous tissue around the jugular notch and the periosteum of the clavicle.

d) R. cricothyroideus

This ramus (ca. 1.0 mm in diameter) divides into twigs which supply the cricothyroid, the thyrohyoid and the sternohyoid muscles.

e) The superior laryngeal artery

This artery (ca. 1.2 mm in diameter) arises about 21 mm distal to the origin of the r. cricothyroideus and follows the same course and distribution of the opposite fellow.

f) R. anterior

This ramus (ca. 1.7 mm in diameter), the terminal branch of the parent artery, trifurcates at the inferior end of the cricothyroid muscle. Two of them supply the anterior surface of the thyroid gland, and the other supplies the posterior surface.

3) The left inferior thyroid artery (Figs. 1 and 4)

This artery (ca. 2.2 mm in diameter) arising from the thyrocervical trunk (ca. 3.0 mm in diameter) runs upward in the medial side of the m. scalenus anterior and the vagus nerve, and gives rise to the ascending cervical artery (ca. 2.0 mm in diameter) about 23 mm distal to the origin of this trunk in the height of the intervertebral disk between CVI and CVIII. The inferior thyroid runs superomedially, then bends to the superior pole of the left lobe inferomedially, and supplies twigs to the lateral and the posterior surfaces of it up to the median area.

4) The right inferior thyroid artery (Fig. 1)

This artery (ca. 2.0 mm in diameter) is similar to the opposite fellow in the origin, course and distribution.

5) A. thyroidea ima (Figs. 1 and 5)

This artery (ca. 1.7 mm in diameter) arises from the anteromedial wall of the brachiocephalic trunk about 33 mm distal to the origin of it and runs superomedially about 15 mm giving off the thyroid glandular branch (ca. 1.5 mm in diameter). This branch divides into the right and left twigs (Mada 1955) about 6 mm inferior to the gland. The former (ca. 1.0 mm in diameter) is distributed to the anterior surface of the lower area of the isthmus, and the latter (ca. 0.5 mm in diameter) to the posterior surface. Other twigs supply the sternothyroid muscles of both sides.

6) The height of the bifurcation of the common carotid arteries (Figs. 1, 2 and 3)

The point of the bifurcation of the left side is in the middle of the anterior tubercle (the middle of the vertebral corpus) of CIII, and
this point of the right side is in the inferior border of the anterior tubercle (the middle of the vertebral corpus) of CIV. The point of the bifurcation of the left common carotid artery was markedly lower than that of the right side. The difference was about 20 mm, equal to the width of one cervical vertebral corpus.

7) The thyroid gland (Figs. 1 and 2)

This gland is in the shape of a horseshoe because of an inferior protrusion of the isthmus. Besides the pyramidal lobe is so prominent that the superior ends reach the laryngeal prominence of the thyroid cartilage. The lobes of both sides are measured as follows: The left lobe is about 48 mm in height, about 26 mm in width and about 20 mm in thickness; the right lobe is about 48 mm in height, about 27 mm in width and about 19 mm in thickness. The superior pole is located in about 4 mm superior to the inferior border of the thyroid cartilage, the inferior pole in the 7th tracheal cartilage and the isthmus ranging from the 1st to the 7th tracheal cartilage.

Discussion

The superior thyroid artery usually arose from the external carotid artery, rarely the common carotid or its bifurcation. Adachi (1928) stated, “Der Ursprung der A. thyreoidea superior entfernt sich vom Teilungswinkel der Carotis communis, meist nur wenig weit (innerhalb 1 cm), mag sich der Ursprung auf der Carotis communis oder der Carotis externa finden, bei höherer wie bei tieferer Teilung der Carotis communis”. He reported only one case of the left superior thyroid artery arising from about 25 mm inferior to the left bifurcation (ca. 0.8%, one case of 120 cases). He also found “Die aus der Carotis communis entspringende A. thyreoidea superior nur selten (4.7%) auf der rechten Seite, auf der linken Seite dagegen sehr häufig (22.0%)!”. Tachihara et al. (1956) also reported one case of this artery arising about 25 mm inferior to the posterior end of the greater cornu of the hyoid bone, but did not give obvious descriptions of the relation between the bifurcation of the common carotid artery and the origin of the superior thyroid artery. In the present case the superior thyroid artery arose about 5 mm inferior than the Adachi's description. Actually the cases reported by Adachi and Tachihara were on the left thyroid artery.

The height of the bifurcation of the common carotid artery lay lateral to the superior margin of the vertebral corpus of CIV to the middle of it from the Adachi’s description. In the present case the bifurcation of the left common carotid was remarkably higher than the opposite fellow being the average height. Although both superior
Table 1. Cases reported on the a. thyroidea ima in Japanese.

<table>
<thead>
<tr>
<th>Authors</th>
<th>Cases</th>
<th>Examples</th>
<th>Parent Arteries</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>Shugyo* (1924)</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td></td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>Adachi (1928)</td>
<td>18 (7.96 (\pm 1.79%))</td>
<td>7 (12.50 (\pm 4.41%))</td>
<td>25 (8.87 (\pm 1.69%))</td>
</tr>
<tr>
<td>Hirose (1931)</td>
<td>(\frac{3}{26}) (11.5%)</td>
<td>26 (11.5%)</td>
<td>26 (11.5%)</td>
</tr>
<tr>
<td>Tsuda (1935)</td>
<td>3</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>Morita** (1936)</td>
<td>(\frac{1+NR}{85})</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Mori (1941) (fetus)</td>
<td>(\frac{5}{30}) (17%)</td>
<td>7 (26%)</td>
<td>12 (21.1%)</td>
</tr>
<tr>
<td>Simizu (1951) (fetus)</td>
<td>(\frac{2}{36}) (5.6%)</td>
<td>3 (9.1%)</td>
<td>5 (7.2%)</td>
</tr>
<tr>
<td>Mada et al.† (1955)</td>
<td>(\frac{8}{54}) (14.8%)</td>
<td>5 (15.2%)</td>
<td>13 (14.9) (\pm 3.8%)</td>
</tr>
<tr>
<td>Okamura et al. (1971)</td>
<td>1</td>
<td>0</td>
<td>NR</td>
</tr>
<tr>
<td>Fujimoto et al. (1974)</td>
<td>1</td>
<td>0</td>
<td>1 (9.0%)</td>
</tr>
<tr>
<td>Total</td>
<td>42</td>
<td>22</td>
<td>75</td>
</tr>
</tbody>
</table>

NR: Not Recorded  \ R, L: Right, Left
* The parent arteries of the a. thyroidea ima were not recorded in 9 cases.
† No recording on one case.
** Morita surveyed only the a. thyroidea ima arising from the aortic arch.
†† In two cases the a. thyroidea ima was two in number, respectively.
thyroid arteries were nearly the average position in their height of the origin, the point of the bifurcation of the left common carotid was exceedingly high, so that it might be a great distance between the bifurcation and the origin of the left superior thyroid.

Adachi gave a suggestion that the height of the bifurcation of the common carotid artery would be standardized on the cervical vertebral corpus rather than the hyoid bone or thyroid cartilage because of the age changes. The present reporters would like to agree with his suggestion, but still there have not been any obvious definition concerning to the bifurcation point of the common carotid artery.

The a. thyroidea ima has been reported as an anomalous artery supplying the lower part of the thyroid gland. In the literature the total cases of the thyroidea ima in Japanese were 75 as given in Table 1. Table 2 showed that its appearance frequency in the adult Japanese was $9.31 \pm 1.20\%$. The difference between male ($9.58 \pm 1.66\%$) and female ($12.90 \pm 3.48\%$) was statistically not significant.

The origin of this artery was the brachiocephalic trunk mostly ($74.29 \pm 5.22\%$), rarely the common carotid artery ($14.29 \pm 4.18\%$), the aortic arch ($5.71 \pm 2.77\%$) or the internal thoracic artery ($5.71 \pm 2.77\%$). In the present case, the thyroidea ima arising from the brachiocephalic trunk supplied the thyroid gland in addition to the inferior thyroid arteries of both sides. Adachi stated, "Bei den meisten der aufgezeichneten Fälle war die Arterie etwa 2 oder 3 mm stark". In the present case this artery was thinner than these values.

De Garis (1933) and Okamura (1971)
stated that the thyroid gland which was supplied by the thyroidea ima additionally appeared to be edematous and larger than the usual. The gland of the present case also was well-developed, especially its isthmus and the pyramidal lobe. The values of the gland in the present case were larger than those described by Ozeki (1910).

Summary

In cadavers for students of 1973, it was found that the left superior thyroid artery arising from the left common carotid artery, and the a. thyroidea ima were present.

1) The left superior thyroid artery (ca. 2.7 mm in diameter) arose from the anterior wall of the left common carotid artery about 30 mm inferior to the bifurcation of it, about 18 mm inferior to the posterior margin of the greater cornu of the hyoid bone, and the superior margin of the vertebral corpus of CV.

2) The right superior thyroid artery (ca. 3.3 mm in diameter) arose from the bifurcation of the right common carotid artery.

3) The left (ca. 2.2 mm in diameter) and the right inferior thyroid arteries (ca. 2.0 mm in diameter) arteries were seen.

4) The a. thyroidea ima (ca. 1.7 mm in diameter) arose from the anteromedial wall of the brachiocephalic trunk.

5) In the literature 75 cases have been reported on the a. thyroidea ima in Japanese. Its appearance frequency in adult Japanese was 55/591 or 9.31 ± 1.20%. It arose from the brachiocephalic trunk (74.29 ± 5.22%), the common carotid artery (14.29 ± 4.18%), the aortic arch (5.71 ± 2.77%) or the internal thoracic artery (5.71 ± 2.77%).

6) The bifurcation of the left common carotid artery was in the height of CIV, and that of the right one in the height of the anterior tubercle of CV. The point of the bifurcation of the left common carotid artery was markedly lower than that of the right side. The difference was about 20 mm, equal to the width of one cervical vertebral corpus.

7) The thyroid gland was larger than the usual in size, that is, the inferior protrusion of the isthmus and the superior prominence of the pyramidal lobe.

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Literature cited


Explanation of Figures

Key to Abbreviations

C: Cricothyroid cartilage  ec: External carotid artery
Ct: Cricothyroid muscle  ic: Internal carotid artery
Gl: Thyroid gland  it: Inferior thyroid artery
H: Hyoid bone  j: Internal jugular vein
L: Cricothyroid ligament  ra: R. Anterior
Sa: Anterior scalenus muscle  rc: R. cricothyroideus
Sh: Sternohyoid muscle  rp: R. posterior
Sy: Sternothyroid muscle  sb: Sternoclidomastoid branch
T: Thyroid cartilage  sl: Superior laryngeal artery
Th: Thyrohyoid muscle  st: Superior thyroid artery
V: Vagus nerve  t: Thyrocervical trunk
ac: Ascending cervical artery  bj: A branch to the jugular notch
cc: Common carotid artery  bp: Transverse cervical artery

Plate I

Fig. 1. Schematic illustration. ca. × 0.9.
Fig 1. Schematic Illustration

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Plate II

Fig. 2. Anterior view. The left superior thyroid artery arises from the left common carotid artery, showing the distance between the point of the bifurcation and the origin of the superior thyroid. The thyroid gland is in the shape of a horseshoe because of an inferior protrusion of the isthmus, also the pyramidal lobe is well-developed. A branch to the thyrohyoid muscle (X). A branch (\( \downarrow \)) to the thyrohyoid and sternothyroid muscles. ca. \( \times 0.8 \).

Figs. 3 and 4. Lateral view from the left side. The point (\( \nearrow \)) of the bifurcation of the left common carotid artery. The left inferior thyroid artery was seen by the removal of the left common carotid in Fig. 4. Phrenic nerve (X). The superior laryngeal artery penetrates (\( \searrow \)) the cricothyroid ligament. ca. \( \times 0.75, \times 0.9 \).

Fig. 5. Lateral view from the right side. The a. thyroidea ima supplies the inferior part of the thyroid gland. The branches (X) to the sternothyroid. Penetration (\( \nearrow \)) of the right superior laryngeal artery. ca. \( \times 0.7 \).
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