

3.1 Internal Thoracic Artery

3.1.1 General Anatomy of the Internal Thoracic Artery

3.1.1.1 Origin and Course of the Internal Thoracic Artery

The thoracic part of the right subclavian artery originates from the brachiocephalic trunk, just behind the sternoclavicular joint, and passes upward in the scalenotracheal fossa to the medial margin of the scalenus anterior.

The left subclavian artery arises directly from the aortic arch, just behind the left common carotid artery at the level of the fourth thoracic vertebra. In its initial run off, the artery ascends in the superior mediastinal cavity to the root of the neck. From the sternoclavicular articulation, the topographies of the left and right subclavian arteries are similar. In the scalenotracheal fossa, the artery winds around the pleural cupule toward the medial border of the scalenus anterior.

The muscular part lies in the subclavian groove of the first rib. Its boundary is formed by the scaleni anterior and medius. This part of the artery forms the highest part of the arch described by the vessel. In some rare variants, the artery passes in front of the scalenus ante-

rior; in these cases, a vascular ring sometimes surrounds the muscle. In the case of a rudimentary first rib, the artery always is seen above the uppermost rib. The cervical part is contained in the omoclavicular triangle. The artery runs downward and laterally from the lateral margin of the scalenus anterior to the outer border of the first rib. This is the most superficial segment.

The internal thoracic artery arises from the thoracic part of the subclavian artery, just opposite to the thyrocervical trunk and medial to the scalenus anterior. In its initial run off, the artery descends on the pleural cupule to cross, after a short course, the sternal third of the clavicle and the first rib cartilage, in order to enter the thoracic cavity. Before reaching the first rib, the artery is crossed by the brachiocephalic vein. Shortly after its origin, the phrenic nerve joins the artery from its lateral aspect. After a short run off, the nerve runs medial and ventral to the artery, behind the subclavian vein (Fig. 3.1 and 3.2).

On the dry-dissected specimen, the right internal thoracic artery is inspected from the omoclavicular triangle. The right clavicle has been removed and the scalenus anterior detached from the first rib. For better interpretation of the topographical relationships, the subclavian vein has also been removed. One can see that

the artery originates just behind the venous angle and runs on the pleural cupule toward the first rib. The phrenic nerve is presented as a white cord running along the ventral aspect of the brachiocephalic trunk and, in this way, crosses the internal thoracic artery (Figs. 3.1 and 3.2).

The internal thoracic artery may branch off from the cervical part of the subclavian artery (with an incidence of 1.4%, as postulated by Adachi); in this rare instance, the artery can be identified on the lateral edge of the scalenus anterior.

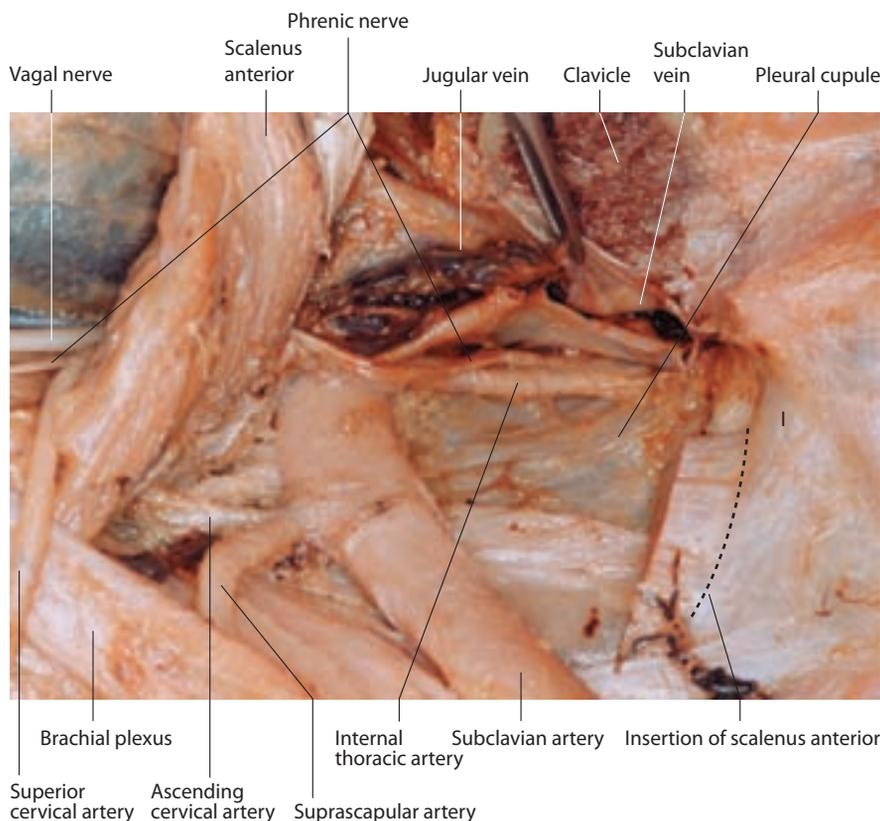


Fig. 3.1. Origin of the internal thoracic artery

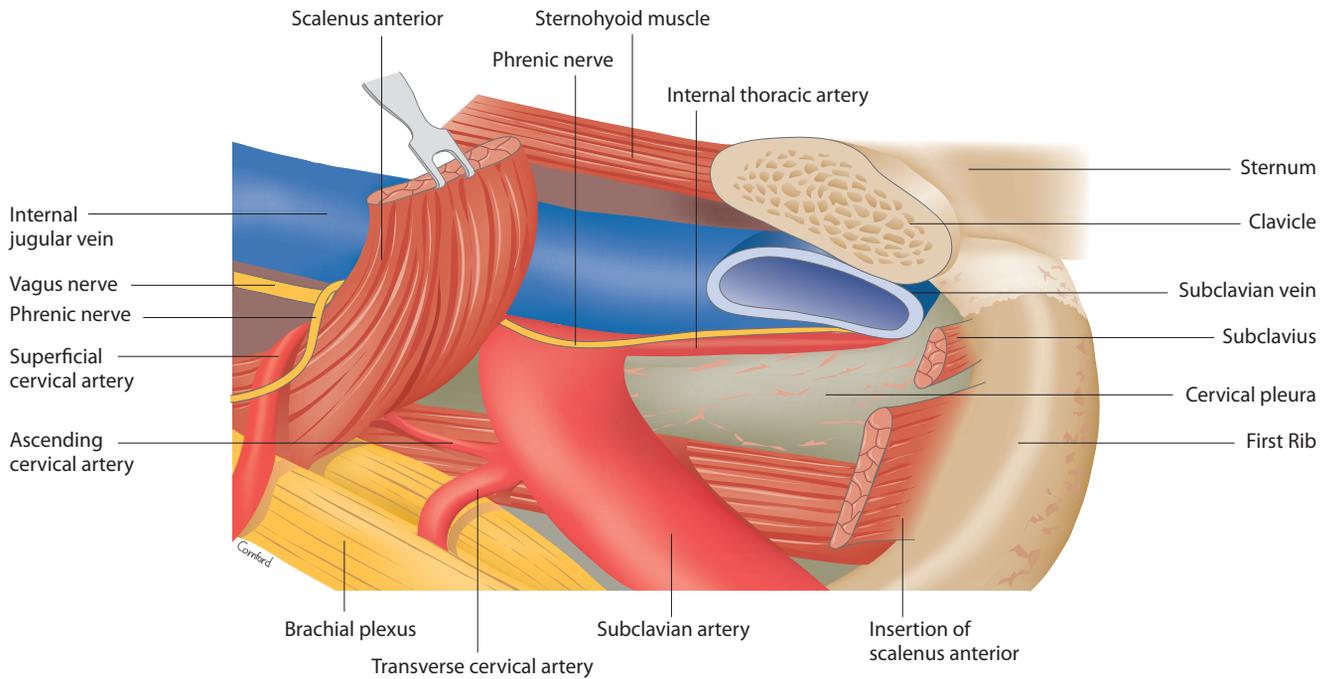


Fig. 3.2. Origin of the internal thoracic artery, schematic drawing

In this case, the cervical internal thoracic artery traverses the first rib and enters the thoracic cavity in the first intercostal space.

Run off of the Internal Thoracic Artery

Below the first costal cartilage, the artery descends just vertical to its branching point. The artery is covered by the intercostal cartilage and the internal intercostal muscle. It runs in the connective tissue of the endothoracic fascia on the parietal pleura, as far as the level of the third rib. Below this level, the artery is found upon the transversus thoracis. The most frequent level of termination of the artery is the sixth intercostal space, where in 90% of cases it divides into two branches and in 10% of cases into three branches (**Fig. 3.3**).

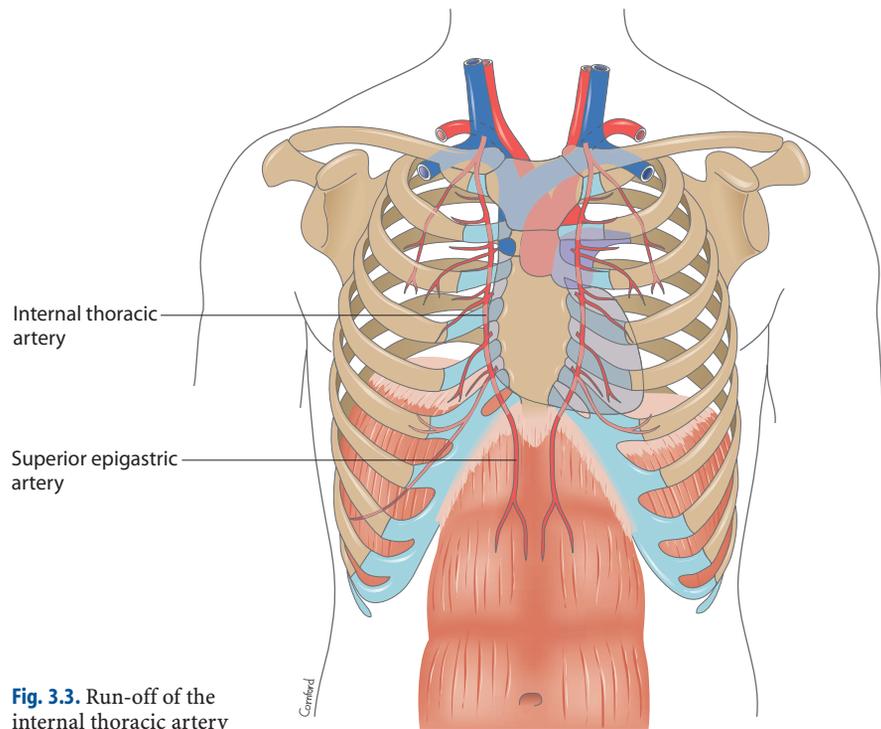


Fig. 3.3. Run-off of the internal thoracic artery

Table 3.1

Intercostal space	Adachi on 52 specimens (mm)		Sandmann on 40 specimens (mm)	Delorme Mignon on 30 specimens (mm)	Our data measured on 50 specimens (mm)	
	Male	Female			Left	Right
I	8–9 (0–16)	8	11	6–20	6 (SD 3.9)	6.4 (SD 3.9)
II	13 (8–19)	10 (6–15)	15.3	10–20	13.7 (SD 2.6)	13.9 (SD 2.7)
III	12, 13, 14 (16–18)	11 (5–14)	15.6	10–21	14.5 (SD 3.1)	14.8 (SD 2.7)
IV	12 (7–16)	10 (6–15)	15.4	8–25	14 (SD 3.6)	14.6 (SD 3.1)
V					16.3 (SD 1.7)	16.8 (SD 2.5)

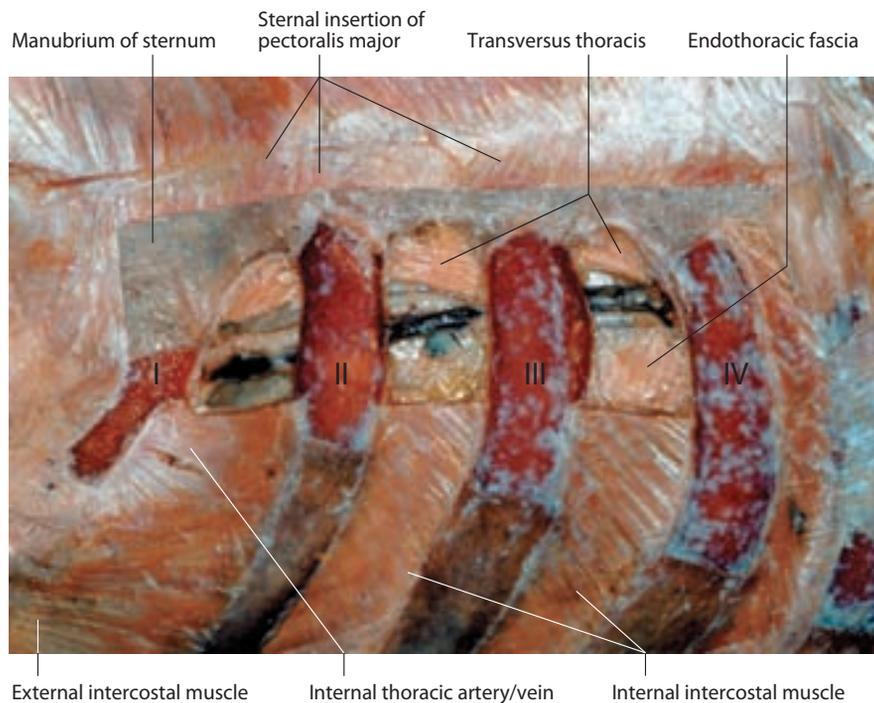


Fig. 3.4. Relation between the internal thoracic artery and the sternum

According to our measurements, the artery runs approximately 13 mm lateral from the sternal edge. **Figure 3.4** shows a superior view of the relationship between the lateral sternal edge and the run off of the internal thoracic artery. The intercostal muscles have been removed; one can see that the artery runs superficial to the endothoracic fascia. The transversus thoracis was left in situ. Initially, the artery is medial to the conjoined vein (first and second intercostal spaces), then just behind the third rib the vein crosses the artery and travels more medially. This is particularly obvious in the third intercostal space. Here, the artery runs along

the transversus thoracis and is lateral to the vein. Note that in the second intercostal space lateral to the vein, a retrosternal lymphoid gland has been left in situ. A comparison of the distance between the left and right arteries revealed no significant deviations (**Table 3.1**). The minimal distance was measured at the first intercostal space. From the second to the fourth intercostal space, the distance between the artery and the sternal line remains approximately constant. We noted increase in this distance at the level of the sixth intercostal space (**Fig. 3.4**).

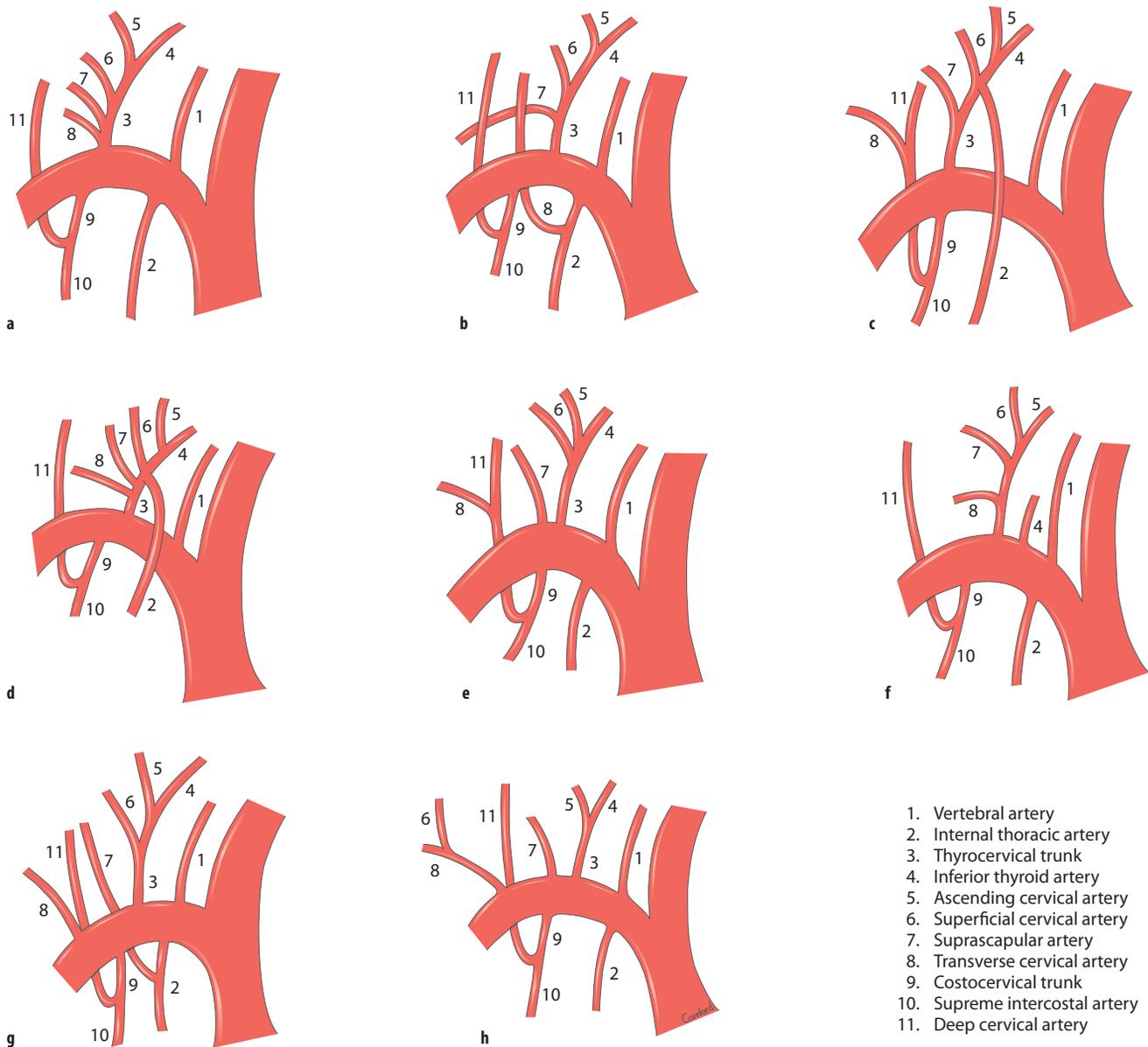


Fig. 3.5. Variants of the origin of the internal thoracic artery

Morphological variants of the origin of the internal thoracic artery cannot be discussed without emphasizing its relationships with the vertebral artery, and the costocervical and thyrocervical trunks. Adachi's classification scheme distinguishes several frequently occurring anatomical types with respect to origin from the subclavian artery. In the most common (normal) type (45.5%), the vertebral and the internal thoracic arteries, and the costocervical and thyrocervical trunks arise as separate branches (**Fig. 3.5a**). In the second variant (19%), the internal thoracic artery and the transverse cervical artery arise from a common trunk, and the oth-

ers likewise together (**Fig. 3.5b**). In the third variant (8.3%), the internal thoracic artery and the suprascapular artery share a common origin (**Fig. 3.5c**). In the fourth variant (4.1%), the transverse cervical artery originates separately and the other arteries branch off together (**Fig. 3.5d**). All of the vessels may arise from a common trunk (3.3%; **Fig. 3.5e**). The internal thoracic, suprascapular, and transverse cervical arteries can arise separately, the others having a common origin (3.3%; **Fig. 3.5f**). The internal thoracic and the inferior thyroid arteries can have separate origins, with the others arising together (3.3%; **Fig. 3.5g**). The transverse cervical



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