Anatomic variations

A rare variant of thyroid gland vascularization

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Summary: Usually the thyroid gland obtains its blood via two paired arteries. One pair, the right and left superior thyroid aa., most commonly arises from the external carotid aa. and the second pair, the right and left inferior thyroid aa., commonly arises from the thyrocervical trunk of the subclavian a. In this particular case the right inferior thyroid a. was replaced by an artery branching off the right internal thoracic a.; the left inferior thyroid a. was replaced by an artery branching off the vertebral a. between the transverse process of the second and third cervical vertebrae. This finding might be explained by the suggestion that in the fetus there exists an anastomotic arterial chain ventral to the spinal column and consisting of the thyrocervical trunk and the ascending cervical a. which itself is connected to the vertebral a.

Key words: Thyroid gland vascularization — Abnormalities

In humans the arterial supply to the thyroid gland is usually via two paired arteries. One pair, the right and left superior thyroid aa., most commonly arises from the external carotid aa. (46%), or from the carotid bifurcation (36%), or from the common carotid a. (18%) on the ipsilateral side [3].

The second pair of vessels that supplies blood to the thyroid gland, the right and left inferior thyroid aa., commonly arises from the thyrocervical trunk of the subclavian a. on the corresponding side of the neck [1]. There may be a single thyroid a., the thyroidea ima a. (reported in 8-12% of patients), which has been found to arise from the aortic arch or from the brachiocephalic, common carotid, or internal thoracic aa. [2, 5, 6, 9]. Also doubling of the inferior thyroid a. on one side was described by Jenny [7] and Lanz [8]; in this case one inferior thyroid a. branched off the thyrocervical trunk and the second from the internal thoracic a.

Materials and methods

A cadaver of a 66-year-old human male without obvious cervical pathology or prior surgery was fixed by Thiel’s method [10] and the arteries were injected via the external iliac a. with Thiel’s DGM 85 mass [11] consisting of dextrin, latex, and lead tetroxide for precise and easy identification of the arteries. The arteries of the neck were dissected and documented by video and drawings.

Findings

In this dissection both inferior thyroid aa. were missing. In place of the right inferior thyroid a. there was an artery branching off the right internal thoracic a., crossing the subclavian a. anteriorly and entering the right lobe of the thyroid gland on its lower anterior surface.
Fig. 1a, b
Left antero-lateral view of the neck showing an a. (ATS) to the lower posterior part of the thyroid gland branching from the vertebral a. between second and third cervical vertebra. a photo, b line drawing according to a. ATS, a. thyroidea suprema; T, trachea; C, common carotid a.; B, brachiocephalic trunk; TG, thyroid gland, left lobe.

Fig. 2a, b
Diagram of the proposed development of the cervical aa. a Normal blood supply of the thyroid gland. The thyrocervical trunk and the ascending cervical a. form an anastomotic chain ("ventral cervical longitudinal anastomosis") with proposed connections to the vertebral a. b Abnormalities found in this case. On the left side the thyrocervical trunk is absent and the supreme thyroid a. (ATS) branching off the vertebral a. via the residual ascending cervical a. replaces the inferior thyroid a. On the right side the thyroidea ima a. (ATI) branching off the internal thoracic a. replaces the inferior thyroid a. V, vertebral a.; TT, thyrocervical trunk; AC, ascending cervical a.; IT, inferior thyroid a.; ATS, arteria thyroidea suprema; ATI, arteria thyroidea ima.

In place of the left inferior thyroid a., there was an artery branching off the vertebral a. between the transverse process of the second and third cervical vertebrae (Fig. 1). This was called the supreme thyroid a. (A. thyroidea suprema). After its origin this supreme thyroid a. separated the longus capitis from the longus colli muscle, crossed the common carotid a. on its posterior aspect, perforated the intercarotid fascia (fascia intercarotica) and entered the lower inferior surface of the left lobe of the thyroid gland. A thyrocervical trunk was absent on this side; only the transverse cervical a. branched off the third part of the left subclavian a.

Discussion

The superior thyroid a. is referred to as a very constant vessel and the original thyroid a., whereas the inferior thyroid a. does not exist in most mammals [2]; Unilateral or bilateral absence of the inferior thyroid a. is not uncommon [8] and is described in 3-6% [2, 4, 9]; in these cases the superior thyroid a. or the thyroidea ima a. supplies the area of the inferior thyroid a. A common stem of the inferior thyroid a. with the vertebral a. is described in 1%; however, in these cases the inferior thyroid a. branches off the beginning of the vertebral a. before it enters the transverse process of the sixth or seventh cervical vertebra. An artery supplying the area of the inferior thyroid a. branching off the vertebral a. just before it enters the head does not seem to have been described before.

The arteries of the head derive from branches of the branchial aa. The cervical segmental aa. form an anastomotic chain that later becomes the vertebral a. The corresponding segmental aa. of the head (proatlantal, trigeminal, otic, and hypoglossic aa.) are connected with the terminal branch of the internal carotid a. and the cerebral vertebral a. The cervical and cerebral vertebral a. form one continuous artery on each side, and the segmental aa. disappear [9]. The presence of an artery branching off the vertebral a. suggests that there must exist also an anastomotic chain ventral to the spinal column - a "ventral cervical longitudinal