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VARIABILITY OF AORTIC ARCH BRANCHING

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Summary

50 aortic arches were studied in adult cadavers (aged 26-73 years) for variations in the origin of branches at arch of aorta, the relative distances between the adjacent branches were observed.

Rezumat

Variabilitatea ramificării arcului aortic

Au fost studiate 50 aorte umane preluate de la persoane mature decedate în vârsta de la 26 până la 73 de ani. Atenţie a fost acordată variabilităţii originii ramurilor aortei şi distanţei între ramuri adiacente.

Novelty of Theme

The aortic arch is a challenging site for endovascular repair. Complication of open surgery of the AA include ischemic problems which can be caused by unrecognized variation of the vascular anatomy. The morphologic variations of the AA and its branches are significant for diagnostic and surgical procedures in the thorax and neck.

Aim

To investigate the prevalence and imaging appearances of anatomical variations of the common aortic arch, the present work was to study the branching pattern of the aortic arch, the diameters of its branches and the distance between their origins. This study would provide an anatomical basis to assist surgeons in performing safe vascular surgery involving the AA, and its branches in cases in which stenting are used as an adjunct to balloon angioplasty for the treatment of both stenotic and occlusive lesions of the supra aortic trunks.

Materials and methods

This study was performed on 50 adult human preserved mediastinal complexes and 5 pre-dissected separate hearts with the aortic arches en-bloc.

The following morphological parameters have been recorded:

• Examination of the branching pattern of the aortic arch major branches.

• Identifying additional arteries originating from the aortic arch.

• Measuring the distance between the branches originating from the arch.

• Measuring the diameter of all branches at the site of their origin from the arch. Measurements were done using a Vernier caliper, accuracy 0.01 mm.

Additionally, photographs were taken using digital camera (Panasonic VDR-D150).

Discussions and results

The common branching pattern of the AA in which the three major branches originated independently was observed. In this study the most common AA branching pattern was found in 85% of the specimens. In this pattern the three major branches: brachiocephalic trunk (BT), left common carotid (LCC), and left subclavian (LS) originated independently from the arch of the aorta (fig.1). According to Lippert and Pabst this pattern was in 70%, different from that found by Shin et al. (84%) and Paraskevas et al. who found it in only 65%.

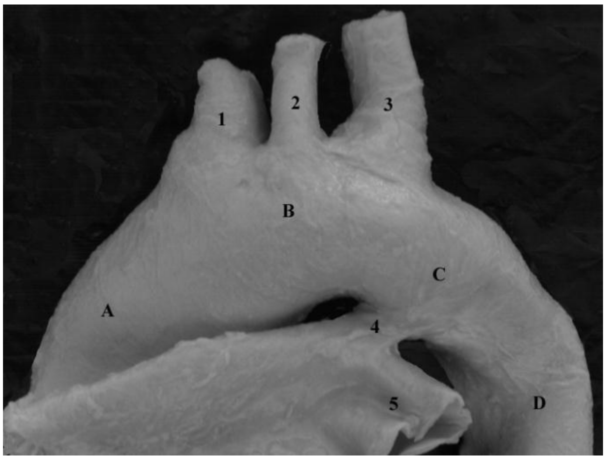

Fig. 1.A photograph of the aortic arch (AA) showing its common branching pattern. The three major branches arise independently from the arch.
A – ascending aorta; B – aortic arch; C – isthmus; D – descending thoracic aorta. 1 –

Tab. 1.The mean diameter of the aortic arch branches

Aortic branch	*The mean diameter*	*Minimum*	*Maximum*
BT	17.87 ± 3.81 mm	11.0 mm	24.5 mm
LCC	9,69 ± 1,90 mm	6.1 mm	14.8 mm
LS	14.33 ± 3.09 mm	7.1 mm	19.8 mm

Tab. 2. The mean distance between the origin of the aortic arch branches

The mean distance between	*Minimum*	*Maximum*
BT - LCC	0,1 cm	0,5 cm
LCC- LS	0,3 cm	2.0 cm

The anomalous origins of the branches of the AA is attributed to the altered development of certain brachial arch arteries during the embryonic period of gestation.

The AA in two specimens of the above group (2%) had only 2 great branches. They originated from the upper convex surface of the aortic arch. The first was a common trunk, which incorporated the BT and the LCC. The second was the LS, which arose independently distal to the origin of the common trunk (fig.2).

In four cadavers (8%) an additional artery was noted in addition to the three branches and four branches had their origin from the upper convex surface of the arch. The additional branch was traced and found to be left vertebral artery (LV). It had an independent origin from the aortic arch. It was located between the origins of the left common carotid and the left subclavian arteries. The arising sequence of the four arteries from the arch, from right to left was BT, LC, LV, and LS (Fig. 2).

In only one cadaver (1%) the LV arose from aortic arch separated. This branch originated from the arch behind the LCC, its diameter was 3.0 mm.

One remarkable finding in the present work was the origin of LV with the LS from a common trunk in one cadaver (2%) out of nine variations. The trunk originated from the arch behind the LC. Its diameter was 19.2 mm. No similar finding was reported in the current literature review.

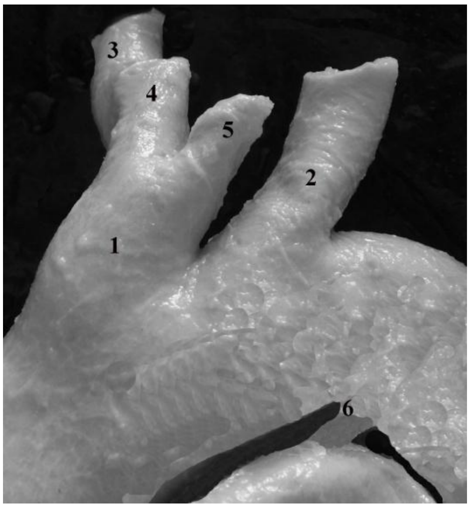

Fig.2. A photograph of the aortic arch showing its two branches.
1 – brachiocephalic trunk fused with the left common carotid artery; 2 – left subclavian artery; 3 – right subclavian artery; 4 – right common carotid artery; 5 – left common carotid artery; 6 – arterial ligament.

Usually described three branches arising at arch of aorta were observed in 85% specimens. Two branches arising from arch of aorta, having different branching pattern were observed in 2%; four- in 10%; five – in 3%. The openings of the arteries were oval in shape in 85% with the mean maximum anteroposterior diameters being greater than the mean maximum side-to-side diameters, while they were elliptical in 10%. The BC artery showed largest size followed by LSC and then LCC in most of the branching patterns ($p< 0.001$). The mean transverse distances between adjacent lumenal openings of these branches were significantly greater than the mean vertical distances ($p < 0.001$). Approximation of LCC to BC trunk was seen in 10% specimens. The most frequent anatomical variant was an additional branch , which occurred in 20% of cases (Fig. 3).

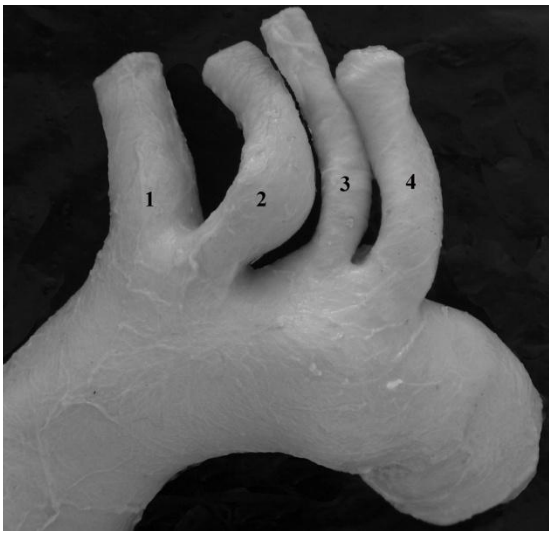

Fig.3. A photograph of the aortic arch showing its four branches.
1 – right subclavian; 2 - right common carotid artery; 3– left common carotid artery; 4- left subclavian artery.

Conclusions

In conclusion, the different branching patterns of the AA observed in this study and the morphometric measurements taken can assist surgeons in performing safe and effective surgeries in the superior mediastinum.

With the ever increasing complex endovascular interventions in the aorta and head and neck regions, recognition and appreciation of these entities is of importance to the interventional and diagnostic radiologist alike.

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VARIATIONS OF THE MANDIBULAR CANAL, MANDIBULAR AND MENTAL ORIFICES

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Summary

The present study assesses variabilities of mandibular canal, the relative position, size and shape of its mandibular and mental foramina, evaluates their measurement and relationship with various landmarks of the mandible in adults. The current study traced out that some of the mandibles had accessory mandibular and mental foramina.

Rezumat

Variabilitatea canalului mandibular, orificiului mandibular şi mental

Studiul de faţă elucidează variabilitatea canalului mandibular, poziţia relativă a orificiilor lui mandibular şi mental, evaluează datele de morfometria a acestora şi demonstrează raporturile lor cu diverse puncte de reper ale mandibulei la adulţi. În acest studiu au fost constatată prezenţa orificiilor supranumerare.

News Theme

Knowledge of mandibular and mental foramina location is useful for the oral and maxillofacial surgeon in orthognatic surgery, especially in vertical ramus osteotomy procedure, in local anesthesia making. The development of implant techniques increased the interest in the mandible anatomy, specially the mandibular foramen localization. Despite this interest a small number of papers has been published on the position of mental foramen. The knowledge of the additional foramina may be important for the radiotherapists while planning radiation therapy. This knowledge is also important for orthognathic or reconstructive surgeries of the mandible and dental implant procedures.

Aim

The aim of this study is to describe morphological variability of mandibular canal and to analyse the position, shape and size of the mandibular and mental foramina in order to provide simple and reliable surgical landmarks.