

ความผิดปกติของแขนงหลอดเลือด Aortic arch ในศพดองคนไทย และการประยุกต์ใช้ทางคลินิก: กรณีศึกษาพบได้ยาก 1 ราย

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Abnormality of Aortic Arch Branching in a Thai Embalmed Cadavers and its Clinical Application: A Rare Case Report

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หลักการและวัตถุประสงค์: ในพัฒนาการปกติการให้แขนงหลอดเลือดแดงใหญ่บริเวณ aortic arch (AA) จะมีแขนงอยู่ 3 แขนงได้แก่ 1) Brachiocephalic trunk 2) Left common carotid artery และ 3) Left subclavian artery ความผิดปกติของรูปแบบหลอดเลือดเหล่านี้มีความสำคัญในการพิจารณาเพื่อวางแผนการผ่าตัดรักษาบริเวณทรวงอกเป็นอย่างมาก แม้ว่าจะมีรายงานความผิดปกติของการพัฒนาของหลอดเลือดดังกล่าวในศพดองที่พบในต่างประเทศอยู่บ้างแล้ว แต่ยังไม่เคยมีรายงานการพบแขนงที่ผิดปกติของหลอดเลือดแดงนี้ในคนไทยมาก่อน

วิธีการศึกษา: ทำการผ่าชำแหละร่างดองอาจารย์ใหญ่คนไทย ในระหว่างการสอนนักศึกษาแพทย์ของวิทยาลัยแพทยศาสตร์และการสาธารณสุข มหาวิทยาลัยอุบลราชธานี โดยทำการผ่าเปิดช่องอกอย่างระมัดระวังเพื่อทำการศึกษาลักษณะโครงสร้างทางกายวิภาคศาสตร์ของแขนงหลอดเลือดที่วิ่งออกจากหัวใจจากร่างดองอาจารย์ใหญ่เพศหญิง 10 ร่าง และเพศชาย 12 ร่าง

Background and Objective: In normal development, the aortic arch (AA) gives 3 major branches: 1) Brachiocephalic trunk, 2) Left common carotid artery, and 3) Left subclavian artery. The abnormality of those AA branching is important for thoracic surgery consideration. Although the abnormality of aortic arch branching has been reported in some races, this abnormality in Thai cadavers has never been investigated previously.

Method: Dissections in this study were performed in Thai embalmed cadavers during teaching gross anatomy for Medical students of Ubon Ratchathani university. The cadavers were carefully dissected thoracic region to investigate the anatomical structures of AA branching. This study was carried out from 10 female and 12 male cadavers.

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ผลการศึกษา: จากร่างอาจารย์ใหญ่จำนวน 22 ร่างได้สังเกตเห็นว่ามีความผิดปกติของ left vertebral artery ในร่างของอาจารย์ใหญ่เพศชาย 1 ร่าง อายุ 58 ปี (คิดเป็นร้อยละ 4.55) โดย left vertebral artery ที่มีความผิดปกตินี้ได้แตกแขนงมาจาก AA บริเวณที่อยู่ระหว่าง left common carotid artery และ left subclavian artery ซึ่งสามารถสังเกตเห็นได้อย่างชัดเจน

สรุป: รายงานความผิดปกติที่พบได้ยากของจุดกำเนิดของ vertebral artery ที่แตกแขนงจาก AA ในครั้งนี้เป็นอีกหนึ่งข้อมูลที่มีความสำคัญยิ่งต่อการพิจารณาวางแผนทำการผ่าตัดรักษาบริเวณทรวงอกและเพื่อลดความผิดพลาดในการแปลผลภาพรังสีในระหว่างการทำ angiography ของรังสีแพทย์

คำสำคัญ: ความผิดปกติของแขนงหลอดเลือด aortic arch,

Result: From total 22 cadaveric samples, it was noted that only one male cadaver (58 years old, 4.55% of total investigated samples) has abnormality of the left vertebral artery obviously projected from the AA by running out between the left common carotid artery and left subclavian artery.

Conclusion: The information of this rare variation in the origin of vertebral artery from the AA is of the most importance to surgeons performing surgery in thoracic region. For radiologist, it is noted to avoid the misinterpretation of radiographs during performing angiography.

Keywords: Abnormality of aortic arch branching

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Introduction

Aortic arch (AA) is the largest artery responsible for blood circulating through its branches to supply the neck, head, and upper extremity of human body. In embryology, the AA is developed from the fourth pair of pharyngeal arch artery¹. When fully developed, the AA located at the superior mediastinum, will branch out into 3 branches which are the brachiocephalic trunk (BCT), the left common carotid artery (LCCA), and the left subclavian artery (LSA), respectively^{2,3}. Many studies have reported the abnormalities of the AA arising⁴⁻⁸. Such variation was documented to be a congenital abnormality^{4,6,8,9} and reported in different shapes, arrangements, and numbers of aortic branches¹⁰⁻¹². It was also found that the abnormalities were varying in the branch of the brachiocephalic trunk^{5,7,13}. In addition, the abnormalities of the common carotid artery have been observed^{7, 13}. Moreover, the variations in the position of vertebral artery and the subclavian artery have been reported in many races^{11, 13-20}. Based on such findings, the aortic branching variations are still rarely recorded in many countries including Thailand. Therefore, we attempted to report the patterns of abnormality of the branching and the position of the branch arising from the AA during medical teaching for human gross anatomy as possible. Hopefully, the result gained in this study will be useful not only for anatomical variation recording of AA branching but also for surgeons and radiologists to consider and avoid the misinterpretation of radiographs during performing angiography.

Case report

The proposal for this study has been approved by the Ethics of Human-related Research Committee of Ubon Ratchathani university (certificate of approval number: UBU - REC- 27/2562), Thailand. During the instruction and systemic dissection for laboratory teaching of the cardiovascular system and mediastinum for medical students at the College of Medicine and Public Health at Ubon Ratchathani University, 22 embalmed cadavers (12 males and 10 females) were carefully dissected at heart and AA to observe the branching patterns. These embalmed cadavers were kindly provided from Department of Anatomy, Faculty of Medicine, Khon Kaen university, Thailand. In all cases, it was found that the variant AA arising was observed in a male cadaver (58 years old) or approximately 4.54 % of abnormality investigated (Fig. 1). This AA has four branches as followings, 1) the brachiocephalic trunk (BCT), 2) the left common carotid artery (LCCA), 3) the left vertebral artery (LVA), and 4) the left subclavian artery (LSA) as shown in Figure 1.

It was noted that the BCT is the first branch of the AA connected to the top of the ascending aorta (Fig.1). The BCT usually has two branches which normally consists of the right subclavian artery supplying the right upper limb, while the right common carotid artery supplies the organs belonging to the neck and the right side of the head. The LCCA arises from the upper surface of AA where it starts to be the curve and runs up to supply the organs in the neck and on the left side of the head (Fig.1). Differ-

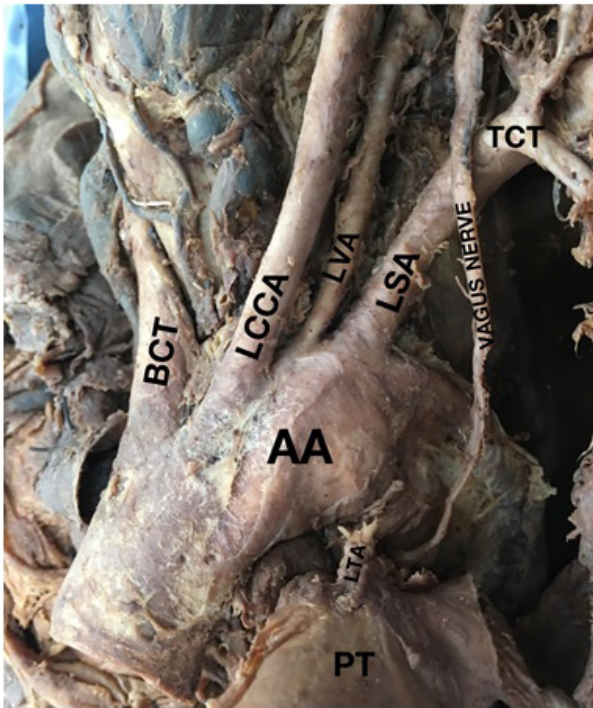


Figure 1 Demonstrating the variation of branching pattern arising from aortic arch. AA; aortic arch, BCT; brachiocephalic trunk, LCCA; left common carotid artery, LVA; left vertebral artery LSA; left subclavian artery, TCT; thyrocervical trunk, PT; pulmonary trunk, and LTA; ligamentum arteriosum

ently, the LVA branches from the upper ridge curve of the AA to supply the ventral surface of pons and the medulla oblongata. We observed that the left vertebral artery is located in a false position which was found to arise between the LCCA and the LSA as shown in Figure1. The LSA branches from the top ridge of AA and runs to supply the left upper limb. In morphometric study using a transverse plane measurement at the same level, the diameters of the BCT, LCCA, LVA, and LSA were approximately 15.14, 5.81, 4.34, and 6.99 millimeters, respectively.

Discussion

The abnormalities of the AA of human subjects have been documented in many countries including Nepal, Germany, India, U.S.A., China, Iran, and Jordan, The incidences of such AA variation were 2.0, 4.2, 14.66, 34, 33.5, 16.2, 0.9, and 38.8%, respectively^{6,7,10,12,13,15-17}. In this recent study in Thais, we have only observed the AA abnormality in one male case (4.54%), which is similar to that finding in a male in Singaporean⁵ and in Japanese¹⁹. In Chinese, the incidence of this AA abnormality was frequently found often in females¹⁷. The pattern of aortic branching abnormality found in our case was found at the

position of the left vertebral artery branch as it directly arises from the aortic arch. The left vertebral artery branch was found between LCCA and LSA. It originates directly from AA between LCCA and LSA. This observation is similar to that from many previous studies^{5,6,12,14,15,17}. In the literatures, various studies have been conducted to investigate the abnormalities of the AA in terms of extra branches^{5,6,11}, fewer branches^{7,12,13}, and false positions of the branches from the aortic arch^{5,6,13,14}. In clinical significance, all findings from previous studies are useful and important for assisting surgeons to diagnose correctly regarding operations of thoracic and neck vessels¹⁰. Additionally, it is also essential for thoraco-cervical aortic surgery⁷. Especially, this variant information is may be used for first reconsideration to avoid the misinterpretation before inserting aortic instrumentation into the branches of the AA under angiograph.

Conclusion

This variant information gained from our observation can be used for the first reconsideration to avoid the misinterpretation before inserting aortic instrumentation into the branches of the aortic arch under angiograph.

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