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Original Research Article

Arteria Lusoria: Descriptive Anatomy, Topography and Clinical Implications at the HUBERT KOUTOUKOU MAGA National University Hospital Center (CNHU-HKM)

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ABSTRACT

Background: The presence of a right aberrant subclavian artery, also known as the lusoria artery, is the most frequent anomaly of the aortic arch. The aim of this study was to describe the anatomy of the lusoria artery and its relationships on CT scans in melanoderm subjects at the CNHU-HKM in Benin.

Methods: This was a descriptive cross-sectional study with retrospective data collection, conducted from January 2018 to December 2021 at the CNHU-HKM. It focused on thoracic angioscans and thoraco-abdomino-pelvic scans that revealed a lusoria artery in patients referred to the medical imaging department. The sampling was exhaustive. Image analysis was performed using Radiant DICOM Viewer software.

Results: A total of 11 cases of lusoria artery were identified among the 732 scans studied, representing a frequency of 1.5%, with a sex ratio of 0.22. The mean age of the patients was 50.81 ± 14.54 years. The discovery of the lusoria artery was incidental in all patients. The lusoria arteries arose from the aortic arch, on average 7.59 mm after the left subclavian artery, with a mean diameter of 14.86 mm at the origin. They all had a retro-esophageal course. The bicarotid trunk was the most frequent associated anatomical variation (90.9%) with a mean length of 11.84 mm. This was followed by Kommerell's diverticulum (18.18%). One case of a common origin of the subclavian arteries and bicarotid trunk associated with the lusoria artery was noted.

Conclusion: The lusoria artery is a rare anatomical variation that predominantly affects women. Often discovered incidentally, it arises from the aortic arch and has a retro-esophageal course. It is almost constantly associated with a bicarotid trunk.

KEYWORDS: Lusoria artery - bicarotid trunk - CT scan - Kommerell's diverticulum - Benin.

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INTRODUCTION

The presence of a right aberrant subclavian artery, or lusoria artery, is the most common anomaly of the aortic arch with a prevalence of 0.5 to 2.5% [1]. This variation is characterized by four vessels that sequentially arise from the aortic arch, namely the right common carotid artery, left common carotid

artery, left subclavian artery, and the aberrant right subclavian artery. The latter travels upwards and to the right in the posterior mediastinum [1]. It results from an anomaly in the complex remodeling of the aortic arches during embryonic development [2]. The aberrant right subclavian artery is often discovered incidentally [3]. With the advancement and better availability of imaging techniques such as CT scans, this variant is frequently identified [4].

Most individuals with a retroesophageal right subclavian artery do not present with symptoms. In symptomatic cases, dysphagia lusoria resulting from compression of the esophagus by the lusoria artery is the most common sign and is observed in 20 to 40% of subjects [5]. Other clinical signs such as dyspnea, chronic cough, and chest pain may also be observed [6,7].

The aberrant right subclavian artery presents dilation at its origin at the aortic arch, known as Kommerell's diverticulum, in 20 to 60% of cases [8]. There is a high risk of rupture of this diverticulum, which is generally fatal with a clinical expression similar to that of an aortic aneurysm rupture [9]. In addition, stenosis of the lusoria artery can lead to a difference in blood pressure between the two thoracic limbs as well as claudication of the right thoracic limb [10]. Moreover, the presence of an aberrant right subclavian artery can make right transradial catheterization more difficult for coronary angioplasty [11]. Since its first description in 1735 by Hunauld [12], the lusoria artery has been the subject of several studies, especially in Western countries [4]. What about this anatomical variation in Benin where there is almost no study on the lusoria artery? This study aimed to describe the anatomy of the lusoria artery and its relationships on CT scans in melanoderm subjects at CNHU-HKM in Benin.

METHODS

This was a descriptive cross-sectional study with retrospective data collection that took place over 4 years, from January 2018 to December 2021 at the CNHU-HKM. It focused on thoracic angioscans and thoraco abdomino pelvic scans that revealed a lusoria artery in patients referred to the medical imaging department. All exams were performed using a SIEMENS Somatom Emotion Excel Edition 16-slice scanner, Germany, according to a standard protocol with injection of iodinated contrast agent. The sampling was exhaustive. Patients with suboptimal examination due to technical reasons and those with a mediastinal expansive process that could modify the relationships of the lusoria artery were excluded. Image analysis was performed using Radiant DICOM Viewer software. The collected data were processed and analyzed using Microsoft Excel 2016 software.

RESULTS

During the study period, 732 thoracic angioscans and thoracoabdominopelvic scans were performed at the CNHU-HKM medical imaging department. A total of 11 cases of lusoria artery were identified, representing a frequency of 1.5% and 2.75 cases per year. The mean age of the patients was 50.81 ± 14.54 years, with a range of 26 to 70 years. A female predominance was noted with a sex ratio of 0.22.

The search for pulmonary embolism was the reason for performing the scans in 3 patients (27.27%). Dyspnea on exertion and chronic cough were found, among other things, in one case (9.09%) each. The discovery of the lusoria artery was incidental in all patients.

All patients had a retroesophageal lusoria artery that arose from the aortic arch after the left subclavian artery (Figure 1,2). The mean diameter of the lusoria arteries at their origin was 14.86 ± 2.64 mm, with a range of 10.61 mm to 20.70 mm. The mean distance between the lusoria artery and the left subclavian artery was 7.59 mm ± 5.60 mm, with a range of 1.27 mm to 18.80 mm.

The bicarotid trunk was found in 10 cases (90.90%) (Figure 3). Its mean length was 11.84 mm ± 5.01 mm with extremes of 9.36 mm and 18.50 mm. Kommerell's diverticulum was detected in 2 patients (18.18%). One case of a common origin of the subclavian arteries and the bicarotid trunk associated with the lusoria artery was noted.

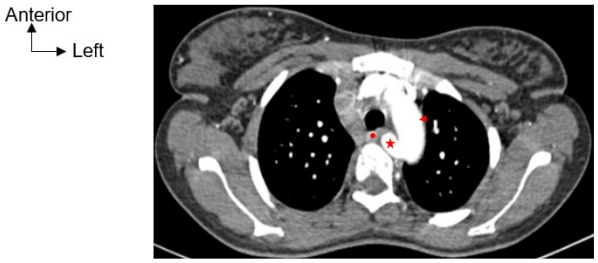

Fig. 1: Chest CT scan with iodinated contrast injection. Axial section in parenchymal window showing a lusorian artery (asterisk). Aortic arch (arrowhead), oesophagus (dot).

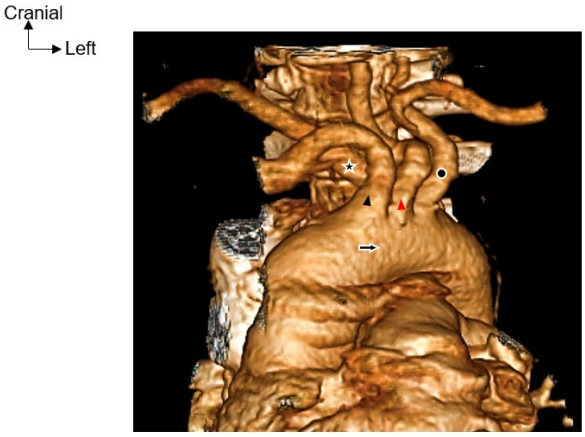

Fig. 2: Three-dimensional reconstruction of the aortic arch (arrow) and its branches based on a chest CT scan with iodinated contrast injection. Ventro-lateral view showing a lusoria artery (asterisk), left subclavian artery (dot), right common carotid artery (black arrowhead), and right common carotid artery (red arrowhead).

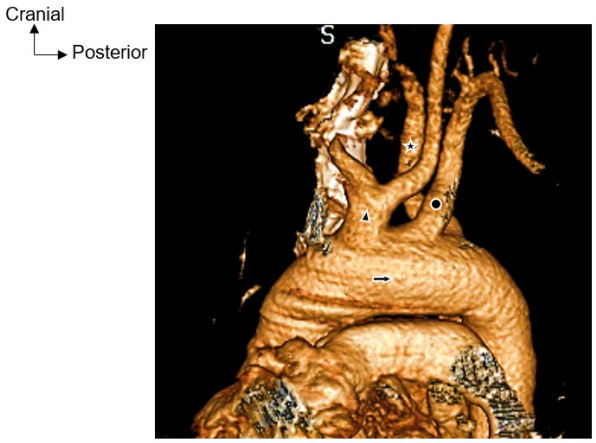

Fig. 3: Three-dimensional reconstruction of the aortic arch (arrow) and its branches based on a chest CT scan with iodinated contrast injection. Ventro-lateral view showing a lusoria artery (asterisk) associated with a bicarotid trunk (arrowhead), and the left subclavian artery (dot).

DISCUSSION

The frequency of 1.5% found in this study confirms the rarity of the aberrant right subclavian artery, but it remains the most common congenital anomaly of the aortic arch [13]. Literature data report a frequency ranging from 0.5% to 2% [13, 14]. Most authors found a female predominance, as we did. Percentages ranging from 55.3% to 66.67% have been reported by Polguj et al [5] and Jain et al [16].

The majority of the different scans performed on the patients were requested to explore pathologies that were not a priori related to the presence of the aberrant right subclavian artery. The aberrant right subclavian artery is most often asymptomatic because it does not form a complete vascular ring around the trachea or esophagus [5]. However, it can be symptomatic in three cases: when the esophagus and trachea are compressed between the aberrant right subclavian artery behind and a bicarotid trunk in front, or with an aneurysm of the aberrant right subclavian artery, or with age when the aberrant right subclavian artery becomes rigid due to atherosclerosis [4]. In our series, one patient had exertional dyspnea and another had chronic cough, which symptoms were also reported by Massaro et al [17] and Ndiaye et al [18]. However, it is difficult to attribute these signs exclusively to the presence of the aberrant right subclavian artery.

All patients had a retroesophageal aberrant right subclavian artery arising from the aortic arch after the left subclavian artery. The aberrant right subclavian artery is retroesophageal to reach the right axillary region in 83% of cases, inter trachea esophageal in 12% of cases, and pretracheal in 4% of cases [20]. Mc Donald et al [15] and Carles et al [21] reported, as we did, only retroesophageal arteries in series of 7 and 382 cases of aberrant right subclavian artery, respectively. This is why the aberrant right subclavian artery is also called the retroesophageal subclavian artery. Jeannon [19] reported a mean diameter at the origin of the aberrant right subclavian artery of 16.4 mm in a CT study in Nancy, France. Alghamdi et al [15] measured a diameter of 16 mm during dissection in Saudi Arabia. These differences with our results (14.86 mm) could be related to inter-operator variations.

The predominance of the bicarotid trunk as an associated variation has also been

highlighted in the works of Polguj et al (19.2%) [5] and Jeannon (49%) [19]. According to some authors [22], the bicarotid trunk would be more frequent in melanoderms. The bicarotid trunk results embryologically from the persistence of the third pair of aortic arches [23]. The presence of the combination of these two anatomical variations could influence therapeutic decisions in several specialties such as interventional cardiology, interventional neurology, and cardiothoracic surgery [24]. According to Tanaka et al [8], the Kommerell diverticulum is associated with the aberrant right subclavian artery in 20 to 60% of cases. It should be noted that although the Kommerell diverticulum is known as a dilation at the origin of the aberrant right subclavian artery, there is no consensus on the limit size of the ostium of the aberrant right subclavian artery [19]. In addition, there is no clear distinction between an aneurysm and the diverticulum of the aberrant right subclavian artery, and several authors have used these terms interchangeably, leading to differences in reported results [5]. Patients with a Kommerell diverticulum have a high risk of rupture and compression of neighboring structures [25]. Furthermore, we noted a case of common origin of the subclavian arteries associated with the aberrant right subclavian artery. Wangermez et al [22] had identified the birth of the subclavian arteries by a common trunk as a very rare anatomical variation. Cetin et al [26] reported a case of a common trunk of the subclavian arteries associated with a common trunk of the vertebral arteries.

CONCLUSION

The aberrant right subclavian artery remains in Benin a rare anatomical variation that has a female predominance. It originates from the aortic arch and has a retro-esophageal course. It is almost constantly associated with a bicarotid trunk. Being often discovered fortuitously, it is necessary to disclose this anatomical variant, especially since it can be symptomatic in certain cases.

Conflicts of Interests: **None**

REFERENCES

[1]. Zapata H, Edwards JE, Titus JL. Aberrant right subclavian artery with left aortic arch: associated cardiac anomalies. Pediatr Cardiol. 1993;14(3): 159-61.

[2]. Vucemilo I, Harlock AJ, Qadura M, Guirgis M, Gowing NR, Tittley GJ. Hybrid repair of symptomatic aberrant right subclavian artery and Kommerell's diverticulum. Ann Vasc Surg. 2014;28(2):411-20.

[3]. Coþkun E, Altýnay L, Tekin A, Tütün U. Aberrant right subclavian artery (arteria lusoria) aneurysm with a Kommerell's diverticulum. J Vasc Bras. 2019;18:1-4.

[4]. Myers PO, Fasel JHD, Kalangos A, Gailloud P. Arteria lusoria: Developmental anatomy, clinical, radiological and surgical aspects. Annales de Cardiologie et d'Angéiologie. 2010;59:147-54.

[5]. Polguj, £, Chrzanowski JD, Kasprzak L, Stefañczyk M. The aberrant right subclavian artery (arteria lusoria): the morphological and clinical aspects of one of the most important variations: a systematic study of 141 reports. Sci World J. 2014;2014 :292734.

[6]. Padmanabhan A, Thomas AV, Sandeep GSK. Aberrant right subclavian artery syndrome manifesting as focal tracheomalacia. Lung India. 2017;34: 292-94.

[7]. Rosa P, Gillespie DL, Goff JM. Aberrant right subclavian artery syndrome: a case of chronic cough. J Vasc Surg. 2003;37(6):1318-21.

[8]. Tanaka A, Milner R, Ota T. Kommerell's diverticulum in the current era: a comprehensive review. Gen Thorac Cardiovasc Surg. 2015;63:245-59.

[9]. Mossad et al. Diverticulum of Kommerell: A Review of a Series and a Report of a Case with Tracheal Deviation Compromising Single Lung Ventilation. Anesth Analg. 2002;94(6):1462-4.

[10]. Tuleja A, Baumgartner I, Schindewolf M. Claudication Caused by stenosis of arteria lusoria-Case Report and Review of Literature. Clinical Medicine Insights. 2019;12:1-2.

[11]. Abhaichand RK, Louvard Y, Gobeil JF, Loubeyre C, T. The problem of arteria lusoria in right transradial coronary angiography and angioplasty. Catheterization and Cardiovascular Interventions. 2001;54(2):196-201.

[12]. Hunauld PM. Examen de quelques parties d'un singe. Hist Acad Roy Sci. 1735;2:516-23.

[13]. Türkvatan A, Büyükbayraktar FG, Olçer T, Cumhur T. Congenital anomalies of the aortic arch: evaluation with the use of multidetector computed tomography. Korean J Radiol. 2009;10(2):176-84.

[14]. Alghamdi MA, Al-Eitan LN, Elsy B, Abdalla AM. Aberrant right subclavian artery in a cadaver: a case report of an aortic arch Anomaly. Folia Morphol. 2021;80(3):726-29.

[15]. McDonald JJ, Anson BJ. Variations in the origin of arteries derived from the aortic arch, in American whites and negroes. Am J Phys Anthrop. 1940;27:91-107.

[16]. Jain KK, Braze AJ, Shapiro MA, Perez-Tamayo RA. Aberrant right subclavian artery-esophageal fistula and severe gastrointestinal bleeding after surgical correction of scimitar syndrome. Texas Heart Institute Journal. 2012;39(4):571-74.

[17]. Massaro N, Verro B, Greco G. Dyspnea in Patient with Arteria Lusoria: A Case Report. Iranian Journal of Otorhinolaryngology. 2020;32(5):112.

[18]. Ndiaye K, Abbassi A, Traoré S, Vagba J, Aouami A, Berret M. Arteria lusoria dyspnéisante: à propos d'un cas. Pan Afr Med J. 2020;37(7):318.

[19].Jeannon F. Arteria Lusoria: Etude morphodensitométrique de 150 cas ; applications cliniques. Thèse de Doctorat en Médecine. Université Henri Poincaré Nancy I. 2011:58-65.

[20]. Stone WM, Ricotta JJ, Fowl RJ, Garg N, Bower TC, Money SR. Contemporary management of aberrant right subclavian arteries. Ann Vasc Surg. 2011;25:508-14.

[21]. Carles D, Pelluard F, André G, Nocart N, Sauvestre F. L'artère sous-clavière droite aberrante (arteria lusoria) et le risque de trisomie 21. Analyse rétrospective de 11 479 examens fœtopathologiques. Journal de Gynécologie Obstétrique et Biologie de la Reproduction. 2014;43(9):698-703.

[22]. Wangermez J, Bonjean P. Variations raciales dans l'origine des branches de la crosse de l'aorte. Bulletins et Mémoires de la Société d'anthropologie de Paris. 1978;13(5):179-88.

[23]. Poultsides GA, Lolis ED, Vasquez J, Drezner AD, Venieratos D. Common origins of carotid and subclavian arterial systems: report of a rare aortic arch variant. Ann Vasc Surg. 2004;18(5):597-600.

[24]. Norris CR, Wilson CA, Lin MC. Truncus bicaroticus with Arteria Lusoria: A Rare Combination of Aortic Root Anatomy Complicating Cardiac Catheterization. Fed Pract. 2021;38(2):84-8.

[25]. Li T, Zou L, Feng Y, Fan G, Xin Y. Hybrid repair of aberrant right subclavian artery with aortic dissection caused by Kommerell diverticulum. BMC Cardiovasc Disord. 2022;21(1):562.

[26]. Cetin I, Varan B, Arman U. Tronc commun des artères sous-clavières et vertébrales : une nouvelle anomalie congénitale des troncs supra-aortiques. Ann Vasc Surg. 2009;23:142-43.

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