Simultaneous Occurrence of Three Anatomical Variations: Anomalous Right Subclavian Artery, Non-Reccurrent Inferior Laryngeal Nerve and Right Thoracic Duct

Ocurrencia Simultánea de Tres Variaciones Anatómicas: Arteria Subclavia Derecha Anómala, Nervio Laringeo Inferior no Recurrente y Conducto Torácico Derecho

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SUMMARY: In one male cadaver of Colombian nationality, dissected by a group of medical students during a gross anatomy course at the Universidad del Valle in Cali, Colombia, three anatomical variations were found: an anomalous or aberrant right subclavian artery (ARSA), a non-recurrent inferior laryngeal nerve and a right thoracic duct. The aortic arch gave origin to four instead of three arteries, which, from right to left, were the right common carotid, the left common carotid, the left subclavian and the right subclavian arteries. The anatomical variation of the right subclavian artery is known also as lusoria artery, in which case the artery passes behind the esophagus and the trachea in its course towards the right side of the neck. The perimeters of the aortic arch and of the lusoria artery were measured in different sites; those of the lusoria artery gradually reduced during the course of the artery towards the right side of the neck. The non-recurrent inferior laryngeal nerve originated at a right angle from the right vagus nerve, at the level of the thyroid gland. The nerve described a horizontal course in its way towards the larynx, passing behind the right lobe of the gland, in close relation with the branches of the inferior thyroid artery. Of the three possible variations in the course of the non-recurrent inferior laryngeal nerve, the one found corresponds to thehorizontal course or type II. The course of the thoracic duct in the thorax was normal, situated behind the esophagus, between the azygos vein and the thoracic aorta, but it gradually deviated towards the right side of the neck to end in the internal jugular vein. Out of the extensive databases that were consulted, only one report was found of these three simultaneous variations.

KEY WORDS: Aberrant right subclavian artery; Recurrent laryngeal nerve; Thoracic duct; Genetic variation.

INTRODUCTION

At present, a significant number of worldwide reports can be found in the area of the anatomical variations. These are important because they can be the cause of clinical manifestations, such as dysphagia due to compression of the esophagus in the case of an anomalous right subclavian artery or dysphagia lusoria (Epstein & Debord, 2002) or by the vascular ring formed by a double aortic arch (Marquez & García, 2004). In surgery, the knowledge of the possible anatomical variations that can be found in a determined organ or structure can prevent injuries in the patient, many of them possibly irreversible.

CASE REPORT

In a male cadaver of Colombian nationality, dissected by a group of medical students during a gross anatomy course at the Universidad del Valle, in Cali, Colombia, the simultaneous occurrence of three anatomical variations was found. It is to be noted that of all the approximately 360 or more cadavers dissected in the cadaver lab of this University during the last 35 or more years, it was the first time that a case like this was detected.

In this cadaver, the aortic arch gave origin to four instead of three arteries which, from right to left, were the right common carotid artery that coursed towards the right side of the neck passing in front of the trachea, the left common carotid artery, the left subclavian artery and the right subclavian artery, which in its course towards the right side passed behind the esophagus (Fig. 1). This variation is known as lusoria artery (Algieri et al., 2008), anomalous right subclavian artery (ARSA) or retroesophageal right subclavian artery (RRSA) (Nathan & Gitlin, 1968).
The perimeter of the aortic arch was measured in two parts and that of the aberrant right subclavian artery in three. The perimeter of the aorta before giving rise to the right common carotid artery was 67 mm and before the origin of the lusoria artery was 68 mm. The lusoria artery had a perimeter of 41 mm in its pre-esophageal portion, 34 mm in its retroesophageal portion and 31 mm in its post-esophageal portion, which means that the perimeter diminished gradually as the artery coursed towards the right side of the neck.

Figure 2 corresponds to the right side of the neck. The great vessels were separated to show the vagus nerve (VN) giving origin to a right non-recurrent inferior laryngeal nerve (NRILN), which arises at a right angle and follows a horizontal trajectory in its way towards the larynx, passing behind the right lobe of the thyroid gland. Out of the three possible variations of the NRILN, this corresponds to the type II.

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Figure 2 corresponds to the right side of the neck. The right common carotid artery was displaced to the left in order to observe the vagus nerve which, at the level of the thyroid gland originates a non-recurrent inferior laryngeal nerve at a right angle. The nerve follows a horizontal trajectory on its way towards the larynx, passes behind the thyroid gland, in close relation with the branches of the inferior thyroid artery, and enters the larynx as the inferior laryngeal nerve. There are three types of variations for this non-recurrent laryngeal nerve: type I with descending trajectory, type II with horizontal trajectory and type III with ascending trajectory (Weiand & Mangold, 2004); type II is the one found in the case of this report.

Fig. 3. Anterior view of the posterior mediastinum. The esophagus (E) was displaced to the right to show the thoracic duct (arrows) in front of the vertebral bodies, between the azygos vein (VA) and the descending aorta (A). In its upper part the duct gradually deviates towards the right side of the mediastinum. Reproduced with permission of the Editorial Board of Biomedical. Published in: Peña & Zuñiga (2009).
Figure 3 corresponds to the posterior mediastinum of the thoracic cavity. The thoracic aorta can be observed to the left and the esophagus was displaced to the right, in order to discover the thoracic duct. This appears as a slender, white and sinuous duct situated between the aorta and the azygos vein, in front of the vertebral bodies. In the upper part of the thorax the duct gradually deviates towards the right side of the mediastinum.

Figure 4 is the right side of the neck, where the thoracic duct can be appreciated describing a slight curve of superior convexity before opening in the right internal jugular vein.

The presence of a non-recurrent inferior laryngeal nerve accompanied a lusoria artery has been reported (Casal et al., 2010; Namking et al., 2009), but in the literature extensively reviewed so far, only one report was found (Namking et al.) of the three simultaneous variations present in this Colombian individual. It is the case of an 80 year-old female cadaver of Thai nationality, dissected in the gross anatomy laboratory of the Khon Kaen University. The diameter of the left subclavian and of the anomalous right subclavian arteries were measured at their origin, being that of the lusoria artery almost twice that of the left vessel. In our case, the diameter of the lusoria artery at its origin (pre-esophageal part) was considerably bigger (41 mm) than that of the Thai female (15.4 mm).

The lack of reports of these three simultaneous anatomical variations could be the result of not having in mind the possibility that, whenever a lusoria artery develops, it can be accompanied by a non-recurrent inferior laryngeal nerve and by a right thoracic duct.

As noted by Nathan & Gitlin, a thoracic duct ending at the right venous angle may or may not be accompanied by anomalies of the large arteries. The extent to which anomalies in the origin and course of the large arteries is accompanied by anomalies of the thoracic duct is not known, since in these cases the thoracic duct is not considered. However, ignoring the possible existence of a right lymphatic duct may lead to its injury or section in the course of a neck surgery, with a subsequent lymph leakage or even a chylothorax (Kaul et al., 1976).
Nathan & Gitlin, report the simultaneous occurrence of a thoracic duct terminating on the right side, at the junction of the internal jugular and subclavian veins, a right subclavian artery arising as the last branch of the aortic arch, beyond the left subclavian artery, and the right and left common carotid arteries arising by a common stem (truncus bicauriticus) from the aortic arch. They briefly describe the embryological basis for the development of these variations and suggest that special attention should be directed to the course of the thoracic duct whenever an anomaly of the branches of the aortic arch is observed.

Another case of three simultaneous variations is the report of Chen et al. (2006), about bilateral thoracic ducts coexisting with a persistent left superior vena cava, being this last variation one of the most common developmental anomaly of the larger systemic veins.

RESUMEN: En un cadáver de nacionalidad colombiana, disecado por un grupo de estudiantes de medicina durante un curso de anatomía macroscópica en la Universidad del Valle de Cali, Colombia, tres variaciones anatómicas fueron encontradas: una arteria subclavia derecha anómala, un nervio laríngeo inferior no recurrente y conducto torácico derecho. El nervio laríngeo inferior no recurrente se originaba en un ángulo recto del nervio vago derecho, a la altura de la glándula tiroidea. El conducto torácico derecho emergía cuatro en lugar de tres arterias, las cuales de derecha a izquierda eran las arterias carótida común derecha, carótida común izquierda, subclavia izquierda y subclavia derecha. Esta variación anatómica de la subclavia se conoce también como arteria lusoria, en cuyo caso la arteria pasa por detrás del esófago y de la tráquea en su curso hacia el lado derecho del cuello. Los perímetros del arco aórtico y de la arteria lusoria fueron medidos en diferentes sitios; los de la arteria lusoria fueron disminuyendo gradualmente en el curso de la arteria hacia el lado derecho del cuello. El nervio laríngeo inferior no recurrente se originaba en un ángulo recto del nervio vago derecho, a la altura de la glándula tiroidea. El nervio siguió un curso horizontal en dirección a la laringe, pasando por detrás del lobo derecho de la glándula, en estrecha relación con las ramas de la arteria tiroidea inferior. De los tres tipos de variación posibles en el curso del nervio laríngeo inferior no recurrente, el encontrado corresponde a la del curso horizontal o tipo II. El curso del conducto torácico en el tórax fue normal, situado por detrás del esófago, entre la vena ácigos y la aorta torácica, pero gradualmente se fue desviando hacia el lado derecho del cuello para desembocar en la vena yugular interna. En las extensas bases de datos consultadas solo se encontró un reporte de estas tres variaciones simultáneas.

PALABRAS CLAVE: Arteria subclavia derecha anómala; Nervio laríngeo inferior no recurrente; Conducto torácico derecho; Variaciones genéticas.

REFERENCES


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