

The Anomalous Trunkus Brachiocephalicus and Its Clinical Significance

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ABSTRACT

The brachiocephalic trunk is a major short artery from the arch of the aorta which supplies the right arm and head. The anomalous course of the brachiocephalic trunk is significant because it can

cause fatal haemorrhage during any midline neck surgery.

The vascular sling can cause tracheal compression in infants. The present study points out the significance of the pre-surgical evaluation of the vascular pattern in the corresponding area.

Key Words: Brachiocephalic trunk, Tracheal compression

INTRODUCTION

A case of the aberrant origin and the course of the brachiocephalic trunk has been presented here. As the pre tracheal region is frequently approached for life saving surgical procedures, the unnoticed vascular anomalies in this region may turn fatal. This case is of diagnostic importance because it is the commonest cause of air way compression by a vascular ring in children. The mere shifting of the origin of the brachiocephalic trunk may cause tracheal indentation.

MATERIALS AND METHODS

During routine dissection of the neck in a 60-years old male cadaver [death due to cardiac arrest], a horizontally placed artery was noticed just below the thyroid isthmus. The artery was traced upto its origin and its termination. The adjacent and related viscera were examined for ruling out any compression effects and haemodynamic changes.

CASE REPORT

The artery which crossed the trachea along the lower border of the thyroid gland was identified as the brachiocephalic trunk. The morphology of the artery was normal. Its origin was 2.2 cms to the left of the midline. By an oblique course, it crossed the trachea over the 4th and 5th tracheal rings and reached upto the 3rd ring [Table/Fig-1]. On reaching the right side, it divided into the right common carotid artery and the right subclavian artery. The level of its termination was 2.2cm above the right sterno clavicular joint. The brachio cephalic trunk was 6.7cm long. The trachea did not reveal any signs of a constriction. The thyroid gland showed normal morphology. The heart did not show any haemo dynamic alteration.

DISCUSSION

The brachiocephalic trunk is otherwise called as the innominate artery. Normally, it arises from the convexity of the aortic arch, posterior to the centre of manubrium sterni. Its origin is anterior to the trachea and posterior to the left brachio cephalic vein. From the posterior part of the inferior portion of the manubrium of the



[Table/Fig-1]: Specimen showing the anomalous brachiocephalic trunk. A.Arch of Aorta B.Brachiocephalic trunk

sternum, the arterial trunk passes upwards to the level of the right sternoclavicular joint and it divides into right the sub-clavian artery and the right common carotid artery [1]. In our specimen, the origin of the brachiocephalic trunk was shifted to the left of the midline by 2.2 cm. The left brachiocephalic vein did not show any anatomical variation.

A minimal shift in the origin to the left of the trachea is actually normal in children [2]. The aberrant innominate artery which arises on the left side and crosses the trachea from the left to the right may cause tracheal indentation and pressure changes in the trachea [3]. The syndrome of innominate artery compression of the trachea was first reported in 1948 [4]. The symptomatic innominate artery syndrome is more likely to arise in patients with a crowded superior mediastinum [5]. One of the causes of tracheomalacia is the extrinsic pressure which is caused by an aberrant artery and one of the major causes of congenital vascular compression is an anomalous innominate artery [6].

The symptomatic patients typically present with expiratory stridor, cough, recurrent bronchopulmonary infections, and occasionally, apnoea [7]. In our specimen, the trachea was apparently normal. By 3 years of age, the growth of the aortic arch causes the innominate artery to move cranially to the right, and anteriorly, away from the trachea. Other factors, including the continued growth of the supportive tracheal cartilage, thymic involution, and rib cage growth may also be partially responsible for the decreased incidence of the tracheal compression with advancing age [8].

In the present case, we could not make out any haemodynamic changes in the heart, as it was noted in some studies [9]. The absence of the haemodynamic changes may be due to the oblique turning of the artery to the right instead of an acute bending. Our case showed an anomalous innominate artery origin to the left side of the trachea, as well as a high crossing of the vessel over the fourth and fifth tracheal rings, reaching upto the lower border of the thyroid isthmus.

While some authors noticed a similar course [10], some others reported that the brachiocephalic trunk was positioned in an abnormally high level over the 2nd tracheal ring [11]. The most probable cause of this abnormality in the course of the blood vessels of the aortic arch might be a disproportional elongation and increase of their diameter during the embryonic life [12]. A genetic association of the chromosome 22q11 deletion and the aortic arch anomaly has been postulated [13].

The majority of the patients with innominate artery compression of the trachea are successfully treated with medical management. Arteriopexy, entailing the anterior suspension of the innominate artery to the sternum, and reimplantation of the innominate artery to a more proximal site on the ascending aorta are the most commonly used methods of surgical repair for obtaining a symptomatic relief [8].

The high localization of the common carotid artery and the brachiocephalic trunk across the trachea increases the risk of injury to these vessels in percutaneous procedures and in any surgeries which are related to them [11]. Percutaneous dilatational tracheostomy (PDT) is becoming increasingly popular in the present day critical care medicine. In contrast to the surgical approach, PDT involves a blind puncture and dilation of the pretracheal space, which may predispose to dangerous complications in patients with vascular anomalies. Many surgeons have reported both the peri and the post operative complications of the severe

bleeding which was caused due to aberrant pretracheal vessels [14]. A post-operative haemorrhage may occur due to the erosion of a highly placed artery [15]. A preoperative knowledge of these individual anatomical variations of the trajectory of vessels of the cervical region of the neck has clinical surgical importance.

CONCLUSION

The tracheal air way compression in children can be due to the anomalous innominate artery syndrome. Obstructive respiratory symptoms occur in only a fraction of such cases, and symptomatic patients are most commonly detected in the first year of their lives. The tracheal indentation was found to be age-related. This syndrome is rarely seen in children who are older than 1.5 years of age. So, this anatomical variation plays a key role in the diagnosis and management of symptomatic airway obstruction. The recognition of vascular anomalies is necessary to avoid a potential catastrophic haemorrhage or other complications during percutaneous and surgical procedures on the trachea and the neck. To avoid hazardous bleeding complications, we recommend at least an ultrasound scan prior to any surgical procedure.

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FINANCIAL OR OTHER COMPETING INTERESTS:

None.

Date of Submission: **Jul 10, 2011**
Date of Peer Review: **Nov 26, 2011**
Date of Acceptance: **Dec 20, 2011**
Date of Publishing: **May 01, 2012**