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Case Report

Anatomy Section

Multiple Tortuous Arteries in Thoracic and Abdominal Walls: A Cadaveric Case Report

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ABSTRACT

The thoracic aorta extends from lower border of fourth thoracic vertebra upto the aortic hiatus of thoraco-abdominal diaphragm at the lower border of 12th thoracic vertebra. Then it continues as abdominal aorta upto lower border of fourth lumbar vertebra where it terminates as common iliac arteries. Commonly the facial, superficial temporal, splenic artery have tortuous course which are routinely taught to the undergraduate students. During routine dissection we noticed variations in the thoracic and abdominal aorta in a female cadaver, approximately 60 years of age. The thoracic and the abdominal aorta were found to have a tortuous course instead of a straight course. The bilateral renal arteries were also tortuous. Further the bilateral common iliac and internal and external iliac arteries were also tortuous in their course. Such a case of multiple arteries being tortuous indicates a possibility of arterial tortuosity syndrome which is autosomal recessively inherited. Familial screening is also needed in such cases. Marked tortuosity of the arteries may be an incidental finding and if so, should raise a suspicion for the underlying clinical condition and search for its cause. These many curves in the course of aorta are hazardous for any patient during vascular procedures. Probabilities of blockage or rupture of the arteries increase with the number of twists in the arteries.

Keywords: Abdominal aorta, Arterial tortuosity syndrome, Iliac arteries

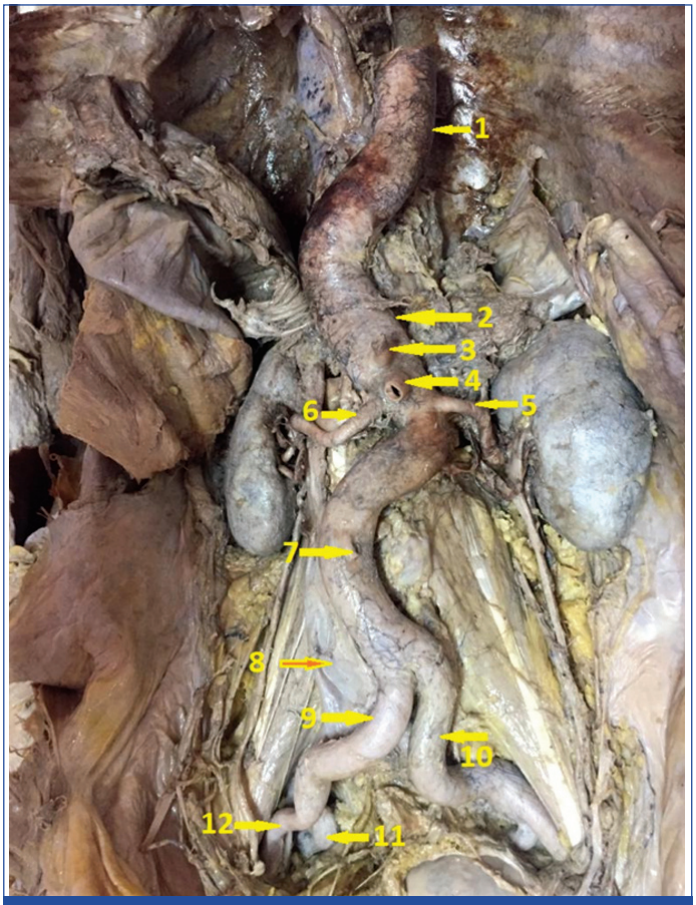
CASE REPORT

During routine cadaveric dissection of a female cadaver of approximately 60 years of age, variation in the thoracic and abdominal aorta was noticed. As seen in [Table/Fig-1] the thoracic and the abdominal aorta were found to have a tortuous course instead of a straight course. The total length of the aorta was 30 cm, descending thoracic aorta measuring 14.5 cm, and the abdominal aorta measuring 15.5 cm. The descending thoracic aorta was curved to the left. The part of the abdominal aorta up to the origin of renal arteries curved to the left, beyond which it took a curve towards the right. The bilateral renal arteries were also tortuous. Further, the bilateral common iliac and internal and external iliac arteries were also tortuous in their course. There was no thickening or dilatation of the vessel wall throughout its course.

DISCUSSION

The thoracic aorta extends from the lower border of the fourth thoracic vertebra up to the aortic hiatus of the thoraco-abdominal diaphragm at the lower border of the 12th thoracic vertebra. Then after it continues as abdominal aorta up to the lower border of the fourth lumbar vertebra where it terminates as common iliac arteries. Commonly the facial, superficial temporal and splenic arteries have a tortuous course that is routinely taught to undergraduate students [1]. During the embryonic life, the dorsal aorta continues as the descending thoracic aorta and the abdominal aorta from the level of the fourth thoracic vertebra up to the fourth lumbar vertebra [2]. Among all the vascular anomalies, tortuous arteries are commonly observed. The most common arteries which have a tortuous course include the aorta, vertebral, iliac, femoral, coronary, cerebral, and internal carotid arteries [3].The newer imaging techniques have made it possible to detect more tortuous arteries. The different forms of tortuosity include curving, curling, angulation, twisting, looping, and kinking vessels [4].

In the elderly, the etiology of the aortic artery tortuosity includes ageing, atherosclerosis, hypertension and genetic causes [3]. In children, Ehler Danlos syndrome, Marfan's syndrome or more recently recognised syndrome of arterial tortuosity are the possible causes [5].



[Table/Fig-1]: Dissected thoracic and abdominal aorta and its branches which have tortuous course in a female cadaver;1) Descending thoracic aorta; 2) Abdominal aorta; 3) Coeliac trunk; 4) Superior mesenteric artery; 5 and 6) Left and right renal arteries; 7) Inferior mesenteric artery; 8) Inferior vena cava; 9 and 10) Right and left common iliac arteries; 11) Right Internal iliac artery; 12) Right external iliac artery.

Gerlock Jr AJ and Goncharenko V evaluated the catheter tip motion in 20 abdominal aortograms which were performed using straight tipped catheters. Fifteen patients showed recoil but five patients had marked tortuosity of abdominal aorta which led to instability

of catheter tip [6]. Shinde A et al., reported tortuous abdominal aorta along with tortuous common iliac arteries in a male cadaver of approximately 60 years of age [7]. Demir M et al., reported a case of the bilateral double renal artery and left side deviated tortuous aorta which was visualised in Computed tomography (CT) angiography in a 46-year-old female donor before renal transplantation. The author comments on the difficulty in performing laparoscopic nephrectomy even by an experienced surgeon [8].

Kara E et al., reported a case of the blocked catheter tip during angiography in a caucasian female of 58 years via the femoral artery. They demonstrated a horizontally U-shaped tortuous abdominal aorta which interfered with the movement of the catheter proximally which was confirmed by CT angiography of the abdominal aorta [9]. Bhat V and Al Muzrakchi A reported a case of a 12-year-old asthmatic boy. His chest CT showed gross tortuosity of the aortic arch, which was partially located within the left upper lobe and all the branches of the aortic arch were also tortuous [5]. Shah P and Ramakantan R reported three cases of sliding Hiatal hernias presented as retrosternal chest pain and oesophagitis due to significant displacement of the oesophagus by the tortuous aorta [10].

In 2016, Sugimoto M et al., conducted a study on 45 patients who underwent multibranched Endovascular Aneurysm Repair (mbEVAR), The authors conclude that the renal arteries were occluded because of high tortuosity of the arteries which led to branch failure [11].

The mechanism related to tortuosity in old age is a decrease in elastin content and increased collagen in the aortic wall. The fact that due to decrease in length of the vertebral column due to decreased height of the intervertebral disc, there may be aortic lengthening leading to mild tortuosity [3]. Mutations in the SLC2A10 (Solute carrier family2 member 10) gene found on chromosome 20 lead to arterial tortuosity syndrome and are inherited in an autosomal recessive manner. The male and female populations are equally affected. About 100 cases have been reported in the literature. Mutations in the SLC2A10 gene result in decreased GLUT10 (glucose transporter 10) protein. This disturbs the TGF-beta signaling which is essential for the production of proteins such as collagen, elastin, fibronectin, and decorin. These proteins maintain the integrity of several connective tissues including the blood vessels wall. Tortuosity arises from abnormal elongation of the arteries; since the end points of the arteries are fixed, the extra length twists and curves [12].

Marked tortuosity of the arteries may be an incidental finding and if so, should raise suspicion about the underlying clinical condition and search for its cause. Arterial tortuosity is a sign of vascular disease either in mild or serious form.

CONCLUSION(S)

This case needs documentation as multiple tortuosities of the aorta and its branches have led us to suspect arterial tortuosity syndrome. In live cases, this needs screening of family members. The various intraoperative and postoperative complications have been discussed. Several procedures such as diagnostic or therapeutic angiography through the femoral artery and intra-aortic balloon pumping, if such tortuous arteries are encountered, surgeons face difficulty in passing the straight tipped catheters into the aorta which may lead to rupture of the vessels. So straight tipped catheters should be discouraged. To overcome these difficulties preoperative doppler study may be helpful. During Endovascular Aneurysm Repair (EVAR), severely tortuous aortoiliac anatomy can alter the deployment and conformability of the endograft.

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