Higher division of abdominal aorta - A case report

Prakash Billakanti Babu

ABSTRACT

A bifurcation pattern of the abdominal aorta was encountered during routine dissection of abdomen in an adult male cadaver. The abdominal aorta was slightly displaced towards its left and bifurcated at the level of the body of L3 vertebra into right and left common iliac arteries. The common iliac arteries had normal course and their termination into usual internal and external iliac arteries were at different levels (asymmetrical). The median sacral artery was arising from right common iliac artery near its commencement. Knowledge of normal and variable termination of abdominal aorta has important clinical significance in abdominal operations or invasive arterial procedures like laparoscopic, orthopedic and other vascular surgeries and also radiological procedures in the upper part of the abdomen.

Key words: abdominal aorta, iliac artery, common iliac artery

INTRODUCTION

Aorta, the main artery of distribution, is divided into three parts in its course: ascending aorta, arch of aorta and descending thoracic aorta (DTA). Abdominal aorta (AA) is the continuation of DTA at the aortic hiatus of the diaphragm anterior to lower border of 12th thoracic vertebra. It descends anteriorly to end at the lower border of the fourth lumbar vertebra (L4), a little left to the midline, by dividing into right and left common iliac arteries (CIA). The CIAs divide into external and internal iliac arteries at the level of lumbosacral intervertebral disc, ventral to the sacroiliac joint (Fig 1). In about 23% of population AA bifurcates at the level of upper part of body of L3 vertebra, in 67% at the level of body of L4 and in 10% between L4 and L5 or rarely opposite the body of L5 vertebra. AA has been found, however, dividing as high as the origin of the renal arteries or even as high as the L2 vertebra. In the present case, AA has terminated into right and left CIA at the level of body of L3 vertebra. Knowledge of normal and variable termination of AA has significant clinical importance in abdominal operations or invasive arterial procedure like laparoscopic, orthopedic and other vascular surgeries as well as radiological procedures in the upper part of the abdomen.

Figure 1: Dissection of the abdomen showing normal level of division of abdominal aorta into common iliac arteries

AA - Abdominal aorta, RCIA- Right common iliac artery
LCIA- Left common iliac artery, IVC- Inferior venacava

CASE REPORT

During routine dissection in an adult male cadaver an anomalous bifurcation of AA was observed. AA was slightly displaced towards the left side and bifurcated at a higher level at the body of L3 vertebra into right and left CIA (Fig.2). The CIA had normal course and their termination into usual internal and external iliac arteries were at different levels (asymmetrical). The RCIA was shorter and divided into terminal branches at higher level than
normal. The median sacral artery originated from RCIA near its commencement. No other vascular anomalies were observed in the distribution of branches of AA and both iliac vessels. Despite this higher division, AA did not show any aortic aneurysms or abnormal curvatures.

**Figure 2**: Dissection of the abdomen showing higher division of abdominal aorta and origin of median sacral artery from right common iliac artery

AA - Abdominal aorta, RCIA- Right common iliac artery, LCIA- Left common iliac artery, IVC- Inferior venacava, MSA- Median sacral artery

**DISCUSSION**

The transperitoneal anterior approach to the lumbar vertebra is a common procedure in vertebral surgery. The aortic bifurcation and the ilio caval junction are the main vessels that lie anterior to the lower lumbar vertebra. The increased difficulty and morbidity in a laparoscopic approach at L4-L5 has been linked to prevertebral anatomy specifically at the level of bifurcation of the abdominal aorta. The risk for vascular damage during anterior lumbosacral surgery varies in each case depending on vascular anatomy. At this level both aortic bifurcation and ilio caval junction restricts extensive exposure.\(^3\) Normally, AA bifurcates into two CIA at the front of body of L4 vertebra, although variations are frequently reported.\(^2\) The bifurcation of AA at the level of upper part of L2 accompanied by variation in the origin of renal artery and inferior mesenteric artery arising from RCIA is also documented.\(^4\) In the present case, AA bifurcated at the level of body of L3 vertebra and also the level of division of common iliac arteries into RCIA and LCIA were asymmetrical.

Although, in 67% of cases, AA bifurcates at the body of L4, in patients with sacralization of L5 the aortic bifurcation was at the body of L3 in 59% of cases. In patients with lumbarization of S1, AA bifurcated at the level of the body of L4 in 40% and at L4/5 intervertebral disc space in 33%. There was no demographic variation of the aortic bifurcation in relation to age and sex.

Assessing the level of bifurcation is traditionally done by counting cephalad from the lumbosacral promontory.\(^5,6\) However, several studies have highlighted that this practice may result in inaccurate localization of the lumbar vertebral segments.\(^7,8\) The versatility and lack of known side effects of MRI can be utilized to evaluate the precise location of the aortic bifurcation in living subjects.\(^2\)

The relationship between the level of bifurcation of AA and the incidence of lumbosacral transitional segments has been highlighted in different studies.\(^7,8,9\) There have been many classifications of lumbosacral transitional vertebrae.\(^9,10,11,12,13\) However, its exact distinction can only be definitely ascertained by counting the total number of vertebral bodies.\(^11\)

The position of aortic bifurcation was found downward with increased age. The aortic bifurcation at the level of L5 vertebral body was mostly found in age group of 88-99 years old. Reduction in length of the spine with ageing influences the dynamic change of the intervertebral discs due to their loss of thickness, while osteopenia and osteoporosis of the vertebra result in loss of height. The loss of spinal height results in caudal shift of the aortic bifurcation.

Although the arterial variations do not explain the symptoms of the patient, their possibility should be borne in mind during application of imaging
techniques and various surgical dissections.

CONCLUSION

The high incidence of positional anatomical variations of the aortic bifurcation is useful when invasive procedures are performed in pelvis. It is also important because anterior lumbar interbody fusion is gaining popularity. An accurate description of the aortic bifurcation may be of more than just academic interest. It may be of relevance in surgical procedures of the pelvis and spinal surgery like laraaroscopic lumbar discectomy and lumbosacral total disc arthroplasty.

REFERENCES


AUTHOR NOTE

Prakash Billakanti Babu, Associate Professor, Contact: 09880780271. Email: billakantibabu@yahoo.co.in

Department of Anatomy, Kasturba Medical College, Manipal University, Manipal, Karnataka, INDIA