

Variation in Bifurcation of Aorta : A Report of two Cases.

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Abstract: Normally abdominal aorta bifurcate at the lower border of L-4 vertebra, in front of its body slightly towards left side and both common iliac arteries diverge towards the corresponding sides, it looks like inverted Y. During routine dissection of abdomen it was noticed variations in bifurcation in two cases: in case bifurcation was normal level but both braches came down parallel to each other till lower border of L - 5 and then diverge opposite sides; in the second case bifurcation took place at lower border of L - 3 and right common iliac artery moved first towards right side then downwards, and left iliac artery looked like continuation of aorta as it come down straight downward till upper border of L - 5 and then towards left side. Earlier variation in bifurcation of aorta was reported by same author. The variations were described by various authors earlier in up to 30 % population. Interestingly GI Boyd found the variation as in the present second case, but he described it as enlargement of third lumbar artery. This becomes important during catheterization through femoral artery.

INTRODUCTION

Abdominal aorta is the continuation of the thoracic aorta after it passes through the aortic hiatus of diaphragm in front of the lower border of T12 vertebra slightly to left to the median plane and continues almost straight downwards till it bifurcates in front of the lower border of L4 vertebra slightly left to the median plane. Throughout its course it is situated slightly left to the median plane and towards its right side inferior vena cava is running. Sometimes some variations are seen in the pattern of the bifurcation.

REVIEW OF LITERATURE

Khamanarong K¹, studied abdominal bifurcation in 187 cadavers (132 males and 55 females) with average age of 67.3 years, and related bifurcation with the level of lumbosacral spine and found that aorta bifurcates at L4 level in 70% cases, L5 level in 17.6% and rest at fourth lumbar intervertebral disc.

Lakchayapakorn K², also studied aortic bifurcation in 65 cadavers, and found that aorta bifurcated at L4 level in 63% case and rest below that. They also studied the ilio caval junction (most of the times at L5 level), interiliac angle (males 73° and females 68° with average of 71°)

Kara E³, reported a case, studying pelvic angiography and MR angiography, that aorta first gave right external iliac artery at L5 level then bifurcated into left common iliac artery and right internal iliac artery, with median sacral artery coming out at this level.

Bergman RA⁴ in his Anatomy Atlases (updated 2013): A Digital Library of Anatomy Information described that aortic bifurcation occurred within 1.2 cm above or below the level of highest point of the iliac crest, which correspond to the L4 vertebral body. The bifurcation may occur at the level of intervertebral disc between L4 and L5 bodies, but rarely at L5 body level.

Boyd GI⁵ found that aorta bifurcated at the level of L3. He also found that aorta continued as left common iliac artery, and right common iliac artery passed behind inferior vena cava and a fibrous slip of right crus of diaphragm and while passing the common iliac artery got constriction.

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CASE REPORTS

During the routine dissection in the Department of Anatomy, Pondicherry Institute of Medical Sciences, Kalapet, Pondicherry, in an adult cadaver it was noticed that abdominal aorta deviated towards left side. It was further dissected to see any other anomaly but could not get. The specimen was cleaned of debris and photographed.: findings are given below:

Case – I (Fig. 1)



- Ø Aorta bifurcated at the level of lower border of L4 vertebra.
- Ø Left Common Iliac Artery continued in same direction / line till lower border of L5 vertebra & then turned at right angle towards left upto transverse process of L5 vertebra, running almost horizontally. Then it turned downwards & laterally. While it was running horizontally, it was crossed by inferior mesenteric artery.
- Ø Right common iliac artery continued downwards and laterally. It was showing some kink in the middle.

Case – II (Fig. 2)



- Ø Aorta coming down vertically slightly on left of bodies of Lumbar Vertebrae till it gave Inferior Mesenteric Artery at L3 level. Then it turned / curved towards right / medially till it reached in front of body of L4 Vertebra, & bifurcated at lower border of L4 vertebra.
- Ø Right Common Iliac Artery continued in the same direction as of aorta towards right side & downwards. Then it ran almost vertical downwards till the pelvic inlet, then turned towards right & downwards as normal course.
- Ø Left Common Iliac Artery ran downwards & right till it reached in front of body of L5 vertebra, where it turned toward left & downwards till its bifurcation at pelvic brim. Just before bifurcation it was crossed by Inferior Mesenteric Artery

DISCUSSION

Normally aorta bifurcates in front of body of L4 vertebra slightly towards left, as just to right side inferior vena cava present. The common iliac arteries run downwards and laterally, and in front of corresponding sacro-iliac joints, near upper end, they bifurcate into internal and external iliac arteries.

Most of the authors like related the bifurcation of aorta with the L4 body^{1,2}, 60% to 70% middle of the body and rest at its lower border. found a few at the level of upper border of L5 body^{1,3}. Kara studied by angiography and Khamanarong studied in cadavers. Bergman (2013) also described the aortic bifurcation in the same manner but he related it with uppermost point of iliac crest. Only Boyd found the bifurcation at higher level, at L3 level.

A case study by Kara³ found that aorta bifurcated in different manner. It first gave right external iliac artery at L5 level then bifurcated into left common iliac artery and right internal iliac artery, with median sacral artery coming out at this level.

The present study of 2 cases also found that bifurcation occurred at L4 level, with only difference the direction of the common iliac arteries as described in the observations (Fig. 1 & 2). Same author found bifurcation was at L4 level in 2 cases (2005 and 2010) only but there was some variation in the direction: the case studied in 2005 (Fig. 3) had some curvature in the aorta before bifurcation with convexity towards left side that began at L2 level and ended at

L4 level; the case in 2010 (Fig. 4) also showed some curvature, 2 in number first towards right and then toward left.

The variations in the bifurcation of abdominal aorta, with or without any other variation become important for the surgeons operating in



Fig. 3: Old Case - 2005



Fig. 4: Old Case - 2010

the lumbar region, for interventional surgeries involving aorta or its branches, or simply catheterization of aorta. The variations should be confirmed by scans before proceeding any surgery to avoid complications, excessive bleeding or any other surprise.

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DRUG PROFILE

Dapagliflozin

Dapagliflozin is a highly potent, selective and reversible inhibitor of sodium-glucose cotransporter 2 (SGLT2) that improves glycaemic control in patients with type 2 diabetes mellitus by reducing renal glucose reabsorption leading to urinary excretion of excess glucose (glucosuria). **Indications and Usage:** In adults aged 18 yrs and older with type 2 diabetes mellitus to improve glycaemic control. As mono-therapy when diet and exercise alone do not provide adequate glycaemic control in patients for whom use of metformin is considered in appropriate due to intolerance. It is not indicated for use in patients with type 1 diabetes. **Dosage and Administration:** The recommended dose is 10mg taken once daily at anytime of the day regardless of meals. **Mono-therapy and Add-On Combination Therapy.** The recommended dose is 10 mg once daily as mono-therapy or as add-on to combination therapy with metformin, a thiazolidinedione, a sulfonylurea, a DPP4-inhibitor (with or without metformin), or insulin (with or without oral antidiabetic therapy, either metformin plus insulin dual therapy or metformin plus sulfonylurea plus insulin triple therapy). Renal Impairment patients with mild renal Impairment (eGFR \geq 60 to < 90mL/min/1.73m²). The safety profile in patients with mild renal impairment is similar to that in the overall population. Patients with moderate Renal Impairment (eGFR \geq 30 to < 60mL/min/1.73m²). Safety in patients with moderate Renal Impairment was assessed in a pooled analysis of 12 clinical studies (384 patients, 88% with eGFR \geq 45 to < 60mL/min/1.73m²). in the short-term plus long-term safety pool up to 102 weeks, the safety profile remained similar. Patients with severe Renal Impairment (eGFR < 30 mL/min/1.73m²) or ESRD, was not anticipated to be effective in these populations. The diuretic effect of Forxiga decreases intravascular volume. For patients at risk for volume depletion or dehydration due to co existing conditions (such as patients with extremely poor glycaemic control, elderly patients and those on concomitant diuretics), a 5mg starting dose of Forxiga may be appropriate. The patients should also be instructed to take water appropriately and carefully monitored. When symptoms of volume depletion arise, appropriate measures including fluid replacement or temporary interruption of Forxiga should be considered. **Contraindications:** Is contraindicated in patients with a history of any serious hypersensitivity reaction to the active substance or to any of the excipients. **Adverse Reactions:** The most commonly reported events leading to discontinuation and reported in at least 3 treated patients were renal impairment (0.8%), decrease in creatinine clearance (0.6%), increased blood creatinine (0.3%), urinary tract infections (0.2%), and vulvovaginal mycotic infection (0.1%).