

Study of Aortoiliac Segment in Newborns and its Clinical Significance

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Abstract

Currently, there are a variety of open surgical, endovascular, and hybrid options to treat any aortic and iliac artery disorders. Anatomy of the distal aorta, common iliac artery plays a role in the decision process towards the preferred treatment method. The study of the variant anatomy of the arterial bed of the human pelvis is important, since a detailed understanding of the iliac arteries undoubtedly affects the outcome of surgery on the pelvic organs. The material of investigation was 50 cadavers of newborns without pathology of vascular system.

This manuscript describes the anatomical variability of aortoiliac vascular segment of newborn. Also, the sex differences in anatomy of that segment was shown.

Keywords: *Aorta Bifurcation; Anatomy; Common Iliac Artery; Newborn*

Introduction

The expansion of indications for intervention on arteries, including iliac, for diagnostic and therapeutic purposes imposes increased requirements to the study of human body vessels at different levels, including their variability, diameter, etc. Diseases of the aortic bifurcation, whether stenotic or dilating, can be occur in children often [1]. If only stenosis is present aortic bifurcation disease is equivalent to a certain form of peripheral arterial occlusive disease (PAOD) characterized by the specific anatomical location. The main symptom of aortic bifurcation PAOD is bilateral claudication whereas aneurysmal disease of the aortic bifurcation is frequently asymptomatic [1,2].

Therapy of stenotic and aneurysmal disease of the aortic bifurcation depends on the degree of the disease. Simple lesions, such as isolated stenoses of the aortic bifurcation or unilateral occlusions of the common iliac artery extending to the aortic bifurcation have been treated endoluminally for many years. Current standard treatment of complex aortic bifurcation disease is open surgery with implantation of an aortobifemoral bypass graft [1].

The study of the variant anatomy of the arterial bed of the human pelvis is important, since a detailed understanding of the iliac arteries undoubtedly affects the outcome of surgery on the pelvic organs [3-5].

We found a lack of information about the anatomy of the aortoiliac arterial segment in newborns, whereas the anatomy of aortic bifurcation in adult can be found in some sources [6].

Aim of the Study

The aim of the research is to study the anatomical variability of the aortoiliac segment in newborn.

Materials and Methods

The material of investigation was 50 cadavers of newborns without pathology of vascular system. There were 22 cadavers of boy and 28 girls. The study was carried out with the help of dissection method, anthropometry, morphometry of blood vessels of pelvis and statistical processing (we used PC soft Statistica 10.0).

Results and Discussion

The results of study have shown that the level of abdominal aorta bifurcation is in the range from the upper edge of the 4th lumbar vertebra (12%, 6 cases) to the lower edge of L5 vertebra (4%, 2 cases). Variability is 6.1%. According to some authors, the level of aortic bifurcation can be more variable - from the middle of the body L3 to the middle of the L5 vertebrae [7-10].

The aorta was most often divided at the level of the middle of the body of the L4 vertebra (30.0%, 15 cases), as well as at the level of the lower edge of the L4 (28%, 14 cases). Less often the aorta bifurcation was noted at the middle of the L5 (16%, 8 cases) or at its upper edge (10%, 5 cases).

Girls showed a bit greater variability in the level of bifurcation (from the upper edge of L4 to lower edge of L5) compared to boys (from the upper edge of L4 to the middle of L5).

The angle of bifurcation of the newborn's aorta ranges from 5° (4.0%, 2 cases) to 80° (18.0%, 9 cases). However, the most common angle of bifurcation was 30° (26.0%, 13 cases) and 60° (24%, 12 cases). The aortic angle ranged within 5 - 20° was observed in 8.0% (4 cases), within 21 - 40° - in 34.0% (17 cases), within 41 - 60° - in 26.0% (13 cases), and within 61-80° - in 32.0% (16 cases).

In girls, the aorta is divided more often at a more obtuse angle than in boys ($p < 0.05$). So, in girls the angle more often was within 60 - 80° (75%, 21 cases), whereas in boys - within 21 - 40° (50%, 11 cases).

The weak correlation of the bifurcation angle with the interspinous diameter of the pelvis ($R = 0.31$, $p < 0.05$) was found, rather due to the insignificant amount of material.

The common iliac artery with a length of 0.98 ± 0.35 cm and a diameter of 0.35 ± 0.06 cm on the right and 0.97 ± 0.39 cm and 0.31 ± 0.07 cm, respectively, on the left in most of cases (68.0%, 34 cases) is bifurcated into the internal and external iliac arteries at the level of promontorium (Figure 1).

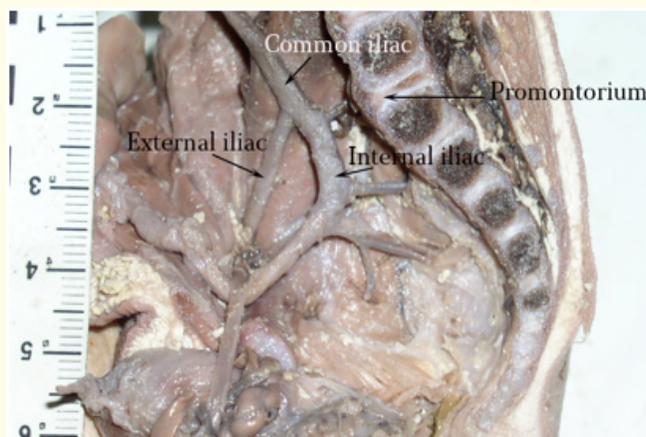


Figure 1: Bifurcation of common iliac artery.

The common iliac artery in girls has a larger diameter on the right (0.35 ± 0.07 cm) compared to the left vessel (0.27 ± 0.07 cm) ($p < 0.01$). No asymmetry was found in boys.

The bifurcation of the artery at the level of the lower edge of L5 vertebra (8%), upper edge of the S1 (8%) and the middle of the S1 (8%) was much less common. In 4% of cases, the common iliac artery bifurcated at the mid-body level of the L5 vertebra (Figure 2). In single

cases, the bifurcation was observed at the level of the lower edge of L4 (2%) or at the level of the upper edge of the L5 vertebra (2%). The last two variants were found only on the right.

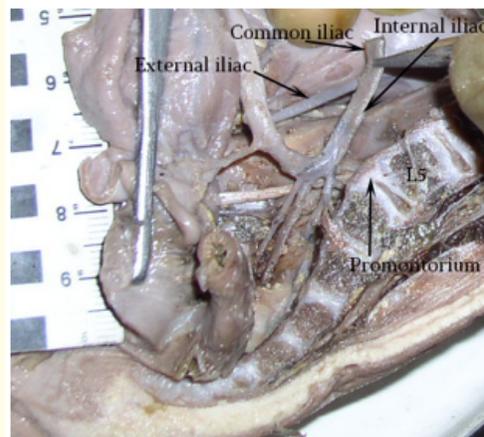


Figure 2: Bifurcation of common iliac artery.

In our study, the right common iliac artery was more variable in both boys and girls compared to the left.

The angle of the common iliac artery bifurcation varies from 5° (2%, 1 case) to 90° (4%, 2 cases). Moreover, more often (34%, 17 cases) the angle was within the range of 41 - 60°. In 32% (16 cases) the angle of the common iliac artery bifurcation ranged from 21° to 40°, in 18% (9 cases) - from 5° to 20°, and in 16% (8 cases) the angle values within 61-90° was observed.

It should be noted that in boys, the angle of bifurcation of the common iliac artery was characterized by a greater variability. In addition, in most of cases they had angle of 45°, while girls - 40°.

Conclusion

The results of the study show a significant variability of the vascular aortoiliac segment in newborn, in the level of abdominal aorta and common iliac artery bifurcation, as well as its dependence on sex. Girls showed a bit greater variability in the level of aorta bifurcation compared to boys. But at the same time in boys, the angle of bifurcation of the common iliac artery was characterized by a greater variability. In girls, the aorta is divided more often at a more obtuse angle than in boys. The right common iliac artery was more variable in both boys and girls compared to the left.

The anatomical variations of the position of the aortic bifurcation, and common iliac artery at the anterior of lumbar and sacral vertebra can be found in a normal population and cause trouble to vertebral and vascular surgery during the operation. Therefore, precaution and full investigation of the anatomical position of the vessels might be required before surgery is performed.

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