Case Report

An Anatomical Study of Anomalous Renal Pedicle

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Abstract : Typically, the renal pedicle is located at the renal hilum, such that the renal vein is anterior to the renal artery, which in turn is anterior to the renal pelvis. Objective: Student dissection of cadavers to observe typical anatomy and observe variations that may occur. Setting: The Gross Anatomy Laboratory, Faculty of Medicine, Khon Kaen University. Results: A total of 180 Thai cadavers were dissected in anatomical practice, during the years 1998 to 2000. Anomalous renal pedicles were found in the cadavers of a 49 year-old female and an 80 year-old male. In the female, the anomalous renal pedicle presented on both the left and the right sides. In both cases the renal pelvises were anterior to the renal vessels. We also found supernumerary renal arteries. The male had only a right anomalous renal pedicle, in which the right renal pelvis lay anterior to the right renal vessel. Variations of the renal arteries were found in this case as well. Conclusion: These observations are important in that during surgery, care should be taken in retroperitoneal operation, especially pyelolithotomy.

เรื่องย่อ : การศึกษาวิกลภาพของก้านไต

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โดยปกติแล้วก้านไต (renal pedicle) จะอยู่บริเวณขั้วไต โดยมีหลอดเลือดดำรีนอล (renal vein) วางตัวอยู่หน้าต่อหลอดเลือดแดงรีนอล (renal artery) และกรวยไต (renal pelvis) วางตัวอยู่หลังต่อหลอดเลือดแดงรีนอล จากการศึกษาศพดองจำนวน 180 ศพที่ห้องปฏิบัติการมหกายวิภาคศาสตร์ คณะแพทยศาสตร์ มหาวิทยาลัยขอนแก่น ระหว่างปี พ.ศ. 2541-2543 พบวิกลภาพของก้านไต (anomalous renal pedicle) ในศพดองเพศหญิงอายุ 49 ปี และเพศชายอายุ 80 ปี ในระหว่างการเรียนวิชามหกายวิภาคศาสตร์ โดยพบวิกลภาพของก้านไตทั้งข้างซ้ายและข้างขวาในศพดองเพศหญิงซึ่งกรวยไต (renal pelvis) วางตัวอยู่ด้านหน้าต่อหลอดเลือดรีนอล (renal vessels) และ

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พบหลอดเลือดแดงรีนอลหลายเส้นทั้ง 2 ข้าง ในศพของเพศชายพบวิกลภาพของก้านไตเฉพาะข้างขวา ตำแหน่งของกรวยไตอยู่หน้าต่อหลอดเลือดรีนอล และพบลักษณะหลายอย่าง (variation) ของหลอดเลือดแดงรีนอล

การศึกษาครั้งนี้มีความสำคัญต่อศัลยแพทย์ในการเปิดช่องท้องทางด้านหลังเพื่อผ่าตัดนิ่วในกรวยไต (pyelolithotomy)

INTRODUCTION

The renal pedicle is classically located at the renal hilum, such that the renal vein is anterior to the renal artery, which in turn is anterior to the renal pelvis.[1] Anomalous renal pedicles have received clinical attention because they may be encountered in retroperitoneal surgery especially pyelolithotomy[2,3] during which surgeons need to dissect the renal pelvis. If the surgeon is unaware of the potential of an anomalous renal vascular pedicles, he/she may inadvertently traumatize the kidney and render it non-functional.

CASE REPORT

A total of 180 Thai cadavers were dissected in anatomical practice during the years 1998 to 2000 at the Gross Anatomy Laboratory, Faculty of Medicine, Khon Kaen University. Three anomalous renal pedicles were observed; two in a 49 years old female and one in an 80 years old male. The anomalies in the retroperitoneal cavity were examined carefully, and the findings were recorded photographically.

Observations

The cadaver of the 49 years old female had anomalous renal pedicles on both the left and the right sides (Figure 1A). The right renal pelvis (Figure 1B) lay anterior to the lower renal artery. The right upper renal artery was superior to the right renal pelvis and divided into apical, upper and middle segments and supplied the anterior surface. The right renal vein lay between the upper and lower renal arteries. A right accessory renal artery lay below the right lower renal artery and both of them crossed anterior to the inferior vena cava but behind the right renal pelvis and ureter to supply the lower pole of the right kidney. The left renal pelvis (Figure 1C) also lay anterior to the left lower renal artery. The upper left renal artery lay superior to the left renal pelvis. The left renal vein lay in front of the left upper renal artery. The left lower renal artery and the left accessory renal artery arose from the aorta, ran behind the left renal pelvis and left ureter, to supply the lower pole of the left kidney.

Figure 1A. Photographic view showing the anomalous renal pedicle in both the right and the left kidney.

A = abdominal aorta
IVC = inferior vena cava
a = accessory renal artery
U = ureter

Figure 1B. Photographic view shows the right anomalous renal pedicle of the 49 years old female cadaver.
RP = renal pelvis
A = abdominal aorta
IVC = inferior vena cava
a = accessory renal artery
U = ureter
LR = lower renal artery
UR = upper renal artery

Figure 1C. Photographic view shows the left anomalous renal pedicle of the 49 years old female cadaver.
RP = renal pelvis
A = abdominal aorta
IVC = inferior vena cava
a = accessory renal artery
U = ureter
LR = lower renal artery
UR = upper renal artery

The second cadaver, that of an 80 years old male, had only a right anomalous renal pedicle (Figure 2). The right renal pelvis was anterior to the right lower renal artery. The right lower renal artery was divided into middle, lower and posterior segments. The right upper renal artery lay superior to the right renal pelvis and divided into apical and upper segments, and also branched into right inferior phrenic and suprarenal arteries. The right accessory renal artery passed behind the right ureter to supply the inferior pole of the right kidney.

Figure 2. Photographic view shows the abnormal position of the right renal pelvis and the variation of the renal arteries of the 80 years old male cadaver.

K = kidney
RP = renal pelvis
A = abdominal aorta
a = accessory renal artery
IVC = inferior vena cava
LR = lower renal artery
UR = upper renal artery
i = inferior phrenic artery
SG = suprarenal gland
s = suprarenal artery
D = diaphragm

DISCUSSION

The incidence of anomalous renal pedicles has not been reported, but awareness of the anomaly has been stressed for surgeons performing pyelolithotomy. In two of 180 cadavers in our study, the abnormal position of the renal pedicle would pose a problem for surgeons, particularly during a pyelolithotomy when the kidney must be rotated. The second cadaver would be especially difficult because the right upper renal artery branched to the right diaphragm and to the right suprarenal gland

The abnormal position of the renal pelvis may be due to the embryological development of the kidney.[3,4] The permanent kidneys lie close to each other in the pelvis and receive their blood supply from vessels that are close to them; initially the renal arteries are branches of the common iliac arteries. As the kidneys ascend from the pelvis to the abdomen they do not rotate medially. When they ascend further, they receive their blood supply from the distal end of the aorta. When they reach a higher level, they receive new branches from the aorta. The accessory renal artery derives from the persistence of embryonic vessels, which enter via the inferior pole of the kidney.

In conclusion, though infrequent, our two cases confirm that awareness of this anomaly is necessary.

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