SHORT REPORT

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Variation of renal hilar structures: A cadaveric case

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SUMMARY

In the present case report, we describe the anomalous arrangement of hilar structures and bilateral absence of renal pelvis on both sides of a 57-year old female cadaver. A branch of the left renal artery crossed the ureter to enter the lower part of the hilum with the left renal vein lying posterior to it. On the right side, the arrangement of the hilar structures from anterior to posterior was renal artery, renal vein and the ureter. Thus, the normal arrangement of renal vein, renal artery and renal pelvis were not seen on both the sides. In addition, the ureter descended in front of the medial border of the lower pole of the kidney on both sides.

Key words: Kidney – Renal artery – Renal vein – Pelvis – Ureter – Variations

INTRODUCTION

A precise anatomical knowledge of the ureteropelvic junction of the kidney is essential for understanding any urinary tract obstruction. Surgeons performing endopyelotomy should be aware of the arrangement of the structures at the hilum of kidney. Many of the investigative imaging and angiographic procedures have described the abnormal anatomy of the hilar structures, which were detected as a sequel to symptoms or were incidental findings. According to conventional description in standard anatomy textbooks, at the hilum, usually the renal vein is the anterior most with the renal artery posterior to it and the pelvis of kidney lying further posteriorly (Standring, 2005).

The present study describes the bilateral anomalous arrangement of the structures at the hilum of kidney that is of clinical and surgical relevance.

CASE REPORT

During routine dissection, we observed anomalous positions of the renal vessels and ureter in 57-year old female cadaver who died of anemia. Admittedly no significant clinical history could be obtained. The variation was detected bilaterally. The hilar region was dissected carefully and the structures and their relations were clearly defined. Appropriate photographs were taken (Fig. 1).

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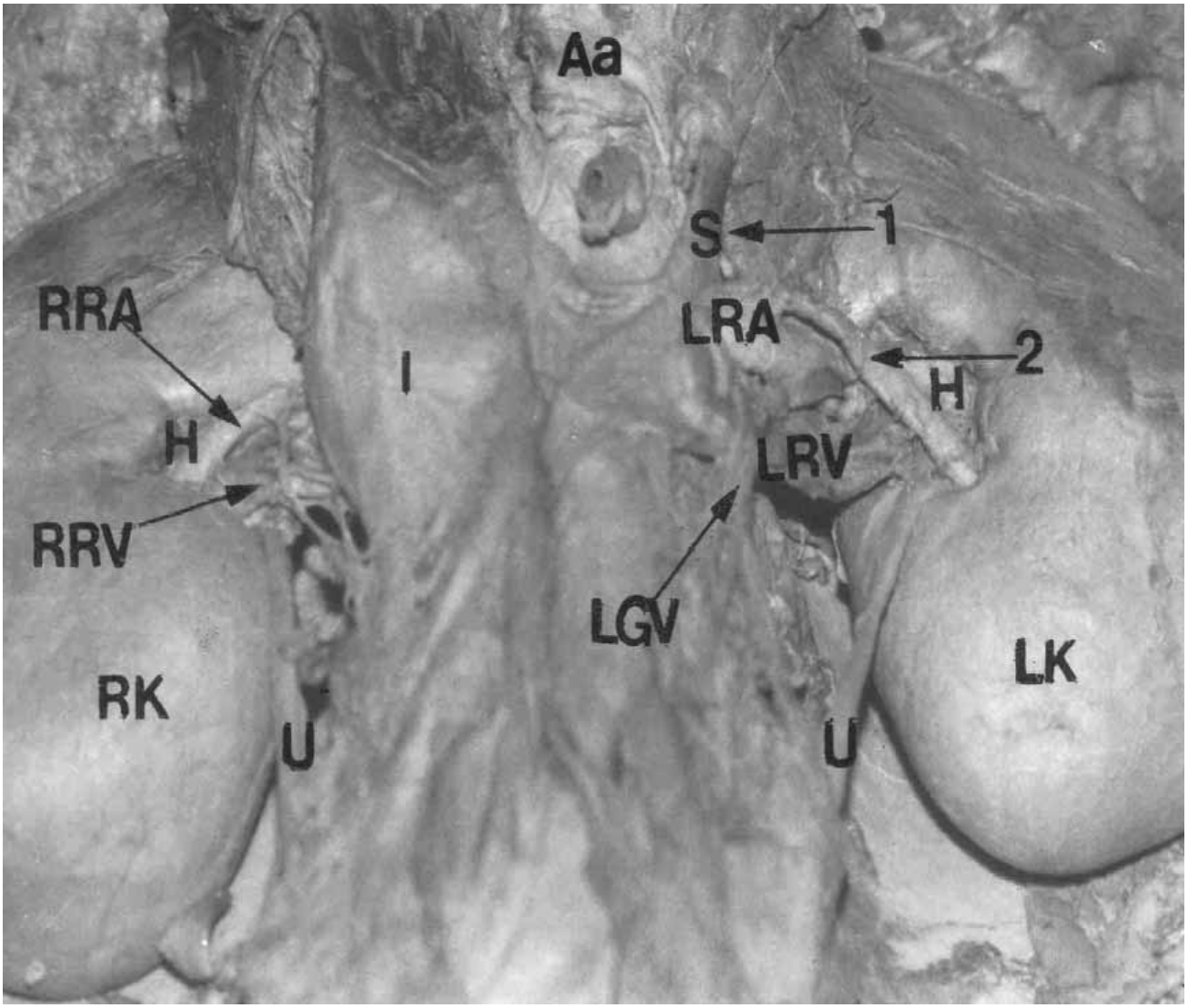

Fig. 1. Anterior view of retroperitoneal upper region showing details of hilar renal regions. **Aa**: Abdominal aorta; **LRA:** Renal artery (on left side); **1** and **2**: Upper and lower branches from the left renal artery, respectively; **LRV**: Left renal vein; **LGV**: Left gonadal vein; **RRA**: Right renal artery; **RRV**: Right renal vein; **U**: Ureter; **H**: Hilum of kidney; **S**: Left supra renal vein; **I**: Inferior vena cava; **LK**: Left kidney; **RK**: Right kidney.

Observations

On the left side

The renal artery had its normal origin from the abdominal aorta but it was above the renal vein. A common trunk was given from the upper border of the main artery 0.5 cm from its origin that immediately divided into two branches. The ascending branch ('1' in Fig. 1) ascended to the suprarenal gland while the descending branch ('2' in Fig. 1) coursed infero-laterally, crossing all the hilar structures to enter the lower end of the hilum lying anterior to the ureter. The renal vein and its tributaries were found to be lying between the main renal artery and the descending branch at the hilum. The renal pelvis was not observed. The ureter emerged from the lower end of the hilum of the kidney and was found to be lying in front of the upper part of the medial border of the kidney. Thus, the arrangement of the structures near the hilum was renal artery, renal vein and ureter from above downwards (ventral to dorsal), with a branch of the artery crossing all the hilar structures.

On the right side

The hilum was nearer to the upper pole. The renal artery arose from the abdominal aorta as usual and entered the middle of the hilum. The right renal artery ('RRA' in Fig. 1) was approximately one third of the diameter of the left renal artery. The renal vein was posterior to the renal artery with the ureter lying still posterior to it. Thus, the arrangement of the structures was renal artery, renal vein and the ureter from above downwards (ventral to dorsal). There was absence of renal pelvis. The ureter traversed in front of the upper part of the medial border of the kidney.

No other abnormalities were detected.

Discussion

Conventional textbooks of anatomy define the relation of renal vein, renal artery and pelvis antero-posteriorly and above downwards at the hilum of each kidney (Standring, 2005). The incidence in classical position of the renal vein anterior to the renal artery has been reported to be 65%, while the position of artery, anterior to the vein has been reported to be 35% of cases, respectively (Kolster, 1901). Variations in the configuration of renal calices, pelvis and ureter have been reported (Bergman et al., 2000; Poirier and Nicolas, 1912). Classical studies reported three different types in the configuration of the renal calices, pelvis and ureter. Type III b has been defined as one where the pelvis is split in two distant portions that leave the kidney in the form of one ureter (Lauth, 1931). The present case has been reported with an incidence of 1% (Hasebe, 1911), 18% (Hauch, 1903) or 21% (Jastrzebski, 1925). The ureter normally crosses over the inferior pole when the kidney has a slight anterior version and it may be a common finding.

The segmental artery crossing the renal pelvis and its branch traversing the superior margin of the renal pelvis to reach the posterior aspect of the pelvis has been documented (Standring, 2005). The same arrangement has also been reported for the renal vein (Standring, 2005). Thus in the present case, the normal anatomical relationship of the renal vein, renal artery and the ureter from anterior to posterior was not observed.

The ureteropelvic anatomy is often important to understand any obstruction occurring in this region. Ureteropelvic junction obstruction is considered to be the most common form of upper urinary tract obstruction (Snyder et al., 1980). Obstruction, strictures and stenosis may be due to any external compression. Interestingly, amongst all cases of ureteropelvic obstruction, the incidence of anomalous course of the renal vessels crossing the pelvis have been found to be 29-65% (Sampaio and Favorito, 1993; Rouviere et al., 1999).

An accurate pre-operative vascular imaging is necessary to check any inadvertent injury to blood vessels but preoperative investigations also have a cost factor to bear for. An anatomical knowledge of the normal and abnormal would perhaps be the best thing in this case.

The reason of extrinsic obstruction by a renal vessel is perhaps due to incomplete rotation of the kidney (Barnett and Stephens, 1962). As a result, the anterior part of the pelvis may be obstructed by a lower pole vessel. Scientists have related this fact to the rotating upper and lower independent segments (Dalla Palma and Rossi, 1982). In the present case also there may have been a rotational defect of the kidney resulting in the anomalous placement of the structures.

Considering the position of anomalous arrangements of hilar structures, past studies have prohibited the anterior incision at the ureteropelvic junction and also the postero and posterolateral aspect (Sampaio and Favorito, 1993). Instead they have advised a lateral deep incision alongside ureteropelvic junction (Sampaio and Favorito, 1993). Such incisions may be helpful during endopyelotomies and may decrease the cost incurred during preoperative imaging.

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