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Research Paper

A Study of Variations of Renal Vein and Clinical Significance

Medical Science

KEYWORDS : renal veins, variations, retro-aortic renal vein, and Multiple renal veins

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ABSTRACT

The embryogenesis of renal veins is a complex process and can result in variation of drainage patterns. Variations of the renal veins are usually discovered during surgeries, autopsy or venograhy. It is therefore mandatory to have a thorough knowledge of the variation pattern of renal veins. The present study was undertaken to find out the incidence of variations of renal veins and correlate its clinical and embryological significance. Thirty adult cadavers were dissected and studied. Renal veins were dissected and the pattern of drainage of the veins were observed and studied on both the sides. In this study additional renal veins were present only on the right side. The incidence of retro-aortic left renal vein was 3.3% in our study. The knowledge of these variations would be of definite help to renal transplant surgeons and clinicians.

Introduction

Major advances in the field of urology, organ transplant surgery, have resulted in kidney transplantation becoming routine in many of the hospitals. The trend now is in favour of conservative surgery; hence the surgeons should be well equipped with sound knowledge of variations and congenital anomalies of renal veins.

The renal veins lie anterior to the renal arteries and drain into the inferior vena cava almost at right angles. The left vein drains slightly at a higher level than the right renal vein. The left vein is three times lengthier (7.5cm) than the right renal vein (2.5cm). The right renal vein does not receive any tributaries. The left renal vein receives two tributaries, left suprarenal vein and left gonadal vein (Gray's Anatomy 1996)[1].The complex process of embryogenesis of renal veins may result in number of clinically significant variations. Knowledge of such variations of renal veins is first step towards avoiding vascular injury during retroperitoneal procedures. Keeping in view of the applied importance, the present work was undertaken, wherein a detail study of the renal veins was done.

Materials and method:

Thirty adult cadavers were dissected and studied. These embalmed cadavers were given for dissection to under graduate medical students in the department of anatomy, J.S.S. medical college. After the students studied the contents of the abdominal cavity and when they approached the posterior abdominal wall, the finer dissection was done. The renal veins were traced from the hilum of kidney up to their termination into the Inferior vena cava .The tributaries of the left renal vein were also observed and studied**.**

Results:

In the present study the following was the observation pertaining to

Left renal vein

Normal course of single vein (which received the drainage of left suprarenal vein and left gonadal vein) was seen in 24 specimens accounting for 80% of cases. Two veins joining to form a single vein and then draining into the inferior vena cava was observed in 20% of cases.

In the present study incidence of retro-aortic vein was seen in 1 specimens accounting for 2% of cases. In one specimen there were 2 veins and 2 arteries at the hilus with arrangement ventral to dorsal – artery, vein, artery, vein. In 2 specimens one of the left inferior phrenic veins was seen draining into the left renal vein instead of joining left suprarenal vein.

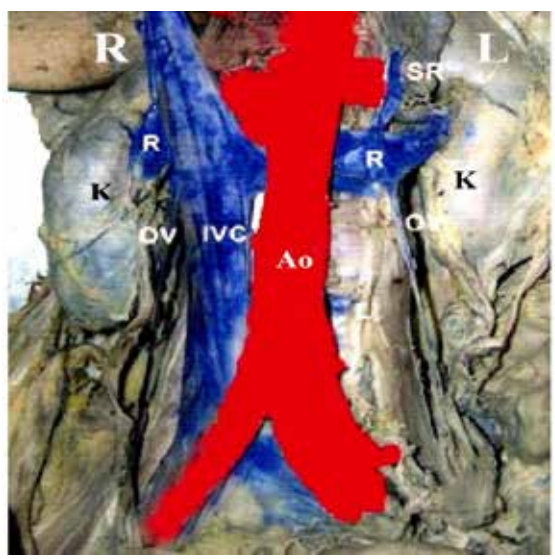

Figure 1: Retro-aortic left renal vein(R-renal vein, Ao-aorta, ivc-Inferior vena cava, ov- ovarian vein)

Right renal vein

Single right renal vein draining into Inferior vena cava was observed in 22 specimens accounting for 73.3%. Double renal veins draining individually into Inferior vena cava was observed in 6 specimens accounting for 20%. Two renal veins joined to form a single vein and then drained into the inferior vena cava were observed to be 6.7 %.

The incidence of single renal draining into the inferior vena cava was 84%. The incidence of double renal vein on the right side was 12 %. Double renal vein on the left was not observed in the present study.

Table I: Results of left and right renal vein

Renal veins	Left Renal veins		Right Renal veins	
	Incidence	Percentage	Incidence	Percentage
Single	24	80.0	22	73.3
2 veins unite to form 1 vein	6	20.0	2	06.7
2 veins	0	00	6	20.0
Retro-aortic	1	3.3	-	-

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Discussion

In the present study additional renal vein were observed only on the right side (20%).Similar results were observed by Mankhause et al (1986)[2]. Dhar et al (2004), Bregman (1988), and Gupta et al (2011) have observed higher incidence of additional renal veins on the right side than on the left side[3, 4, 5, 6]. The higher incidence of additional renal veins on the right side results due to a complex embryological process. During the eighth week of intrauterine life, bilaterally symmetrical cardinal venous system converts into unilateral right-sided inferior vena cava. Two renal veins are present on each side, one on the ventral plane and another on the dorsal plane. With further development, confluence of the tributaries occurs to from a single vein. Persistence of these two veins on the right side results in additional vein. The shifting of venous arrangement to the right and complex embryogenesis of the left renal vein discourages the incidence of any additional vein on the left side. The incidence of retro-aortic left renal vein is 3.3% in our study. The incidence of retro-aortic left renal vein has been reported from 0.5% to 17% in different studies[3, 4, 5,6,7,8]. The retro-aortic left renal vein is a developmental anomaly and a form of abnormal persistence of the supracardinal anastomosis, associated with regression of the inter-subcardinal anastomosis[2].

Anatomical variations of the renal veins, such as additional renal veins are a real threat during various retroperitoneal surgical and interventional procedures[9]. The retro aortic course of left renal vein could be the cause of hyperemia of the left kidney and they are susceptible for obstruction which may result in chronic interstitial nephritis. In aortic aneurysm repair, the retro-aortic vein may be avulsed while mobilizing the kidney or clamping the aorta. Senecail et al.(2005), described that anomalies of left renal vein are difficult to recognize in abdominal CT scan or in magnetic resonance[10]. Satyapal et al (1999), Senecail et al (2005) reported that it may modify the values obtained by catheter sampling for suprarenal hormonal levels[6, 10,]. In the present day, acute and chronic renal failures are on the rise at an alarming high rate. Living kidney donors and cadaver kidney transplantation has become quite common, giving new lease of life to the patients. Hence the approach of renal veins during kidney resection from donors is inevitable and a sound knowledge of this regional anatomy is very essential for surgeons.

Conclusion

Complicated embryogenesis of Inferior vena cava and left renal vein are the reasons for increased anomalies at this region. The incidence of additional renal veins were commonly observed on the right side (20%) than on the left side (nil).Retro-aortic left renal veins were observed in 4% cases. Although operative techniques have become standardized, the more serious complication is venous hemorrhage during and after surgery. Hence a prior knowledge of the possible anatomical variations can avert inadvertent traumas and unforeseen bleeding to a greater extent. The presence or absence of variations may help in modifying the criteria adopted for the management by the surgeons.

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