Clinical Anatomy

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Case report

Bilateral multiple renal arteries: A case report

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Abstract

Introduction

The renal artery is the branch of the abdominal aorta given off at the level of second lumbar vertebra. The present case, reports presence of multiple renal arteries on both sides.

Case report

We report a case of an 18 yr old female, having five renal arteries, three on the right side and two on the left side found on the CT Aniographic image analysis. All of them originated opposite to the body of the L1 vertebra from the aorta in close approximation and entered the substance of the kidney through the hilum.

Discussion

Commonly reported variation regarding renal arterial vasculature is presence of an accessory renal artery along with the main renal artery. But the number of total renal arteries more than three or four is less frequently reported. Embryologically the accessory renal arteries represent the persistence of foetal arteries supplying the developing kidneys.

Conclusion

Presence of multiple renal arteries is of profound clinical importance because of increasing number of surgical and radiological intervention in the renal hilar area. Moreover there is gradual preference towards the minimally invasive surgeries. So knowledge of these variations should be kept in mind prior to intervention in this area.

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Introduction

Knowledge of renal artery variations is important because of increasing number of surgical and radiological interventions in the region of the kidney. Usually the renal artery arises from the lateral aspect of abdominal aorta below the origin of superior mesenteric artery at the upper lumbar level. It divides into anterior and posterior divisions close to the hilum of the kidney, which give rise to a number of end arteries known as segmental arteries supplying the respective segments of the kidney. While an accessory RA is the one that is accessory to the main RA supplying the kidney.

Existence of variation in renal arterial anatomy is accountable in renal pathologies, radiological interventions, renal transplants and other procedures involving the kidneys because altered state of haemodynamics is obvious in such cases. Transplantation of kidneys that have one renal artery is technically easier and post-surgical rates of vascular and urological complications and kid-ney loss are lower compared to those with more than one renal artery[1]. One such case having total five renal arteries arising in close approximation from the abdominal aorta is reported and its clinical significance is discussed here.

Case report

A study on the renal artery was conducted in the Department of Anatomy and 64-slice CT centre of the Department of Radiodiagnosis, King George's Medical University, UP, Lucknow. The study group included 53 patients including 33 males and 20 females of age ranging between 13 yrs to 65yrs. The patients underwent computed tomographic aortic angiographic scan for various indications. Computed tomographic angiographic images taken were reviewed for normal anatomy of renal arteries and their variants. Firstly, the kidneys were identified in axial as well as volume rendered images and then observed for the arteries entering and supplying them. The number of renal arteries on either side was noted. In case of presence of more than one renal artery, the artery showing maximum diameter was considered to be the main renal artery and the rest of the arteries were considered as accessory renal arteries (ARA). After identifying all the

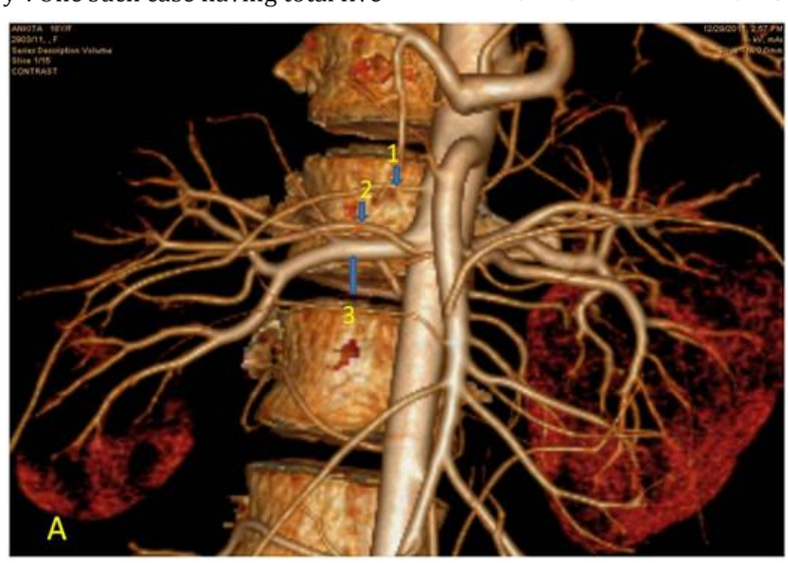

Figure 1: : showing three renal arteries (numbered 1,2 and 3) on the right side supplying right kidney and originating from abdominal aorta note that the 2nd renal artery is crossing third renal artery from front.

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visible arteries entering the kidneys, their vertebral level of origin was observed and noted in sagittal maximum intensity projection (MIP) images as well as in volume rendered images. Also the length and diameter of the arteries was measured with the help of an electronic caliper.

While performing the study, on analysis of angiographic images of an eighteen years old female we observed that there were three renal arteries supplying the right kidney (Figure 1). All of them were originated from abdominal aorta opposite the L1-vertebra in close approximation and entered the kidney through the hilum. The second renal artery was crossing the third renal artery from the front while passing to the hilum (Figure 1).

On observing the left side we found that the left kidney was supplied by two renal arteries (Figure 2). Both the arteries were given off by the abdominal aorta opposite the L1 – vertebra in close approximation and entered the kidney from the hilum. We measured the length and diameter of the arteries and analysed their branching pattern. If the artery divided before reaching the hilum of the kidney then it was labelled as prehilar branching. The observations regarding these arteries are shown in table 1.

Figure 2: Showing two renal arteries (numbered 1 and 2) on the left side originating from the abdominal aorta in close approximation.

Table 1: Displaying the observations regarding renal arteries found in this case.

Renal artery	Level of origin	diameter	length	Branching pattern	Site of entrance
Rt. Renal Ar. 1	L-1 vertebra	2.5mm	Unable to measure	In renal substance	Renal hilum
Rt. Renal Ar. 2	L-1 vertebra	2.8mm	57.7mm	hilar	Renal hilum
Rt. Renal Ar. 3	L-1 vertebra	4.2mm	14.7mm	prehilar	Renal hilum
Lt. Renal Ar. 1	L-1 vertebra	4.3mm	15.2mm	prehilar	Renal hilum
Lt. Renal Ar. 2	L-1 vertebra	3.5mm	34.8mm	hilar	Renal hilum

Discussion

During embryological development as the kidneys ascend from the pelvis they receive their blood supply from the vascular structures close to them. Initially renal arteries are the branches of common iliac arteries.

Later, while the kidneys ascend they receive new branches from the aorta, and the inferior branches disappear. In the ninth week of the intrauterine life the kidneys come into contact with the suprarenal glands and the ascent stops. The kidneys receive their most cranial branches from the aorta. These are the permanent renal arteries[2]. Persistence of the foetal arteries; present in adults as accessory renal arteries. In recent times, minimal invasive surgery is preferred in all surgical branches to decrease morbidity. Despite refinement in surgical techniques in the field of urology like laparoscopic procedures; vascular complications still accounts for considerable morbidity and mortality. Small diameter (less than 3 mm) accessory vessels are often not relevant to graft function and can be sacrificed but can cause unexpected bleeding from accidental transaction. Such bleeding is a potentially serious complication of laparoscopic surgery. The same can require conversion of a laproscopic procedure to an open procedure[3]. To avoid these complications the knowledge of renal vasculature is mandatory prior to any surgical intervention.

Presence of the accessory renal artery (ARA) is the most common and clinically important variation of the renal artery. The ARA arises as a separate branch from the aorta or iliac artery, and it has been reported with a prevalence of approximately 25–30% in different study groups[4,5]. According to Novic et al. there is no definite limit to the number of accessory renal arteries; although more than three on the same side seems to be very rare[6]. Rossi et al. reported a case with seven renal arteries while Kinnunen et al. reported another case with ten additional renal arteries[7,8].

Miclaus and Matusz described a rare case with eight renal arteries (bilateral quadruple) as revealed by routine multidetector computed tomography angiography[9].

Ogeng'o et al. studied the trajectory of renal arteries. Out of all double renal arteries they found; 59.5% were parallel, 21.4% overlapped, 11.9% were divergent and 7.1% crossed[10]. We also report crossing of the renal arteries on the left side.

Conclusion

The knowledge of renal angio-architecture, whether usual or variant, is considered to be a prerequisite for

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successful and uncomplicated surgical and radiological procedures.

Consent

Written informed consent was obtained from the patients for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

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