



Case Report

Aberrant renal arteries and its clinical significance: a case report

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ABSTRACT

The increasing use of invasive diagnostic and interventional procedures in cardiovascular diseases makes it important that the type and frequency of vascular variations are well documented and understood. With the advent of laparoscopic renal surgeries and donor nephrectomies, it becomes mandatory for the surgeons to understand the abnormality or variations in the renal vasculature. Otherwise renal transplant may be jeopardized by the presence of aberrant vessels. Existence of the aberrant arteries is accountable in cases of renal pathologies, radiological interventions, renal transplants, and other surgical approach on them. Therefore this case report would serve as ray of light for knowing the possible anatomical variations associated with the renal vasculature. During routine dissection we observed an unusual variation in the vascular supply to the kidney on the right side of a 60-year-old male cadaver. However such variation was not found on the opposite side. Patients with such variations may be asymptomatic. © IJAV. 2011; 4: 37–39.

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Introduction

The renal arteries are a pair of lateral branches arising from the abdominal aorta below the level of superior mesenteric artery at the upper lumbar level (L1-L3). The paired renal arteries take about 20% of the cardiac output to supply organs that represent less than one-hundredth of total body weight [1]. The right renal artery is longer in its course owing to the location of the abdominal aorta more towards the left side of midline. Each renal artery divides into anterior and posterior divisions at or very close to the hilum of the kidney. Further it divides into segmental arteries to supply the respective segments of the kidney being themselves the end arteries.

Variation in the number, source, branching and course of the renal arteries are very common. These accessory renal arteries or the aberrant arteries account for about 30% of existence, while 70% owes for the normal type. Further there is a difference in terminologies related to an aberrant renal artery and an accessory renal artery. An accessory renal artery is the one that is accessory to the main artery accompanying the same towards the hilus and entering the kidney through the hilum to supply it, while the aberrant artery supplies the kidney without entering its hilum [1].

Existence of the aberrant arteries is accountable in cases of renal pathologies, radiological interventions, renal

transplants, and other surgical approach on them. Altered state of hemodynamic was thought of in cases of multiple arteries supplying it.

In the present study we reported the unusual branching pattern of the aberrant right renal artery and associated clinical significance of the same.

Case Report

Using conventional dissecting techniques, the posterior abdominal wall was dissected in a 60-year-old embalmed male cadaver, with a purpose of preparation of the teaching and museum anatomical specimens. The medical history of this cadaver was not available. In the present case we reported a rare case of aberrant renal artery arising from the abdominal aorta on the right side. Following the fine dissection, the aberrant renal artery was photographed. However, such variation was not found on the opposite side of the same cadaver.

In the present case, we noticed that the aberrant right renal artery originated at the level of lower border of L1 vertebra along with the origin of the normal right renal artery. This aberrant renal artery had a parallel course with that of the right renal artery lying superior to it. The trunk of the aberrant renal artery entered the kidney from its anterior surface through its capsule giving off branch to the upper

pole called superior polar artery. Further this artery gave a posterior branch that was entering the capsule of the right kidney from its posterior surface almost close to its medial border behind the hilum. This aberrant artery gave a branch to the right suprarenal gland, the inferior suprarenal artery instead of the main renal artery supplying it. We also noticed an extra-capsular branch given off by the main right renal artery to the anterior surface in front of the hilum (Figure 1).

Discussion

Knowledge of the existence of aberrant renal arteries is important because they may be inadvertently damaged during renal surgery and their presence must be considered in evaluating a donor kidney for possible renal transplantation. Persistence of certain of the cephalic mesonephros vessels, however, may result in the arterial abnormalities [2].

Different origins of the renal arteries and its frequent variations are explained in various literatures owing to the development of mesonephric arteries. These mesonephric arteries extend from C6 to L3 during the development. Most cranial vessels disappear while the caudal arteries form a network, the rete arteriosum urogenitale that supplies in future the metanephros. The metanephros in future develops into adult kidney deriving its blood supply from the lowest suprarenal artery which gives out a permanent renal artery. Persistent roots of the network form these segmental arteries of the adult kidney having variations at their point of origin. The kidney grafts with multiple arteries resulted in post-transplant morbidity and graft loss following the ligation of the polar arteries. The transplantation of the kidney with the single renal artery is technically easier compared to the kidney with multiple arteries [3].

Aberrant or accessory arteries have been of interest to the clinicians for some years, mainly because of the possible part the vessel may play in the causation of hydronephrosis. However, judging by the many descriptions of these vessels in the literature, it is evident that there is no established criterion for aberrance; the term has been applied equally to an additional artery in the renal pedicle, or to a vessel entering the kidney at either pole, whether derived from the main renal artery, from the aorta or from a branch of the aorta [4].

Aberrant renal arteries are common in fused kidneys. Aberrant arteries perforate the substance of the kidney rather than entering its hilum to supply it. These arteries could arise as high as inferior phrenic artery or as low as internal iliac arteries. The unusual vessels may originate from the aorta, as well as gonadal, common iliac, middle sacral, external or internal iliac or superior or inferior mesenteric arteries. Superior renal polar renal arteries are usually single. They arise as separate branches from the aorta or as branches of the renal artery, inferior suprarenal, inferior phrenic or superior mesenteric artery. Inferior renal polar arteries are usually single and arise from the aorta or renal artery. They have also occasionally been reported arising from a

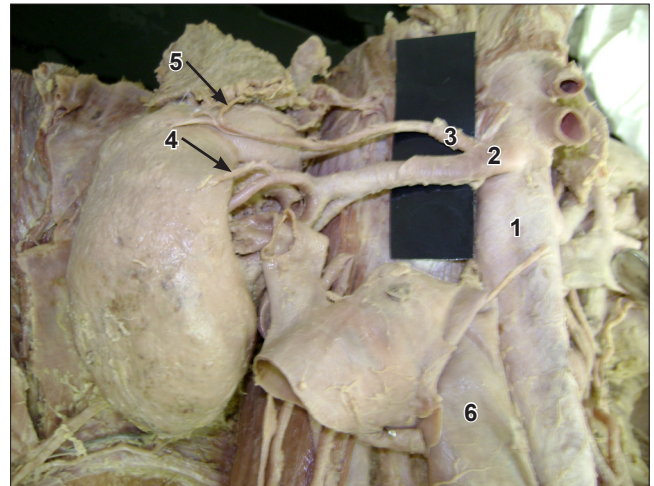


Figure 1. Abdominal aorta on the right side showing the origin of renal artery and aberrant renal artery. (1: abdominal aorta; 2: right renal artery; 3: aberrant renal artery; 4: aberrant renal artery; 5: inferior suprarenal artery; 6: inferior vena cava)

suprarenal, common iliac or superior mesenteric artery. The inferior polar arteries are sometimes doubled, with one arising from the aorta and the other from the renal artery, or the pair from the either source. The inferior polar arteries have been implicated as an etiological factor in a form of hydronephrosis correctable by surgery [5].

The arterial supply of the suprarenal gland vary to such an extent that no two are ever alike. The inferior suprarenal arteries are considered to be very important because they supply all or most of the gland. The inferior suprarenal arises mainly from renal artery, in few percent of cases it arises from aorta and very rarely from gonadal artery [5].

The presence of unusual branching pattern of the renal arteries is not uncommon. In 70% of cases, there is single renal artery supplying each kidney. Considering this fact, multiple branching pattern of the renal arteries may not be uncommon finding, the clinical implication of such an anomaly need to be given due attention. Presence of variant renal arteries may be associated with other underlying renal pathological conditions [6].

Two relatively young patients with significant hypertension have been identified with an elongated single aberrant renal artery supplying blood to a renal segment, and an evidence for localization of the elevated plasma renin activity to the side and vein draining the affected kidney [7].

The presence of additional renal arteries is very probable when the main renal artery has a diameter of less than 4.15 mm. Kidneys presenting a main renal artery greater than 5.5 mm very probably do not present additional renal arteries. So the renal artery diameter is a factor which should be considered as predicting the presence of additional renal arteries [8].

Conclusion

Variations in the origin and course of the renal arterial blood supply occur frequently and are of special interest to the urologist with respect to the disease associated with it. The relevance of the aberrant arteries in systemic hypertension and urethral obstruction was established. With the advent of laparoscopic renal surgeries and donor nephrectomies, it becomes mandatory for the surgeon to understand the abnormality or variations in the renal vasculature. Otherwise renal transplant may be jeopardized by the presence of aberrant vessels. Therefore, considering the increase in incidence of the accessory and multiple renal arteries, the anatomical knowledge of such may be important for academic, surgical as well as radiological procedures and the present study is a humble effort to highlight the same.

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