ANALYSIS OF VARIATIONS OF POSTERIOR DIVISION OF RENAL ARTERY IN KIDNEY DONORS

Kumaresan.M¹, Sangeetha A²*, Yuvaraj Maria Francis¹, Balaji Karunakaran¹, Gunapriya Ragunath¹.

¹Department of Anatomy, ²Department of Physiology, Saveetha Institute of Medical & Technical Sciences, Chennai, Tamil Nadu, India 602 105

*Corresponding Author:
Sangeetha.A
Assistant professor
Department of Physiology,
Saveetha Medical College & Hospital,
Saveetha Institute of Medical & Technical Sciences,
Chennai, Tamil Nadu, India 602 105
Mobile: 09444686966
Email Id: sangeethasrmc@yahoo.com

Abstract

Introduction: Renal artery arises from lateral part of abdominal aorta. When it reaches near the hilum of kidney it gives anterior and posterior division. The posterior division of renal artery supplies the posterior segment of the kidney. This branching pattern of posterior division shows 3 different patterns. Aim: The aim of this study is to determine the different branching pattern of posterior division of renal artery among the sides and to find the gender differences. Materials and methods: A total of 99 Computed tomography angiogram images of kidney donors were evaluated and attempt taken to trace posterior division of renal artery. Computed tomography angiogram images were collected from specialised scan centre in Chennai. Results: In this study majority of posterior division was found to be type 2. Percentage of occurrence of pattern of posterior division is discussed in this study. In this current study we find association between the pattern of posterior division of renal artery between right and left side \( \chi^2 = 8.178; P = 0.042 \). Conclusion: To conclude, this study suggests knowledge of renal artery and its posterior division is helpful in segmental transverse resection of kidney evaluate in order to decide the precise surgical approach.

Keywords: Branching pattern, Computed tomography angiogram, Kidney, Renal artery, and Segmental transverse resection

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Introduction

Renal artery arises from lateral part of abdominal aorta. When it reaches near the hilum of kidney it gives anterior and posterior division. The posterior division of renal artery almost supplies the posterior segment of the kidney [1]. The different pattern of renal artery is vulnerable and its surgically important [2]. From a posterior approach, the posterior segmental artery is accessible to clamping at pre segmental [3].

A vascular plane of brodel is a section of renal parenchyma, which is positioned between the anterior and posterior segmental arteries. A vascular plane is a fairly constant aspect of a kidney and this hypovascular area is usually oriented 20-30 degree from sagittal plane. Puncturing these area results in reduced bleeding risk compared to puncturing other areas of kidney. Bleeding may occur during the any aspect of percutaneous nephrolithotomy injury to main renal vessels occur during initial percutaneous access [4]. Previous studies mainly used corrosion cast technique to rule out this pattern. In this study we used 64 slice angiographic images and attempt has been made to rule out the various patterns of intrarenal arteries which have several clinical implications.

MATERIALS AND METHODS:

It is an observational study of diagnostic accuracy a total 99 kidney donors CT Angiogram images were investigated. The present study was carried out after getting approval from Institutional Human Ethics Committee IHEC No. 001/09/2015/IEC/SU Dated, 29 September 2015. The study was conducted in specialized scan centre located in Chennai after getting appropriate permission. The study group was drawn from kidney donors who approached the scan center had no diseases related to kidney. An attempt was taken to trace the branching pattern of posterior division of renal artery. This branching pattern of posterior division shows 3 different patterns (fig2). Type 1 runs downward behind the pelvis of ureter with lateral convexity from which 3 or more branches which are not named arises to supply the posterior segment of kidney. Type 2 terminates by bifurcation or trifurcation before supplying the posterior renal terminal segment. Type 3 posterior division gives off the superior, anterior inferior or the inferior segmental artery usually the branches of the anterior division. The data were compiled and analysed using SPSS software.

RESULTS:

In the 99 donors (198 kidneys) of the present study the posterior divisions of the renal artery shows, type 1 is more frequent in right side (33 kidneys) than left (22 kidneys). On right side type 1 is more frequent in male (37%). On left side type 1 is more frequent in female (24%). Type 2 is more frequent in left (61 kidneys) than right (56 kidneys). On right side type 2 is more frequent in male (51.8%). On left side type 2 is more frequent in female (71%). Type 3 is more frequent in left (13 kidneys) than right (4 kidneys). On right side type 3 is more frequent in female (4.4%). On left side type 3 is more frequent in male (22.2%). We also observed other patterns in 9 kidneys.
In this study majority of posterior division found to be type 2 and certain other patterns which were not classified. Percentage of occurrence of pattern for sides and gender are given in table 1 and statistical values for sides are given in figure 1.

<table>
<thead>
<tr>
<th>Pattern</th>
<th>Right</th>
<th>Left</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male (n=54)</td>
<td>Female (n=45)</td>
</tr>
<tr>
<td>Type 1</td>
<td>20 (37%)</td>
<td>13 (28%)</td>
</tr>
<tr>
<td>Type 2</td>
<td>28 (51.8%)</td>
<td>8 (17.7%)</td>
</tr>
<tr>
<td>Type 3</td>
<td>2 (3.7%)</td>
<td>2 (4.4%)</td>
</tr>
<tr>
<td>Other pattern</td>
<td>4 (7.4%)</td>
<td>2 (4.4%)</td>
</tr>
</tbody>
</table>

Figures given in parenthesis are percentage. Statistical values are given in Figure 1
Figure 1: Distribution pattern of posterior division of renal artery.

There is association between the Pattern of posterior division of renal artery between right and left side.

$\chi^2 = 8.178; P = 0.042$.

The percentage of occurrence of different pattern of posterior division is given in Table 5.2.
DISCUSSION:

It should be remembered that the origins of the segmental arteries are accessible. In the majority of cases, they are easily seen in the hilum and often at the points nearer the aorta. This is of practical value, since segmental resection is best carried out from the hilum towards the periphery [5]. The present studies were compared to the studies carried out by various other workers in study of the variations of the renal vasculatures during period of 1954 to 2014.

Comparison of posterior division of renal artery with previous workers

|---------------|-----------------|------------------|-----------------|------------------------|--------------------------|-------------------|

The table shows the studies carried out by various workers to study the variations of the posterior division of the renal artery and their respective findings were compared to the present study.

In this current study majority of kidney we see posterior division of renal artery terminates by bifurcation or trifurcation before supplying the posterior renal terminal segment which in contrast to the study conducted by kher, verma , Fine [6,7,8]. And similar to the study done by Raghavendra and chandragirish [9, 10].

The previous workers have categorized the intrarenal segmental patterns using cadaveric dissection, corrosion method and x-ray photographs of cadaveric specimens whereas in the current study we categorized the intrarenal pattern using 64-Slice CT angiography in live potential kidney donors.

The posterior segmental renal artery can be injured during transverse resection. The basilar renal artery, which typically arises from the anterior segmental renal artery, may occasionally arise from the posterior segmental artery. In that case, injury to the posterior segmental artery would devascularize a major portion of the remnant kidney during an upper pole transverse resection\(^{(1)}\).

**CONCLUSION:**

To conclude, this study suggests that apart from detailed clinical history and examination, a thorough and depth anatomical knowledge of renal artery and its posterior division is helpful in segmental transverse resection of kidney evaluate in order to decide the precise surgical approach. The information provided will also avoid donor complication during renal transplantation and to ensure good recipient graft function.

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**REFERENCES:**