Simple renal cyst & high blood pressure in adult population: Sonological correlation.

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ABSTRACT

Introduction: Simple renal cyst is most common benign mass lesion of kidney. The incidence increases as the age advances. It is mostly unilateral with equal involvement in either side. Cortical cysts are more common than medullary and males are twice affected than females. Smaller cysts are mostly asymptomatic. When cysts size increases it may show various clinical presentation.

Aim of study: To observe the effect of simple renal cyst causing high blood pressure in adult population by ultrasonogram. Materials & method: This study was done in the department of Radiology & imaging Bir-hospital kathmandu. The study was conducted in 102 patients consisting simple renal cyst who was selected from the population of routine ultrasonogram examination. Both sexes were included and age ranges from 18 to 90 years. Number & largest cyst size was recorded. Following 15 minutes of rest, patients blood pressure was recorded from each arm.

Observations & results: Patients studied with simple renal cyst were studied with 1.8:1 male female ratio. The minimum age was 18yrs and maximum was 90yrs (mean 54.8yrs). Study shows equal incidence of cyst in both kidney. The mean volume of cyst was 34 and 35cc in either side. In 46 normotensive patients mean age was 49.8 & 56 patients found to be hypertensive with mean age of 58.8 yrs. In 31 hypertensive patients the mean volume was 42.7 cc. in the right and 47.4 cc in the left.

Conclusion: When the volume of cyst increases the arterial blood pressure also increases irrespective of age.

INTRODUCTION:

Simple renal cyst is the commonest renal mass. The incidence is about twice as common in male than in females which accounts 65-70% among all renal masses1,3,5. They are catogarized as congenital, genetic, medullary spong kidney, aquired (Simple renal cyst & malignant cystic mass). Typically cyst development occures as proliferation of epithelial cells with tubular ectasia, saccular dilatation and fluid collection6. It is found by chance during routine ultrasound scanning. They are usually small but may attain large size in due course and may become palpable and present with flank pain, infection, hematuria, hypertension, impaired renal function rarely catastrophic intra abdominal hemorrhage. Age and blood pressure are interchangeable phenomena. Enlarging cyst causing pressure effect over aretrial system causing ischemia and renin-angiotensin system activation leading to increase in systemic blood pressure7. Cystic renal masses are easily diagnosed by ultrasonogram despite of various imaging modalities like computarized tomography, magnetic resonance imaging and intravenous urography. Anechoic lesion with acoustic enhancement is characteristic of cystic mass5,8. Computerized tomography (CT) will better characterized the outline, shape, size and internal content better than ultrasonogram. But easy availability, non radiating and low cost ultrasonogram (USG) appears to be practically more feasible in detecting simple renal cyst with equal sensitivity & specificity of CT and magnetic resonance imaging (MRI). CT is an excellent modality in detecting complication of cyst & other organ involvement5. MRI is equally sensitive in detecting cystic renal mass but high tissue contrast resolution makes possible complication detection rate high. Use of MRI is reserved for those
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In the right kidney 57 patients had cortical cyst (55.9%) and one has medullary. So in total 56.9% of patients were having right renal cysts. In the left kidney 58.8% had cortical cysts no medullary. Out of 58 patients in the right and 60 in the left B/L involvement of cysts were 16. 50 pts had one cyst and 2-10 in rest of the 8 patients. In descriptive term 59(48%) have one and remaining 11 patients had 2-8 cysts (12%). 58 patients had cysts in right kidney, the minimum volume was 1.66 ml and maximum was 315 ml (mean 33.5 ml) 60 patients had cysts in left kidney where the minimum was 0.4 and maximum was 567.6 ml (mean 34.0 ml) see table 1.

The minimum blood pressure was 70 mmHg and maximum was 176.65 mmHg. Mean=103.19 mmHg.

Among 58 patients of right renal cyst, 27 were normotensive and 31 hypertensive. 60 patients having left renal cyst, 24 were normotensive and 36 hypertensive. Out of 46 normotensive patients the minimum age was 18 yrs and maximum was 82 yrs. Mean 49.8 yrs. Out of 56 patients found to be hypertensive, the minimum age was 29 yrs and maximum was 90 yrs. Mean=58.8 yrs. See table 2.

27 normotensive patients of right cyst have minimum of 1.6 cc an maximum of 86.3 cc, mean=22.9 cc. 24 normotensive of left cyst having 2.5 cc minimum volume and 62.5 cc maximum, mean=16.4 cc. 31 hypertensive has 2.5 cc minimum volume and 315 ml.
maximum volume, mean = 42.7 cc, and 38 hypertensive patients with left cyst the minimum volume of 0.4ml and maximum volume of 567.6 cc. Mean = 47.4 cc. See table 4.

**DISCUSSION**

Simple renal cyst is the most common benign renal mass. It starts to appear at the age of 30 yrs and over 50 the number of patients increases. The evolution of cyst with very small size at the beginning which may not be detected by ultrasonogram. It may be single, multiple unilateral or bilateral. It can be medullary but commonly cortical in location. Most of the patients are asymptomatic and are chance findings. Although benign, malignant transformation is extremely rare. Despite curious clinical presentation like pain, heaviness in flank, hemorrhage & recurrent infection. Hypertension is one of the most important complication of cyst. Similarly as age increases systemic blood pressure also increases. However various studies has been done and found that the simple renal cyst is also one of the causes of hypertension ⁴. We conducted the study to show the impact of cyst on arterial blood pressure.

Etiology is unknown but it is postulated that tubular obstruction and ischemia helps in the formation of cyst which occur more in the cortex area.

Congenital cystic disease is 90% associated with renal dysplasia and ureteral abnormality or distal urinary tract obstruction. Autosomal inheritance polycystic kidney disease has occurrence in later age and have many member involvement in a same family suggest other biologic or environment factors may play role in disease progression. Autosomal recessive polycystic kidney disease commonly occurs in neonates with pulmonary hypoplasia as a component of Potter syndrome and occurs secondary to oligohydramnios and renal enlargement (10-20 times normal size). Cyst formation in the kidney, pancreas, liver & epididymis with aneurism in skull base is termed as Von Hippel-Lindau syndrome ⁶.

JF Pedarsen et al performed ultrasonogram in 686 patients and found the prevalence of simple renal cyst was 5.2% at 30 yrs to 9.7 at 70 yrs. Mean arterial blood pressure measures with age was significantly high. Johnson et al reported elevation of renal vein rennin activity in larger cyst and marsupialization of cyst reduces hypertension. Cortical renal cyst of larger size causes hydronephrosis, vascular stretching & renal parenchyma compression. Churchill D et al concluded that aspiration of cyst & injection of sclerosing contrast media was associated with decreased arterial blood pressure. Al-said J et al ¹⁴ concluded that the kidney size is reduced in patients with simple renal cyst and the

### Table-3 Correlation of patients age with blood pressure

<table>
<thead>
<tr>
<th>Blood pressure</th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>Age in years</td>
<td>46</td>
<td>18</td>
<td>82</td>
<td>49.8</td>
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<tr>
<td></td>
<td>Valid N(listwise)</td>
<td></td>
<td>46</td>
<td></td>
<td>49.8</td>
</tr>
<tr>
<td>Hypertensive</td>
<td>Age in years</td>
<td>56</td>
<td>29</td>
<td>90</td>
<td>58.8</td>
</tr>
<tr>
<td></td>
<td>Valid N(listwise)</td>
<td></td>
<td>56</td>
<td></td>
<td>58.8</td>
</tr>
</tbody>
</table>

### Table-4 Correlation of cyst volume with blood pressure

<table>
<thead>
<tr>
<th>Blood pressure</th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>Vr=volume of right cyst in cc</td>
<td>27</td>
<td>1.6</td>
<td>86.3</td>
<td>22.9</td>
</tr>
<tr>
<td></td>
<td>Vl=volume of left cyst in cc</td>
<td>24</td>
<td>2.3</td>
<td>62.5</td>
<td>16.4</td>
</tr>
<tr>
<td></td>
<td>Valid N(list wise)</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypertensive</td>
<td>Vr=volume of right cyst in cc</td>
<td>31</td>
<td>2.5</td>
<td>315.0</td>
<td>42.7</td>
</tr>
<tr>
<td></td>
<td>Vl=volume of left cyst in cc</td>
<td>36</td>
<td>0.40</td>
<td>567.6</td>
<td>47.4</td>
</tr>
<tr>
<td></td>
<td>Valid N(list wise)</td>
<td>11</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>
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Simple renal cysts must be associated with impaired renal function. This suggested that isolated cyst is an indication of nephron loss in patients with renal abnormality & increasing arterial blood pressure. Hinman F Jr.\textsuperscript{15} found renal cysts are usually asymptomatic and required no treatment once diagnosed. Occasionally larger cyst causes progressive obstruction to pelvic out flow.

102 patients of simple renal cyst were taken as a sample set. We found cysts are more common in male 64.7% (n-66) than female 35.3% (n=36) with ratio of 1.8:1. It shows remarkable difference in the incidence of simple renal cyst by sex while comparing with study done by Terade N et al\textsuperscript{11}. Yasuda M et al\textsuperscript{12} has identical sex incidence of simple renal cyst. They found 1.6:1 sex ratio in their routine ultrasonogram examinations. We found the incidence increases after 50 yrs. The mean age was 54.8 yrs which well coincide with the findings conducted by luscher et al\textsuperscript{7}. Our study shows 56.9% had right sided cysts among them almost all were cortical except one which was medullary. 58.8% of patients had left sided cysts all cortical. 16 patients had B/L renal involvement. So it is clear that cysts have about equal incidence of involvement in either kidney. Most of the time it is unilateral but can B/L in minority. Ravind D et al\textsuperscript{13} say B/L involvement 1% in 30-49 yrs, 4% in 50-70 yrs and 9% above 70 yrs.

From the above result we saw over 90% the number of cysts found single. Out of 58, 50 patients were posing only one cyst in right kidney and more than one in rest of the 8. Similarly out of 60 patients, 49 have only one and 11 have many more in the left kidney. The volume of cyst can be very small or very large. We found as small as 1.68cc in right, 0.5cc in left side and as large as 315 cc in right and 567 cc in left side. In both kidney the mean volume was 33.53 cc in right and 35 cc in left kidney.

Further we correlated the cyst volume with blood pressure. Here we saw 27 normotensive patients of right cyst the mean volume was 22.91 cc and 24 normal patients of left the mean volume was 16.42 cc. Of 31 hypertensive patients with right cyst the mean volume was 42.77 cc and 36 patients of left cyst the mean volume was 47.47 cc. Here comparing the blood pressure with age, blood pressure can be normal at the mean age of 49.87 yrs and may be hypertensive at the mean age of 58.86 yrs. But while comparing the blood pressure with the cyst volume the blood pressure was normal when the volume was 22.9 cc and 16.4 cc in either side but when the volume increases in either kidney cyst that is 42.77 cc in the right and 47.47 cc in the left the blood pressure increases. JF Pedersen et al\textsuperscript{4} found that the mean arterial blood pressure measured with age was significantly high in the individual with cyst. As Luscher TF et al\textsuperscript{1} suggested that the cyst size greater than 2cm diameter are associated with hypertension which is well correlated with our result. As we have discussed above, our youngest patient was 18 yrs old having normal blood pressure. But in hypertensive age group the youngest patients was 29 yrs, while 82 yrs old patient was having normal blood pressure. Our study suggests certainly age is not the only factor for hypertension. From the above study we can assume that the cyst volume is the most important indicator for the cause of hypertension.

**CONCLUSION:**

Simple renal cysts are commonly asymptomatic and may remain indolent for many years. The study shows that the hypertensive group in compare to normotensive has remarkably larger cyst size. Hence it is assumed that the size of the cyst may have some impact on arterial system causing hypertension. Cyst volume may be one of the denominators of the increasing blood pressure. Periodic follow-up and maintaining the cyst size stable may prevent hypertension. Further ultrasonogram guided cyst decompression may reduce hypertension.

**REFERENCES:**

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