Prevalence of Benign Lesions in Partial Nephrectomy

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ABSTRACT

Objectives: To determine the prevalence of benign lesions in patients, who underwent partial nephrec tomy for suspected renal malignancy.

Methods: The medical records and histopathologic reports of 74 patients who underwent partial neph rectomy for renal masses radiologically suspected to be malignant between 2010-2017 were reviewed retrospectively to determine the prevalence and the parameters associated with benign lesion.

Results: Among the 74 patients, 52 patients were found to have RCC (70.27%) and 22 patients wer e found to have benign lesion (29.73%). Among benign lesions oncocytoma was found in 11 patients (50%) and was the most common benign lesion,followed in decreasing order of frequency by : 7 angi omyolipomas (AML) (32%), one complicated cyst (4.5%), one Lymphangioma (4.5%), one malkopl akia (4.5%),and one patient had a mixed epithelial and stromal tumor (4.5%).

Conclusions: The prevalence of benign tumors was 29.73% . Oncocytoma was found to be the most common benign lesion, which is comparable to other published studies; the prevalence of benign lesi ons is almost the same in both kidneys, both genders and different age group, it was more prevalent in small size lesions although this was statistically insignificant.

Keywords: radical nephrectomy, partial nephrectomy, nephron sparing surgery, benign renal tumors, renal cell carcinoma.

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INTRODUCTION

Renal cell carcinoma (RCC) is ranked number one among fatal Urologic cancers. Nephrectomy of fers the only therapeutic option for localized tumors, which increases survival rate of patients.[(1)] There are two types of nephrectomy: (1) radical nephrectomy (RN) and (2) partial nephrectomy (PN) or ne phron sparing surgery (NSS). Principles of RN were set by Robson in 1963. It was the procedure of c hoice for all renal masses till late 1970s. PN was introduced as a treatment option to preserve the rem ainder healthy renal tissue. Since then PN has been proven to be not inferior to RN. Due to the tumor recurrence concept, PN can be performed up to a certain stage to achieve the same survival rate as R N.

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There has been more than one study about the upper size limit (the T stage) for resectable tumors, which can be resected safely by NSS. Tumors ranging in size from 4 cm (T1a) to 7 cm (T1b) can be resected by this procedure, recent studies also showed that PN is safe and effective for tumors larger than 7 cm in selected patients[2].

Due to the increased use of cross-sectional imaging along with improved image quality, the incidental finding of small asymptomatic renal tumors has increased.[3] NSS offers oncologic control and survival results equivalent to RN with more preservation of renal functions.[4] PN is now considered the standard surgical treatment option for small renal tumors, especially stage T1a (≤ 4 cm) renal cell carcinoma.[5] Of the solid renal tumors ,small renal masses (SRMs) account for(48%-71%) . These are defined as solid lesions ≤ 4 cm that are enhanced on computed tomography (CT) and magnetic resonance imaging (MRI) ,are suspected of being renal cell carcinoma, and are found incidentally.[6] Among SRMs about (20%-30%) are benign lesions, 55%- 60% are indolent RCC, and only 10%-25% are aggressive in nature.[7]Therefore, due to the increased detection of asymptomatic solid renal tumors by the widespread use of imaging modalities,[8,9] and because the mortality rate of RCC has not changed significantly despite of an increasing rate of radical surgery, in addition to the higher complication rate of RN ,[10] with data confirming that most of SRMs are benign or indolent, as a result, the treatment of SRMs has changed toward being less invasive and less radical.[11] On the other hand, due to the lack of imaging methods that can accurately distinguish between benign renal lesions such as oncocytoma and small angiolipoma from renal cell carcinoma, partial nephrectomy nowadays is the most selected treatment. [12]

The aim of this study is to estimate the prevalence of benign renal tumors among patients who underwent PN with suspicion of RCC, determined by different imaging tools.

MATERIAL AND METHOD

The medical records and the histopathologic reports of 74 patients who underwent PN for renal masses suspected to be malignant without metastasis between 2010-2017 were reviewed retrospectively. All patients' files included follow up notes, imaging reports and histopathologic reports. All patients underwent open PN through a supracostal 11th or 12th rib incision, somtimes applying warm ischemia especially in larger lesions. Patients had renal masses suspected of being malignant by imaging modalities like ultrasonography (US), enhanced computed tomography (CT), and magnetic resonance imaging (MRI). These tumors had varying sizes, and were classified into two groups based on size, i.e. 4 cm or less or more than 4 cm. In principle, patients who had ≤ 4 cm solid tumors, complicated cysts (Bosniak type III or IV), and peripherally located tumors less than 7 cm, underwent PN. The histopathologic reports of these patients were obtained from Princess Iman Centre for Research and Laboratory Sciences at Royal Medical Services. Inclusion and exclusion criteria of patients are summarized in Table I below.

Included patients	Excluded patients
• Patient age 20-80 years • Patients with dibetis mellitus • Patients with hypertension • Patients with chronic kidney disease but not on dialysis	• Patients with a diagnosis of benign lesion or urothelial carcinoma • Patients with sever coagulopathy • Patients with metastatic tumors • Pregnant female patients • Patients with genetic syndromes of RCC or angiomyolipoma (Von Hipple-Lindau, Birt-Hogg-Dube, Hereditary papillary renal cancer, Hereditary leiomyomatosis, constitutional chromosome 3 translocation, Tuberous sclerosis)

Table I

Renal tumors were histopathologically classified by the world health organization (WHO) according to the cell of origin of these tumors into: renal cell tumors, metanephric tumors, nephroblastic and cystic tumors, mesenchymal tumors, mixed epithelial and stromal tumors, neuroendocrine tumors, haematopoietic and lymphoid tumors, germ cell tumors, and metastatic tumors.
Each of the previous types contains subtypes that are either malignant or benign. So our results were dependent on this classification to identify malignant and benign tumors. **(13)**

Patients were divided into two groups based on the histopathological nature of tumor (benign or mal ignant), according to the following variables: age, gender, size of the tumor, and the location of the tu mor (in the right kidney or in the left kidney).We obtained approval for publication from our institutio n via the Royal Medical Services ethical committee. Most of the data were presented in the form of t abulated descriptive statistics; the frequency and percentages were generated for the categorical data . The frequency distributions and the summary statistics were calculated to describe the sample chara cteristics. In addition chi square of independence was used to find association between categorical var iables, alpha set at 0.05 considered statistically significant and SPSS software version 24 was used to analyze data.

RESULTS

Of the 74 patients included in this study, 52 had malignant lesions and 22 had benign lesions. The subtypes of these are shown in Table II below

Malignant lesions	Benign lesions
Clear cell renal cell carcinoma (38 patients, 73%) Papillary renal cell carcinoma (12 patients, 23.1%) Chromophobe subtype (2 patients, 3.9%)	Oncocytoma (11 patients , 50%) Angiomyolipoma (7 patients, 32%)* Complicated renal cyst (1 patient 4.5%) Lymphangioma (1 patient, 4.5%) Malakoplakia (1 patient, 4.5%) Mixed epithelial and stromal tumor (1 patient, 4.5%)

Table II

**non of these AMLs were diagnosed preoperatively, although AML is a radiologic diagnosis, all lesions included in the study were suspicious for malignancy radiologically.*
In relation to the TNM staging according to the American Joint Committee on Cancer (AJCC) of 2009, the following stages were noticed in patients with malignant disease: 38 patients had T1a tumors (73.1%), 10 patients had T1b tumors (19.23%), and T3a disease was found in 4 patients (7.7%).
68 patients (91.9%) had negative margins and 6 patients (8.1%) had positive margins for malignant disease. “The follow up of these patients is not the scope of this study”.
The patients were divided into age groups and figures 1,2,and 3 below show the distribution of patients among different age groups, according to gender, and the distribution of benign and malignant lesions in each.

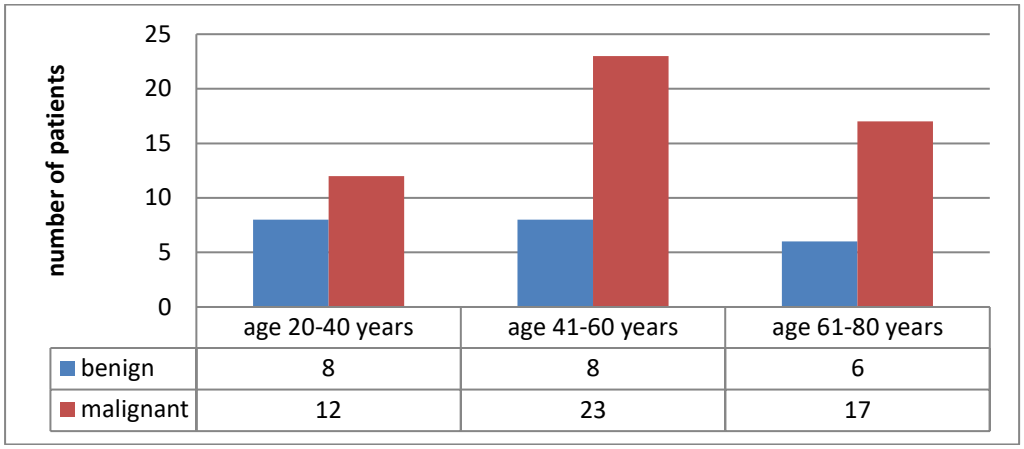

Figure 1

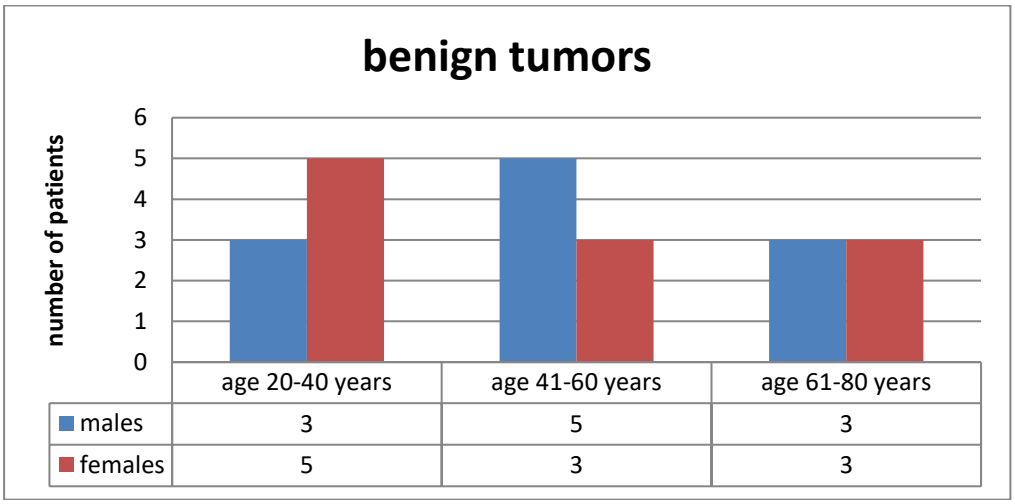

Figure 2

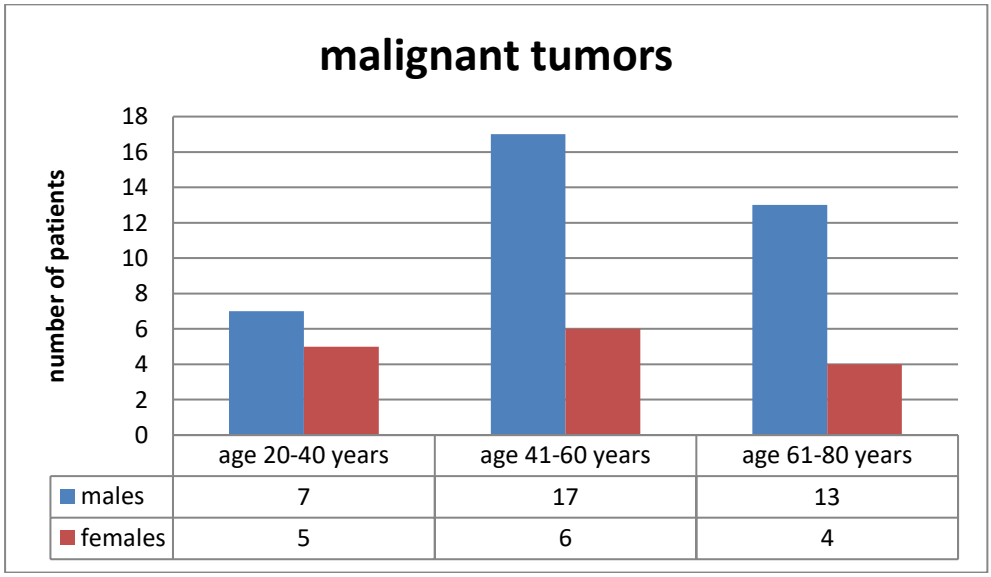

Figure 3

Some of the statistics related to the distribution of malignant and benign lesions, in relation to gender, site and size of the tumor are shown in Table III below.

	Malignant lesions	Benign lesions	X^2	p
Number of patients	52 (70.3%)	22 (29.7%)		
Gender:			3.035	0.814
Males	37 (50%)	11 (14,86%)		
females	15 (20%)	11 (14.86%)		
Site:			0.0917	0.762
Right kidney	28 (37.8%)	11 (14.86%)		
Left kidney	24 (32.4%)	11 (14.86%)		
Size:			2.9008	0.088
4 cm or less	38 (51.35%)	20 (27%)		
>4 cm	14 (18.9%)	2 (2.7%)		

In total 58 patients had tumors less than or equal to 4 cm in size, 34.5% of these had benign lesions.16 patients had tumors more than 4 cm in size and 12.5% of these had benign lesions. So the prevalence of benign lesions was lower in patients with tumors larger than 4 cm. the descriptive statistics (in terms of percentage and averages) showed an apparent difference in the tumor histopathology whether benign or malignant in relation to tumor size. Moreover these differences were not statistically significant based on chi square test "X^2 *(1) 2.9008, p=0.088*".

DISCUSSION

In this study, we found that, benign lesions were found in approximately 30% of the total number of the patients; half of these benign lesions were oncocytomas (50%) with AML as the second most c ommon benign lesion accounting for 32% of benign lesions. The prevalence of benign lesions was n ot related to gender, site, or age. Although About 91% of benign lesions were 4 cm or less in size, wh ile only about 73% of malignant lesions were 4 cm or less in size, this observation of higher incidence of malignancy with larger tumor size was statistically insignificant.

In an original article published in 2010 about the benign pathologic findings in patients who underwe nt surgery for presumed localized RCC (renal cell carcinoma) in

China, Yong-Hong Xiong and colleagues found that the incidence of benign lesions was almost the sa me as in our study, but the most common benign lesion was angiomyolipoma. Similar to our study, tu mors ≤ 4 cm were more common than the tumors > 4 cm, but the percentages were different and the male to female ratio was 2:1, in contrast to our study.**(14)**

In 2013, Soga and colleagues reported on the predictive factors of benign lesions in partially or radically resected kidneys, that the incidence of benign lesions was low (13.5%), which was lower than our result and other results in recent western studies

(15-20%). The predictive factors were younger age, female gender, and small sized tumors.**(15).** Other studies performed in Austria and Turkey found a prevalence of 20% for benign tumors among small renal lesions. (16) While in a study performed in the USA assessing pathologic findings after nephrectomy, the prevalence of renal

tumors other than RCC was 16.9%.**(17)** Our study had the highest prevalence of benign renal tumors a mong these studies.

A study performed by Stravodimos and colleagues on the distribution of benign lesions after radical or partial nephrectomy according to the size of the tumor showed that, when the size of the tumor was ≤ 4 cm it was observed that benign tumors were found in 31.5% of patients, while when the size was between 4.1 and 7 cm, benign tumors comprised approximately 10%, and when the size was > 7 cm, then the percentage of the benign tumors was 5.6%.[18] In our study, the percentages of benign tumors for ≤ 4 cm and > 4 cm tumors were 27%, 2.7%, respectively.

Zisman et al. reported that renal tumors are benign in 20% of women, regardless of the size, whereas in men the chance of a benign mass decreases with increasing tumor size. [19] The same results were found by Colli and colleagues (the percentage of benign tumors was 16% and twice as often seen in females compared to males).[20]In our study, we noted that the benign behavior of the renal mass was not related to the gender as mentioned above. On the other hand, Tsivian et al. found that age, male gender, and the size of the renal tumor are associated with an increased risk of malignancy. [21] In another study on the unreliability of radiology measurements of renal tumor size, the authors found no correlation between the size of the tumor and the benign behavior of a tumor. [22] A study done by Thompson et al. supports an increased risk of malignancy with larger tumor size and of high grading of the renal tumors with a greater tumor size. [23]

In relation to the most common benign tumors, Kurban et al. mentioned that Oncocytomas were the most commonly found among benign lesions in a study published in 2017, which supports our results about this issue. [24]

The location of the tumor is not related to its benign or malignant potential, this idea was supported by Violette and colleagues when they concluded that there is no relationship between the location of the tumor and benign tumor characteristics. [25].

Finally, although about 30% of the patients involved in this study had benign lesions, and in spite of the fact that smaller lesions have even higher probability of being benign, 38 out of the 58 patients who had tumors 4cm or less in size had malignant lesions, so we still recommend these radiologically suspicious lesions be surgically resected. To reduce the number of PNs done for benign lesions obviously we need to improve radiological certainty.

The limitations of our study

include a small sample size, the lack of review of histopathology, the lack of baseline and follow up data, and the fact that the study was carried out at a single site, so we cannot generalize the findings.

CONCLUSION

The percentage of benign tumors in this study was 29.73%, which is consistent with other published studies. The most common benign lesion was found to be the oncocytoma, which is comparable to other published studies. The prevalence of benign lesions was similar in both kidneys, both genders and different age groups, but more prevalent in small lesions in descriptive data. When the tumor was larger than 4 cm the prevalence of benign lesions was 12.5%, this increased to 34.5.% when the tumor size was 4 cm or less, but this was statistically insignificant (probably due to the small sample size)

REFERENCES

1. Robson CJ, Churchill BM, Anderson W. The results of radical nephrectomy for renal cell carcino ma.J Urol 1969; 101:297-301.

2. Michael E.Karellas, M.Frank O'Brien, Thomas L.Jang, Melanie Bernstein, and Paul Russo, Par tial nephrectomy for selected renal cortical tumors of more than or equal to 7cm, US National Library of Medicine. National institution of health February,6th 2015.

3. Yasuhisa Fujii, Yoshinobu Komai, Kazutaka Saito, et al. Incidence of Benign Pathologic Lesio ns at Partial Nephrectomy for Presumed RCC Renal Masses: Japanese Dual-Center Experience with 1 76 Consecutive Patients. Urology 72: 598 – 602, 2008.

4. Sascha Pahernik, FrederikRoos, Bernd Röhrig, et al. Elective Nephron Sparing Surgery for Ren al Cell Carcinoma Larger than 4 cm. The Journal of Urology Vol. 179, 71-74, January 2008.

5. Goran Štimac, Ante Reljić, Ivan Pezelj, et al. The evolution of the partial nephrectomy for kidne y tumors – are we abandoning the basic principles of Robson's radical nephrectomy? ActaClin Croat 2014; Vol.53:455-461.

6. Victor Srougi, Raphael B. Kato, Fernanda A. Salvatore, et al. Incidence of Benign Lesions Acc ording to Tumor Size in Solid Renal Masses. International Braz J Urol Vol. 35 (4): 427-431, July - A ugust, 2009.

7. EU Chang Hwang, Ho Song Yu, Dong Deuk Kwon. Small Renal Masses: Surgery or Surveillanc e. Korean J Urol 2013; 54:283-288.

8. Alison Elstob, Michael Gonsalves, Uday Patel. Diagnostic modalities.International Journal of Sur gery 36 (2016) 504e512.

9. Yasuhisa Fujii. Benign lesions at surgery for presumed renal cell carcinoma: An Asian perspectiv e. International Journal of Urology (2010) 17, 500.

10. F. M. S ´anchez-Mart´ın, F.Mill ´an-Rodr´ıguez, G. Urdaneta-Pignalosa, et al. Small Renal Ma sses: Incidental Diagnosis, Clinical Symptoms, and Prognostic Factors. Hindawi Publishing Corporati on Advances in Urology Volume 2008, Article ID 310694, 6 pages.

11. Christina Lindkvist Pedersen, LiliWinck-Flyvholm, Claus Dahl &Nessn H. Azawi.High rate of benign histology in radiologically suspect renal lesions. Dan Med J 2014; 61(10):A4932.

12. Emil Scosyrev, Edward Messing & Steven Campbell. Radical versus partial nephrectomy for a small renal mass: does saving nephron save lives? Expert Review of Anticancer Therapy,2014, 13:12, 1349-1351.

13. Holger Moch, Antonio L.Cubilla, Peter A.Humphrey, Victor E.Reuter, Thomas M.Ulbright. The 2016 WHO Classification of Tumors of the Urinary System and Male Genital organs-Part A: Re nal, Penile, and Testicular Tumors. European Urology 70 (2016) 93-105.

14. Yong-Hong Xiong, Zhi-Ling Zhang, Yong-Hong Li, et al. Benign pathological findings in 303 Chinese patients undergoing surgery for presumed localized renal cell carcinoma. International Journ al of Urology (2010) 17, 517–521.

15. Norihito Soga Yuji Ogura Norio Hayashi. Predictive Factors for Benign Lesions in Partially or Radically Resected Kidneys in a Single Independent Cancer Center.CurrUrol 2013; 7:70–74.

16. Mesut Remzi, EmreHuri, Michael Bamberger. The importance of benign kidney tumors amon g small renal masses: diagnosis andtreatment algorithms. Turkish Journal of Urology 2009; 35(4):286 -292.

17. Silver DA, Morash C, Brenner P, Campbell S, Russo P. Pathologic findings at the time of neph rectomy for renal mass. Ann SurgOncol 1997; 4:570-4.

18. K Stravodimos, S Tyritzis, V Migdalis, et al. Benign renal tumor prevalence and its correlation with patient characteristics and pathology report data. The Internet Journal of Uroloy,2009,Volume 6 Number 2, p: (1-5).

19. Amnon Zisman, Jean-Jacques Patard, Orit Raz, et al. Sex, Age, and Surgeon Decision on Nep hron-sparing Surgery Are Independent Predictors of Renal Masses With Benign Histopathologic Find ings– a Multicetric Survey. Urology 2010 76(3) 541.

20. Jan Colli, Kevin Walls, Glen Lau, et al. Comparing Rates of Benign versus Malignant Kidney T umors between 2001 to 2010, in Nephrectomy and Partial Nephrectomy cases,2011, in U.S. hospitals. The Journal of Urology Vol. 189, p: 738.
21. Matvey Tsivian, Vladimir Mouraviev, David M. Albala, et al. Clinical predictors of renal mass pathological features. 2010 B J U International | Vol.107, p: (735 – 740).
22. Mesut Remzi, Daniela Katzenbeisser, and Matthias Waldert, et al. Renal tumor size measured radiologically before surgery is an unreliable variable for predicting histopathologic features: benign t umors are not necessarily small. 2007 B J U International | Vol.9 9, p: (1002 – 1006).
23. R. Houston Thompson, Jordan M Kurta, Matthew Kaag, et al. Tumor size is associated with malignant potential in Renal Cell Carcinoma. J Urol. 2009 May; 181(5): 2033–2036.
24. Lutfi Ali S. Kurban, AlirezaVosough, Preman Jacob, et al. The Pathological nature of ren al tumors - does size matter? Urology Annals | Volume 9 | Issue 4 | p: (330-335).2017
25. Philippe Violette, Samuel Abourbih, and Konrad M. Szymanski, et al. Solitary solid renal ma ss: can we predict malignancy? 2012 B J U International | Vol. 110, E 548 – E 552.