FREQUENCY OF MALIGNANCY IN RENAL CYSTIC LESIONS BASED ON BOSNIAK GRADING SYSTEM

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Abstract

Objective: The aim of this study was to determine the malignancy rates in different Bosniak grades of renal cystic lesions.

Material and Methods: This was descriptive study conducted in Radiology department, Hayatabad Medical Complex Peshawar from June 2019 to December 2019. Record of 142 patients who were operated for renal cystic lesions in Institute of Kidney Diseases Peshawar were evaluated retrospectively. Bosniak grade of cyst for each patient was determined by retrieving and reviewing CT urograms. Histopathological diagnosis (benign or malignant) of each cystic lesion was determined from patients' records. The data was entered and analyzed in SPSS version 20.

Results: A total of 142 patients operated for renal cystic lesions were included in the study. There were 76 (53.5%) males and 66 (46.5%) females. Out of 142, 45(31.69%) patients had type I cysts, 30(21.13%) type II cysts, 15 (10.56%) type IIF cysts, 29(20.42%) type III cysts and 23(16.20%) patients had type IV cysts. In this study, all type I cysts were benign. The malignancy rates of Type II, type IIF, type III and type IV cysts were 3.3%, 13.3%, 58.6% and 87.0 %, respectively. The difference in malignancy rates among different types of renal cystic lesions was statistically significant ($p<0.001$).

Conclusion: Though the malignancy rate of renal cystic lesions increases as their bosniak grade increases, a conservative approach rather than surgery may be justified in patients with lower bosniak types.

Key Words: Bosniak types, renal cystic lesions, Computed tomography, malignancy rate.

INTRODUCTION

The incidence of renal cysts increases with increasing age. Simple renal cysts are the most common cystic renal lesions. They are present in up to 5% of the general population. This percentage increases to more than 25% in people older than 50 years of age. In the elderly population, renal cysts accounts for up to 65-70% of the renal lesions. The prevalence of renal cysts was found to be higher in men compared to women in a retrospective study of 2063 patients. They also reported higher prevalence in patients having history of hypertension and smoking.[1]

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The main advantage of ultrasound is identification and classification of renal lesions into cystic, solid, and indeterminate. One of its drawbacks is lack of contrast medium injection for enhancement of solid component. Studies show that utilization of contrast enhanced ultrasound similar to MDCT can be used for follow up of patients with lower degree of exposure to radiations.[2]

Recent advances in cross sectional abdominal imaging has resulted in early detection of renal lesions. Computed Tomography (CT) is the most frequently used modality for detection and categorization of renal cystic lesions. Criteria for categorization of these lesions was first described by Bosniak in 1986 and named as Bosniak classification of renal cysts based on computed tomography.[3]This classification was reviewed in 1993 which is currently used worldwide by both radiologists and urologists for assessment of renal cystic lesions. In type I, the cyst is simple having hairline thin wall without any calcifications and septas. Type II cysts show few hairline thin septas with a diameter less than 3cm and 10- 15% short segment of thickened calcifications in the wall or septa might be seen. Type II F cysts show multiple hairline septas with a diameter more than 3 cm. There are no enhancing soft tissues in type II cysts. Cysts containing thickened irregular or smooth walls with septas and measurable enhancement are categorized as type III cysts. Type IV cysts show enhancing soft tissue component and other features similar to type III cysts. [4,5] .

Many studies are conducted on solid renal masses however no significant research is done on categorization of renal cystic lesions and its histopathological diagnosis.[6] There is a paucity of local evidence supporting the Bosniak's classification's ability to differentiate between surgical and non-surgical cases. In addition, interobserver difference is greatest in majority of cases. Errors can be minimized by completely ensuring that CT scan is technically appropriate and performed under supervision of experienced radiologists with all relevant clinical information available.[7]

The aim of this study is to determine the malignancy rate in renal cystic lesions classified on Bosniak classification on CTurogram in patients presenting to Institute of kidney diseases, Peshawar. The results of the study may help urologists avoid surgical interventions in patients with cysts types with lower rates of malignancy.

MATERIALS AND METHODS

This was descriptive study conducted in Radiology department, Hayatabad Medical Complex and Institute of Kidney diseases, Peshawar from June 2019 to December 2019. Approval of the study was taken from ethical committee of Hayatabad Medical Complex, Peshawar.Record of 142 patients who were operated for renal cystic lesions in Institute of Kidney Diseases were evaluated retrospectively. The patients with polycystic kidney disease, history of surgery, and those having differences in opinion of CT were excluded.All the patients were evaluated with CT urogram and their postoperative findings and histological reports were retrieved. Study was performed on 128 multislice CT of GE company**.** CT urography was conducted as a combination of renal CT plus CT of the contrast-enhanced upper urinary tract. Therefore, a three-phase CT urographic protocol was followed, consisting of unenhanced, nephrographic (90 to 100 sec delay), and excretory phases (after 12 to 15min delay). The volume of the contrast material bolus ranges from 100 to 150 ml, administered at a rate of 2–3 ml/sec with slice thickness of 3 to 5mm. These CT urograms were reported by two radiologists having more than 5 years of experience. All these reports were reevaluated by two urologists after assessment of radiologists.Statistical analysis of the data was done on SPSS version 20.

RESULTS

A total of 142 patients presenting with renal cystic lesions were included in the study. There were 76 (53.5%) males and 66 (46.5%) females. Male to female ratio was 1.15:1Average age of the patients was 55.57 years$\pm$7.36 years with range 43-70 years.Renal cystic lesions were most prevalent in patients aged 51 to 60 years (48.6%).
Out of 142, 45(31.69%) patients had type I cysts, 30(21.13%) type II cysts, 15 (10.56%) type IIF cysts, 29(20.42%) type III cysts and 23(16.20%) patients had type IV cysts. Basic demographic of the study variables like age, gender and type of cysts are shown below in Table I.

In this study, all type I cysts were benign. The malignancy rate for Type II, type IIF, type III and type IV cysts were 3.3%, 13.3%, 58.6% and 87.0 %, respectively. When the classification was stratified over the pathology results it showed the difference in malignancy rates among different types of renal cystic lesions was statistically significant ($p<0.001$). (Table 2)

Table I Basic demographic parameters of the study population (n=142)

	No.	**%**
Age (in years)		
Up to 50	30	21.1%
51 – 60	69	48.6%
More than 60	43	30.3%
Gender		
Male	76	53.5%
Female	66	46.5%
Type of cysts		
Type 1	45	31.69%
Type II	30	21.13%
Type IIF	15	10.56%

Type III	29	20.42%
Type IV	23	16.20%

Table 2: Comparison of Bosniak types on CT and histopathological diagnosis of renal cystic lesions

Bosniak class (No.)	Histopathology result, No. (%)		p value
	Benign	Malignant	
Type I (45)	45 (100.0%)	0 (0%)	p < 0.001
Type II (30)	29 (96.7%)	1(3.3%)	
Type IIF (15)	13 (86.7%)	2 (13.3%)	
Type III (29)	12 (41.4%)	17 (58.6%)	
Type IV (23)	3 (13.0%)	20 (87.0%)	

DISCUSSION

Renal cystic lesions are the most common lesions seen in kidneys incidentally. Most of them are benign and can be ignored without further work up.[8]

In most of the cases simple renal cysts are usually asymptomatic, however the frequently encountered symptoms of renal cysts include lumbar pain, palpable mass, hematuria, abdominal discomfort and obstructive symptoms. The arousal of symptoms in simple renal cysts should alert the urologist of suspicion of malignancy and need for further evaluation and diagnostic studies.[9,10,11]

In our study we found male to female ratio of 1.15:1, clearly favoring the incidence more in males. This finding is similar to the study conducted by Chang et al, in his study male-to-female ratio was 2.8:1 (15.14% vs. 5.38%; *P* < 0.001).[12] Ozveren et al. conducted another similar study concluding that renal cysts were more common in males and elders, and associated with diabetes.[13] These observations confirms finding that male gender is significantly associated with the prevalence of simple renal cysts.

Bosniak classification categorized the renal cystic lesions in four types i.e Type I (simple), Type II, Type III and Type IV and this classification was followed in our study. The most common type found in our study was type I (30.28%) followed by Type II (21.13%) and the least common was type IIF (10.56%) which was similar to the study conducted by Mensel B etal [1] about prevalence of renal cysts and association with risk factors in a general population: an MRI-based study.

It was confirmed in our study that the rate of malignancy increases with the increase of Bosniak type, Bosniak IV being inevitably malignant, this observation is consistent with studies of Aronson etal[14], Siegel CL etal[15], Koga S etal [16], Israel GM etal [17] and Curry NS etal.[18] In this study all type I were benign. The malignancy rate of type II was 3.3%, type IIF 13.3%, type III 53% and type IV 88% which are comparable to the results of Keseroglu B etal[3] who concluded the malignancy rate of type I 0%, type II 7.9%, type IIF 31.8%, type III 55.3% and type IV 79.3%.

Clear cut management should be made by urologist after the Bosniak categorization of renal cysts which has markedly reduced the frequency of unnecessary nephrectomies in our set up. Due to absence of malignant potential in type I and very low malignancy rates in type II, no follow up is required in such patients[19].Due to increased risk of malignancy i.e. 5 _10% in Type II F ,regular radiological follow up of these cysts is required with computed tomography or MRI to asses any change in morphology.[20] The recommended follow up protocol for type IIF cysts is that imaging should be performed 6 monthly for the first year and annually for at least 5 years according to American College of Radiology.[21] The cyst with highest risks of malignancy are Type III and Type IV carrying 50% [21,22] and more than 80% malignancy rate respectively. Type III cysts require further work up and possibly surgery, however Type IV cysts are inevitably malignant and nephrectomy is recommended for these patients.[22] There is no strong correlation of lesion growth rate in Bosniak classification as benign lesion can sometime grow faster than malignant[23], so the whole concern should be given to morphological features on follow up studies rather than lesion growth rate[24].

The current study has certain limitations, which includes small sample size for each Bosniak

category which is insufficient to evaluate Bosniak grading, and intra and inter observer variability. Another important limitation is that currently Magnetic Resonance Imaging has a superior contrast resolution as compared to CT, which may result in up or down grading in Bosniak categorization of a renal cystic lesion.

CONCLUSION

Bosniak grading has a major role in categorization of renal cystic lesions in terms of prognosis. Our study shows that the rate of malignancy in patients presenting to institute of kidney diseases increases significantly as the Bosniak grade increases.

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