Original Research Article

A study of diagnostic efficacy of USG abdomen versus CT scan for the diagnosis of renal pathologies

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Abstract

Background: CT is considered the imaging gold standard for the diagnosis of renal pathologies. CT has high sensitive and specificity for detection and diagnosis of renal calculi and other infective, neoplastic and congenital renal pathologies and can be helpful for deciding medical therapy and the need for surgical intervention **Aims and objectives:** To study diagnostic efficacy of USG abdomen versus CT scans for the diagnosis of renal pathologies at tertiary health care center. **Methodology:** This was a cross-sectional study carried out in the department of Radiology in Bharati Vidyapeeth Medical College and Hospital, Pune. It was carried out on the patients with renal diseases who were referred for the radiological diagnosis during the one year period i.e. June 2017 to June 2018. There were 123 patients referred for the diagnosis of various pathologies related to renal system. Written and explained consent was taken for USG abdomen followed by CT scan. All the clinical and radiological details of the patients were noted. The sensitivity and specificity was calculated by Medcal software. **Result:** In our study we have seen that the majority of the patients were in the age group of 30-40 years (26.02%), followed by 20-30 years (22.76%), 40-50 years (15.45%), 10-20 years (13.82%), 50-60 years (12.20%), and >60 years (9.76%). Male constitute 63.41% and female constitute 36.59% in the study. Benign tumors were 24.39%. Angiomyolipomas were present in 7.32%, papillary renal adenoma were 5.69%, mixed epithelial and stromal tumors were 7.32%, and oncocytoma were 4.07%. Cystic lesions were present in 39.02%, in that abscess was present in 12.20%, infarction in 8.94%, cystic nephroma in 5.69%, pyelecalvaceal diverticulum in 4.88%, glumerulo cystic disease in 4.07%, and acquired cystic disease in 3.25%. Nephrolithiasis were present in 18.70% of patients. Malignant tumors were present in 17.89%, in that renal cell carcinoma were 7.32%, Lymphoma were 4.07%, transitional cell carcinoma were 4.07%, and Wilm's tumor were 2.44%. **Conclusion:** It can be concluded from our study that CT scan is more sensitive and specific in the detection and characterization of the renal lesions. Though sonography is less accurate in the diagnosis of renal pathologies, it showed fairly good sensitivity and septicity. So USG being cost effective, radiation free and easily available should be initial line of investigation for renal disease.

Key Word: Renal pathologies, renal tumors, renal calculus

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INTRODUCTION

The detection rate of renal masses has increased in the last decades owing to the widespread use of CT[1]. Therefore, an accurate characterization of renal masses is essential to ensure appropriate management. Renal masses can be divided into cystic and solid lesions[2]. The most common are cysts in up to 27% of patients over 50 years[3]. Eighty-five percent of the solid masses are malignant[4]. Therefore, a solid, enhancing mass must be considered malignant unless proven otherwise. Renal cell carcinoma (RCC) is the most common malignant tumor with a rising incidence of about 3% per year since 1975. The most common subtype of RCC is the clear cell RCC that constitute 65% of renal cortical tumors. Further subtypes are papillary (basophilic and eosinophilic) and chromophobe RCCs that constitute about 25% of renal cortical tumors. Clear-cell RCC causes 90% of metastases of all renal malignancies[5,6]. Other malignant masses include transitional cell carcinoma (TCC), lymphoma

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(primary and more frequent secondary), metastases and primary/secondary sarcoma. Primary tumors of the lung, breast and gastrointestinal tract are the most common sources of renal metastases[7]. Benign tumors account for approximately 20% of all solid renal cortical tumors, and renal oncocytoma is the most common solid tumor type[8,9]. Non-neoplastic renal masses include inflammatory pseudotumours with and without abscess formation and focal nephronia are also common. Other non-neoplastic but most common lesion is nephrolithiasis. For this, CT scan is the preferred modality because of its high sensitivity and specificity. However, CT entails exposure to ionizing radiation. So we have carried out the diagnostic efficacy of USG with respect to CT.

METHODOLOGY

This was a cross-sectional study carried out in the department of Radiology in Bharati Vidyapeeth Medical College and Hospital, Pune. It was carried out on the patients with renal diseases who were referred for the radiological diagnosis during the one year period i.e. June 2017 to June 2018. There were 123 patients referred for the diagnosis of various pathologies related to renal system. Written and explained consent was taken for USG abdomen followed by CT scan. All the studies were performed Affinity 50 and Affinity 70 Phillips USG machines and 16 slice multi-detector CT machine by Phillips. All the clinical and radiological details of the patients were noted. The sensitivity and specificity was calculated for the each lesion for CT scan and USG independently by ROC function and table given for calculation of sensitivity and specificity by the Medcal software.

RESULT

Table 1: Distribution of the patients as per the age

Age in years	No.	Percentage (%)
10-20	17	13.82
20-30	28	22.76
30-40	32	26.02
40-50	19	15.45
50-60	15	12.20
>60	12	9.76
Total	123	100.00

Majority of the patients were in the age group of 30-40 years (26.02%), followed by 20-30 years (22.76%), 40-50 years (15.45%), 10-20 years (13.82%), 50-60 years (12.20%), and >60 years (9.76%).

Table 2: Distribution of the patients as per the sex

Sex	No.	Percentage (%)
Male	78	63.41
Female	45	36.59
Total	123	100.00

The majority of patients were male i.e. 63.41% and female were 36.59%

Table 3: Distribution of the patients as per the various lesions of kidney

Lesions	No.	Percentage (%)
1. Benign		
a.Tumors	**30**	24.39
Angiomyolipoma	9	7.32
Papillary Renal Adenoma	7	5.69
Mixed Epithelial and Stromal tumors	9	7.32
Oncocytoma	5	4.07
b.Cystic	**48**	39.02
Abscess	15	12.20
Infarction	11	8.94
Cystic nephroma	7	5.69
Pyele calvaceal diverticulum	6	4.88
Glumerulo Cystic Disease	5	4.07
Acquired cystic disease	4	3.25
c. Nephrolithiasis	**23**	18.70
2. Malignant	**22**	17.89
RCC	9	7.32
Lyphoma	5	4.07
Transitional Cell Carcinoma	5	4.07
Wilm's	3	2.44

Benign tumors were 24.39%. Angiomyolipomas were present in 7.32%, papillary renal adenoma were 5.69%, mixed epithelial and stromal tumors were 7.32%, and oncocytoma were 4.07%. Cystic lesions were present in 39.02%, in that abscess was present in 12.20%, infarction in 8.94%, cystic nephroma in 5.69%, pyelecalvaceal diverticulum in 4.88%, glumerulo cystic disease in 4.07%, and acquired cystic disease in 3.25%. Nephrolithiasis were present in 18.70% of patients. Malignant tumors were present in 17.89%, in that renal cell carcinoma were 7.32%, Lymphoma were 4.07%, transitional cell carcinoma were 4.07%, and Wilm's tumor were 2.44%.

Table 3: Distribution of the patients as per the sensitivity and specificity

Investigation	Benign			Malignant			
	Tumors	Cystic	Nephrolithiasis	RCC	Lymphoma	TCC	Wilm's
CT	95%, 92%	94%, 95%	95%, 97%	92%, 90%	93%, 91%	90%, 89%	91%, 92%
USG	78%, 65%	85%, 80%	92%, 90%	85%, 75%	74%, 63%	62%, 59%	59%, 55%

The sensitivity and specificity of CT was 95%, 92% ; 94%, 95%; 95%, 97%; 92%, 90%; 93%, 91%; 90%, 89%; 91%, 92% and of USG was 78%, 65%; 85%, 80%; 92%, 90%; 85%, 75%; 74%, 63%; 62%, 59%; 59%, 55% respectively for tumors, cystic lesions, nephrolithiasis, renal cell carcinoma, lymphoma, transitional cell carcinoma and Wilm's respectively.

DISCUSSION

The increased use of abdominal imaging has resulted in an increase in the number of small renal incidentaloma in recent decades. In a study evaluating 3000 patients undergoing computed tomography (CT) for screening colonography, 14% were found to have an incidental renal lesion >1 cm[15]. Overall, up to 66% of the small renal masses <4 cm are incidentally found[16]. Because up to 20% of the solid small renal masses <4 cm are benign, warranting conservative management, preoperative imaging should aim to differentiate benign from malignant tumors[17]. Dedicated diagnostic renal imaging aids in the appropriate treatment planning for renal tumors and may avoid an unnecessary operation. Of the malignant renal tumors, 90% are RCCs, of which 75% are clear cell (ccRCC), 7% to 15% are papillary (pRCC), and 5% are chromophobe (chrRCC) subtypes. Collecting duct and medullary carcinomas are rare and account for <1% of the renal tumors. The other 10% of renal tumors consist of metanephric, nephroblastic and mesenchymal tumors. The group of mesenchymal tumors includes a wide variety of sarcomas. More rare tumors, such as neuroendocrine, hematopoietic, lymphoid, germ-cell tumors, and others are also found. Each RCC subtype harbors a different prognosis underlining the importance of differentiation of these entities. There are two benign renal tumors that should be differentiated from RCC. The most common benign renal tumor is the oncocytoma (3%-7%), known for mimicking RCC on imaging. The second most common benign tumor is an angiomyolipoma, which does not derive from renal epithelial cells. Angiomyolipoma is a mesenchymal tumor composed of blood vessels, smooth muscle, and adipose tissue and accounts for 3% of the renal tumors[20]. The amount of fat varies between angiomyolipomas, and up to 5% are classified as fat poor[22]. The diagnosis of this latter subtype based on imaging alone can be challenging. When US became available for the detection of renal masses, other imaging techniques, such as intravenous pyelography, slowly became obsolete[22,23]. Nowadays, US is considered a feasible first-imaging option for screening renal tumors[24, 25]. The main advantages of US are the lack of ionizing radiation and no need for nephrotoxic contrast agents. In most hospitals, US is a relatively low-cost and easily available imaging modality, and no specific preparations of the patient are necessary. Despite the considerable overlap in the morphologic pattern of different masses, a characteristic sonographic appearance frequently allows at least a narrow differential diagnosis and sometimes a specific diagnosis, particularly when the imaging findings are coupled with sufficient clinical data. It differentiate solid from cystic masses and to certain extent discriminate benign or malignant masses[14]. Majority of the patients were in the age group of 30-40 years (26.02%), followed by 20-30 years (22.76%), 40-50 years (15.45%), 10-20 years (13.82%), 50-60 years (12.20%), and >60 years (9.76%).The majority of patients were male i.e. 63.41% and female were 36.59%. Benign tumors were 24.39%. Angiomyolipomas were present in 7.32%, papillary renal adenoma were 5.69%, mixed epithelial and stromal tumors were 7.32%, and oncocytoma were 4.07%. Cystic lesions were present in 39.02%, in that abscess was present in 12.20%, infarction in 8.94%, cystic nephroma in 5.69%, pyelecalvaceal diverticulum in 4.88%, glumerulo cystic disease in 4.07%, and acquired cystic disease in 3.25%. Nephrolithiasis were present in 18.70% of patients. Malignant tumors were present in 17.89%, in that renal cell carcinoma were 7.32%, Lymphoma were 4.07%, transitional cell carcinoma were 4.07%, and Wilm's tumor were 2.44%. NVK Sundeep[25] et found that sensitivity of CT was 100%, specificity of 85.71% for the differentiation of benign and malignant lesions of kidney. Scott Gerst[26] found also found that 63% sensitivity, and 80% specificity for differentiation of benign and malignant lesions of Kidney

CONCLUSION

It can be concluded from our study that CT scan is more sensitive and specific in the detection and characterization of the renal lesions. Though sonography is less accurate in the diagnosis of renal pathologies, it showed fairly good sensitivity and septicity. So USG being cost effective, radiation free and easily available should be initial line of investigation for renal disease.

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