

## Original Research Article

# The role of ultrasonic guided fine needle aspiration cytology in the diagnoses of renal masses

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## ABSTRACT

**Background:** FNAC has been widely applied in the diagnosis of tumors and tumor like lesion of the abdomen including the kidney. The aim of this study was to evaluate the outcome of FNAC to a sample of Iraqi patients with kidney tumor.

**Methods:** Patients with clinical, radiological suspicion of renal masses underwent FNAC of the kidney under ultrasound guidance were invited to this study. Those who fulfilled inclusion criteria were recruited. FNAC was done in accordance with stipulated clinical practice.

**Results:** 53 patients with clinical and radiological suspicion of renal mass underwent FNAC of the kidney under ultrasound guidance. The age ranged from 1-2 year to 70 years (mean 44.7 years) with male to female ratio (1.9:1). Around 94.3% had primary renal mass, 1.9% metastatic tumor to the kidney and the rest 3.8% was undiagnosed. Sensitivity was 90% while specificity was 100%.

**Conclusions:** We conclude that FNAC of the renal masses is safe and reliable, and fast diagnostic procedure in the evaluation of patient with renal masses.

**Keywords:** FNAC, Iraq, Mass, Renal

## INTRODUCTION

Fine needle aspiration cytology (FNAC) has been used worldwide both for the diagnoses and therapy.<sup>1</sup> All areas of the body are suitable sites for this procedure including superficial palpable masses or deeply seated lesions or that has been visible only with the use of imaging modalities. FNAC has been widely applied in the diagnosis of tumors and tumor like lesion of the abdomen including the kidney.<sup>1,2</sup> The advantages are a rapid diagnosis, minimal trauma to the patient and low cost when compared with the surgical open biopsy the object of this study is to report our experience about the role of FNAC in the diagnosis of renal masses.<sup>1-3</sup> In early studies, pyelography alone determined the puncture site.

Later, TV monitored fluoroscopy allowed more precise localization today most biopsies are performed with ultrasonic guidance and a few with CT-scan.<sup>3,4</sup>

Furthermore, a CT-SCAN provide additional information with regard to tumor stage, and the function of the contra lateral kidney. FNAC of the renal masses may be an outpatient procedure. Indication and advantages.<sup>1,4</sup> In order to reach to an accurate final diagnosis using the method certain criteria should be fulfilled. The lesion should be adequately and accurately sampled, which necessitate a skilled and experienced person. The adequacy of the sample is judged at the time of aspirate by the cytopathologist sometimes up to three punctured are required to obtain an adequate material.

Correlation with the clinical findings and a team work involving (the pathologist clinician and radiologist) is recommended.<sup>4,5</sup> In the diagnosis of benign and non-neoplastic conditions which is more difficult using this method, application of special stains and special microbiological studies may be helpful.<sup>6,7</sup>

The main problem in the false negative results are the unsatisfactory specimen which either due to: insufficient sample due to technical errors (lacks of skills which results in missing the target lesion cooperation of patients, lack of immediate handling of the sample by, poorly preserved cells due to lack of availability of cytopathologist and with the sample (early preparation of the slides and immediate fixation), presence of hemorrhage diathesis and considerable heavy inflammation and necrotic debris which obscure the underlying cellular criteria.<sup>1,3,5</sup>

Suspicious samples which are the main problem in the cytological results diagnosis are usually due to paucity of abnormal cells (atypical cell or dysplastic cell). In such cases the radiological and clinical findings are important in deciding whether repeating aspiration or tissue biopsy is recommended. So, in general to regard the lesion, negative results should be at least 4-5 passes done the specificity (false positive results) of FNAC was 81-100%.<sup>8-10</sup> C- team work approach (the cytological finding correlate with the clinical impression and ultrasound results). D- usage of various special stains and full microbiological study in order to reach a final diagnosis.<sup>11-14</sup>

## METHODS

Patients with clinical-radiological suspicion of renal masses underwent FNAC of the kidney under ultrasound guidance. To perform this procedure simple equipment are needed. Spinal disposable needle 20-22 gauge, length of 30-90 cm, disposable syringe (10cc), Xylocaine solution 2% (local anesthesia).

General condition of the patient should be assessed. The procedure was explained to the patient in details to prevent undue worry and to obtain full cooperation.

### Processing

For each patient 4 slides were made. All slides were immediately fixed in jar containing ethyl alcohol 95% for 30 minutes (3 of them are stained with hematoxylin-eosin stain), these were used for cytomorphological examination, the last one for special stain if needed.

Full bacteriological study was performed in any suspicious infectious lesion. If fluid was obtained cytocentrifuged, it was immediately, smeared, precipitated on glass slide and immediately fixed while the supernatant fluid sent for biochemical study.

## Statistical analysis

Descriptive statistics were produced for the study sample. The diagnostic results of fine needle aspiration cytology were evaluated by the criteria of sensitivity, specificity and over all accuracy.

## RESULTS

53 patients with clinical and radiological suspicion of renal mass underwent FNAC of the kidney under ultrasound guidance. The range of age was from 1-2 year to 70 years (mean 44.7 years) with male to female ratio (1.9:1) (Table 6). Most of them lost to follow up (mostly out patients). The type of renal lesion is listed in Table 1, according to FNAC results. 16 patient had surgical removal of the tumors with tissue diagnosis.

One benign tumor was highly suggestive of benign angiomyolipoma by aspiration in patient with a known case of tuberous sclerososis. In one case, the cytological diagnosis of metastatic tumor to the kidney was compared with the histological findings on the primary lesion.

The malignant lesions removed surgically include 9 RCC, one advanced transitional cell carcinoma of the kidney, 4 Wilm's tumor and one neuroblastoma (Table 2).

**Table 1: FNAC results of patients with renal masses (N=53).**

FNAC results	N	%
Primary renal masses	50	94.3%
Metastatic tumor to the kidney	1	1.9%
Inadequate	2	3.8%
Total	53	100%

The largest RCC measured around 7.8 cm and the smallest 5.1 cm in greatest diameter. Inadequate specimens were obtained in 2 cases both are non-neoplastic lesion on clinical-radiological basis. The elaboration of the numbers reported results in Table 3 on the correlation between the FNAC results and histological and or clinical-radiological final diagnoses yielded the following values: sensitivity of 90%, specificity of 100% and over all accuracy 90.3% no significant complication was recorded in the present series, the results of punctures were classified according to WHO into:

### Malignant tumors

The total number of malignant tumors diagnosed by FNAC smear are 27 cases, most of them are primary malignant tumors, one case shows metastatic lymphoma in young girl a known case of non-Hodgkin lymphoma. among primary renal malignancies in adult, RCC constituted the majority of cases 17 out of 18 cases. The

exception, a misdiagnosed transitional cell carcinoma in one case in correlation with the final histopathological results. among the pediatric cases, 7 out of 8 cases

correctly diagnosed as Wilm's tumor. The exception a misdiagnosed neuroblastoma in one case in correlation with histopathological results.

**Table 2: Comparison between FNAC results and histopathological findings in patients with renal masses (N=16).**

Cytological diagnoses by FNAC	N	RCC	Wilms tumors	Transitional cell carcinoma	Metastatic lesions	Neuroblastoma
RCC	10	9	0	1	0	0
Wilms tumors	5	0	4	0	0	1
Metastatic lesions	1	0	0	0	1	0
TOTAL	16	9	4	1	1	1

**Table 3: Correlation between the cytology and/or radiologic-clinical diagnoses.**

Cytological finding	No. of cases	Malignant tumors	Benign tumors	Non neoplastic lesions
Malignant tumors	27	27	-	-
Benign tumors	4	3	1	-
Non-neoplastic lesions	20	-	-	20
Inadequate	2	-	-	2
Total	53	30	1	22

Number of cases with clinical diagnoses are shown in parentheses; Considering non-neoplastic lesions as benign lesions and ignoring the inadequate cases; Sensitivity of the test (T.P./T.P.+F.N.) × 100 = (27/27+3) × 100 = 90%; Specificity of the test (T.N./T.N.+F.P) × 100 = (1/1+0) × 100 = 100%; Over all accuracy (T.P.+T.N./T.P.+F.P.+T.N.+F.N.) × 100 = (27+1/27+0+1+3) × 100 = 90.3%.

**Table 4: Presentation of patients with renal masses.**

Diagnosis	hematuria	Other renal	Non-renal	Incidental	Total
Simple cysts	1	4	2	9	16
Renal cell carcinoma	10	4	2	4	20
Transitional cell carcinoma	1	0	0	0	1
Wilm's tumor	0	1	5	1	7
Neuroblastoma	0	0	1	0	1
Abscess	0	0	4	1	5
Metastatic lesion	0	0	0	1	1
Hydronephrosis	0	1	0	0	1
Aniomyolipoma	0	0	0	1	1
Total	12	10	14	17	53

**Table 5: FNAC results of non-neoplastic lesions (N = 20).**

Non-neoplastic lesions	N	%
Simple cyst	16	80
Abscess	3	15
Hydronephrosis	1	5
Hematoma	0	0
Total	20	100

**Benign tumors**

There were 4 patients with benign lesions by FNAC. 3 of them falsely diagnosed as benign tumors which proved later on the bases of histopathological and or clinical-radiological diagnoses as malignant RCC. In one case, a known patient with tuberous sclerosis the aspiration cytology was highly suggestive of benign angiomyolipoma.

**Table 6: Distribution of sex in 53 patients with renal masses.**

Diagnoses	Total	Male	Female
Simple renal cyst	16	11	5
Renal cell carcinoma	20	13	7
Transitional cell carcinoma	1	1	0
Wilm's tumor	7	5	2
Neuroblastoma	1	0	1
Abscesses	5	3	2
Hydronephrosis	1	1	0
Metastatic lesion	1	0	1
Angiomyolipoma	1	1	0
Total	53	35	18

**Non-neoplastic lesions**

Of 20 patients with non-neoplastic conditions including 14 men and 6 women of mean age 43 years 16 had renal cysts, abscess 3 cases, hydronephrosis one case (Table 3 and 5).

Other renal (renal colic, frequency, recurrent infection) non-renal (ill-defined abdominal or low back pain, abdominal masses, hypertension, pyrexia of unknown origin) incidental (on routine abdominal ultrasound).

In regard to sensitivity and specificity, it was found that sensitivity was 90%, specificity was 100% and overall accuracy was 90.3 %.

**DISCUSSION**

FNAC of the renal masses is previously carried out under the guidance of I.V. pyelogram. Using ultrasound guidance has certain advantages. The principle is in itself atraumatic and without discomfort to the patient and the ultrasonic picture is not influenced by the excretory function of the kidney. The place and direction of punctured needle tip can easily be visualized and dynamically controlled at the time of aspiration. The method incurs no hazard of irradiation neither for the patient nor for physician performing aspiration, in addition, the availability of ultrasonic machine, low cost, and rapidity to diagnose the lesions made it the best guidance.

In the present series both neoplastic and non-neoplastic lesions were diagnosed with an overall accuracy of approximately 90.3%. The usefulness of the method is related not only to its high sensitivity (90%) but also to its high degree of tissue typing accuracy (Table 2).

One case of transitional cell carcinoma was incorrectly diagnosed by FNAC as a RCC which may be attributed to insufficient clinical data and its rarity with the renal parenchyma and marked necrosis of the aspirated material. 4 out of 5 cases of Wilm's tumors with adequate material, in correlation with histopathology, the typing

was correct (Table 2).<sup>16,17</sup> The exception, a mis-diagnosed neuroblastoma in one case, was due to difficulties of typing small tumors of infancy.<sup>3,8,17</sup> Although it has been stressed that the main indication for FNAC in the diagnose of pediatric tumors is to rule out malignancy.<sup>3,8</sup> We feel that every effort should be made to differentiate Wilm's tumor from neuroblastoma, whenever the available material permits, immunohistochemistry and or electron microscopy can be employed on pediatric small cell tumors to solve this problem.<sup>3,4,8</sup> Regarding the specificity of our series, no evidence of false positive diagnostic case using FNAC was uncounted (specificity 100%). The sensitivity ranged from 75% to 100%, specificity 81% to 100% over all accuracy ranged 80% to 100%. Only 3 significant complications were reported. These results are compared favorably with the present series. The absence of any significant complication in the present series and majority of other series, add other further value to this diagnostic method. The main problem of false negative result in the present and other series is mainly due to mis-shitting the target of the renal mass by needle puncture, insufficient sample and or auspicious aspirate due to poorly preserved cell and or extensive haemorrhagic bloody sample or associated necrosis.<sup>1,5,7,8</sup> Recent technologic advances in the diagnostic radiology and increased experience of the clinician permit in many cases the anticipation of a correct diagnoses of an actual renal tumors without morphological confirmation.<sup>7,12-14</sup>

Based on our experience gained from the present study and reviewing of other, the following diagnostic procedure in suspected renal masses is presumed to provide a very high diagnostic accuracy with a minimum risk and inconvenience to the patient.<sup>4,5,11</sup>

All patients suspected to renal masses are subjected to I.V. pyelography and ultrasonic scanning of the kidneys.

If both these investigations turn out normal, further investigations for renal masses can be omitted.<sup>7-9</sup>

If ultrasonic scanning and iv pyelography OS ultrasonic scanning alone demonstrate a mass, this is punctured under the guidance of ultrasound.<sup>13,14</sup>

If tumor cells are demonstrated in the aspirate, further investigation can be omitted.<sup>5,8,9</sup>

If no tumor cells are found in the aspirate from ultrasonically typical cyst, further investigation can be omitted.<sup>18,19</sup> If no tumor cells are found in the aspirate from an ultrasonically solid or partly solid mass, the puncture must be repeated (even if fluid without tumor cells is aspirated). If a second and even third puncture does not demonstrate tumor cells either, an arteriography must be performed.<sup>13,18,20</sup> If an IV Pyelography raised suspicion of a renal mass and ultrasonic scanning is normal or inconclusive, further investigations must be performed.<sup>2,4,12</sup>

In summary, it appears from the present series and other series, that FNAC contribute to ruling out malignancy in patients with radiologically cystic renal masses, to recognizing the malignancy of solid or mixed radiologically equivocal renal masses and to typing primaries and metastases, in addition to identify the site of the origin of tumors with radiologically uncertain topography and to narrow the diagnostic possibilities in those cases because of the patient age and clinical history or unusual manifestation of the disease, lastly the use of FNAC is in therapeutic purposes in cases of cysts without inflammatory complication .

## CONCLUSION

We conclude that FNAC of the renal masses is safe and reliable, and fast diagnostic procedure in the evaluation of patient with renal masses.

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