Ultrasound Guided Fine Needle Aspiration Biopsy in Renal Tumors

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Abstract

Objective: To assess the sensitivity and specificity of ultrasound guided fine needle aspiration biopsy (FNAB) in renal tumors.

Methods: A diagnostic study was performed on 23 patients with renal tumors who visited the Urology Division, Department of Surgery, Dr. Hasan Sadikin General Hospital from January 2011 to August 2012. First time ultrasound guided was performed to the patients before nephrectomy. Renal tissues that were obtained from both procedures were examined histopathologically, and the result from nephrectomy was used as the gold standard. Analysis was conducted by measuring the sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) of the ultrasound guided FNAB.

Results: The results showed that the sensitivity value of ultrasound guided FNAB was 85.71%, with 50% specificity, 94.74% PPV and 25% NPV. From 23 patients, only 2 patients had hematoma.

Conclusions: Ultrasound guided FNAB is sufficiently sensitive with a fair specificity for diagnosing renal tumors and is safe for patients.

Keywords: Renal tumor, sensitivity, specificity, ultasound guided FNAB

Introduction

Renal cell carcinoma (RCC) represents about 2–3% of all cancers with the highest incidence occurring in western countries. During the last two decades, there has been an increase in the incidence of approximately 2% per year in Europe and throughout the world. Renal cell carcinoma is a solid tumor and accounts for approximately 90% of all malignancies found in kidney.[1] Nowadays in western countries, most renal tumors (60%) are found in early stage (less than 4 cm).[2] Kidney tumors can be primary tumors or secondary tumors such as lymphoma.[3]

In determining the histopathology of the tumor, a biopsy procedure is performed. Biopsy procedure comes in various types, including percutaneous biopsy and open biopsy. The percutaneous renal biopsy has been used for a long time, but it has not been used anymore in the last decade because of the low accuracy in retrieving tumor tissues.[4–6] With further development of imaging equipments, such as ultrasound, Computerized Tomography scan (CT scan) and Magnetic Resonance Imaging (MRI), percutaneous biopsy is reused, albeit in combination with those equipments.[2,3,5,7–9] Remzi and Marberger[6] reported that biopsy using CT-scan guided fine-needle aspiration method in kidney tumors has the ability to predict the presence of 92–96% malignancy, 67–70% grading of tumors, and 78–92% tumor's subtype determination. A report from Reichelt et al.[10] stated that ultrasound guided Fine Needle Aspiration Biopsi (FNAB) has an accuracy of 83.3% in predicting renal tumors. The use of ultrasound guided FNAB has many advantages when compared to CT-scan or MRI. In addition, ultrasound is cheaper and it does not involve radiation exposure. This ultrasound can be performed in real-time and is more readily available in hospitals, especially in Indonesia. The study was conducted to measure the sensitivity and specificity of the ultrasound guided FNAB for renal mass tumor.

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Methods

A diagnostic study on 23 patients with renal tumors who visited the Urology Division of the Department of Surgery, Dr. Hasan Sadikin General Hospital was performed in the period of January 2011 to August 2012. Patients underwent ultrasound guided FNAB in the operating room shortly before nephrectomy. The procedure used 25G or 23G biopsy fine needle and the biopsy was performed once or twice until sufficient tumor tissues were obtained for histopathologic examination. The histopathologic examination was performed by two different pathologists. One examined the tumor tissues from the FNAB and the other examined the tumor tissues from the nephrectomy. The gold standard used was the histopathology results from the nephrectomy. The histopathology results that were obtained from both specimens were then compared and analyzed using 2x2 table diagnostic test consisting of sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) values.

Results

This study found that from 23 samples, 14 of them were renal tumors with T4, followed by 6 with T3 and 3 with T2 (Table 1).

Table 1 Staging of Renal Tumors

Stage	Frequency
T1	0
T2	3
T3	6
T4	14
Total	**23**

Fine-needle biopsy can cause complications such as hematoma. In this study, there were 2 cases of hematoma out of 23 samples.

The sensitivity was 85.71%, specificity was 50%, PPV was 94.74% and NPV was 25% for ultrasound guided FNAB in this study (Table 2).

Two cases with T2 and one case with T3 that were found negative for malignancy based on the ultrasound guided FNAB histopathologic results were positive based on the results of the surgery histopathologic results. On the contrary, one case with T4 that received positive result for malignancy based on the histopathologic results from ultrasound guided FNAB was negative based on the results of the surgery.

Table 2 Sensitivity, Specificity, Positive Predictive Value and Negative Predictive Value of Ultrasound Guided FNAB

Histopathologic FNAB	Histopathologic from Surgery (Gold Standard)		Total
	Positive	Negative	
Positive	18	1	19
Negative	3	1	4
Total	**21**	**2**	**23**

Sensitivity = 18/21 x 100 = 85.71%
Spesificity = ½ x 100 = 50%
Predicted positive value = 18/19 x 100 = 94.74%
Negative predicted value = ¼ x 100 = 25%

Discussion

Fine-needle biopsy can be used to avoid open-biopsy surgery for patients with high risk factors for surgery.[2,4,6] This study found that the accuracy of the renal tumor diagnosis using ultrasound guided FNAB has a sensitivity of 85.71%. This means that the histopathologic results from ultrasound guided FNAB is sufficiently sensitive to diagnose malignancy. This is supported by the fact that this approach has a PPV of 94.74%. This is similar to the result found by Reichelt *et al.*[10] that reported the accuracy of ultrasound guided FNAB for renal tumor of 83.3%, mainly for a tumor of less than 4 cm. Furthermore, the study found that the specificity of the ultrasound guided FNAB was 50% and the NPV was 25%, meaning that the ability of ultrasound guided FNAB to detect a negative results was only 50% and the percentage of true negative cases was 25%. Remzi and Marberger[6] reported that CT-scan guided FNAB was able to predict 92–96% malignancy, 67–70% grading the tumors, and 78–92% tumor's subtype determination. Most patients came to the hospital at T3 stage or above. This situation influences the value of sensitivity and specificity of ultrasound guided FNAB. Based on this information, further

studies should be conducted on patients with smaller tumors (less than T2).

Fine needle aspiration biopsy can cause complications such as hematoma with an incidence of less than 5%.[6,8,10] There are also other complications, such as pneumothorax, tumor seeding, arterial-venous malformation (AVM), and death.[2,3,6] Malformation of the arterial venous occurred in less than 2% of the cases and the mortality rate is 0.031%. Only 2 cases of hematoma were found in this study.

This indicates that the use of the ultrasound guided FNAB for renal tumors is relatively safe.

The ultrasound guided FNAB can be used to diagnose malignant kidney tumors. It can be used to obtain sufficient tumor tissues with no radiation effects. This approach is also affordable and a minimally invasive. Hence,it does not need general anesthesia and hospitalization.

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