Renal biopsy with 16 G needle: A safety study


Servicio de Urología, Hospital Universitario 12 de Octubre, Madrid, Spain

Received 26 October 2013; accepted 1 December 2013
Available online 13 April 2014

**KEYWORDS**
Kidney; Biopsy; Safety

**Abstract**

**Introduction and objective:** The development of percutaneous renal biopsy as a routine diagnostic procedure for renal masses has been the topic of discussion for the last few years. However, this technique has been associated with some complications, although infrequent, and morbidity. Our objective was to carry out a descriptive study about the complications and outcomes of orthotopic kidney biopsies with 16 G needle.

**Material and methods:** A retrospective review of 180 orthotopic ultrasound-guided renal biopsies performed in our service from January 2008 to May 2010 was carried out. The procedure was developed using an automated biopsy gun (16 G needle). Data on multiple clinical variables, early post-procedure complications andrenal biopsy management were collected. Complication rates as well as the relationship between risk factors and occurrence of complications were studied.

**Results:** Mean age of the subjects was 55.8 years. The average number of biopsy cylinders per intervention was 2.49. The overall complication rate was 5.6%. An interventionist attitude derived from complication of the procedure was necessary in only 3 patients (1.67%). No surgical interventions were required and no death as consequence of procedure was registered. No relationship between hypertension ($p = 0.09$), previous anticoagulation ($p = 0.099$) or previous antiaggregation ($p = 0.603$) and complications was demonstrated. In 2.8% of biopsies the material obtained was insufficient for diagnosing.

**Conclusions:** Percutaneous ultrasound-guided renal biopsy with 16 G needle is a safe technique with high diagnostic performance.

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* Corresponding author.

**E-mail address:** felixguerrero@gmail.com (F. Guerrero-Ramos)
Background and objectives

The percutaneous biopsy of native kidneys is a technique that has been employed for several decades for the diagnosis of medical renal diseases. The technique was first described in 1951, although its variant in the prone position (similar to the method we know today) was described in 1955 by Muehrcke et al. Since then, this technique has been simplified and continuously improved. However, in the last three decades, the technique has undergone its two more significant changes: the use of ultrasound and the automatic biopsy gun.

Percutaneous renal biopsy has traditionally been rejected in the diagnostic regimen of renal masses for 3 main reasons: the risk of disseminating tumor cells through a puncture trajectory, the technique’s questionable diagnostic yield and the complications resulting from the procedure. These issues have brought into question the appropriateness (in terms of risk-benefit) of the percutaneous renal biopsy of renal masses.

However, percutaneous renal biopsy is a well-established technique for ascertaining renal disease in standard clinical practice. There is currently little discussion concerning its effectiveness in the diagnosis of renal diseases, which according to the literature is above 90%. Furthermore, various studies have demonstrated the safety of the technique, with a rate of major complications of approximately 5–7% in virtually all of the studies. In the last two decades, there have been no reported complications requiring nephrectomy or surgery as a result of the use of the ultrasound-guided automated biopsy gun, and there has been only 1 death related to the technique.

Since the widespread use of imaging techniques, there has been a spectacular increase in the incidence of renal masses, a large proportion of which are small (smaller than 4 cm). These masses create the most controversy in urological forums, given that a rate of histological benignity of up to 20% has been reported in those that are suspected of malignancy due to imaging techniques. For this reason, in recent years there has been a return to the discussion of implementing percutaneous renal biopsy as a routine procedure in the diagnosis of small renal masses. Although problems are infrequent, this technique is not without complications and morbidity.

The aim of this study was to perform a descriptive study of the complications and results of orthotopic renal biopsies indicated for medical reasons and conducted in our department. We conduct these biopsies with 16 G needles, one of the thickest used currently, which in theory entail a greater risk of morbidity. Furthermore, given the current controversial status of renal mass biopsy, we performed a review to evaluate the role of percutaneous renal biopsy in the diagnosis of renal masses.

Materials and methods

We conducted a retrospective review of 180 consecutive cases of orthotopic ultrasound-guided renal biopsies performed by nephrological indication in our department between January 2008 and May 2010. According to our renal biopsy protocol, the patient is admitted the day before the procedure and undergoes laboratory tests (blood count, biochemistry and coagulation). After the biopsy,
the patient remains for 24–48 h under observation, with the first 24 hours in bed rest. For patients with renal failure and to prevent the deleterious effects of associated uremic thrombopathy, desmopressin acetate (Minirin®) is administered intravenously 1 hour before the operation at a dose of 0.4 μg per kg of body weight, diluted in 50 cc of physiological saline at 0.9%, to be passed in 30 min. After administering local anesthesia with mepivacaine at a concentration of 1%, the technique is performed under ultrasonic control and with a guide adapted to the transducer, using a 16 G needle attached to a Bard® automated biopsy gun. We collected a number of patient demographic variables (age, history, serum creatinine readings, coagulation parameters, etc.), as well as the early complications resulting from the procedure and the approach adopted for each complication, if applicable. We studied the rate of complications and the relationship between risk factors and the onset of complications. To assess the relationship among hypertension, anticoagulation or antiplatelet therapy and complications, we used the chi-squared test.

Results

The mean age of our patients was 55.8 years (range, 18–88 years), with a mean of 2.49 cores per intervention (range: 1–7 cores). The most common indications are listed in Table 1. The most common elements in the patients’ history are shown in Table 2. In our series, we found that 5.6% of the patients had undergone anticoagulation therapy, and 10.6% had undergone anticoagulation therapy. The overall rate of complications was 5.6% (the complications are detailed in Fig. 1). Only 3 (1.67%) of the 180 patients required an interventional approach due to procedural complications: 2 embolizations for retroperitoneal hematoma (1.1%) and 1 for anemia secondary to hematuria (0.6%). There was no need for surgery, and there were no deaths resulting from the procedure. There was no relationship (Table 3) between hypertension and complications (p = 0.09), prior anticoagulation therapy and complications (p = 0.099) or prior antiplatelet therapy and complications (p = 0.603). Only 2.8% of the biopsies presented insufficient material for the diagnosis.

Discussion

Orthotopic ultrasound-guided renal biopsy with a 16 G needle is a safe technique in our center and has a low rate of complications, even in patients with prior risk factors or coagulation disorders, provided these are corrected appropriately prior to the procedure. There are few publications that evaluate the results of renal biopsies with 16 G needles. The results of our study therefore strengthen the available evidence.15,16 With the rate of complications described, there is no question about this technique’s safety, which thereby allows us to broaden its indications, even for renal mass biopsies.

At present, small renal masses (smaller than 4 cm) constitute 48–66% of all newly diagnosed renal cancers.14,17 Of these, up to 20% present histological criteria of benignity and 60% are low-grade renal cell carcinoma.13 However, the percutaneous biopsy of small renal masses remains highly questioned among urologists, only 5% of whom indicate that they perform the procedure more or less routinely.18

The three main reasons for rejecting the biopsy of small renal masses are the safety of the technique, the diagnostic yield and the risk of tumor dissemination over the course of the puncture trajectory. In terms of safety, the data submitted in this study clearly support the view that the procedure presents an acceptable risk, even when performed with a 16 G needle.

In terms of yield, our series obtained a 97.2% diagnostic yield, although our study is limited in that the yield was achieved with kidneys with medical nephropathies and not renal masses. In the case of renal mass biopsies, the diagnostic yield rates described in the literature are approximately 95%.19 This yield is greater for the diagnosis of benignity than of malignancy, with less precision in the assignment of tumor grade in cases of malignancy.20 Occasionally, the diagnostic reliability is limited by the presence of areas of

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Table 1  Indications for orthotopic renal biopsy.

<table>
<thead>
<tr>
<th>Indication</th>
<th>%</th>
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<tbody>
<tr>
<td>Renal failure</td>
<td>50.6%</td>
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<tr>
<td>Nephrotic syndrome</td>
<td>20.6%</td>
</tr>
<tr>
<td>Proteinuria</td>
<td>17.8%</td>
</tr>
<tr>
<td>Systemic disease (lupus, vasculitis, etc.)</td>
<td>7.2%</td>
</tr>
<tr>
<td>Others</td>
<td>3.8%</td>
</tr>
</tbody>
</table>

Table 2  Relationship of personal medical history.

<table>
<thead>
<tr>
<th>Condition</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension</td>
<td>66.1%</td>
</tr>
<tr>
<td>Type 2 diabetes mellitus</td>
<td>23.3%</td>
</tr>
<tr>
<td>Anticoagulant</td>
<td>10.6%</td>
</tr>
<tr>
<td>Anticoagulation</td>
<td>5.6%</td>
</tr>
<tr>
<td>Vasculitis</td>
<td>12.2%</td>
</tr>
</tbody>
</table>

Table 3  Relationship between risk factors and complications.

<table>
<thead>
<tr>
<th>Complications</th>
<th>Complications rate</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antiplatelet</td>
<td>(n = 19)</td>
<td>0%</td>
</tr>
<tr>
<td>Anticoagulation</td>
<td>(n = 10)</td>
<td>20%</td>
</tr>
<tr>
<td>Hypertension</td>
<td>(n = 119)</td>
<td>3.4%</td>
</tr>
<tr>
<td>Overall</td>
<td>(n = 180)</td>
<td>5.6%</td>
</tr>
</tbody>
</table>

Figure 1  Relationship of complications.
central necrosis or inflammatory infiltrates associated with the tumor. This problem could be minimized by obtaining (in addition to the central cores) at least 2 cores from the periphery of the mass.\textsuperscript{21} Furthermore, the incorporation of new techniques developed in molecular biology-based diagnosis, if they can be applied to the material obtained from biopsies, could contribute to increasing our ability to individually stratify the risk for each patient and, consequently, adopt the most appropriate management for each patient.\textsuperscript{22} A number of authors have reported the possibility of optimizing the yield of the biopsy using a repeat biopsy, for cases that are initially negative, with satisfactory diagnostic rates in the second biopsy of approximately 83.3%.\textsuperscript{23}

In terms of the dissemination of tumor cells over the course of the puncture trajectory, there have been numerous studies that have estimated the dissemination in negligible percentages, varying between 0.009% and 0.01%.\textsuperscript{24,25} Even in cases of transitional cell tumor histology and despite a number of reported cases,\textsuperscript{26} this risk is negligible. Therefore, the hypothetical possibility of dissemination as the result of the biopsy should not preclude performing the biopsy.\textsuperscript{27}

The current discussion focuses on the indications of renal mass biopsy, whether this technique has the ability to change the approach to management when dealing with small renal masses and whether it should be included in diagnostic and therapeutic algorithms.\textsuperscript{28-30} At present and depending on the available evidence, the use of biopsies for renal masses smaller than 4 cm can be recommended for the following cases:\textsuperscript{11,31}

1. As support for imaging tests in the differential diagnosis of benignity versus malignancy, adjusting the treatment to the result.
2. In metastatic renal masses, to determine the histological type and choose the ideal treatment.
3. In the context of the emergence of new ablative techniques for the local treatment of small renal tumors, directed to minimize the loss of nephron mass associated with surgical treatment.\textsuperscript{32} In these cases, renal mass biopsy is included in the diagnosis section of management protocols and plays an important role in the monitoring of the disease.\textsuperscript{33}
4. Lastly, renal mass biopsy maintains its role in the diagnosis of potential renal metastases of other tumors.

As in other solid tumors (breast, lung, prostate, etc.), biopsy is a standard procedure prior to treatment.\textsuperscript{35} Its application in renal tumor disease remains a challenge among urologists. In recent years, there has been an enormous amount of interest in the subject and a considerable number of studies, many of them of unquestionable quality. The standardization of the technique and, with it, a paradigm shift in the management of renal tumors are therefore probably just a matter of time.

Conclusions

Based on the results of our study and the available literature, ultrasound-guided percutaneous renal biopsy is a safe technique with a high diagnostic yield, even in patients with risk factors, if these factors are properly corrected prior to the procedure. This fact, along with the change in scenario of renal cancer (a considerable majority of small and incidentally diagnosed tumors) we are experiencing, leads us to a new concept in the management of this cancer, in which renal mass biopsy plays a key role.

Conflicts of interest

The authors declare that they have no conflicts of interest.

References

19. Wood BJ, Khan MA, McGovern F, Harisinghani M, Hahn PF, Mueller PR. Imaging guided biopsy of renal masses: