

# RENAL BIOPSY: ULTRASOUND GUIDED RENAL BIOPSY USING A CAUDAL ANGULATED NEEDLE PATH TO IMPROVE CORTICAL SAMPLING

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## ABSTRACT

Renal biopsy for the diagnosis of parenchymal renal diseases, has long been established as the diagnostic modality of choice. Traditionally this is performed from the lower pole of the native kidney using image guidance and a spring loaded biopsy device that obtains a core of renal tissue for histopathological analysis. A cranial angulation is usually applied to the path of the biopsy needle. The diagnostic accuracy of the sample is based on the number of glomeruli present in the sample. Over shooting the renal cortex and sampling the renal medulla not only increases the risk of complications (vascular injury) but also reduces the diagnostic yield due to the absence of glomeruli in the tissue. We describe a technique where using an image guided caudally angulated needle which precludes medullary sampling, improving both safety and diagnostic yield of the renal biopsy.

**KEY WORDS:** Renal biopsy, ultrasound, complications.

## Introduction

Percutaneous renal biopsy is mandatory for establishing the specific diagnosis of diffuse renal disease and helping to ascertain the degree of active (Potentially reversible) and chronic (irreversible) changes. The degree of active or chronic changes helps to determine prognosis and likelihood of response to treatment. The routine evaluation of renal biopsy involves examination of tissue under light, immunofluorescent and electron microscopy.<sup>1,2</sup> Complications were significantly reduced after introduction of ultrasound guided renal biopsies and using automated spring loaded devices.<sup>3,4,5,6</sup> Lower pole of native kidney is ideal site for biopsy because of relatively less vascularity at this site and easy approach.<sup>7,8</sup>

The path of the needle to the lower pole of the native kidney is not established in literature. Most authors state that under real time ultrasound guidance tip of biopsy needle is advanced up to renal capsule and during a breath hold, spring loaded gun is activated for biopsy.<sup>5,9,10</sup>

The quality of renal biopsy depends on the size of

core and number of glomeruli. It is generally agreed that 10 to 15 glomeruli are adequate for diagnosis. For the diagnosis of severity of focal glomerular lesion, a small biopsy sample with low number (less than 6 glomeruli) will lead to considerable misclassification of disease severity and it will also be difficult to exclude focal disease.<sup>11</sup>

Before era of ultrasound guided biopsies only approximately 88% of core biopsy provided adequate tissue.<sup>12</sup> With the use of ultrasound guidance getting tissues from kidney were significantly improved from 88% to 93%-98% for histopathology with more than 9 glomeruli per specimen.<sup>12,13,14,15</sup>

Our aim of this study is to improve the sampling of renal cortical tissues for histopathology and achieve 100% results, while minimizing complications by using ultrasound guidance and a caudal angulation of the biopsy needle. We will also compare our complication rate with literature.

## Methods

A prospective study was conducted in the department of Radiology of Aga Khan medical university Hospital, Karachi, Pakistan, from January 2008- to August 2008. A total of 20 patients of both sexes presenting with various indications for renal biopsy were included in

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this study. Percutaneous biopsy was done to establish the diagnosis of type of renal disease.

A complete blood count, prothrombin time (PT), and partial thromboplastin time (APTT), International Normalised Ratio (INR) and platelets were checked before the procedure. Derangements were corrected before the biopsy was performed.

To reduce the risk of post biopsy bleeding aspirin was stopped for at least a week before biopsy. Biopsy was only performed in patients with blood pressure within the normal range.

Biopsies were not performed if native kidney was smaller than 9cm with cortical thickness <1cm, which are generally indicative of chronic irreversible disease. An informed consent was taken from patients. All biopsies were performed in ultrasound interventional room. Previous imaging and lab results were verified. The presence and size of kidneys was confirmed. Intravenous access was established with a 22G cannula. The patient was placed in a prone position. Noninvasive blood pressure monitoring and pulse oxymetry were instituted. Ultrasound was performed initially with low frequency probe for selection of biopsy site. After selection of the appropriate site, the area was cleansed with 10% povidone solution. Area was covered with sterile drapes. Ultrasound probe was also draped to eliminate contamination. Local anesthesia by 2% lignocaine was used along the needle insertion tract to lower pole of kidney. This was applied under ultrasound control. A small nick was made on skin for easy access for needle insertion. Free hand technique under real time ultrasound guidance was used for biopsy in all patients.

Kidney was visualized in longitudinal plane; lower pole of kidney was visualized with superior (upper) end of curvilinear ultrasound probe. Needle was inserted near to superior (upper) end of curvilinear US probe with possible short distance and caudal angle to target the lower pole of kidney. Needle was advanced until the capsule of kidney had been reached. The patient was asked to hold breath when biopsy was obtained after unlocking and firing the biopsy device. After the removal of biopsy needle manual pressure was applied at punctured site for ten minutes followed by dressing. All patients were on strict bed rest for six hours in supine position and advised to bed rest for a further 24 hours. Post biopsy vital signs including blood pressure, pulse, and respiration were monitored at every fifteen minutes for two hours then every thirty minutes for next two hours, then hourly interval for next 24 hours after biopsy. Transient gross hematuria was watched for, for 24 hours. The next morning hemoglobin and hematocrit were measured.

All biopsies were performed with 18G biopsy needles.

A minimum two passes were made in all patients. One sample was sent for routine light microscopy and other for immunofluorescent studies.

## Results

In all patients (100%) sufficient material was obtained for histopathology.

Transient gross hematuria was not observed in any patient. After fifteen minutes of biopsy minimal perinephric hematoma was observed in one (5%) patients, however this patient did not show a drop in haemoglobin which was unchanged from pre-procedure values.

## Discussion

The renal biopsy plays a very important role in diagnosis of renal disease. Recent development of imaging guided techniques has significantly reduced complication and also improved diagnostic yield.<sup>6</sup> The automated needles have provided more glomeruli per core and per biopsy when compared to the manual needle of the same gauge.<sup>16,17</sup>

There is no difference in complication rate between a manual needle and an automatic needle of the same gauge.<sup>16,17</sup> A higher complication rate with a manual 14 gauge compared to smaller automated needles has been reported.<sup>3,18</sup>

Preda et al<sup>19</sup> found an overall complication rate of 12.2% in 515 ultrasound guided renal biopsies. Major complications occurred in 2.7% of the cases, minor complications in native kidneys were 17.1%. Burstein et al<sup>16</sup> reported overall complications in 14.3% of patients who underwent ultrasound guided renal biopsies. Of these, 6.6% were minor complications and 7.7% were major complication for which patients required blood transfusion.

Cozen NJ<sup>5</sup> had adequate tissue specimen of kidney for histopathology in 93% of patients. Most of the authors claim obtaining optimal tissue from lower pole of native kidney for diagnostic histopathology in 95% to 98% of cases. Maya et al<sup>6</sup> reported 100% adequate tissue with 0% complications using ultrasound guided renal biopsies.

In our study our aim was to get 100% cortical tissue in renal biopsy specimen with optimal glomeruli for the diagnosis of renal disease while reducing hemorrhagic complications with a tailored new technique.

## Conclusion

In conclusion by using caudal angle of needle, under real time ultrasound guidance for core biopsy from

lower pole of native kidney is an effective technique to get cortical tissues. In our initial experience there were no major complication, which may be because of small number of procedures. Major complication rate which is documented, which required hospital stay and blood transfusion, is approximately 3%. However, our initial results are encouraging and support our caudal angulations of biopsy needle for obtaining of core tissue from lower pole of native kidney to obtained good cortical tissues.

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