

# Safety and efficacy of real time percutaneous ultrasound guided renal biopsies by nephrologist – a single center experience

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Received: 9 May 2016

Accepted: 17 July 2016

ePublished: 14 Aug. 2016

**Keywords:** Ultrasound guided renal biopsy, Renal biopsy complication, Adequacy of renal biopsy, Spring loaded biopsy gun

**Citation:** Shetty M, Sounderrajan CC, Kelur K, Satish S, Chandrashekar M, Kumar P. Safety and efficacy of real time percutaneous ultrasound guided renal biopsies by nephrologist – a single center experience. J Prev Epidemiol. 2016;1(2):e16.



## Abstract

**Introduction:** Renal biopsies in India were usually done by nephrologists with the help of radiologists. Accommodating a procedure like renal biopsy into the radiologists' busy schedule is often a difficult task. To overcome this, nephrologists nowadays have trained themselves to do ultrasound guided renal biopsies without radiologist's guidance.

**Objectives:** Primary objective of the current study was to look for adequacy of the specimen for histopathologic examination and secondary objective was to analyse procedure related complications.

**Patients and Methods:** With this retrospective study we share our biopsy experience between January 2013 to May 2014. There was no comparative arm in our series as we have been doing biopsies without radiologist guidance since 2006. All patients underwent a set list of investigations prior to biopsy. After obtaining written consent, both USG and renal biopsy were done by the nephrologist using an automatic spring loaded biopsy gun with 18G disposable needle.

**Results:** Fifty percent of patients in this series were in the 20-50 years age group. The most common clinical presentation requiring renal biopsy in our series was nephrotic syndrome (100/254) followed by unexplained worsening of renal function (77/254). The procedure was very safe with only two patients out of 254 requiring blood transfusion. Minor complication like mild hematuria not requiring blood transfusion was seen in 18/254 patients and small perinephric hematoma in 16/254 patients. In 236 patients two cores of tissue were obtained and this was achieved with two needle pass in 150/236 (59.1%) biopsies. More than three attempts were not required in any of them. Mean number of glomeruli was 11.69 and a histological diagnosis was possible in all cases.

**Conclusion:** Our series shows that renal biopsies can be safely done by nephrologist alone with good yield.

## Introduction

Renal biopsy is an essential part of nephrologists diagnostic tool for many renal diseases (1,2). Use of ultrasound in nephrology practice has made procedures like renal biopsy safer and easier. The availability of automated spring loaded biopsy gun and needle has added to the precision and ease of doing a biopsy.

Renal biopsy at most centers is carried out by nephrologist with radiologist's assistance or by interventional radiologists. Fixing an appointment with the radiologist for renal biopsy is difficult in high patient volume centers due to the radiologist's busy schedule, it becomes even more difficult for cases which need urgent biopsy and early initia-

## Core tip

Observation from our retrospective study would encourage more and more nephrologists especially nephrology trainees to take up intervention nephrology. This will reduce the medical expenses to a significant extent and in a resource poor country like India this will be of great benefit to the patients.

tion of treatment (3). Various studies have shown that renal biopsy can be safely and successfully performed by a nephrologist. This can avoid the unnecessary delays and allows prompt initiation of treatment (4,5), also a matter for concern is when post biopsy complications arise and the radiologist is

not available for performing a repeat scan on the patient. The ability to guide the needle into the exact biopsy location, to give a proper description of the cortical thickness and echogenicity depends on the radiologist's competence. There is a need for the nephrologist to be familiar with renal ultrasound. As more and more nephrologists are getting trained in renal ultrasound, biopsies can also be performed without radiologist's assistance (6).

Renal ultrasonography by the nephrologists was popularized by O'Neill in the 1990s. He reported that diagnostic information and quick initiation of therapy was possible when a nephrologist was involved. A data from the United States have shown a significant reduction of the time required to perform a renal ultrasound on an outpatient basis from a mean  $46.5 \pm 2.4$  to  $4.7 \pm 0.7$  days when the procedure was performed by a nephrologist (5). Similar delays for the performance of a renal ultrasound for outpatients was usual in the hospitals of Thessaloniki (6). Nephrologists should be trained adequately with ultrasound imaging technique for use in interventions like renal biopsies. For best clinical outcomes ultrasonogram (USG) findings should be interpreted keeping the clinical picture of the patient for which nephrologist is the most suited person (7,8).

### Objectives

We, at our center have been performing USG guided real time renal biopsies without radiologist assistance for the last 9 years and thus far have performed more than 2000 renal biopsies. We analyzed our data retrospectively and share our experience with regard to the safety and efficacy of nephrologist doing USG guided biopsies. Primary objective of the current study was to look for adequacy of the specimen for histopathologic examination and secondary objective was to analyse procedure related complications.

### Patients and Methods

This retrospective case record analysis is undertaken among biopsies from Jan 2013 till May 2014 at department of nephrology, JSS hospital, Mysore. All patients underwent a set list of investigations including hemoglobin, platelets, bleeding time, clotting time, APTT and prothrombin time prior to biopsy. Abnormalities in these were corrected prior to biopsy. Renal biopsy was not done if the blood pressure (BP)  $>160/100$  mm Hg till the BP was brought under control.

Both USG and renal biopsy were done by the nephrologist. We used portable USG machine Prosound Japan for real time USG and renal biopsy was done using BARD automatic spring loaded biopsy gun with 18G disposable needle.

Written consent was obtained from all the patients before biopsy. The patient's skin surface was cleaned with povidone iodine and draped. Then 3.5 MHz transducer was used to localize the lower pole of the native kidney. The distance to the biopsy point from the skin surface was measured and the skin surface was marked at the expected needle entry point. The skin, subcutaneous, and peri-re-

nal tissues were infiltrated with local anesthetic. A small stab incision was made to facilitate passage of the biopsy needle. The biopsy needle was then directed towards lower pole under real-time ultrasonic guidance. Patients were asked to hold their breath when the needle approached the kidney. The gun was then fired, instantaneously advancing the cannula over the stylet and obtaining a core of renal parenchyma. The sampling time was less than 1 second. Repeat passes were performed to obtain two biopsy specimens. After the procedure, the kidney was scanned to assess for the presence of hematoma or active bleeding. All the patients were observed in our intermediary unit by trained nurses for a period of 6 hours post procedure and then returned to the hospital ward for overnight observation with monitoring for vitals and hematuria as per the protocol. A follow up check ultrasonography was done if there was hematuria or severe pain to rule out hematoma which would have developed later.

Complications were graded as major if they required blood transfusions post procedure or surgical/interventional radiology to stop bleeding. Mild hematuria and small perirenal hematoma not requiring blood transfusion were considered minor complication.

### Ethical issues

All renal biopsies done by us had definitive indications for a biopsy. Our study was a retrospective analysis of the patient case records and as per our hospital policy written informed consent was taken from all the patients. Hospital ethical committee has given permission to analyse the data.

### Data analysis

Data analysis was done by measuring proportions, mean and standard deviation. All the measurements were done using SPSS version 21.

### Results

A total of 254 patients underwent renal biopsies from January 2013 to May 2014. We looked for the adequacy of the biopsy specimen from the histopathologic report and the details of immediate complication following procedure was obtained from hospital case records. The demographic characteristics are given in Table 1. Two-thirds of our study population were males. Fifty percent of study population were in the age group 20-50 years.

Nephrotic syndrome was the most common indication for renal biopsy (39.4%) followed by unexplained renal failure (30.3%) (Figure 1). Two cores of tissue were obtained in 236 (93.0%) patients. Only one core was taken from 18 (7.0%) patients due definitive reasons. 59.1% of patients required only two needle passes through the kidney to obtain two cores of renal tissue (one pass for each core). 35.5% required three passes to obtain two cores of renal tissue each for IF and light microscopy. In no case the number of attempts exceed three per patient. The mean number of pass per patient was 2.3 (Table 2).

Major complications were requirement for blood transfu-

**Table 1.** Age and gender distribution of study subjects (N = 254)

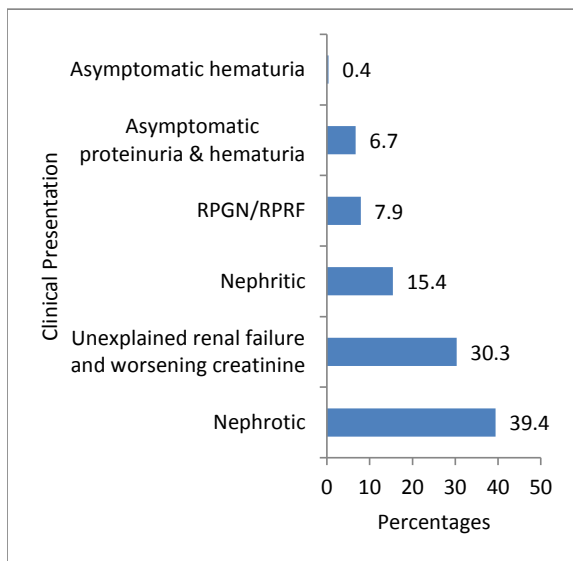
	Proportion	Percent
<b>Gender</b>		
Male	157	61.8
Female	97	38.2
<b>Age group (years)</b>		
<10	2	0.8
11-20	32	12.6
21-30	59	23.2
31-40	44	17.3
41-50	41	16.1
51-60	45	17.7
61 and above	31	12.2

**Table 2.** Efficacy parameters of renal biopsy

	Number	Percent
<b>Number of cores</b>		
Single tissue core	18	7.0
Two tissue cores	236	93.0
<b>Number of attempts at needle pass</b>		
One	14	5.5
Two	150	59.1
Three	90	35.4

**Table 3.** Procedure related complications given as percentage

Complications	Number	Percent
Mild hematuria not requiring transfusion	18	7.08
Small perinephric hematoma not requiring transfusion	16	6.3
Hematuria requiring Blood transfusion	1	0.39
Requirement for surgery / intervention	0	0



**Figure 1.** Frequency of indications for renal biopsy.

sions post procedure and the need for surgical or interventional radiology to stop bleeding. Only one patient (0.39%) needed blood transfusion for gross hematuria and was managed conservatively. Mild hematuria was seen in 18 patients (7.08%) and small perinephric hematoma which was picked up in post biopsy check USG in 16 (6.3%) cases (Table 3).

**Discussion**

Ultrasound-guided percutaneous kidney biopsy using an automated spring-loaded biopsy device has made renal biopsies easy and safe. The success rate in various ultrasound guided renal biopsy series in terms of tissue adequacy varies from 88.4 to 98.9% (9-11). In our series, both the adequacy and success rate was 100% . Many of these studies have used 16G needles. The average number of glomeruli ranged 9 to 12.5 (9-11). In the comparative study by Yesudas et al, the glomerular yield of nephrologist done biopsies averaged 15.62 ± 5.26 (12). In our study the mean number of glomeruli per core 11.69 which was histologically adequate. In the study by Gupta et al, the mean number of passes per patient to obtain tissue 2.48 (13). In other series the number of attempts per patient ≤4 (14).

We needed a mean of 2.3 needle pass per patient. Major complication rates in the form of requirement for blood transfusion and interventions to stop bleeding occurred in 2.84 % and minor complications in 3.7% (15). Small perinephric hematoma in 2.2% and mild self-limited hematuria in 0.8% (9). Another study noticed perirenal hematoma (clinically asymptomatic) in 3.6% and visible hematuria in 1.2%; bleeding complications requiring blood transfusion or therapeutic radiologic intervention were not seen, and surgical procedure was indicated in one (0.4%) patient (11). In a meta-analysis of the post biopsy complications macroscopic hematuria was seen in 3.5% and blood transfusion needed in 0.9% (16). The major complication in our series was the requirement of blood transfusion for gross hematuria in 0.38% biopsies. No patient required surgical intervention to stop the bleeding.

**Conclusion**

To conclude, renal biopsy can be safely and easily done with good tissue yield by nephrologist trained adequately in renal ultrasound.

**Limitations of the study**

The only limitation was the absence of control group which could have made the study more scientific.

**Acknowledgements**

We would like to thank Dr. Praveen Kul Karni, (community medicine) and Sumanth (community medicine) for statistical analysis.

**Authors' contribution**

MS, CCS and KK; study design. CCS and KK; data collection. SS, PM and MC; writing of the manuscript.

**Conflicts of interest**

The authors declared no conflict of interest.

**Ethical considerations**

Ethical issues including plagiarism, misconduct, data fabrication, falsification, double publication or submission, redundancy have been completely observed by the authors.

**Funding/ Support**

None.

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