USG assisted and USG guided percutaneous renal biopsy at Nepal Medical College Teaching Hospital: A three and half years study

AS Tuladhar,[1] A Shrestha,[1] S Pradhan,[1] DN Manandhar,[2] PK Chhetri Poudyal,[2] A Rijal,[3] P Poudel[2] A Maskey[2] and KK Bhoomi[3]

Corresponding author: Dr. Abhushan Siddhi Tuladhar, MBBS, MD (Radio-diagnosis) Assistant Professor, Department of Radiology and Imaging, Nepal Medical College & Teaching Hospital, Attarkhel, Jorpati, Kathmandu, Nepal; e-mail: abhushant@gmail.com

ABSTRACT

A prospective study was carried out from 2009 to 2013 in the Department of Radiology and Imaging of Nepal Medical College and Teaching Hospital, Attarkhel, Jorpati, Kathmandu, Nepal, in which a total of 75 patients underwent percutaneous renal biopsy with a 16 or 18 gauge needles. This was done blindly by marking a site on the skin, or, whenever there was difficulty with the blind procedure, by direct real time USG guidance. In all cases, the marking in the skin was done by the radiologist and the biopsy was performed by the Nephrologist, with the aid of the radiologist in cases of real-time USG guided renal biopsy. This study was carried out to assess the safety and efficacy of the USG aided, and USG guided renal biopsy, to see for the types and severity of complications arising from renal biopsies to determine the optimal period of observation required after the procedure. All renal biopsies were performed after the patients were admitted to the hospital at least 1 day prior to the procedure. Coagulation profile was done in all patients prior to the procedure. All patients were kept under strict complete bed rest for 24 hours post procedure. The ages of the patients ranged between 14 years to71 years, with 42 female and 33 male patients. A mean of 21.8 glomeruli was obtained in each specimen, with absent glomerular yield seen in only 3 patients. Minimal change disease was seen in 19 patients, being the most common histopathological diagnosis followed by a spectrum of others. The overall complication rate was 4% and all of these were self-limiting needing no other intervention, or management except for observation and bed rest. Late complications were not seen. Percutaneous renal biopsy with the help of USG is a safe and efficacious procedure with less chance of minor complications.

Keywords: Renal biopsy, USG guided, complications

INTRODUCTION

Renal biopsy is the diagnostic procedure of choice in many patients in whom renal disease is suspected. Histological diagnosis of renal disease plays a fundamental role in clinical practice, providing information about both the diagnosis and prognosis of various renal diseases. In the past, renal tissue was usually obtained by use of a manual technique with a large bore cutting needle.[1] The first reported percutaneous renal biopsy was in 1951.[2]

Like every invasive procedure, renal biopsy was burdened with several potential complications in those days. However, with the introduction of automated biopsy guns and localization of the kidney by real-time ultrasound guidance, the efficacy and safety of renal biopsy and the risk of complications has been dramatically reduced.

Percutaneous renal biopsy using automated biopsy guns under real time ultrasound guidance has now become a routine procedure in most centres.[3] Ultrasound guided renal biopsy with an automated spring-loaded biosy device has become the standard method for kidney biopsy. Information on the success rate and safety of the procedure from large series is not available. Such information is of interest for cost benefit considerations and for medicolegal purposes.[4]

For patients with difficult landmarks and poor visualization on ultrasound, alternative methods include CT guidance, laparascopic and open kidney biopsies.[5-7]

USG guided renal biopsy can also be performed accurately and safely for renal masses and not just for renal parenchyma disease.[8]

Percutaneous renal biopsy in expert hands, with radiologist and nephrology unit members, working as a team can give better results in terms of safety and efficacy.

MATERIALS AND METHODS

A prospective study was carried out from 1st December 2009 to 31st May 2013, for and half years in the Department of Radiology, Nepal Medical College and Teaching Hospital, Jorpati, Kathmandu, Nepal in which a total of 75 patients underwent percutaneous renal biopsy.

All patients were admitted to the Nephrology ward at least 1 day prior to the procedure. Informed consent was obtained in all patients. Normal coagulation profile (Total Platelets Count, BT, CT, PT, APTT and INR) was prerequisite in all patients. Presence of gross ascites, uncontrolled diabetes, uncontrolled hypertension and fever, were other contraindications for the procedure.

All patients were placed in prone position with a sandbag between the surface of the bed and the ventral surface of the abdomen. All biopsies were performed from the left kidney. In all cases, the surface marking of the best site on the lateral aspect of the lower pole cortex of the left kidney was marked on the skin surface with USG assistance by the radiologist. For this the lower pole of left kidney was visualized in USG in both axial and longitudinal planes with the probe position placed perpendicular to the table top surface. The distance from the skin surface to the renal capsule and the thickness of the renal capsule were also noted. Ultrasound assessment and surface marking was performed by the Radiologist using Nemio 17 Ultrasound unit, Toshiba Medical Systems, Japan.

All procedures were performed under strict aseptic precautions under local anaesthesia infiltration. A small nick was made in the skin at the marked site with a scalpel. A 20 G spinal needle was advanced from this site till the renal capsule has been traversed, with the patient holding his / her breath after a deep inspiration. This was observed by to and fro movement of the needle during respiration after insertion of the needle into the kidney. The spinal needle was then withdrawn, and the actual depth of the renal cortex from the skin surface measured in the withdrawn spinal needle. The needle of the biopsy gun was then inserted through the same nick in the same plane as the spinal needle to the same depth, with the patient holding his / her breath after a deep inspiration. The gun was fired and a biopsy specimen obtained. Two good specimens were obtained in all patients, one each for light microscopy and for immuno-fluorescence. All biopsies were obtained by the Nephrologist with a 16 or 18-gauge Bard Maxcore Biopsy Needle.

In most cases, biopsy was performed just with USG assisted surface marking of the optimal site in the skin. However, if there was difficulty with the blind procedure or if repeated unsuccessful attempts were made then renal biopsy was performed with direct real-time USG guidance by combined teamwork of the radiologist and the nephrologist. For this, the tip of the needle of the biopsy gun was inserted through the nick until the tip was seen just outside the lower pole renal cortex. The patient was then asked to the hold breath in deep inspiration. The needle was then advanced until the tip was seen just inside the renal cortex and the biopsy gun fired.

A quick scan was performed by the radiologist immediately after the procedure to look for any haemorrhage or collection at and around the biopsy site.

Pressure bandage was applied over the biopsy site and the patient transferred to the ward on a trolley. Patient was put on 24 hours strict bed rest. All patients underwent detailed ultrasound the next day to see for any biopsy related complications. Patients were discharged from the hospital the next day after biopsy if no complications were seen, or later if other indications prevailed other than those related to renal biopsy.

Data analysis was done by compiling all the data and results using statistical software SPSS 11.0.

RESULTS

A total of 75 patients underwent percutaneous renal biopsy with ages of the patients ranging between 14 and 71 years, 42 (56%) being female and 33 (44%) being male patients (F:M ratio = 1.27:1). 28 (37.3%) patients were in the age group of 20-29 years followed by 24 (32%) in 30-49 years. There were 14 (18.7%) between 14 to 19 years and 8 (10.7%) between 50-69 years. Only one patient of 71 (1.3%) years was above the age of 70. Among 75 patients who underwent renal biopsy, 8 (10.7%) patients did not come back for follow-up with the biopsy report, or neither could their report be traced from the concerned laboratory.

In all patients, initially biopsy was attempted blindly from the site marked on the skin surface without real time USG guidance. In 49 (65.3%) patients this was successful with at least 2 good specimens which were obtained on 2 to maximum of 4 passes. In 26 (34.7%) patients, successful biopsy was performed with real-time USG guidance, when 1 or maximum 2 unsuccessful passes were attempted blindly without any satisfactory tissue yield. In 6 (8%) patients, as many as 5 passes were made, including those without and with real-time USG guidance, to get 2 satisfactory specimens. More than 5 passes were not done in any patients. In 2 (2.7%) patients, several (upto 5 maximum) passes did not yield satisfactory specimen and the procedure was repeated a week and 10 days later. In both cases repeat biopsy was successful and uneventful.

A mean of 21.8 glomeruli per specimen was achieved (considering for both light microscopy and immune-fluorescence). In 3 (4.5%) patients, no glomeruli were found and hence the reports were inconclusive.

Minimal Change Disease was found in the histopathological

report in 19 patients (28.4%), Membranous Nephropathy in 12 (17.9%), Focal Segmental Glomerulosclerosis in 11 (16.4%), Lupus Nephritis IV in 10 (14.9%), IgA Nephropathy in 5 (7.5%), Membrano-Proliferative Glomerulopathy in 3 (4.5%), Diffuse Proliferative Glomerulopathy in 2 (2.9%), Lupus Nephritis III in 1 (1.5%) and C1q Nephropathy in 1 (1.5%) patients (Table-1).

Table-1: Histopathological diagnosis

Histopathological diagnosis	no. (%)
Minimal Change Disease	19 (28.4)
Membranous Nephropathy	12 (17.9)
Focal Segmental Glomerulosclerosis	11 (16.4)
Lupus Nephritis IV	10 (14.9)
IgsA Nephropathy	5 (7.5)
Membrano-Proliferative Glomerulopathy	3 (4.5)
No glomeruli / Inconclusive	3 (4.5)
Diffuse Proliferative Glomerulopathy	2 (2.9)
Lupus Nephritis III	1 (1.5)
C1q Nephropathy	1 (1.5)
Total	**67 (100)**

None showed any haemorrhage or haematoma in immediate scan done after the procedure.3 (4%) patients showed minimal perinephric collection around the biopsy site in the scan done on the next day, one patient (1.3%) showed minimal retroperitoneal and intraperitoneal collection (which was not present before biopsy). Among these 3 patients, 2 (2.7%) had macroscopic haematuria and 1 (1.3%) had gross haematuria. In all 3 patients the complication was self-limiting and showed gradually decreasing collection in subsequent scans done at weekly intervals until they resolved completely with a patient with gross hematuria, showing the most delayed resolution in 3 weeks time. No major complication needing surgical or vascular intervention or blood transfusion was seen. No injury to the renal pelvis, hilum, or to the renal vascular pedicle was observed. No arterio-venous fistula was reported. Minor complaints like pain at the biopsy site, fever, and weakness were reported by a few patients, all of which were also self-limiting.

DISCUSSION

For a percutaneous renal biopsy, once it is scheduled, proper planning, careful technique and selection of instrumentation contribute to a successful procedure.

Since 1990, most people have been performing renal biopsy using real-time ultrasound guidance with a semiautomated spring loaded needle to make it safe and reliable.[9] However, percutaneous renal biopsy is not free of severe complications which may result in loss of kidney and rarely, even death.[10,11] Selection of patients, and patient preparation plays an important role in avoiding complications in renal biopsy. It is imperative to evaluate the patient for history of bleeding diathesis, recent use of NSAIDs, hypertension control, recent pyelonephritis or skin infection near the biopsy site and the ability to comply with the instructions during biopsy.[12] Prerequisite to biopsy are complete blood count with platelets count, BT, CT, PT, APTT and INR. But studies have shown BT has no significant correlation with surgical bleeding.[13,14]

Sonographic guidance can be used in the diagnosis of kidneys with diffuse parenchymal disease. Insertion of the needle into the lower pole renal parenchyma under continuous real-time guidance, with avoidance of the renal pelvis and major vasculature, has been shown to result in very few complications and produces a tissue sample of excellent quality for microscopic analysis.[15-17]

The use of real time ultrasound guided renal biopsy is believed to be superior to blind biopsy, but there are few reports comparing the two techniques. It provides a superior yield of the kidney tissue and results in fewer haemorrhagic complications.[18]

Mendelssohn and Cole found an overall complication rate of 5.3% in 544 consecutive cases of percutaneous renal biopsies.[19] Burnstein et al reported complications in 14.3% of 91 patients, out of which 6.6% were minor (microhematuria not requiring transfusion) and 7.7% were major.[20] Hergesell et al retrospectively analyzed the results of 1090 renal biopsies and found that ultrasound-guided percutaneous renal biopsy is a safe procedure and skilled operators obtain satisfactory amount of kidney tissue in almost all cases.[4]

Manno et al prospectively evaluated the predictive value of demographics, clinical data, baseline chemistry and needle size for the risk of post renal biopsy complications in 471 patients. They concluded that only gender, age and baseline PTT showed a significantpredictive value and other variables investigated did not have any predictive value.[21]

Marwahet al performed renal biopsy in 394 native kidneys and concluded that observation of patients for 23 – 24 hours is optimal and that observation for eight hours or less risks missing 20% of complications.[22]

There were substantially fewer complications with the 18-gauge needle and biopsy gun than with the 14-gauge needle.[23]

Chan et al performed percutaneous renal biopsies on 25 native kidneys and 70 allograft kidneys using a 16-gauge

automated core biopsy device under real-time ultrasound guidance. They concluded that real-time ultrasound guidance in conjunction with an automated biopsy device is a safe and accurate method of performing percutaneous renal biopsy in the hands of radiologists and they were accurate in estimating sample adequacy in most cases.[24]

The causes of 10% of defaulters may be due to demise or terminally ill and moribund state of patients in a 3 to 4 weeks long duration between the procedure and report collection day. Or, it could be due to lack of adequate motivation among the patients and their family members from peripheral parts of the country to feel imperative to come back for follow up with the report. Few patients might have visited some other kidney centres in the country or elsewhere or some might not have submitted the sample to the laboratory due to various reasons whatsoever. Lack of immune-fluorescence examination in the country itself and therefore the need to depend on laboratory services of the neighboring country is still a disadvantage in terms of swift reporting, ease, patient's compliance, logistics and cost.

With a good team work and with highly motivated team spirit of both the Radiologist and the Nephrology unit members, the procedure of percutaneous renal biopsy in terms of safety, accuracy and efficacy and its yield in terms of histopathological diagnosis was found good in the initial effort itself at Nepal Medical College Teaching Hospital.

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