EVALUATION OF PERCUTANEOUS KIDNEY BIOPSY COMPLICATIONS IN AMBULATORY PATIENTS – A TWO YEAR REVIEW FROM A TERTIARY CARE CENTRE

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ABSTRACT

Objective: To evaluate the complications of percutaneous kidney biopsy in ambulatory patients in a tertiary care centre over a two year period.

Study Design: Cross sectional, descriptive.

Place and Duration of Study: The study was carried out at the Department of Nephrology Military Hospital, Rawalpindi from Jan 2008 to Jan 2010.

Material and Methods: Patients referred to the Nephrology Department for kidney biopsy were considered for inclusion in the study provided they did not have any contraindications to the procedure and had a normotensive state with BP <130/90 mm Hg and a normal coagulation profile including partial thromboplastin time, prothrombin time, bleeding time and platelet count. Patients with an evidence of malignancy, congenital anomalies of kidneys on ultrasound examination or a skin disorder affecting the likely site of biopsy were excluded.

Results: A total of 100 patients who merited standard indications for kidney biopsy were included in the study. Average age was 45.53 years (+1 SD = 10.96) with age range of 25 years to 75 years. There were 83 males (83%) and 17 females (17%) with male to female ratio of 4.9:1. Microscopic hematuria occurred in 82 (82%) patients. Gross hematuria occurred in 12 (12%) patients. Decrease in hemoglobin level by 1 g/dL or more occurred in 35 (35%). There was no episode of hypotension secondary to severe bleeding. No patient required transfusion. Surgery was not required in any patient for controlling bleeding. Death was not recorded among the reported complications.

Conclusion: Percutaneous kidney biopsy can be safely conducted as an outpatient procedure with an observation time of 12 hours post-biopsy to watch for any complications.

Keywords: Hematuria, Kidney biopsy, Outpatient.

INTRODUCTION

A percutaneous renal biopsy may be conducted for a number of reasons, including establishment of the exact diagnosis, as an aid to determine the nature of recommended therapy or to help decide when treatment is futile[1,2]. It is however important to recognize that prognostication based on renal pathology alone may be affected by the size of the sample obtained and may be inconclusive in biopsies with few glomeruli (i.e ≤5). The findings in renal biopsy always need to be interpreted in the context of the clinical and laboratory features.

The routine evaluation of a percutaneous renal biopsy involves examination of the tissue under light, immunofluorescence (and immunoperoxidase in some laboratories), and electron microscopy[3]. Each component of the evaluation can provide important diagnostic information. The routine immunofluorescence examination of biopsy specimens should include (at a minimum) evaluation of IgG, IgM, IgA, C3, C1q, albumin, fibrin, and kappa and lambda immunoglobulin light chains. Special studies, including evaluation of serum Amyloid A deposits, IgG subclasses (IgG1-4), and collagen chains (alpha 3.4 and 5) may be helpful in some

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cases where available[4]. The indications for performing a renal biopsy vary among nephrologists, determined in part by the presenting signs and symptoms[1,2,5-7]. The overall rate of native kidney renal biopsy (in number of procedures per million population) varies from over 250 per million population in Australia to less than 75 per million population in the USA[8]. The results of the renal biopsy impact patient care in up to 60% of cases[5,9-11].

Prior to a percutaneous renal biopsy, a history, physical examination, and selected laboratory tests should be performed[12]. The skin overlying the biopsy site should be free of any signs of infection, and the blood pressure should be normal or well-controlled. Recommended laboratory tests include a complete biochemical profile, complete blood count, platelet count, prothrombin time, partial thromboplastin time, and bleeding time, if available. A bleeding diathesis, if discovered, should be appropriately evaluated and treated prior to undertaking a renal biopsy. The value of routine measurement of the bleeding time continues to be debated[13-16]. Observational studies have demonstrated a bleeding complication rate that is 3-5 times higher in those patients with abnormal bleeding times[17-18]. Other series, however, report no increased risk[14,19].

Bleeding is the primary complication of renal biopsy[1,2]. Post-biopsy bleeding can occur at three sites: (1) into the collecting system, leading to microscopic or gross hematuria and possible ureteral obstruction; (2) underneath the renal capsule, leading to pressure tamponade and pain; or (3) into the perinephric space, leading to hematoma formation and a possibly large fall in hematocrit. Most clinically significant bleeding is recognized within 12 to 24 hours of the biopsy[21]. As previously mentioned, the incidence of bleeding is minimized with normal partial thromboplastin time, prothrombin time, platelet count, and bleeding time. Additional clinical risk factors for bleeding include hypertension, renal insufficiency, and anemia[12,20,21,24].

Prior reports suggested an increased risk of complication in certain disorders, such as autoimmune disease, end-stage renal disease, acute tubular necrosis, and amyloidosis[17,19,24]. However, recent reports have called many of these results into question[25,26]. The incidence of additional complications that may or may not be related to bleeding include pain lasting more than 12 hours is about 4 percent. This problem may be due to ureteric obstruction from a blood clot in patients with gross hematuria or to stretching of the renal capsule by a subcapsular hematoma. Arteriovenous fistulas form in up to 18 percent of cases due to damage to the walls of an adjacent artery and vein[1,28]. Another rare complication is chronic hypertension due to the "page kidney"[29-31]. In this setting, pressure-induced ischemia from a large subcapsular hematoma can lead to persistent activation of the renin-angiotensin system. Perirenal soft tissue infection may occur in 0.2 percent of cases, most often in patients with active parenchymal renal infection[1,27]. Rarely, puncture of the liver, pancreas, or spleen may occur.

The rationale of conducting this study was to evaluate the safety of percutaneous kidney biopsy as an out-patient procedure. This routine can enable us minimize cost of hospital expenses. This will also enhance the patients' sense of well being due to minimal hospital stay. In view of the result obtained it is strongly suggested that this procedure should routinely be conducted as out-patient except those who are already admitted or those who have other co-morbid issues that require hospitalization. It is further emphasized that each centre should formulate their own surveillance plan to watch for procedure related complications. The one that was adopted in this study included vital signs monitoring every 15 minutes for 1 hour then every 1 hour for 12 hours, repeat urinalysis, hemoglobin and ultrasonography of abdomen 8 hours post-biopsy.

MATERIAL AND METHODS

It was a cross sectional descriptive study carried out in the Department of Nephrology, Military Hospital Rawalpindi over a period of 2 years. The patients who fulfilled the inclusion criteria and gave informed written consent for inclusion in the study were taken into account. The patients with comorbid conditions in addition to renal symptoms were not included in the study. Microscopic hematuria, fall in hemoglobin levels, gross hematuria, hypotension, transfusion, nephrectomy & death were the possible side effects associated with the procedure. A total of 100 patients were included in the study on the basis of non-probability consecutive sampling technique. The patients were divided into different groups on the basis of the complications of the procedure & frequencies were determined for each group.

An elaborate proforma containing all the relevant information including possible side effects of kidney biopsy was used. The filling up of basic patient information and signing of consent was carried out by the patients however the rest of information was endorsed by the physician doing the biopsy. All the patients underwent ultrasonographic evaluation prior to conducting biopsy in the radiology department utilizing expertise of senior radiologist. All biopsies were conducted in the radiology department under direct visualization of biopsy needle with ultrasonographic localization. The evidence of internal and external bleeding was gathered using post biopsy clinical and radiological assessment. A repeat ultrasonographic evaluation was done to rule out intra-abdominal complications before shifting the patient from Nephrology department. All the patients were detained under direct observation for 12 hours post-biopsy and evaluated for side effects. After completion of observation time period they were either shifted back to respective medical wards (in case of admitted patients) or sent home (in case of OPD patients). The observation period included monitoring of all vital signs, and follow up measurement of hemoglobin levels as well as urine routine examination.

RESULTS

One hundred patients who merited standard indications for kidney biopsy were included in the study. Average age was 45.53 years (SD = 10.96) with age range of 25 years to 75 years. Eighty three (83%) were males while 17 (17%) were females with male to female ratio of 4.9:1. (Fig-1).

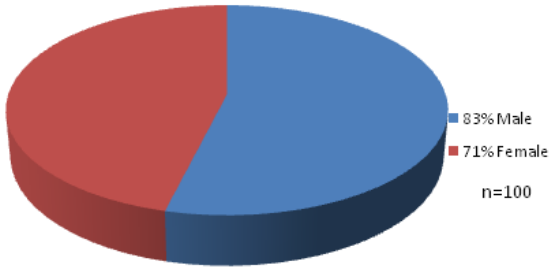

Figure-1: Gender of the test subjects.

Microscopic hematuria occurred in 82 (82%) patients. Gross hematuria occurred in 12 (12%) patients. Decrease in hemoglobin level of 1 g/dL or more occurred in approximately 35 (35%).

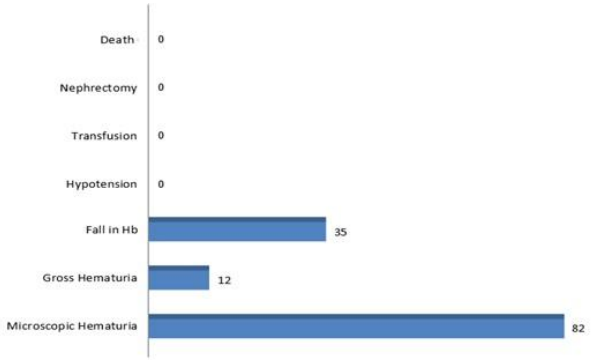

Figure-2: Complications of percutaneous kidney biopsy.

Bleeding severe enough to cause hypotension or requiring additional hospital stay beyond the mandated outpatient observation period did not occur. There was no instance of subcapsular hematoma or arteriovenous fistula formation. None of the patients required blood transfusion. Surgery was not required in any patient for

controlling bleeding. Death was not recorded among the reported complications. (Figure-2).

DISCUSSION

Percutaneous kidney biopsy remains an important diagnostic aid in nephrology specialist clinics as an outdoor procedure for ambulatory as well as admitted patients. Various international studies have been carried out to elaborate the risks associated with kidney biopsy which show a remarkably similar pattern of adverse effects. In one retrospective study of 645 renal biopsies, post-biopsy bleeding occurred in 2 and 12% of patients with serum creatinine concentration below or above 2 mg/dL (177 micromol/L) respectively[35]. Post-biopsy bleeding occurred in less than five and greater than ten percent of patients with systolic blood pressures less than and greater than 160 mmHg, respectively (similar for diastolic blood pressures less than or greater than 100 mmHg). The lowest frequency of bleeding was reported for blood pressures <120/80 mmHg.

The approximate incidence of the different bleeding complications as ascertained in different studies is similar[1,2,12,17,20,22,27]. Transient microscopic hematuria was seen in almost all patients; this was associated with post biopsy CT scan evidence of an intrarenal or perinephric hematoma in 60 to 80 percent of patients. Transient gross hematuria in 3 to 18 percent. Decrease in hemoglobin level of 1 g/dL or more was seen in approximately 50 percent cases. Bleeding severe enough to cause hypotension in 1 to 2 percent, and to require transfusions in up to 6 percent. Surgery was required to control the bleeding in 0.1 to 0.4 % with a nephrectomy rate of roughly 0.3%. The risk of mortality is 0.02 to 0.1%[14], but many highly experienced and manually skilled operators have performed native kidney biopsies over many decades and not encountered a single mortal event. In two large series spanning the years 1952 to 1990, the death rate was reported to be just 0.1%[23,27].

Another study reviewed biopsy complications from 1988 to 1994 and reported a mortality rate of 0.02%, implying that the use of modern techniques may reduce the rate of death[22]. However, another large series using real-time ultrasound and automated needles reported a mortality rate of 0.1%, suggesting that significant morbidity may still occur even with modern techniques. This may reflect factors that increase risk of bleeding in many patients undergoing biopsy such as hypertension, anemia, and chronic kidney disease[21]. One study assessed the predictive value of ultrasonography findings one hour after the biopsy in determining the post-biopsy clinical course. The ultrasound findings of a hematoma at one hour had a positive predictive value of only 43% but a negative predictive value of 95% for the development of a complication. Thus, while the presence of a hematoma was not predictive of a complicated clinical course, a negative ultrasound was highly predictive of an uncomplicated post-biopsy course[18]. Another study evaluated the predictive value of an initial six-hour hematocrit with respect to the hematocrit at 24 hours in patients undergoing percutaneous renal biopsy of transplant and native kidneys. The authors found that in patients observed in the hospital for 24 hours, a linear correlation of the hematocrit at six hours to the hematocrit at 24 hours existed[32].

Percutaneous Kidney Biopsy can safely be conducted as an out-patient procedure with an in-hospital observation time of 12 hours post-biopsy to watch for any complications. The procedure has an excellent safety profile in patients selected with careful pre-biopsy screening methods including evaluation of any underlying bleeding problems. The patients meriting indoor management of these complications may be considered for further retention in the hospital.

CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author.

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