Original Article

Evaluation of Gross Hematuria and/or Drop in Hemoglobin in Post-Renal Biopsies within and after 8 Hours

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ABSTRACT

Objective: To evaluate and optimize the observation time of post-biopsy complications to perform a percutaneous biopsy as a daycare procedure.

Study Design: cross-sectional study

Place and Duration of Study: This study was conducted at the department of Nephrology, The Kidney Centre Post Graduate Training Institute, Karachi, Pakistan from first August, 2020 till July, 2021.

Materials and Methods: This cross-sectional study included 95 consecutive patients admitted to the hospital, which fulfilled our inclusion criteria for undergoing ultrasound-guided native renal biopsy. Relevant clinical and laboratory data were collected at admission, after eight hours and 24 hours post-biopsy. The data was entered and analyzed on IBM SPSS version 21. Shapiro Wilk's test checked the normality of data

Results: The mean age of our patients was 38.9±15 years, the youngest at 16 and the oldest at 77 years, with the female to male ratio of 1:1.2. Most biopsies were done due to renal dysfunction 44(46.3%), followed by nephrotic syndrome. Focal Segmental Glomerulosclerosis (FSGS) was the most common diagnosis in our patients 24(25.3%), followed by Acute Tubular Necrosis (ATN/ACN) 17 (17.9%) and diabetic nephropathy 12(12.6%).

Conclusion: Elective native PRB is a safe procedure and can be done as a daycare procedure that reduces the overall cost of overnight hospitalization.

Key Words: Renal biopsy, Gross hematuria, Daycare, Complication

Citation of article: Rahim S, Nasir K, Qureshi R, Dhrolia MF, Ahmad A. Evaluation of Gross Hematuria and/or Drop in Hemoglobin in Post-Renal Biopsies within and after 8 Hours. Med Forum 2023;34(3):12-16.

INTRODUCTION

Percutaneous renal biopsy (PRB) by nephrologists has become the diagnostic tool for renal diseases. Over the years, advances in imaging techniques and biopsy needles have led to the successful extraction of renal tissue for diagnosis in>95% of renal biopsies. These vital developments have enhanced the procedure's safety profile, thereby decreasing the rate of significant complications to 0.02% from 0.12% in the last five decades[1]. Studies have shown that automated biopsy needles resulted in higher yield (more glomeruli) and nominal rates of major complications than Trucut biopsy needles[2]. The most frequent post-biopsy complication is bleeding, which mainly occurs within the first 12–24 hours in nearly all patients[3,4].

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Received: October, 2022
Accepted: January, 2023
Printed: March, 2023

Before performing PRB, history, physical examination, and specific laboratory tests comprising a complete biochemical profile, Hb, platelet count, and coagulation profile. The blood pressure should be normal or under control, and the skin at the biopsy site should be infection-free. In addition, if a bleeding disorder is found, it should be evaluated and treated[5]. There are two categories of post-PRB complications minor & major. Minor complications include self-limiting gross hematuria without a drop in Hb which does not require any intervention like a blood transfusion or angiography and perinephric Hematoma <5 cm in size on imaging not requiring any intervention. Major complications comprise gross hematuria or perinephric hematoma with a drop in hematocrit 10% or decrease in HB of 1gm/dl or more from pre-biopsy level for which packed RBC transfusion, surgery, or angiography is required and hypotension that needs intravenous fluid/vasopressor support or a higher level of nursing care[1,5-7]. With the application of real-time ultrasound together with automated biopsy needles, ≥99% of biopsies have no or only minor complications. However, the optimal time duration of post-biopsy observation is still unsettled[8]. Based on the present safety protocol and to reduce the overhead costs, it is suggested that the PRB observation can be done without overnight admissions, allowing patients to be discharged after six-eight hours of observation as the appearance of most major complications usually occurs

within six hours post-biopsy. Making an outpatient PRB highly cost-effective with no added risks to patients[9-10]. However, the optimal timing of post-biopsy observation remains debatable. Outpatient observation has been reported to be safe, whereas others showed concerns regarding the apparent risk of major complications after a short observation following the procedure[11].

The optimal timing of post-biopsy observation remains debatable. The data, in such regard from Pakistan, is limitedly available. Our study aims to evaluate and optimize the observation time of post-biopsy complications to perform a percutaneous biopsy as a daycare procedure, reducing the cost of hospital stay and improving the patient's sense of well-being.

MATERIALS AND METHODS

This Cross-sectional study was conducted in the Department of Nephrology, the Kidney Centre Postgraduate Training Institute (TKC-PGTI), after approval by the institutional ethical review committee. The study was conducted from first August 2020 till 31st July 2021. The study was started after getting approval of synopsis and permission from the Ethical Review Committee of The Kidney Centre. Informed consent was taken from all patients. Information collected included demographic data, comorbidities, laboratory tests, complications, and treatment. Consecutive adult patients admitted for PRB fulfilling the inclusion criteria were included in the study. Data collected was Hb value obtained at 8 hours and then in the morning (approximately 18 hours), and urine for bleeding was observed every time patient passed urine. Laboratory assessments consisted of Hb, urea, and creatinine: treatment measures included hydration, blood transfusion and bladder irrigation. Complications studied were gross hematuria and a drop in Hb. Gross hematuria was defined as blood in the urine that can be seen with the naked eye. We defined a drop in Hb as a fall in hemoglobin of 1g/dl or more from the pre-biopsy level. The data was entered and analyzed on IBM SPSS version 21. Cleaning and coding of data were done prior to analysis. Mean ± Standard deviation was computed for normally distributed continuous variables, while median with interquartile range was also observed along with mean ± STD for skewed data. Shapiro Wilk's test checked the normality of data. The frequency with percentage was calculated for categorical variables. Wilcoxon sign rank test was applied to compare the mean of pre and post-biopsy Hb, while Paired sample t-test was executed to evaluate the mean differences of Hb within and after 8 hours after the biopsy. The chi-square test established the association of demographic variables and comorbidity with a post-biopsy drop in Hb. Multivariate logistic regression analysis was conducted to observe the effect of these variables on Hb drop, and an odds ratio with a 95% confidence interval was obtained. The significant level of the p-value was set as ≤ 0.05.

RESULTS

We recruited 95 patients in our research with a female to male ratio of 1:1.2, the mean age of our patients was 38.9±15 years, with a minimum of 16 and a maximum of 77 years. Most biopsies were done due to renal dysfunction 44(46.3%), followed by nephrotic syndrome.

Table No.1: Base line characteristics of patients n = 95 & laboratory parameters of patients & mean differences in pre and post biopsy HB

Baseline parameters of the patients		N(%)/ Mean ± STD & Median,IQR	p-value
Gender	Male/Female	51(53.7)/44(46.3)	
Age in years		38.9 ±15 & 36,21	
Comorbid	HTN	60(63.2)	
	CKD	35(36.8)	
	Obesity	28(29.5)	
	DM	24(25.3)	
	Hepatitis B/C	2(2.1)	
	SLE	5(5.3)	
	Other	20(21.1)	
Hematuria and Hb drop	Gross hematuria within 8 hours	3(3.2)	
	Gross hematuria after 8 hours	0	
	Irrigation was done for gross hematuria	2(2.1)	
	Hb drop within 8 hours	15(15.8)	
	PCV transfusion for Hb drop	1(1.1)	
No. of core attempts	1	1(1.1)	
	2	61(64.2)	
	3	26(27.4)	
	4	7(7.4)	
Laboratory parameters of the patients			
Creatinine		3.8 ± 2.8&2.7,4.1	NA
Urea		88.3 ±57.6&70,77	NA
Pre Biopsy Hb		11 ±1.8&10.8,3.1	0.002
Post Biopsy Hb within 8 hours		10.7 ±1.9&10.6,2.7	
Pre Biopsy Hb		11 ±1.8&10.8,3.1	0.019
Post Biopsy Hb after 8 hours		10.8 ±1.7&10.6,2.8	
Mean Difference in pre and post Hb within 8 hours		0.3 ±0.8&0.3,1	0.127
Mean Difference in pre and post Hb after 8 hours		0.2 ± 0.8&0.2,0.9	

FSGS was the most common diagnosis in our patients 24(25.3%), followed by Acute Tubular Necrosis (ATN/ACN) 17(17.9%) and diabetic nephropathy 12(12.6%). The most common comorbid condition was hypertension 60(63.2%) followed by CKD 35(36.8%) and obesity 28(29.5%). Only three (3.2%) patients suffered from gross hematuria all within 8 hours of biopsy, while none of the patients developed gross

hematuria after 8 hours. A drop in Hb occurred in 15(15.8%) patients after the biopsy (Table 1).

When we compared the Hb pre and within 8 hours post-biopsy, we found a statistically significant drop in mean from Hb 11±1.8 g/dl to 10.7±1.9 g/dl (p=0.002). It was not statistically significant when we computed the mean differences in Hb before (0.3±0.8 g/dl) and after 8 hours (0.2±0.8 g/dl) (Table 1). In univariate analysis, a statistically significant drop in Hb belonged to the age group of 36-55 years seven (46.7% p-value 0.034), 10(66.7%) were obese with a p<0.001, and seven (46.7%) p-value 0.038) were diabetic Table 2.

Table No.2: Association of demographic and comorbid variables with post-biopsy Hb drop of the patients

Demographic and comorbid parameters		Post biopsy HB drop		P value
		No	Yes	
Age	< 36 years	42(52.2)	3(20)	0.034
	36-55 years	28(35)	7(46.7)	
	> 55 years	10(12.5)	5(33.3)	
Gender	Male	42(52.5)	9(60)	0.593
	Female	28(47.5)	6(40)	
Obesity	No	62(77.5)	5(33.5)	0.001
	Yes	18(22.5)	10(66.7)	
HTN	No	31(38.8)	4(26.7)	0.373
	Yes	49(61.3)	11(73.3)	
CKD	No	51(63.8)	9(60)	0.782
	Yes	29(36.3)	6(40)	
DM	No	63(78.8)	8(53.3)	0.038
	Yes	17(21.3)	7(46.7)	

Table No.3: Multivariate logistic regression analysis to observe the effect of age, gender and comorbid of patients on post biopsy Hb drop

Independent variables	Odds ratio	95% C.I. for odds ratio		p value
		Lower	Upper	
Age of the patients				.389
< 36 years	1			
36 - 55 years	2.1	.41	10.2	.344
> 55 years	4	.54	29.8	.173
Male Gender	.8	.21	3.1	.744
Comorbid of the patients				
Obesity	5.1	1.4	21.4	.014
Diabetes mellitus	.6	.12	2.9	.522
Hypertension	1.5	.31	7	.622
Chronic kidney disease	1.6	.42	6.1	.488

In the multivariate model, we found that the significant association of age and diabetes mellitus on the post-biopsy drop in Hb vanished (p>0.05), but obese patients had a statistically significant post-biopsy Hb drop than non-obese patients (p=0.014). However, the odds ratios for age significantly affected the drop in Hb. The patients who were in the age group of 36 to 55 years were affected 2.1 times more with Hb drop than patients in the age group of <36 years (reference category), and patients with age of >55 years experienced four times more drop in Hb as compared to <36 years of age (Table 3).

DISCUSSION

The optimal duration to monitor the patients after PRB should be based on the likelihood of the most severe complications. The follow-up period should give nephrologists ample opportunity to promptly identify and treat a potential complication to avoid a severe or catastrophic outcome. Compared to another study from Rawalpindi, Pakistan (2016), where 35% of patients had a 1 g/dl decrease in Hb, 12% had gross hematuria, and 82% of patients had microscopic hematuria within the first 12 hours of the procedure. In our study, three patients (3.2%) developed gross hematuria, mainly within 8 hours of the procedure, and there was a decrease in Hb in 15 patients (15.8%). The mean difference in Hb was the same (p = 0.127) before and after 8 hours post-biopsy.

In our study, hypertension 60 (63.2%) was the most common comorbidity, which is similar to the study by Beatriz et al, while the most common cause of renal biopsy in our study was renal dysfunction 44(46.3%) compared to nephrotic range proteinuria in 27% of patients in the study by Beatriz et al[2]. Compared to international studies Whittier et al 2004[8] in the United States performed native renal PRB in 750 adult patients. Complications occurred in 98 (13%) patients; Minor complications occurred in 50 (6.6%) patients, and major complications in 48 (6.4%) patients and these complications occurred within eight hours of PRB. When we compared the Hb levels before 11 ± 1.8 g/dl and eight-hours post biopsy10.7 ± 1.9 g/dl (p = 0.002), this drop in Hb was statistically significant. However, there was no statistically significant (p=0.127) drop in Hb when we computed the mean differences in Hb between before (0.3±0.8gm/dl) and after (0.2±0.8 g/dl) eight hours.

In another study by Chung S et al[11] from Korea in 2014, gross hematuria was observed in 9.8% of patients, Eiro et al. in Japan in 2005 found no major complications, such as blood loss requiring transfusions, loss of kidney function or death, and 10 patients had to stay in bed for a long time due to moderate complications[12]. Recent studies showed that transfusion rates were higher when serum creatinine was > 2 mg/dl than those reporting lower mean creatinine levels[13]. No such relationship was found in our study. Manno et al[6] and Korbet et al[14] found that women risk complications after PRB. The increased risk in women is attributed to different body composition than in men, i.e., a higher percentage of fat in women may increase the expansion of hematomas in the peri-renal adipose tissue[14]. Based on our research, we did not find such an association. A study by Lee et al[15] found that age is associated with an increased risk of major bleeding. Similarly, in our study, most patients whose Hb decreased were in the age group 36-

55 years seven (46.7%), while patients in the age group <36 years 42 (52.2%) had no decrease in Hb levels. Patients in the age group 36 to 55 years had a 2.1-fold decrease in Hb compared to patients in the age group <36 years (reference category), and patients in the age group > 55 years had experienced four times more drop in Hb as compared to <36 years of age. Kohliet al[18] suggested that the increased risk of post-PRB complications in the elderly may be related to increased arterial stiffness. Based on these results, we could also determine that age increases the frequency of bleeding after PRB.

Most of our patients who had experienced a post-biopsy drop in Hb were obese 10(66.7%) as compared to no drop in which majority were non-obese 62(77.5%) (p<0.001). Lada et al[17] also found that increased body weight was associated with a higher risk of bleeding. The percentage of diabetic patients with a drop in Hb was higher than non-diabetics (46.7% v/s 21.3%), (p 0.038). Hasegawa et al[18] also found that diabetes was significantly associated with major bleeding complications after PRB. William L[8] found that >90% of cases presented with major complications within 24 hours. Marwah[12] and Korbet[16] found that serious complications occur within the first hours after the biopsy in >90% of cases. In comparison, our study showed gross hematuria and Hb drop within eight hours, with no gross hematuria and no significant change in Hb after eight hours, PRB.

CONCLUSION

In our study, we found that PRB is a safe and successful procedure that can be performed in an outpatient setting, most complications, 19% occurred within the first eight hours after PRB. We saw no nephrectomy or death after PRB. Our data support that PRB is a safe procedure and can be done as a day-care procedure with an in-hospital observation time of eight hours.

Acknowledgment: We would also like to extend our gratitude to Dr. Bina Salman for her help with the statistics portion of this article.

Author's Contribution:

Concept & Design of Study:	Shabana Rahim
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Conflict of Interest: The study has no conflict of interest to declare by any author.

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