

Predictors of bleeding complications in percutaneous ultrasound-guided renal biopsy with spring-loaded 18 G needle biopsy in diffuse renal parenchymal diseases

Morteza Tahmasebi, Neda Aynehband, Golzaree Kh., Rezaee E., Motamed A.

Department Of Radiology, Jondishapur Medical University, Ahvaz, Iran

Correspondence: Dr. Morteza Tahmasebi, Department of Radiology, Golestan Blvd, Ahvaz, Iran.

tahmasebilmn@yahoo.com

Abstract: **Amis:** this study was designed to evaluate the risks that associated with performing a percutaneous ultrasound-guided renal biopsy, and also, comparing the relationship between bleeding complications and influence factors. **Materials and methods:** Since April 2009 to November 2010 among 65 patients whom were referred for renal biopsy, 60 fulfilled the study criteria. They underwent biopsy of kidneys by automated 18 G needle in a single center with single operator. Predictive value of demographics (age, gender), clinical data (blood pressure), baseline hematologic factors, BMI (body mass index) and number of biopsy for the risk of major complication were investigated. **Result:** The study consisted 60(27 male, 33female) 41(68.37%) experienced post biopsy bleeding [30(50%) hematomas, 34(56.6%) hematuria, 2(3.3%) blood transfusion, 9(15%) Hb decrease]. Major complication developed in 12 (20%) [Blood transfusion N=2, Gross hematuria N=5, hematoma thickness >20mm N=9]. On the other hand we had no death, nephrectomy or interventional angiography. Post biopsy bleeding was higher in younger (21 to 30, 31 to 40 years $p < 0.001$) abnormal baseline hematologic factors (53.33% vs. 15%) or systolic blood pressure more than 140 mm Hg (136 ± 11.86 vs. 125.8 ± 15.59 $P=0.008$). **Conclusion:** Biopsy with 18 G needle is safe and accurate but not a risk free procedure. On the data collected for potential predictor of post biopsy complication, only age, abnormal baseline hematologic factors, blood pressure show a significant predictive value. The other variables investigated such as BMI, Number of passes, gender doesn't have any predictive value. [Morteza Tahmasebi, Neda Aynehband, Golzaree Kh., Rezaee E., Motamed A. **Predictors of bleeding complications in percutaneous ultrasound-guided renal biopsy with spring-loaded 18 G needle biopsy in diffuse renal parenchymal diseases.** Journal of American Science 2012; 8(4):179-183]. (ISSN: 1545-1003). <http://www.americanscience.org>. 24

Keywords: Renal biopsy; bleeding complication; hematoma.

1. Introduction

Renal biopsy is an essential procedure in the diagnosis of primary and secondary renal diseases.^[1] According to wide range of studies ultrasound-guided percutaneous renal biopsy provides a superior yield of kidney tissue and results in few complications.^[2] Despite the simplicity of procedure and frequency with which biopsies are routinely performed in nephrology unit, we still do not know exactly rate of post biopsy bleeding complication and the factors that influencing it. Many baseline demographic, clinical, chemistry finding and other data (e.g., age, gender, blood pressure, hemoglobin / hematocrite, prothrombin time, partial thromboplastin time, bleeding time, serum creatinine, daily proteinuria, type and size of needle used) are collected prior to the renal biopsy but no study has shown that all these are necessary to predict post biopsy bleeding.

The available study investigates the question using univariant comparisons. Six variant (gender, age, hematologic factor abnormality, number of biopsy, blood pressure and for the first time BMI) were compared between those with and without bleeding post biopsy bleeding. For the first time BMI effect on the bleeding risk was evaluated. The present

study explores the association between post biopsy bleeding complication after correction of variable factors (such as abnormal hematologic factor or high blood pressure) and the factors that predict it.

The risk of post biopsy bleeding complication and predictors were evaluated. All patients were biopsied after correction of variable factors such as abnormal hematologic factor or high blood pressure.

2. Material and methods

The present analysis includes all patients who underwent kidney biopsy of native and transplant kidney, since April 2009 to November 2010. Renal biopsies performed in kidneys more than 9 cm in length with diffuse increased cortical echogenicity. Exclusive criteria were severing blood pressure, uncontrolled homeostasis, hydronephrosis and single kidneys ant transplant kidneys with tumor or edema. Patients referred by nephrologists and expert radiologist performed all the biopsies. An 18- gauge automated spring-loaded gun was used for the biopsy. Real-time ultrasound ALOKA model prosound with 8-10 MHz curved probe was used for

localization and visualization of the needle. Finally spacemen were sending for pathology evaluation.

All patients with, blood pressure more than > 140/90 mmHg were medically controlled. Fresh frozen plasma was administered to patients with abnormal bleeding time and uremia. Following biopsy, patients should lay on their backs for a 24-hour under close observation. During this time, clinical evaluation specially (gross hematuria and hypotension should be checked. After 6 hour kidney sonography performed for hematoma. Also first urine sample for microscopic hematuria and CBC for blood hemoglobin level, were carried out.

3. Results

Data relate to 60 consecutive renal biopsy procedures of native and transplant kidney were prospectively collected in the database. The baseline demographic and clinical findings are summarized in Table 1.

Indicators for renal biopsy were diffuse renal parenchymal disease, Proteinuria, hematuria, recurrent macrohematuria, nephritic syndrome and acute renal failure. There were two cases (3.3%) with inadequate sampling, they recalled for sampling. Post biopsy bleeding complications occurred in 68.3% (41/60) of the study. Major complications occurred in 20% (12/60), including Gross hematuria 8.3% (5/60) [1/5 No hematoma, 2/5 hematoma >20mm, 2/5 hematoma <20mm], post biopsy renal hematoma more than 20mm thickness in 15% (9/60) [7/9 microhematuria, 2/9 gross hematuria]. Minor complications were seen in 48.3% (29/60) of patients microscopic hematuria 48.3% (29/60), post biopsy renal hematoma less than 20mm thickness 35% (21/60) and also hemoglobin decreased more than 1

mg/dl, 15% (9/60) Table 2, 3. In 3.3% (2/60) Blood transfusion was done. No patient underwent interventional angiography for embolization and no nephrectomy or deaths occurred. Data for the various potential predictors of post biopsy bleeding complication are presented in Table 2.

Table 1. Baseline demographic and clinical findings of 60 patients who underwent percutaneous ultrasound-guided renal biopsy

characteristic	measure
Number of patients	60
Age years	38.87 ± 15.08
Gender (female: male)	33: 27
Length (cm)	164.53 ± 8.71
Body weight (kg)	77.117 ± 14.84
BMI	28.38 ± 4.96
Systolic blood pressure (mm Hg)	132.98 ± 13.55
Hemoglobin g/L	110 ± 23
Platelets number × 10 ³ /mm ³	186 (146 - 228)
Proteinuria (>3.0 g/24hr %)	1.4 (0.5 – 3.3)
Kind of kidney (native: transplant)	54: 6
Hematologic factors (Abnormal: normal)	41: 19 §
Serum creatinine (μmol/L)	1.79 ± 0.68
Creatinine clearance	72.95 (23.98 – 293.98)
Adequate specimens	58: 2

§ Hematologic factors: BT: bleeding time minutes, PTT: partial thromboplastin time % and PT: prothrombin time %.

Data are expressed as mean ± SD, median (interquartile range), or absolute frequency.

Table 2. Distribution of potential predictors of bleeding in patients who did or not present with postbiopsy bleeding complications

Item	Value in patients with complication	Value in patients without complication	P value
Number of patients	41	19	NA
Age years	30.54 ± 9.45	55.19 ± 12.9	< 0.001
Gender female, N (%)	22 (66.7)	11 (33.3)	0.041 ^a
Gender male, N (%)	19 (70.1)	8 (29.6)	-
Systolic blood pressure (mm Hg)	136 ± 11.86	125.8 ± 15.59	0.008
Body weight (kg)	73.11 ± 14.99	82.75 ± 11.79	0.61
BMI	27 ± 4.73	30.5 ± 4.75	0.021
Length (cm)	164.32 ± 8.62	164.16 ± 8.62	0.822
hematologic factors (Abnormal: normal)	32: 9	9: 10	0.017
Kind of kidney (native : transplant)	37: 4	17: 2	0.728
Number of passes (1, 2, ≥3)	7: 30: 4	3: 9: 7	0.44

NA, not applicable. Data are expressed as mean ± SD, median (interquartile range), absolute, or absolute frequency; comparisons between groups were made by one-way analysis of variance (ANOVA), kruskall test, unpaired / test, Mann - Whitney U test, or chi- square test.

^{For} male vs. female gender.

Table 3. Comparative analysis of post biopsy hematuria and renal hematoma of patients who did or not present with postbiopsy bleeding complications

Post complication	biopsy	Urin RBC	Renal Hematoma		
			0mm thickness	<20mm thickness	>20mm thickness
With	Null (RBC<5)		0	7	0
	Microscopic hematuria		10	12	7
	Gross hematuria		1	2	2
Without	Null (RBC<5)		19	0	0
	Microscopic hematuria		0	0	0
	Gross hematuria		0	0	0

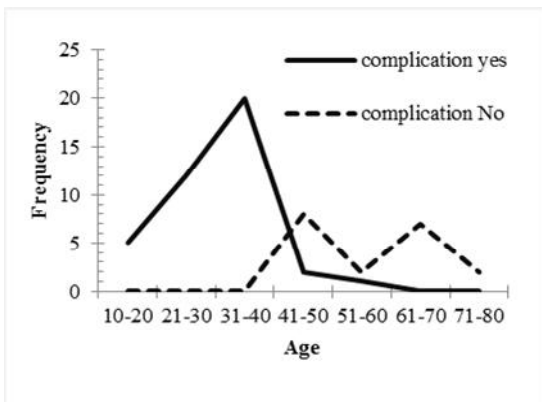


Figure 1. Distribution of 60 cases of postbiopsy bleeding complications in seven age categories.

There was not a significant proportion of women (66.7%) compared with men (70.1%) for developing post biopsy bleeding complications ($P=0.041$). There was also a variable distribution in the risk of post biopsy bleeding according to age, with post biopsy bleeding occurring more frequently in younger age groups (21 to 30, 31 to 40 years). There was statistically significant decrease in bleeding complications with increasing age ($p<0.001$).

Abnormal baseline hematologic factors were significantly higher in patients who developed post biopsy bleeding complications (53.33% vs. 15%). All patients with abnormal baseline hematologic factors (41/60) received blood transfusions and fresh frozen plasma before biopsy so that all patients had a normal bleeding time prior to biopsy. Patients were not received nonsteroidal anti-inflammatory drugs, anti platelet agents, or antihistamines at the time of biopsy. Other baseline chemistry factors were not significantly different among patients.

There was a strong correlation between post biopsy bleeding and increasing systolic blood pressure (136 ± 11.86 vs. 125.8 ± 15.59 $P=0.008$) however the risk of post biopsy bleeding did not significantly increased with numbers of needle passes. There was no significant correlation between

number of needle passes and BMI and bleeding complication ($7:30:4$ vs. $3:9:7$ $P=0.44$) and (27 ± 4.73 vs. 30.5 ± 4.75 $P=0.021$), respectively Table 2. Furthermore major complication occurred only in 10 patients with high BMI (> 26.1) (16.3%) Table 3. These results indicate that with increasing BMI, the risk of post biopsy bleeding complications is not extended.

Increase in major bleeding complications in patients who have a BMI > 29.1 is due to the almost 2-fold increase in biopsy patients than patients with normal BMI [Figure 2, 3]. There was significant relationship between factors such as systolic blood pressure and hematologic factors ($P<0.01$) and post biopsy major complication Table 4.

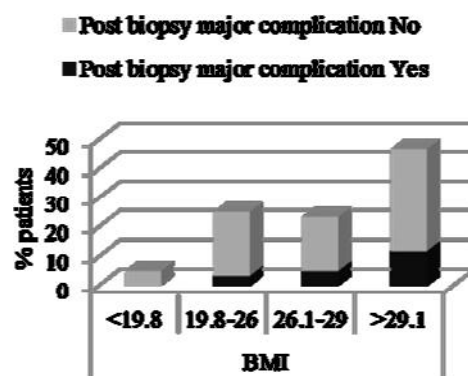


Figure 2. Distribution of 60 cases of postbiopsy major bleeding complications in four BMI categories.

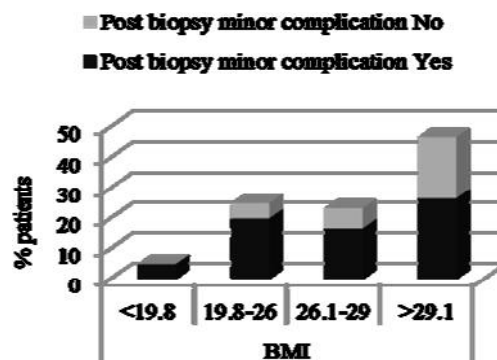


Figure 3. Distribution of 60 cases of postbiopsy minor bleeding complications in four BMI categories.

Table 4. Comparative analysis of potential predictors of bleeding in post biopsy major or minor complication

Parameter	Post biopsy minor complication		Post biopsy major complication	
	Yes	No	Yes	No
Age				
10-35	29 (48.3%)	1 (1.3%)	8 (26.7%)	22 (73.3%)
36-80	12 (20%)	18 (30%)	4 (13.3%)	26 (86.7%)
Sex				
Female	22 (36.67 %)	19 (31.67 %)	7 (11.67%)	26 (43.33%)
male	11 (18.33 %)	8 (13.33 %)	5 (8.33%)	22(36.33%)
BMI				
<19.8	3 (5%)	0 (0%)	0 (0%)	3 (5%)
19.8-26	12 (20%)	3 (5%)	2 (3.3%)	13 (21.7%)
26.1-29	10 (16.7%)	4 (6.7%)	3 (5%)	11 (18.3%)
>29.1	16(26.7%)	12 (20%)	7 (11.3%)	21 (35%)
BP				
100-139	16 (26.7%)	14 (23.3%)	0 (0%)	30 (50%)
140-170	25 (41.7%)	5 (8.35%)	12 (20%)	18 (30%)
hematologic factors				
Abnormal	32 (53.3%)	9 (15%)	11 (18.3%)	30 (50%)
normal	9 (15%)	10 (16.7%)	1 (1.7%)	18 (30%)
Number of passes				
1	7 (11.7%)	3 (6.7%)	1 (1.7%)	9 (15%)
2	30 (50%)	9 (16.7%)	10 (16.7%)	29 (48.33%)
≥3	4 (6.7%)	7 (11.67%)	1 (1.7%)	10 (16.7%)

4. Discussion

Automated needle biopsy under ultrasound guidance appears to be safe procedure^[3-5]. Although the rate of bleeding complications in our study was relatively high (about two third of all procedures) when systematically detected with ultrasound guidance and clinical analysis, almost all proved to be minor complication, with major complications occurring in only one fifth of patients. The majority of published studies on this topic have focused on the comparative performance of different renal biopsy techniques and types of needle.^[6, 5, and 8] Aim of these studies was looking factors significantly predict post biopsy bleeding.^[9-11] No one evaluates the influence of BMI on post biopsy bleeding. According to published studies only baseline abnormal hematologic factors, systolic blood pressure and age have independent predictive value for post biopsy bleeding. Carlo Manno et al, reported that for every 10-year increase in age till 40 years the risk of post biopsy bleeding complication was significantly decreased (AOR 0.80, 95% CI 0.68-0.94, P=0.006).^[1, 12] In all patients with systolic blood pressure 100 to 139 mmHg only minor complications were occurred and major complications happened in whom with systolic pressure up to 140 mmHg. Hergesell et al, reported, that if contraindications, especially high blood pressure and abnormal homeostasis are

respected, renal biopsy with and automated biopsy device is safe.^[13, 17]

For baseline hematologic factors, the fact that, abnormal baseline hematologic factors before biopsy (even with correction prebiopsy) is significantly reliable predictor of post biopsy bleeding. In current study the survey data indicated that, with modification of coagulation factors, major complication in this group significantly high, it seems correction of coagulating factors before biopsy dose not reducing the risk of complications, especially major complication but in this cases, major complication such as gross hematuria or large hematoma had no progress and self-limiting and without need for surgical intervention. Corrections of hematologic factors did not reduce the incident of bleeding complications but make it easier to control. Tikkakoski et al. reported prebiopsy screening of coagulation variables did not prevent complications.^[13, 15] In current study we also founded BMI > 26.1, gender and numbers of needle passes do not have significant predictive value.

Finally the risk of post biopsy bleeding complication increased with younger age, abnormal baseline hematologic factors even with empiric treatment^[16, 17] and controlled systolic blood pressure. It suggested that post biopsy bleeding complications should be watched for the young, as

well as in elderly and hypertensive patients and whom with corrected hematologic factors before biopsy. Lastly, BMI and its predictive value on bleeding complication need further studies.

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