

Comparing Adequacy And Complication Rate Between Percutaneous Renal Biopsy Techniques; FreeHand Versus Coaxial With Gel-Foam.

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ABSTRACT

Introduction: Renal biopsy is a gold standard method for diagnosis of medical kidney disease, as well as assessment of prognosis and to guide therapy in the medical diseases of the kidney. The renal biopsy was first used in 1934, its usefulness and safety improved after the ultrasonography and spring loaded gun introduced. In recent years the disposable needles such as freehand and coaxial under ultrasonography guidance were replaced the use of Franklin-Modified Vim- Silverman needle under fluoroscopy. Freehand and Coaxial Set With Gelfoam techniques are the two methods have been used at King Abdulaziz Medical City (KAMC). **Objective:** The aim of this study is to compare the adequacy and complication rate between two techniques of percutaneous renal biopsy; Free -hand and coaxial with gel-foam by using 18G needle. **Method:** A retrospective cohort chart review of 130 patients, 100 patients with native kidney and 30 patient with transplanted kidney, who underwent percutaneous renal biopsies (PRB) to be investigated for medical renal diseases at (KAMC), Jeddah, Saudi Arabia. The study period between 2008 to 2013. The primary outcomes were the total number of glomeruli in a histopathology report and number of needle passes with each technique. The data was retrieved from a Picture archiving and communication system (PACS) and medical records. The clinical indications in the total population were assessed and the complication rate was compared between the two techniques. The data were analyzed by SPSS software version 16, a simple descriptive statistic reported in the form of proportions for qualitative variables, mean and standard deviation for quantitative variables Independent t-test and cross tabulation were performed, and the statistical significance defined as a p - value ≤ 0.05 , all P-values were 2-tailed. **Result:** The population mean age was 34 years (SD ± 16.8). The males were 70 (53.8%) and females were 60 (46.2%). Biopsies were taken from 100 (76.91%) native kidney and 30 (23.1%) transplanted kidney. The most common clinical indications for renal biopsy in the native kidney were nephrotic syndrome in 62 (47.7%), systemic lupus nephritis in 14 (10.8%) and acute kidney injury in 13 (10%). Freehand technique was carried out in 57 patients (43.8%). The coaxial with gel-foam technique was carried out in 73(56.2%). The mean number of glomeruli to reach a diagnosis in free hand was 14.4 (SD ± 9.16), while in coaxial 16.6 (SD ± 9.41), with p-value of (0.190). The number of passes were not statistically significant between the two techniques with p-value of (0.761). No complications were reported in 49 (43.8%) patients with freehand and 63 (56.2%) patients with coaxial with gelfoam, while one patient after freehand developed a major complication. Seventeen patients developed a minor complications, 7 (41.2%) with freehand and 10 (58.8%) in coaxial with gelfoam. **Conclusion:** : When using an 18 G needle in both techniques of PRB (coaxial with gel-foam and freehand), there is no significant statistical differences in adequacy of tissue samples or rate of complications.

KEYWORDS: Renal-biopsy, Free-hand, Gel-foam.

INTRODUCTION

Renal biopsy is the gold standard method for diagnosis of medical kidney disease, as well as assessment of prognosis and to guide therapy in medical diseases of the kidney [1]. The renal biopsy was first used in 1934, its usefulness and safety improved after the ultrasonography and spring loaded gun introduced [2]. Renal biopsy can be done by different methods, the safest and commonly used method is a core biopsy needle, which was discovered by Danish physician Poul Iversen and Clans Burn in 1951[3]. The rate of minor and major complications are low with percutaneous renal biopsy (PRB) in comparison with other methods as open or laproscopic approach [4].

In recent years the disposable needles such as freehand and coaxial under ultrasonography guidance were replaced the use of Franklin-Modified Vim- Silverman needle under fluoroscopy [5]. Freehand and Coaxial Set With Gelfoam techniques are the two methods have been used in King Abdul-Aziz medical city (KAMC).

In the freehand technique, multiple punctures are obtained from different sites transgressing the renal capsule if the initial core is not adequate. While, in the coaxial technique, a guiding needle and trocar are inserted into the kidney, and multiple biopsies are obtained through a single pathway, by means of a biopsy gun [6].

Furthermore the success rate depends on the needle type and size, number of glomeruli adequate for histopathological diagnosis and complication rate[7]. According to our knowledge There are studies discussed the adequacy and complications of different needles size, but there are limited data in the literature compared the freehand technique to the coaxial technique with 18G needle, for these reasons our aim is to compare the adequacy and complication rates between freehand and coaxial with gelfoam technique with needle size 18-gauge as in our institute.

MATERIALS AND METHODS

Patients and variables:

We used a data collection sheet to collect data from medical records, pathological reports and picture archiving and communication system (PACS) GE Centricity version of (KAMC). We collected the data of all patients who underwent a percutaneous renal biopsy (PRB) in the radiology department of (KAMC) in Jeddah, Saudi Arabia, from 2008 to 2014 for a retrospective cohort study. We included 130 patients except those with renal mass or needle size other than 18 gauge had been used. Patients' demographic data (age and gender), a type of kidney (native or transplant), biopsy technique (coaxial with gelfoam or free hand), total number of glomeruli under light microscope, clinical indication for renal biopsy, histopathological diagnosis, the number of needle passes, date of admission, date of discharge and post biopsy complication (major or minor) were recorded. Major complications were defined as bleeding requiring (blood transfusion, interventional radiology or surgical intervention) while minor complications were defined as only requiring close observation [8].

Renal biopsy procedures:

The medical charts have been reviewed to analyze the (PRB) procedure. All patients have been admitted as in-patients or day care patients. The coagulation profile and controlled blood pressure have been documented. Consultants in interventional radiology with 10 years experience performed the biopsies. In all patients percutaneous biopsy was performed using standard sterile techniques, local anesthesia and under ultrasound guidance Esaote MylabTM50. Patients were divided into two groups, the freehand technique group and the coaxial set with gelfoam (a gelatinous material injected before removal of the tract) were used, in both techniques an 18-gauge needle size (BARD Max-Core) was used. The biopsy was taken from the lower cortical pole of the kidney and repeated passes were made until adequate tissue obtained. Specimen adequacy was defined as enough number of glomeruli for histopathological evaluation rendering a diagnosis. The histopathology evaluation included: light microscopy, immunofluorescence, and transmission electron microscopy. The tissue was evaluated under dissecting microscopy by a histopathology technician under supervision by a Consultant pathologist. At the final stage, the specimen is transferred immediately to the laboratory on a filter paper soaked with normal saline for further pathological analysis.

Statistical analysis:

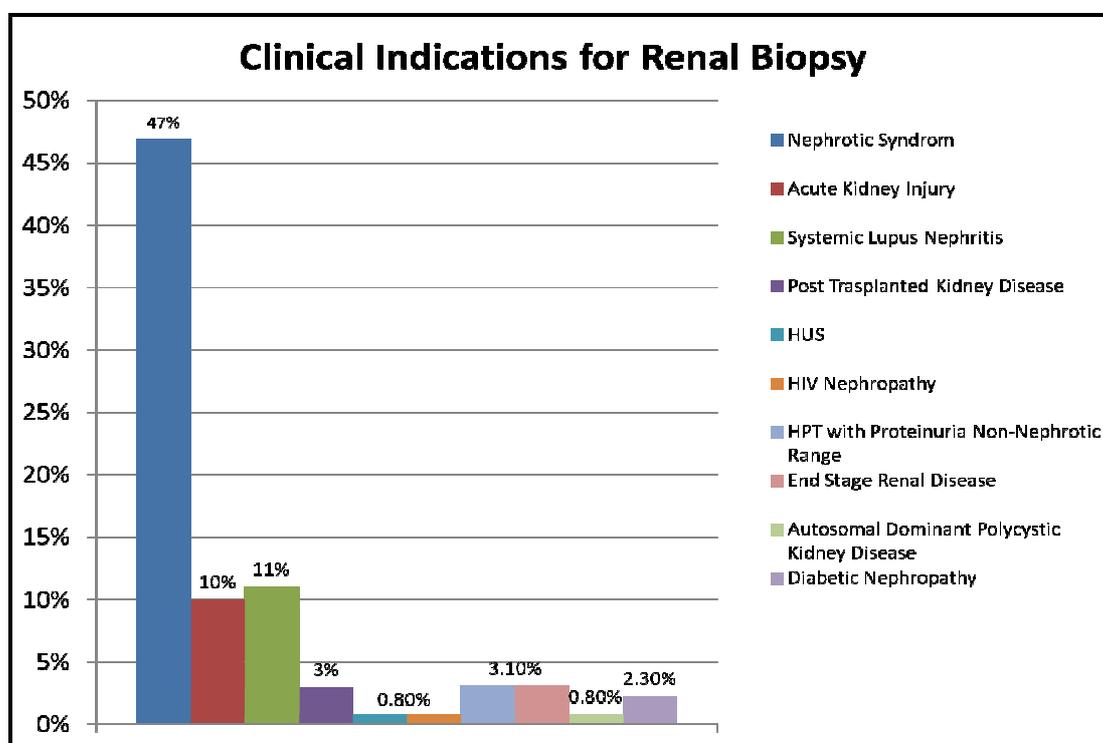
The data were analyzed by SPSS software version 16. Simple descriptive statistical analyses was reported as proportions for qualitative data and mean with standard deviation was reported for quantitative data. Independent t-test and cross tabulation were performed to show a statistical significance which was defined as the P - value ≤ 0.05 , all P-values were 2-tailed

Result:

Between 2008 - 2013, 130 patients who underwent (PRB) for the medical kidney diseases. The demographic data of study population has calculated (table1). Consequently, The clinical indications for biopsy were nephrotic syndrome in 62 (47.7%), acute kidney injury in 13 (10%), systemic lupus nephritis in 14 (10.8%), hypertension with significant proteinuria (>1.0g/day) in 4 (3.1%), end stage renal disease in 4 (3.1%), HIV nephropathy in 1 (0.8%), hemolytic uremic syndrome in 1 (0.8%) and post transplanted renal disease in 27 (20.8%). The total numbers of patients where Freehand and coaxial with gel-foam techniques had been used were 57(43.8%), 73 (56.2%) respectively (fig1).

Table 1: Demographic information of study population.

Age	Mean \pm SD	34 \pm 16.8
Gender		
Male	N (%)	70(53.8)
Female	N (%)	60(46.8)
Type of kidney		
Native	N (%)	100(76.91)
Transplanted	N (%)	30(23.1)

**Fig. 1:** Percentages of clinical indications of percutaneous renal biopsy in this study.**Table 2:** Comparison between the mean of total number of glomeruli under light microscope and the number of passes needle with two techniques of kidney biopsy.

Variable	Freehand	Coaxial with gelfoam	P-value
Number of patients (%)	57(43.8)	73 (56.2)	-
Mean of Total number of glomeruli \pm SD	14.4 \pm 9.1	16.6 \pm 9.4	0.190
Number of passes needle (%)			0.761
1 Pass	2(66.7)	1(33.3)	
2 Passes	7(36.8)	12(63.2)	
3 Passes	42(45.2)	51(54.8)	
4 Passes	6(42.9)	8(57.1)	
5 Passes	0(0.0)	1(100)	
Total	57(43.8)	73(56.2)	

The average number of glomeruli and percentage of needle passes compared with two (PRB) techniques demonstrated in (table 2). A final histopathological diagnosis was achieved in (98.1%) with coaxial and in (90.9%) with freehand technique. On the other hand a suboptimal or insufficient diagnosis was reported in (1.9%) with coaxial and in (9.1%) with freehand, with p-value of (0.118). There were no complications have been reported in (43.8%) of patients with freehand , and in (56.2%) of patients with coaxial (table 3). The mean length of stay in the hospital during percutaneous renal biopsy was 14.8 days (SD27.3) in free-hand technique and 13.4days (SD58) days in coaxial with gelfoam with p-value of (0.371).

Table 3: Complication in relation to the type of needle.

Variables	Freehand N (%)	Coaxial with gelfoam N (%)	P-value
No complication	49(43.8)	63(56.2)	(0 .956)
With complication	8(44.4)	10(55.6)	

Discussion:

Percutaneous renal biopsy with ultrasound guidance has better diagnostic yield and low risk of complication [11]. The safety of the patient and effort to decrease the risk of hemorrhage are the most important aspect of renal biopsy [8,9]. Using 18-gauge needle, as in this study, which is most commonly needle size has been used in (KAMC). This needle size has been associated with low risk of mortality as previous studies revealed [10].

Our findings suggest that the coaxial with gelfoam technique has similar adequacy, success rate of finding adequate tissue for histopathological diagnosis, and the number of needle passes as freehand technique. Furthermore, the data showed that there was no significant difference in the number of glomeruli and success rate between coaxial and freehand. So both techniques gave enough tissue sample for diagnosis. The data suggested that no significance in the number of needle passes between freehand and coaxial. This study may indicate that the lower number of passes required was 1 passes and the higher number to be 4 passes. It was found that the “3 passes” were commonly used to obtain enough tissue for histopathological diagnosis. Although (PRB) has been considered a safe procedure, complications were found in ten, and eight patients where freehand and coaxial with gelfoam techniques used respectively. Therefore, coaxial with gelfom may has shown the ability to carry a lower risk of complications than freehand, nonetheless supported by our data. One out of seven patients after freehand (PRB) was developed retroperitoneal hematoma, which considered as a major complication and he required left renal artery embolization. Minor complications that may need clinical observations only occurred more in coaxial than in freehand. This was demonstrated by our data in which there was no significant difference between the length of stay in hospital and needle technique. Yet, These results may be affected by other clinical indications that necessitate patient to stay in the hospital for an extended period.

Our result was agreeing with a published date of 1060 patients who underwent percutaneous renal and hepatic biopsies, 3.4% with noncoaxial method developed minor complications while 2.6% with coaxial. Major complications occurred in 1.0% with noncoaxial and 0.9% with coaxial. The coaxial technique with gelfoam had a major complication rate of 0.7% and the minor complication rate was 3.8% and without gelfoam the major complication was 1.0% and 2.0% for a minor complication. Therefore, this study showed that no significant difference in complications between coaxial or noncoaxial biopsy technique or between coaxial with gelfoam or without gelfoam [6]. Consequently, the coaxial with gel-foam technique trend towards lower complication rate, when compared to noncoaxial.

Our major limitations in this study, is the retrospective cohort study, which based on reviewing data. This limitation might cause underreporting of the complications. The complication might occur after patient discharge, or the patient might present to another clinic or hospital. We can solve this limitation in the future by applying the post procedural kidney ultrasound, and making telephone interviews to follow up with patients.

To conclude, There are no significant differences in adequacy or complication rate between Coaxial with gel-foam and freehand techniques for renal biopsy as practiced in (KAMC).

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