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Research Article

### EFFICACY OF ULTRASOUND-GUIDED PERCUTANEOUS RENAL BIOPSY IN CHILDREN BY AUTOMATED BIOPSY GUN

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**Abstract:**

**Objective:** To test and evaluate the accuracy and safety of an automatic biopsy gun for collecting kidney tissue samples in children.

**Design:** prospective study in a hospital.

**Place and duration:** Pediatric Medicine Unit, Bahawal Victoria Hospital, Bahawalpur for one-year duration from June 2019 to June 2020.

**Methodology:** Fifty children diagnosed with nephrotic syndrome (steroid-dependent, steroid-resistant and frequently relapsing) underwent percutaneous ultrasound-guided kidney biopsy with an automatic biopsy gun (needle size 16G or 18G) under local anesthesia in 1-3 trials in each patient, followed by observation after biopsy for 24 hours.

**Results:** With a majority of 38 men (76%), the age ranged from 2 to 14 years with a mean  $\pm$  SD (7.20  $\pm$  3.41) years. A suitable kidney tissue sample was obtained in 48 (96%) cases, while 2 (4%) tissue samples were inadequate. The core length of the tissue sample was mean  $\pm$  SD (1.04  $\pm$  0.37) and the number of glomeruli per tissue sample remained mean  $\pm$  SD (13.07  $\pm$  3.62). Five patients developed a small perirenal hematoma <2 cm.

**Conclusion:** Percutaneous ultrasound-guided kidney biopsy in children is a fairly accurate and safe procedure. Observation for 24 hours allows you to identify any complications.

**Keywords:** Kidney biopsy in children, automatic biopsy gun, safety, complications

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## INTRODUCTION:

Percutaneous biopsy is the most common method of obtaining kidney tissue for histopathological examination, while other approaches include percutaneous and open or laparoscopic surgical techniques. A carefully performed biopsy in appropriately selected patients is in fact the basis for the final diagnosis of kidney disease, which helps to make more accurate and precise therapeutic decisions. A kidney biopsy is also an important tool for monitoring patients for response, prognosis, and outcome. Correlation of information obtained from a kidney biopsy with relevant clinical data remains the most important key to developing an accurate diagnosis and treatment of kidney disease. The first of all-round successful kidney aspiration biopsy technique was developed by Danes Iversen and Bruno in 1951. Over the years, many improvements and innovations have been made in the development and design of biopsy needles, as well as a technique for increasing the accuracy, diagnostic efficiency and safety of the procedure. The spring-loaded automatic biopsy gun has been used since 1980. Such a device is especially useful in children due to the reduced needle size, the simple and easy to learn quick technique with fewer complications such as bleeding and laceration. The automatic biopsy gun as an advanced and sophisticated instrument, under ultrasound guidance, has indeed simplified the procedure and increased the diagnostic efficiency. This has certainly led to greater accuracy and precision in kidney biopsies in children. The automatic gun is now considered the first-choice instrument for biopsy in young patients. Currently, kidney biopsy is routine and is best done under real-time ultrasound guidance under direct vision guidance. Percutaneous blind punctures are no longer recommended. The effectiveness and safety of the automatic biopsy gun and procedure has been proven in many studies, and now we have overwhelming evidence to suggest that kidney biopsy in children with an automatic device is safe and relatively free from clinically significant post-biopsy complications.

## PATIENTS AND METHODS:

This prospective study was conducted at Pediatric Medicine Unit, Bahawal Victoria Hospital, Bahawalpur for one-year duration from June 2019 to June 2020. Fifty children of both sexes underwent percutaneous kidney biopsy under ultrasound guidance. Selection Criteria: All selected children were known cases of SRNS, SDNS and frequently recurrent NS with well-controlled blood pressure,

hemoglobin > 10 g / dL, normal coagulation profile, and kidney ultrasound. The study did not include patients with contraindications to kidney biopsy, chronic renal failure, and people over the age of 2 to 14 years. After the kidney biopsy procedure was thoroughly explained, written consent was given to both patients and parents. Each patient was hospitalized the day before, and then underwent a detailed history, physical examination, and a set of laboratory tests, such as a complete blood count with platelet counts, activated partial thromboplastin time, prothrombin time, kidney function tests, and kidney ultrasound. The biopsy gun used in the procedure is "Biopty 'Bard Inc. with a 16G or 18G needle. Diazepam or midazolam was used for parenteral / rectal sedation. The local anesthetic used at the biopsy site was 1% Xylocaine. Under real-time ultrasound control, each biopsy sample obtained in 1-3 runs was fixed in 10% formalin and sent for histopathology to the pathology department after the length of the tissue sample was recorded. Each patient was closely monitored for the first 24 hours for vital signs and biopsy complications such as pain, hypotension, and micro / macroscopic hematuria. Indeed, it was very difficult to ensure that all patients had complete bed rest. By the end of 24 hours, each patient underwent an ultrasound of the kidneys to check for perirenal bleeding or hematoma formation. Data were recorded and analyzed using SPSS version 15. Nominal variables were reported as frequency or percentage and analyzed using the Chi-square test. Numerical variables were recorded as mean  $\pm$  SD (standard deviation).

Operational definitions:

- a. SDNS:** Relapse on steroid therapy every other day or within 28 days of steroid discontinuation.
- b. SRNS:** No response to steroid therapy within 8 weeks.
- C. Often recurrent NS:** recurrent 3-4 times or more a year.
- d. Appropriate biopsy specimen:** a tissue specimen with at least 8 glomeruli or more.

## RESULTS:

Out of 50 children included in the study, there were 38 (76%) boys and 12 (24%) girls. Their ages ranged from 2 to 14 years with the mean  $\pm$  SD (7.20  $\pm$  3.41) years. The biopsy was able to provide an adequate tissue sample in 48 (96%) patients. Renal core tissue length was mean  $\pm$  SD (1.04  $\pm$  0.37) cm. The number of glomeruli per sample was mean  $\pm$  SD (13.07  $\pm$  3.62). In 2 (4%) cases, the sample obtained even after three attempts was inadequate (Table 1).

TABLE 1: Renal Biopsy Yield (n=50)

Adequate biopsy	48 (96%)
Inadequate biopsy	2 (4%)
Glomeruli per sample	13.07 ± 3.62
Specimen length	1.04 ± 0.37 cm

The parents declined the request for another biopsy, sometimes later in these patients, and stopped observation and treatment themselves. With normal vital signs, mild to moderate pain and swelling at the biopsy site occurred in 21 (42%) cases that were manageable with oral ibuprofen. Microscopic hematuria was documented in 17 (34%) cases. There was no hematuria or hypotension in any of the patients. In 5 (10%) patients performed after renal ultrasound biopsy within 24 hours, a small perirenal hematoma <2 cm in size was found, which, however, did not justify any therapeutic intervention (Table 2).

TABLE 2: Complications (n=50)

Complications	No. of patients	Percentage
Biopsy site pain / induration	21	42
Microscopic hematuria	17	34
Perinephric hematoma	05	10

There was no clot in the bladder.

### DISCUSSION:

There is a lot of published international data on this, but we only have a few local studies for reference. Since the advent of kidney biopsy in children, phenomenal progress has been made as a procedure and clinical technique. A kidney biopsy can be safely and reliably performed with an automatic ultrasound-controlled device as it provides more diagnostic tissue without increasing the incidence of clinical complications. Percutaneous kidney biopsy with an automatic gun under ultrasound guidance can even be used for a single active kidney. Żurowska (2001) recommended real-time ultrasound using an automatic biopsy device as standard practice in kidney biopsy in children primarily due to its safety and effectiveness. The biopsy specimen was secured in 98% of cases, but the author noted a high frequency of symptomatic perirenal hematoma in 80% and an arteriovenous fistula in 4.6% of cases. In our study, a suitable biopsy sample was obtained in 48 (96%) cases, and in 5 (10%) cases a biopsy hematoma <2 cm was found. For financial reasons, we did not examine our patients for complications such as arteriovenous fistula. In a study of 147 children's kidney biopsies using an automatic pistol, the procedure was found to be safe in children with success, with an adequacy rate of 91.9% and 95.2%, respectively, although with a relatively higher complication rate of up to 17.68%. The 1136 series of kidney biopsies with the automatic pistol showed an extremely high success rate of 99.9%, with the advantages of easy manipulation, higher diagnostic

efficiency and lower complication rate. The reason we were able to take a better number of glomeruli per tissue sample in 96% of patients was because of the precision of the ultrasound guided approach when performing a renal cortex biopsy, as it directly improves diagnostic performance. Automated pistol biopsy has been found to be a safer and more effective way to obtain renal tissue, as in 94.7% of cases a definitive pathological diagnosis can be obtained with a low complication rate, such as post-biopsy perirenal hematoma. The procedure is now considered relatively safe as most recent reports point to life-threatening complications occurring in less than 0.15% of biopsies. A series of 448 kidney biopsies have shown that switching from a manual biopsy to a real-time pistol biopsy under ultrasound guidance resulted in a significant increase in diagnostic accuracy and a reduction in the risk of procedural complications. There is some controversy in the literature about the length of the follow-up period from 2 to 24 hours after biopsy, and studies suggest that a kidney biopsy should be performed as a day care facility to avoid unnecessary hospitalization. Due to the lack of easy access to medical care, illiteracy and other social causes, we suggest that all cases be followed up for at least 24 hours in hospital after surgery to quickly identify serious complications. In a series of 523 adult patients who underwent kidney biopsy with an automatic biopsy gun, a complication rate of 13%, mainly total hematuria and perirenal hematoma, was found. The authors suggested that a post-biopsy

follow-up period of no less than 24 hours in the hospital, as a shortened period of 8 hours is likely to miss 33% of complications. On the other hand, some authors suggest that the reduced period of 2-7 hours of bed rest after biopsy did not show an increased bleeding rate or other biopsy-related complications in subsequent cases. The conventional 24-hour bed rest following a kidney biopsy just seems questionable. Percutaneous kidney biopsy in children can be safely performed on an outpatient basis using an automatic gun. With good clinical and laboratory support readily available, post-biopsy observations can be reduced to 4-6 hours in a day care setting. Sinha (2006) found that kidney biopsy in children with an automatic pistol is a safe day-care procedure with a reduced follow-up period of 6 hours instead of 24 hours after biopsy. In a series of 162 adult patients, percutaneous kidney biopsies with an automatic gun under ultrasound guidance showed perirenal hematoma 1 hour after biopsy in 16% of cases. Absence of perirenal bleeding within 1 hour was considered an uncomplicated prognosis. A perirenal hematoma of 2 cm or more in ultrasound examination immediately after renal biopsy justifies clinically significant bleeding complications requiring therapeutic intervention. The Automated 18G needle biopsy gun is the best choice as it provides faster tissue recovery and a very low complication rate compared to large sized needles. We managed to secure a section of kidney tissue after 1-3 attempts in one setting, but studies have shown that increasing the number of attempts up to 4 times does not affect the risk of complications and the safety of the procedure with an automatic biopsy gun.

### CONCLUSION:

We come to the conclusion that percutaneous ultrasound-guided kidney biopsy with an automatic biopsy gun in children is a relatively safe procedure with minimal risk of biopsy complications when observed in the hospital for 24 hours.

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