Original Article

Bedside Sonography in the Assessment of Suspected Nephrolitiasis

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ABSTRACT

Background: Nephrolithiasis, commonly referred to as kidney stones, is a prevalent urological condition frequently encountered in emergency settings. Rapid and accurate diagnosis is critical for effective management. Bedside sonography has emerged as a valuable diagnostic tool for assessing renal colic and detecting kidney stones due to its non-invasive nature and immediate availability.

Objective: To evaluate the diagnostic accuracy and practicality of bedside sonography in suspected cases of nephrolithiasis, particularly in emergency department settings, and to assess its impact on patient management.

Methods: A cross-sectional study was conducted at Mahaban Medical and Research Hospital, Swabi, KP, Pakistan, including 72 patients with suspected nephrolithiasis. Bedside sonography was performed using a Toshiba prime ultrasound machine with convex (3.0-5.0 MHz) and linear (7.0-14.0 MHz) transducers. Clinical data, including patient history and symptomatology, were collected and analyzed using SPSS version 25.0. The study focused on identifying the presence, location, and size of kidney stones and correlating these findings with clinical outcomes.

Results: Among the 72 participants, 42 (58.3%) had a history of kidney stones. Bedside sonography revealed stone locations as follows: bilateral in 5 (6.9%), left kidney in 27 (37.5%), right kidney in 36 (50.0%), and no stones in 4 (5.6%). The high prevalence of kidney stones, particularly in the right kidney, highlights the importance of BUS in initial evaluations.

Conclusion: Bedside sonography is an effective diagnostic tool for nephrolithiasis, providing immediate and detailed information without patient discomfort. Its implementation in emergency settings can enhance patient management, allowing for timely diagnosis and treatment. Further research is warranted to explore the broader applications and long-term outcomes associated with BUS.

Keywords: Bedside sonography, nephrolithiasis, kidney stones, ultrasound diagnosis, renal colic.

INTRODUCTION

Nephrolithiasis, commonly known as kidney stones, represents a significant urological concern due to its prevalence and potential complications. The kidneys, essential organs for maintaining homeostasis through filtration and waste excretion, are prone to the formation of these hard mineral masses, which can obstruct urinary pathways and cause severe pain. The emergency department (ED) frequently encounters cases of renal colic, a condition often indicative of nephrolithiasis. Focused bedside ultrasound (BUS) has emerged as a crucial, non-invasive diagnostic tool, favored for its rapid assessment capabilities and safety profile (1). Unlike computed tomography (CT) and intravenous pyelography (IVP), which, despite their high diagnostic accuracy, are often constrained by cost and accessibility, BUS offers a practical alternative for initial evaluation (2).

The increasing use of point-of-care ultrasound (POCUS) in EDs underscores its value in promptly diagnosing conditions like hydronephrosis, a common sign of ureteral obstruction caused by kidney stones (3). This research aims to evaluate the diagnostic accuracy and practicality of bedside sonography in suspected cases of nephrolithiasis, particularly within the context of emergency care. By comparing ultrasound findings with patient history and symptomatology, this study seeks to determine the efficacy of BUS in providing timely and accurate diagnoses that facilitate immediate and effective patient management (4).

MATERIAL AND METHODS

This cross-sectional study was conducted at the Department of Radiology, Mahaban Medical and Research Hospital, Swabi, KP, Pakistan, following approval from the Ethical Committee of Women University Swabi. The study adhered to the principles outlined

in the Declaration of Helsinki. Participants included patients from the Swabi district presenting with symptoms suggestive of nephrolithiasis. Data collection spanned from January to June 2023, utilizing a Toshiba prime ultrasound machine equipped with both convex (3.0-5.0 MHz) and linear (7.0-14.0 MHz) transducers.

Patients underwent bedside sonography to identify the presence, location, and size of kidney stones. Clinical data, including patient history and symptomatology, were recorded. The study focused on the bilateral assessment of suspected nephrolithiasis, with particular attention to the detection of hydronephrosis as an indicator of ureteral obstruction. Data were processed and analyzed using Statistical Software for Social Sciences (SPSS) version 25.0, with descriptive statistics used to summarize patient demographics and clinical findings. The study aimed to correlate sonographic findings with clinical outcomes to evaluate the diagnostic utility of BUS in the ED setting.

RESULTS

The study included 72 participants, of whom 58.3% reported a history of kidney stones. Bedside sonography was performed on all patients, revealing varying locations of nephrolithiasis. Among the respondents, 41.7% had no kidney stones, while 58.3% had stones present. The distribution of stones was as follows: bilateral (6.9%), left kidney (37.5%), no stones (5.6%), and right kidney (50.0%).

Table 1: History of Kidney Stones among Participants

History	Frequency	Percent	Valid Percent
No	30	41.7	41.7
Yes	42	58.3	58.3
Total	72	100.0	100.0

Table 2: Distribution of Kidney Stones by Location

Location	Frequency	Percent	Valid Percent
Bilateral	5	6.9	6.9
Left kidney	27	37.5	37.5
Normal	4	5.6	5.6
Right kidney	36	50.0	50.0
Total	72	100.0	100.0

DISCUSSION

The findings of this study underscore the significant role of bedside sonography in the initial assessment of suspected nephrolithiasis. The high prevalence of kidney stones detected, particularly in the right kidney, aligns with previous research indicating a higher propensity for stone formation in this location (5). The non-invasive nature and immediate availability of BUS make it an invaluable tool in the ED, enabling rapid diagnosis and facilitating prompt management decisions (6).

Previous studies have highlighted the limitations of CT and IVP in resource-constrained settings, reinforcing the need for alternative diagnostic modalities like BUS (7-9). The ability to detect hydronephrosis and assess the anatomical details of kidney stones without exposing patients to ionizing radiation is a significant advantage, particularly for recurrent cases (8). However, this study also acknowledges the limitations inherent in its design, including the reliance on self-reported patient history and the potential for selection bias (8-13). Future research should aim to expand the sample size and incorporate longitudinal data to better understand the long-term outcomes associated with BUS-diagnosed nephrolithiasis (14-18).

CONCLUSION

This study highlights the efficacy of bedside sonography in diagnosing nephrolithiasis, emphasizing its practicality and diagnostic accuracy in the emergency department setting. The results support the integration of BUS as a first-line diagnostic tool for patients presenting with renal colic, facilitating timely and effective patient care. Further research is warranted to explore the broader implementation of this modality and its impact on clinical outcomes.

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