

THE VALUE OF COMBINED URINALYSIS AND ABDOMINAL ULTRASOUND IN DIAGNOSING RENAL COLIC IN AQABA REGION

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ABSTRACT

Objective: To assess the yield of both urinalysis and abdominal ultrasound in diagnosing renal colic and abdominal pain at Princess Haya Hospital in Aqaba.

Methods: Two hundred and eighty one successive patients presented to the emergency room at Princess Haya Hospital between November 1997-May 1998 with abdominal pain and flank pain mimicking renal colic. All patients gave complete medical history, and underwent physical examination and urine analysis investigation for pyuria, hematuria and/or crystaluria. Then they had abdominal ultrasound and 17 patients had plain abdominal radiograph. Urine analysis, abdominal ultrasound were evaluated using 2x2 contingency table for sensitivity, specificity, positive and negative predictive values. {Mean age (\pm SD) was found to be 33.2 ± 11.66 years; (range 15-60). Male: Female ratio was (1.4:1)}.

Results: There were 24 (8.%) abnormal urinalysis (pyurea, hematuria) and 74 (26.3%) abnormal abdominal U/S 69 (24.5%) cases were related to urinary tract and prostate). Nephrolithiasis dominated the ultrasonic findings (44.9%) followed by hydronephrosis (33.3%), small kidneys in 5.8%, prostate pathology, 4.3%, double kidneys, nephrectomy and renal cyst in 2.9% each. Adult polycystic kidney disease and horseshoe kidneys constituted (1.5%). Non-renal ultrasonic findings included gall bladder stones found in two patients, epigastric mass, intrapelvic mass in one female and hepatosplenomegaly in one patient.

Combined urine analysis and ultrasound had a sensitivity of 12% (95% CI: 4-19) and specificity of 92% (95% CI: 89-96). Positive predictive value was 33% (95% CI: 14-52). While combined ultrasound and kidney, urinary bladder had a sensitivity of 83% (95% CI: 62-104) and a specificity of 60% (95% CI: 17-103). The predictive value for positive results was 83% (95% CI: 62-104) and the predictive value for negative results was 60% (95% CI: 17-103).

Conclusion: Nephrolithiasis and hydronephrosis constitute the major causes of renal colic in Aqaba.

Key words: Renal colic, Aqaba-Jordan, Ultrasound, Urinalysis, Sensitivity, Specificity.

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Introduction

The diagnosis of renal colic depends on medical history and physical examination, which give a sensitivity of 84% and specificity of 99% ⁽¹⁾. Confirmatory radiological tests include abdominal plain film kidney urinary bladder (KUB), intravenous pyelogram (IVP), ultrasound (US) and computerized Tomography (CT scan).

One study found that acute unilateral flank pain, hematuria and positive plain film of the abdomen were present in 90% of emergency room patients presenting with stones ⁽²⁾.

Ultrasound is the procedure of choice for patients who should avoid radiation including those with known allergy to intravenous contrast and pregnant women. CT scan, on the other hand, has become the gold standard for radiological diagnosis that gives a higher sensitivity and specificity for diagnosis ⁽³⁾. The unenhanced helical CT scan for diagnosis of kidney stones gave a 95%, 98% and 97% sensitivity, specificity and accuracy, respectively ⁽⁴⁾.

In Aqaba, a temperate seaside county in the south of Jordan, we tried to assess the yield of testing both simple urinalysis and abdominal ultrasound in diagnosing renal

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colic; a common presentation to the emergency room (ER) at Princess Haya Hospital, trying to evaluate the sensitivity, specificity and predictive values for the results of these simple and accessible tests in a peripheral non-referral hospital.

Methods

Two hundred and eighty one patients presented to the ER at Princess Haya Hospital (PHH) between November 1997 and May 1998 with abdominal pain or flank pain mimicking renal colic.

A simplified protocol for the management of these patients was set up in ER including a complete medical history, physical examination, simple mid-stream urinalysis and abdominal ultrasound to be performed preferably on the same day of presentation.

Urine analysis was performed by the same operator looking for pH, sediment (RBC, WBC) and crystaluria under light microscopy in all patients along with abdominal US. Seventeen patients had a KUB for managerial problems.

Statistics performed were calculating percentages, mean and standard deviation (SD), 2x2 contingency tables for calculation of sensitivity, specificity, and predictive values for positive and negative results.

Urinalysis was considered normal according to the criteria of Kroenke as follows: Hematuria > 2 red blood cells /high power field, pyuria > 5 white blood cells/ high power field and casts other than hyaline and proteinuria > trace ⁽⁵⁾.

Ultrasound was performed using a 3.5 MHZ probe and was reported by a single radiologist ⁽⁶⁾. Stones appear echogenic and cast an acoustic shadow. Small stones < 5mm may not be visualized. The diagnosis of hydronephrosis was made if there was uretero-calyceal dilatation without obvious cause for obstruction (sludge, stone or masses) ⁽⁷⁾.

Results

The mean age (\pm SD) was 33.1 \pm 11.7 years (range 15-60 years), and male: female ratio was 1.4:1.

History revealed recurrent renal colic (presentation to hospital) five times in 5 patients, three times in 11 patients and 6 patients had two recurrences. The rest of the patients were having their first presentation. Thirty percent of the cohort was from tourists coming from outside Aqaba.

Table I presents the frequency of abnormal US findings. The most common was kidney stones in 29 cases (42%) while the least frequent was horseshoe kidneys and polycystic kidneys 1 (1.5%) each.

Positive abdominal US (abnormal ultrasonic) findings were detected in 75 patients (26.7%), of whom 69 patients (92%) had abnormal findings related to the urinary tract. Non-renal abnormal US findings included gall bladder stones in 2 patients, epigastric mass in one,

intrapelvic mass in one female and hepatosplenomegaly in one patient and one lady was pregnant.

There were 24 (8.5%) patients with abnormal urinalysis (8 patients with pyurea, 16 with hematuria) and 9 patients had associated acid urine. No crystalluria was found and proteinuria was considered due to hematuria in 7 patients.

Statistical parameters on a 2x2 contingency table (Table II) revealed a sensitivity of 12% (95%, Confidence Interval (CI): 4-19) and a specificity of 92% (95%, CI: 89-96). The predictive value for positive results was 33% (95%, CI: 14-52) while the predictive value for negative results was 24% (95%, CI: 71-81).

Table I. The frequency of abnormal (positive) ultrasound findings.

Disease	No.	%
Kidney stones*	29	42
Left ureteric stones	2	3
Hydronephrosis**	23	33
Small kidneys	4	6
Prostate pathology#	3	4
Renal cysts	2	3
Absent kidney (Lt. nephrectomy)	2	3
Duplex kidney	2	3
Adult polycystic kidneys	1	1.5
Horseshoe kidneys	1	1.5

* Rt.: 11, Lt.: 15, bilateral 3. **Rt. 9, Lt.10, Bilateral 42%. # Prostrate hypertrophy in 2 and prostate cancer in one

Table II. A 2x2 contingency table showing positive and negative results.

	Positive US	Negative US
Positive urinalysis	8	16
Negative urinalysis	61	196

Seventeen patients had KUB combined with ultrasound of the abdomen. The sensitivity of both tests was 83% (95%, CI: 62-104) and a specificity of 60% (95%, CI: 17-103). The predictive value for positive results was 83% (95%, CI: 62-104) while the predictive value for negative results was 60% (95%, CI: 17-103).

Discussion

Up to our knowledge, this is the first study investigating the value of US and urinalysis in establishing a diagnosis in the ER in a peripheral hospital in Aqaba Region. Other studies were conducted concerning the value of US and CT separately ⁽⁸⁾.

This study emphasized the importance of US in establishing and clarifying the nature of abdominal pain and renal colic in a remote area in Jordan. The high specificity makes abdominal US the first line tool of diagnosis.

The use of KUB as a tool of diagnosis has lower cost and higher yield. The sensitivity and specificity are much higher when combined with ultrasound ⁽⁶⁾.

Although a small number of patients had had this investigation with US in this cohort, nevertheless, the sensitivity and specificity were comparable with other studies⁽⁹⁻¹¹⁾ and high enough to conclude recommending it as first line investigation. Sinclair and associate demonstrated as sensitivity of 85% and specificity of 100% to US (compared with 90% and 94%, respectively for IVP)⁽¹²⁾. A higher sensitivity (93%) with specificity of 95% was revealed by US in the study conducted by Patlas M *et al*⁽¹³⁾.

The prevalence of kidney stones in this cohort (11%) was higher than that found elsewhere^(14,15). The most probable explanation would be that some degree of dehydration induced by high temperature reaching 45 degrees centigrade in many days and that the increase in consumption of soft drinks substituting tap water for cooling; the thing that is known to increase the risk of kidney stones⁽¹⁶⁾, and finally some unrecognized metabolic and structural abnormalities of the urinary tract.

Only two patients were diagnosed to have uretric stones in this study. It is well known for ultrasound to have a lower yield for uretric stones when compared to helical CT scan that became the gold standard investigation tool⁽⁴⁾.

The need for the establishment of a unified protocol for approaching patients with renal colic in the ER is needed to reduce patients' suffering, waiting time and cost^(1, 2, 17,18).

Limitations of this Study

1. A small number of patients who had KUB to get significant results.
2. No urinary cultures were obtained in patients with hematuria/pyuria.
3. Emphasis on history and physical examination was not highlighted well in preliminary data collection.
4. No proper follow-up beyond ER settings was carried out to retrieve an accurate documentation of stones whether by intravenous urology, CT scan, history of passage of stones or need for lithiotripsy or surgery.
5. Finally, comparison of urine analysis, ultrasound, KUB and CT scan for better yield was not the aim of this study, however further larger studies are needed.

In conclusion, nephrolithiasis constitutes the major cause of renal colic in Aqaba. The combination of simple urinalysis and ultrasound gives an adequate and specific diagnostic tool of renal colic pathology in a peripheral hospital where the access to a helical CT scanning is not available.

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