

ORIGINAL RESEARCH

Role of color doppler in obstructive uropathy

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ABSTRACT

Background: One of the frequent causes of abdominal discomfort observed in the emergency room is obstructive uropathy. The present study was conducted to assess the role of color doppler in obstructive uropathy. **Materials & Methods:** 54 patients of obstructed kidney of both genders were selected. Patients were kept in group I and controls in group II. Parameters such as clinical features were recorded. The interlobar arteries and veins of both kidneys were examined using color doppler ultrasound, and the arterial resistive and impedance indices were calculated. Both arterial and renal venous doppler studies of the interlobar arteries and veins were performed on all of the subjects. **Results:** Group I had 30 males and 24 females and group II had 27 males and 27 females. Duration of pain was <24 hours in 34, 24-48 hours in 12 and >48 hours in 8 cases. clinical features in group I were loin pain in 30, hematuria in 25, and vomiting in 18 patients. Site of obstruction was PUJ in 37, VUJ in 12 and ureter in 5 cases. The difference was significant ($P < 0.05$). The mean resistive index was 0.78 in group I and 0.67 in group II. The mean venous impedance was 0.32 in group I and 0.45 in group II. The difference was significant ($P < 0.05$). **Conclusion:** The venous impedance index decreased in the majority of blockage instances. Patients with obstructive uropathy have been reported to benefit from color doppler.

Key words: Color doppler, Obstructive uropathy, US

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INTRODUCTION

One of the frequent causes of abdominal discomfort observed in the emergency room is obstructive uropathy.¹ It is known to cause pelvicalyceal dilatation when there is structural resistance to urine flow anywhere along the urinary system. "Obstructive nephropathy" refers to the damage to the renal parenchyma that results from the obstructive uropathy.² Early obstructive uropathy can be challenging to diagnose using arterial sensitivity index or regular B-mode USG. When the urinary tract is blocked, the pressure in the collecting system rises, reducing renal parenchymal compliance. This has a bigger impact on intraparenchymal venous blood flow than arterial flow.³

Even though traditional US has a claimed sensitivity of up to 98% for detecting upper urinary tract dilatation, it is unable to provide meaningful physiological information on renal state and hence cannot be used to determine the etiology of obstructive dilatation. Acute and chronic renal failure are frequently caused by urinary tract obstruction,

which can be quickly identified and assessed with ultrasound.⁴ Increased hydrostatic pressure that travels directly to the tubules of the nephron can cause elevated intraluminal ureteral pressure if the urinary system is blocked. The benefits of ultrasonic imaging include its portability, affordability, lack of a need for contrast material, and capacity to identify fluid collection brought on by obstruction.⁵ The present study was conducted to assess the role of color doppler in obstructive uropathy.

MATERIALS & METHODS

The present study consisted of 54 patients of obstructed kidney of both genders. The written consent was obtained from all patients.

Data such as name, age, gender etc. was recorded. Patients were divided into 2 groups. Patients were kept in group I and controls in group II. Parameters such as clinical features were recorded. The interlobar arteries and veins of both kidneys were examined using color doppler ultrasound, and the arterial resistive and impedance indices were calculated. Both arterial and

renal venous doppler studies of the interlobar arteries and veins were performed on all of the subjects. PSV, EDV, RI, and II (Impedance Index) values were measured in the interlobar arteries and veins of both blocked and unblocked kidneys. The formula Peak

Systolic Velocity (PSV) - End Diastolic Velocity (EDV)/Peak Systolic Velocity was used to compute the venous impedance index from PSV and EDV. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I Distribution of patients

Groups	Group I	Group II
Status	Obstructed kidney	Healthy
M:F	30:24	27:27

Table I shows that group I had 30 males and 24 females and group II had 27 males and 27 females.

Table II Assessment of parameters

Parameters	Variables	Number	P value
Duration of pain (hours)	<24	34	0.01
	24-48	12	
	>48	8	
Clinical features	Loin pain	30	0.05
	Hematuria	25	
	vomiting	18	
Site of obstruction	PUJ	37	0.01
	VUJ	12	
	ureter	5	

Table II, graph I shows that duration of pain was <24 hours in 34, 24-48 hours in 12 and >48 hours in 8 cases. Clinical features in group I were loin pain in 30, hematuria in 25, and vomiting in 18 patients. Site of obstruction was PUJ in 37, VUJ in 12 and ureter in 5 cases. The difference was significant (P < 0.05).

Graph I Assessment of parameters

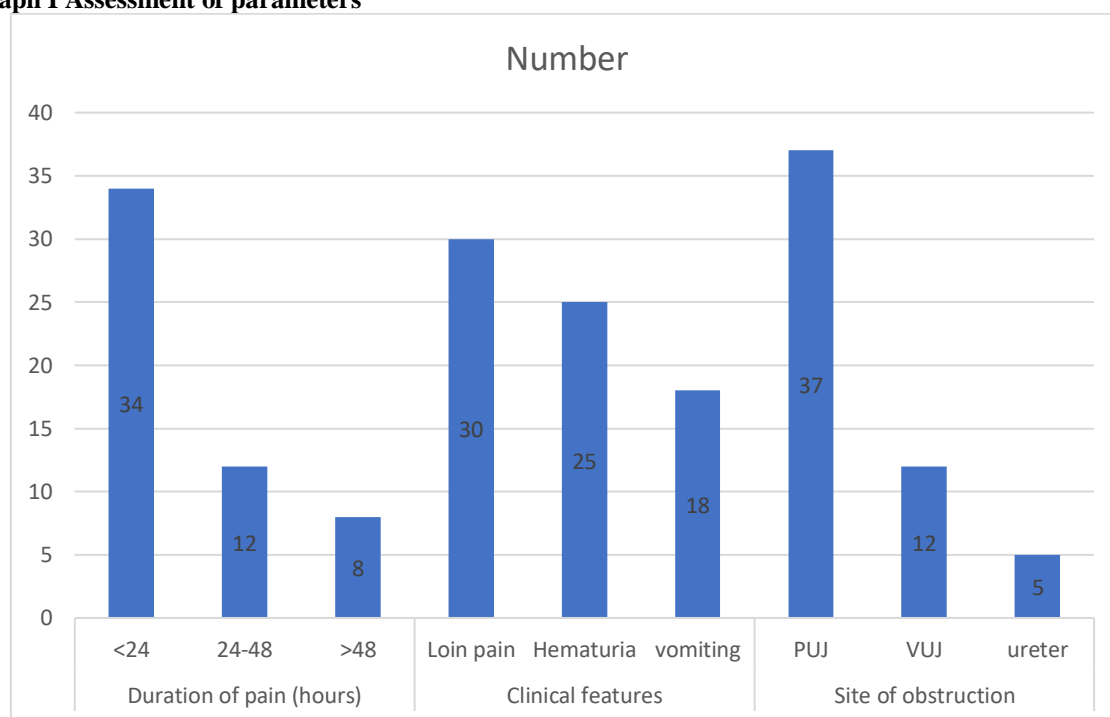


Table III USG findings in both groups

Parameters	Groups	Group I	Group II
Mean resistive index		0.78	0.67
Mean venous impedance		0.32	0.45

Table III shows that the mean resistive index was 0.78 in group I and 0.67 in group II. The mean venous impedance was 0.32 in group I and 0.45 in group II. The difference was significant (P < 0.05).

DISCUSSION

Gray scale sonography has low sensitivity for diagnosing acute ureteric blockage, despite being the first line of defense for detecting a variety of renal diseases.⁶ Because pyelocaliectasis can develop later in obstructive situations, conventional gray scale sonography may miss the diagnosis of renal obstruction due to its high sensitivity (90%) but low specificity (65%–84%) for urinary system dilatation.⁷ In contrast to other causes of collecting system dilatation, such as residual dilatation from previously existing relieved obstruction, extrarenal pelvis, and pyelonephritis, conventional grayscale USG only detects anatomical changes, such as pelviureteric dilatation in ureteral obstruction. Additionally, in a severe situation, obstruction could last for a number of hours before the collecting system dilatations.^{8,9} The present study was conducted to assess role of color doppler in obstructive uropathy.

We found that group I had 30 males and 24 females and group II had 27 males and 27 females. On 100 patients, 50 of whom had obstructed kidneys and 50 of whom were controls, Choudhary et al.'s¹⁰ evaluation of the diagnostic efficacy of color doppler in obstructive uropathy involved 100 patients. In our study, PUJ and VUJ are respectively 30% and 30% more prevalently implicated. On color doppler, the statistically computed mean resistive index and mean venous impedance value between blocked and control are 0.723 and 0.307, respectively. Mean arterial and venous PSV in the blocked and control groups are calculated to be 31.14 and 17, respectively, and 23.9 and 15.2, respectively, for the blocked group.

We observed that the duration of pain was <24 hours in 34, 24-48 hours in 12 and >48 hours in 8 cases. clinical features in group I were loin pain in 30, hematuria in 25, and vomiting in 18 patients. Site of obstruction was PUJ in 37, VUJ in 12 and ureter in 5 cases. In 32 patients who had renal colic, Rodgers et al¹¹ compared the findings of urography with color doppler ultrasound. The sensitivity and specificity were only 44% and 82%, respectively, when the reported discriminating limits for renal obstruction (mean resistive index >0.70) were utilized. The variation in the degree of renal obstruction may account for this obvious divergence in the results.

We found that the mean resistive index was 0.78 in group I and 0.67 in group II. The mean venous impedance was 0.32 in group I and 0.45 in group II. In contrast to arterial doppler studies of the inter lobar arteries, renal venous doppler ultrasound was investigated by Vadana et al¹² for its diagnostic efficacy in the diagnosis of acute obstructive uropathy. Fifty patients who presented with symptoms of obstructive uropathy were examined, and their non-obstructed kidneys from the same patient were compared. 50 healthy people were studied and used as controls. It was statistically significant that the mean venous impedance index on the blocked side was lower than the mean venous impedance index on the

unobstructed side. The mean arterial Resistivity Index (RI) did not alter in a statistically meaningful way.

De Toledo et al¹³ examined the diagnostic efficacy of color doppler ultrasound in 64 patients with a threshold of >0.70 for full and partial renal obstruction. They found a sensitivity of 92% in 37 patients for complete blockage and 48% in 27 patients for partial obstruction. Due to their ability to identify minute variations in intrarenal blood flow, angiographic measures of the arterial RI by duplex doppler sonography can be utilized to diagnose blockage. Doppler sonography can be used to measure renal blood flow along with real-time sonographic data from the collecting system to compare mean arterial Resistivity Index (RI) differences.

CONCLUSION

Authors found that the venous impedance index decreased in the majority of blockage instances. Patients with obstructive uropathy have been reported to benefit from color doppler.

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