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ORIGINAL RESEARCH

ROLE OF COLOR DOPPLER IN OBSTRUCTIVE UROPATHY

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Abstract:

Background: Obstructive uropathy is one of the common cause of pain abdomen seen in emergency department. The present study was conducted to assess role of color doppler in obstructive uropathy.
Materials & Methods: 40 patients of obstructed kidney of both genders were included. Group I comprised of patients of obstructed kidney and group II had controls. The obstruction and size and site of obstruction noted.Color doppler ultrasound of the interlobar arteries and veins of both kidneys was performed, with arterial resistive index as well as the impedance indexes is calculated.
Results: Group I had 22 males and 18 females and group II had 23 males and 17 females. Clinical features were hematuria in 26, loin pain in 22 and vomiting in 11 cases. Site of obstruction was PUJ in 24, VUJ in 10 and ureter in 6. Duration of pain was <24 hours in 31, 24-48 hours in 6 and >48 hours in 3 cases. The difference was significant (P< 0.05). The mean resistive index was 0.73 in group Iand 0.64 in group II. The mean venous impedance was 0.31 in group Iand 0.43 group II. The difference was significant (P< 0.05).
Conclusion: Most of the cases with obstruction showed a decrease in the venous impedance index. Color doppler found to be useful in obstructive uropathy patients.
Key words: Color doppler, Obstructive uropathy, venous impedance

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Introduction:

Obstructive uropathy is one of the common cause of pain abdomen seen in emergency department. It is defined as structural impedance to the flow of urine anywhere along the urinary tract leading to pelvicalyceal dilatation.[1] The resulting renal parenchymal damage caused by a virtue of the obstructive uropathy is collectively termed "obstructive nephropathy". Obstructive uropathy in early stages can be difficult to diagnose using standard B-mode USG or arterial sensitive index. During obstruction of urinary tract, the pressure in the collecting system increases causing reduction in renal parenchymal compliance which affects the intraparenchymal venous blood flow to a greater degree than arterial flow.[2]
While conventional US is a sensitive method for detecting upper urinary tract dilatation with upto 98% sensitivity reported in earlier studies it lacks the ability to provide significant physiological data on renal status and, hence cannot specifically assess the cause of obstructive dilatation. Urinary tract obstruction is common cause of acute and chronic renal failure which can be easily diagnosed and evaluated based on Ultrasound.[3] Elevation of intraluminal ureteral pressure can be due to obstruction of the urinary tract, this can lead to increase in the hydrostatic pressure and get transmitted directly to nephron tubules.[4]The advantages of using ultrasound imaging include its mobility, low cost, and no need for contrast media as well as the ability to detect fluid collection which result from obstruction. Other imaging techniques, such as IVU and radioisotope scans can also be used as complementary tools for diagnosis however, cannot replace the gold standard test which is ultrasound.[5]The present study was conducted to assess role of color doppler in obstructive uropathy.

Materials & Methods:

The present study comprised of 40 patients of obstructed kidney of both genders. The consent was obtained from all enrolled patients.
Data such as name, age, gender etc. was recorded. We made 2 groups. Group I comprised of patients of obstructed kidney and group II had controls. Clinical details like abdomen pain, burning micturition, haematuria sonography was performed. The obstruction and size and site of obstruction noted.Color doppler ultrasound of the interlobar arteries and veins of both kidneys was performed, with arterial resistive index as well as the impedance indexes is calculated.All the individuals were subjected to arterial doppler of interlobar arteries and renal venous doppler study of interlobar veins. The following parameters such as PSV, EDV, RI and II (Impedance Index)were obtained in both inter lobar arteries and veins in obstructed and non-obstructed kidneys. The venous impedance index was calculated from PSV, EDV by the formula- Peak Systolic Velocity (PSV) - End Diastolic Velocity (EDV)/ Peak Systolic Velocity. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

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Results:

Table I Distribution of patients

Groups	Group I	Group II
Status	obstructed kidney	control
M:F	22:18	23:17

Table I shows that group I had 22 males and 18 females and group II had 23 males and 17 females.

Table II Assessment of parameters

Parameters	Variables	Number	P value
Clinical features	Hematuria	26	0.13
	Loin pain	22	
	vomiting	11	
Site of obstruction	PUJ	24	0.01
	VUJ	10	
	ureter	6	
Duration of pain (hours)	<24	31	0.02
	24-48	6	
	>48	3	

Table II, graph I shows that clinical features were hematuria in 26, loin pain in 22 and vomiting in 11 cases. Site of obstruction was PUJ in 24, VUJ in 10 and ureter in 6. Duration of pain was <24 hours in 31, 24-48 hours in 6 and >48 hours in 3 cases. The difference was significant (P< 0.05).

Graph I Assessment of parameters

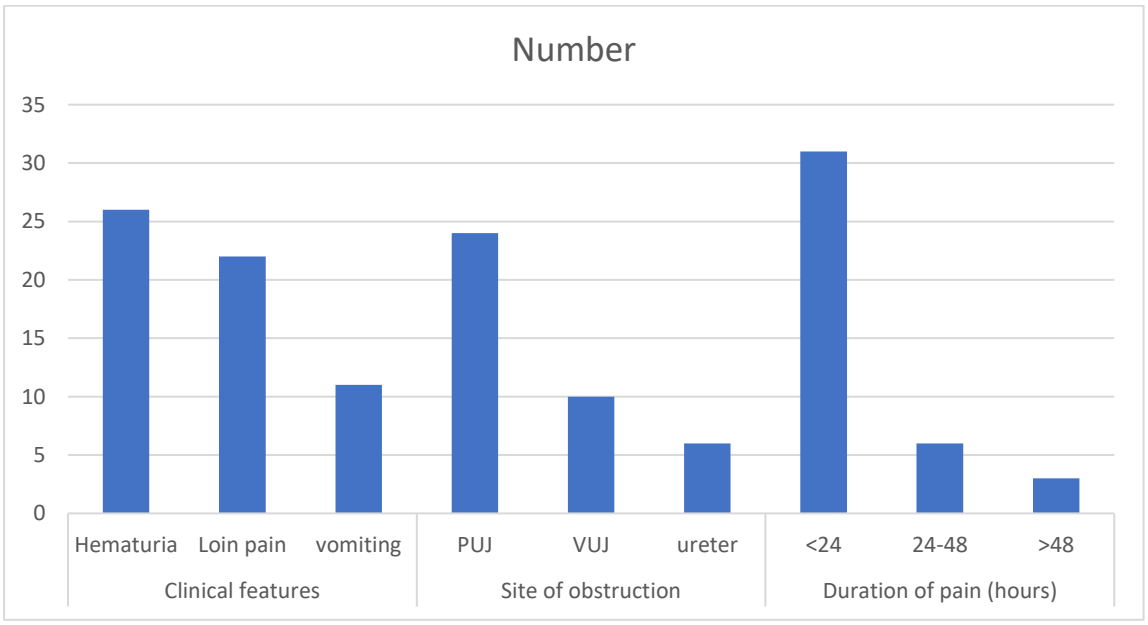

Table III USG findings

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Parameters	Groups	Group I	Group II
Meanresistiveindex	0.73	0.64	0.05
Mean venousimpedance	0.31	0.43	0.04

Table III shows that mean resistive index was 0.73 in group Iand 0.64 in group II. The mean venous impedance was 0.31 in group Iand 0.43 group II. The difference was significant (P< 0.05).

Discussion:

Sonography is the initial tool for detecting various renal pathologies, however gray scale sonography has low sensitivity for detecting acute ureteric obstruction.[6] Conventional gray scale sonography has high sensitivity (≥90%) but low specificity (65%–84%) for urinary system dilatation in the diagnosis of renal obstruction and may miss the diagnosis because pyelocaliectasis can occur late in obstructive conditions.[7] Conventional grayscale USG identifies only anatomical changes like pelviureteric dilatation in ureteral obstruction and it cannot distinguish this from other causes of collecting system dilatation like residual dilatation from previously existing relieved obstruction, extrarenal pelvis and pyelonephritis on gray-scale USG alone. Moreover, in an acute setting, obstruction may persist for several hours prior to collecting system dilatation.[8]The present study was conducted to assess role of color doppler in obstructive uropathy.

We found that group I had 22 males and 18 females and group II had 23 males and 17 females. Vadana et al[9]evaluated the diagnostic accuracy of renal venous doppler ultrasound in diagnosing acute obstructive uropathy either alone or in addition to arterial doppler study of inter lobar arteries. Fifty patients presenting with features suggestive of obstructive uropathy were studied and compared with non-obstructed kidney of the same patient. Fifty normal individuals were studied and taken as controls. The mean venous impedance index on the obstructed side (0.26 ± 0.07) was less than the mean venous impedance index on the unobstructed side (0.41 ± 0.08) and was statistically highly significant. There was no statistically significant difference in mean arterial Resistivity Index (RI).

We found that clinical features were hematuria in 26, loin pain in 22 and vomiting in 11 cases. Site of obstruction was PUJ in 24, VUJin 10 and ureter in 6. Duration of pain was <24 hours in 31, 24-48 hours in 6 and >48 hours in 3 cases. Choudhary et al[10] evaluated diagnostic accuracy of color doppler in obstructive uropathy on 100 patients, out of these 50 were obstructed kidney and 50 were control. PUJ and VUJ are most commonly involved in our study 30% and 30%respectively. On color doppler mean resistive index and mean venous impedance value between obstructed and control is statistically calculated 0.723 and 0.307. the mean arterial PSV in obstructed and control group is calculate to be 31.14 and 17 respectively, and mean venous PSV in obstructed and control group calculated to be 23.9 and 15.2 respectively.

We found that mean resistive index was 0.73 in group I and 0.64 in group II. The mean venous impedance was 0.31 in group I and 0.43 group II. Rodgerset al[11]correlated the results of color doppler ultrasound with those of urography in 32 patients presenting with renal colic. When the published discriminatory thresholds for renal obstruction(mean resistive index

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>0.70 is applied, the sensitivity and specificity of were only 44% and 82% only respectively. This marked discrepancy in the results could be explained by the difference in the degree of renal obstruction.

de Toledo etal[12] investigated the diagnostic accuracy of color doppler ultrasound in complete as well as partial renal obstruction in64 patients with a threshold of >0.70 and they showed a sensitivity of 92% in 37 patients with complete and 48% in 27 patients with partial obstruction.Arterial RI measurements by duplex doppler sonography can be used for the diagnosis of obstruction as they detect subtle intrarenal blood flow changes. It is useful to assess renal blood flow by doppler sonography together with real-time sonographic information of the collecting system.[13]

Conclusion:

Authors found that most of the cases with obstruction showed a decrease in the venous impedance index. Color doppler found to be useful in obstructive uropathy patients.

References:

1. Bateman GA, Cuganesan R. Renal vein Doppler sonography of obstructive uropathy. AJR. 2002;178:921-25.
2. Mostbeck GH, Zontsich T, Turetschek K. Ultrasound of the kidney: obstruction and medical diseases. Eur Radiol. 2001;11:1878–89.
3. Ellenbogen PH, Scheible FW, Talner LB, Leopold GR. Sensitivity of grayscale ultrasound in detecting urinary tract obstruction. AJR Am J Roentgenol. 1978;130:731-33.
4. Platt JF, Rubin JM, Ellis JH. Acute renal obstruction: Evaluation with intrarenal duplex Doppler and conventional US. Radiology. 1993;186:685-88.
5. Saboo SS, Soni SH, Saboo SH, Chinapuvvula NR, Kaza S. Doppler sonography in acute renal obstruction. Indian J Radiol Imaging. 2007;17:188-92.
6. Platt J, Marn C, Baliga P, Ellis JH, Rubin JM, Merion RM. Renal Dysfunction in Hepatic Disease: Early Identification with Renal Duplex Doppler US in Patients Who Undergo Liver Transplantation. Radiology. 1992;183:801-06.
7. Moody TE, Vaughan ED, Gillenwater JY. Relationship between renal blood flow and ureteral pressure during 18 hours of total unilateral ureteral occlusion. Investig Urol. 1975;13:246–51.
8. Chen J, Pu Y, Liu S, Chin TY. Renal Hemodynamics in Patients with Obstructive Uropathy Evaluated by Duplex Doppler Sonography. J Urol. 1993;150:18-21.
9. Vadana BM, Pasumarthy A, Penumalli N, Bellapa NC. Renal venous Doppler study in obstructive uropathy. Journal of Clinical and Diagnostic Research: JCDR. 2015 Nov;9(11):TC13.
10. Choudhary A, Singh S, Nagar A, Banzal S, Alvi S. Role of color doppler in obstructive uropathy. European Journal of Molecular & Clinical Medicine. 2022 Mar 12;9(3):525-39.
11. Rodgers et al. Intravenous DU in normal and acutely obstructed kidneys. Brj radiol.1992:68:207.
12. De Toledo et al: DU in renal colic. Eur jradiol.23:143.

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13. Salgado OJ, Martin MG, Urdaneta B, Garcia R, Rodriguez-Iturbe B. Serial pulsatility index measurements in renal grafts before, during, and after episodes of urinary obstruction. J Ultrasound Med. 1999;18:827–30.