
THE VALUE OF ULTRASOUND GUIDED PERCUTANEOUS ANTEGRADE PYELOGRAPHY IN THE DIAGNOSIS OF OBSTRUCTIVE UROPATHY

Assal B. Shindi

M.B.Ch.B., M.Sc., Lecturer, Department of Surgery, College of Medicine University of Basrah and Specialist Radiologist & Head; Division of Radiology, Saddam Teaching Hospital, Basrah; IRAQ.

Summary

Twenty-one patients with non-visualized kidney on intravenous urography (IVU), whose ultrasound (US) examinations showed moderate to severe hydronephrosis (3 of them subjected to non-conclusive retrograde uretrography), were included in this study. All of them underwent percutaneous antegrade pyelography (PAGP) under US guidance at Radiology Department, Saddam Teaching Hospital, Basrah, from January 2000 to January 2002. Ninety-five percent of them had satisfactory and conclusive results; nine cases with radiolucent stones, 5 with congenital pelvi-ureteric junction (PUJ) obstruction, 5 with ureteric strictures and one case with severe hydrocalyces and contracted pelvis that was proved to be tuberculosis of the kidney. On the other hand, the technique failed in one case. The study included 15 males and 6 females, their ages ranged between 12-71 years and the mean age was 45 years. No complication was recorded. We conclude that this procedure is a relatively simple, safe, and useful technique to visualize the renal collecting system in certain cases allowing the surgeon to choose a more suitable operative approach for that particular condition.

Introduction

Radiologic imaging is commonly used in the diagnosis, classification and follow-up of renal or ureteric obstruction. Precise definition of the elements of obstructive uropathy is critical. Despite the fact that a wide spectrum of imaging modalities is currently used to diagnose the site of the obstruction, plain radiography (KUB) is

still regarded as one of those commonly performed worldwide. The detection of a calcification along the course of the ureter is often used as a presumptive evidence of an obstructing ureteral stone. The problem lies in cases of nonvisualized stones in the ureter, a predicament that occurs in a range of 10-15% as reported in several publications^{1,2}. Because the ureter can not be directly visualized on KUB, one can never be sure of the precise location of a calcific density seen anywhere along its course.

Correspondence to:

Dr. Assal B. Shindi, Department of Surgery,
College of Medicine, University of Basrah,
Basrah, Iraq.

Leivine et al³ found KUB to have a sensitivity of only 59% for detecting ureteral calculi. US is of limited value in detecting middle 1/3 ureteral stones, but stones located within the intrarenal collecting system, renal pelvis or near the ureterovesical junction are often visible^{4,5}. IVU, CT and recently MRI are equally accurate in detecting the site of ureteric obstruction^{7,8,9}.

Patients and Methods

Twenty-one patients with non-visualized or poorly visualized kidney on IVU and moderate to severe hydronephrosis on US were included from January 2000 to January 2002 at Saddam Teaching Hospital, Radiology Department. There were 16 males and 5 females, their age ranged between 12 to 71 years (average =45 years).

All patients were examined by US, after application of US gel on the patients skin. They were examined in supine, prone and oblique positions, choosing the prone position for injection of the contrast after localization of the kidney by US to inject the contrast through the lower calyces using free-hand technique⁹. The contrast used was omnipaque (Iohexol) in a dose of 10-50ml. The needles used were spinal needles gauge 20-22. Before injection of the contrast, 10-50ml of urine was aspirated to ascertain the position of the needle in the collecting system. We informed the patients to tell us when they experienced pain not related to needle insertion, which usually results from distension of the collecting system, to stop the injection; moreover, we continuously observe the renal collecting system by US while injecting the contrast to assess any increase in the dilatation of the renal pelvicalyceal system. Then we shift the patient to the x-ray room for a KUB which is usually the only film we need. In few cases, though, we need a KUB in prone

position needed for optimal visualization of the ureters in certain cases of ureteric obstruction. There is no need for special preparation of the patients.

Results

Twenty-one patients with nonvisualized or poorly visualized kidney on IVU and moderate to severe hydronephrosis on US were included in this study, with age range of 12 to 71 years and an average of 45 years. AGPU under US guidance revealed the cause of ureteric obstruction to be radiolucent stones in 9 case, congenital PUJ obstruction in 5 cases and ureteric strictures in 5 cases. The test was not conclusive in one case. On the other hand, there was one case with PUJ obstruction caused by tuberculosis and one case with severe end-stage hydrocalyces that was proved to be tuberculous, too. Details are outlined in table I.

Discussion

IVU and antegrade pyelography are excellent and accurate methods to demonstrate the urinary tract anatomy precisely, as they show more details of pelvicalyceal and ureteric anatomy than do the other imaging methods. But in certain cases, like our patients 2 of which were allergic to the contrast and 19 had either poorly functioning kidney or non-excreting kidneys in spite of double dose contrast and 24 hours delayed films. Three of the 19 patients were subjected to non-conclusive retrograde ureterography as their plain x-ray showed kinked coiled ureteric catheter within the urinary bladder. Helical CT is a more rapid and accurate method to detect the level and possible cause of obstruction¹⁰, but it is not widely used here possibly due to the limited availability of CT and its relatively high cost.

Table 1. Details of the results of the study

Case no.	Age	Sex	Level of obst.	Cause	Side	Degree of hydroneph.
1	60	F	PUJ	Congenital	R	Moderate
2	70	M	Lower 1/3 ureter	Radiolucent stone	R	Moderate
3	35	M	Hydrocalyemia	Congenital	L	Severe
4	50	M	Distal end ureter	Stricture	R	Severe
5	65	M	=	=	R	Severe
6	26	M	PUJ	Congenital	L	Severe
7	25	F	=	Radiolucent stone	R	Moderate
8	50	F	mid 1/3 ureter	Radiolucent stone	L	Moderate
9	55	M	distal end	Stricture	L	Severe
10	56	F	lower 1/3 end	Stricture	R	Severe
11	38	M	failure	?		
12	20	M	PUJ	Congenital	R	Severe
13	50	F	Distal end ureter	Stricture	R	Moderate
14	32	M	Lower 1/3 ureter	Radiolucent stone	R	Moderate
15	12	M	PUJ	Congenital	R	Moderate
16	30	M	mid 1/3 ureter	Stone	L	Moderate
17	58	M	PUJ	Congenital	R	Moderate
18	60	M	Lower 1/3	Stone	R	Moderate
19	45	M	Lower 1/3	Stone	L	Moderate
20	39	M	Mid 1/3	Stone	R	Moderate
21	71	M	Upper 1/3	Stone	L	Severe

The latest imaging technique in this field is T2-weighted MR sequence and MR-urography, but this technique demands the MR machine, which is not widely available in our country, the presence of highly qualified radiologist and well-trained personnel; moreover it is costly and lacks specificity¹¹. On the other hand retrograde pyelography is not risk-free; its complications include infection, ureteric perforation and the risk of anesthesia, furthermore, it needs a highly skilled urologist. Still, it should be reserved for certain cases.

The AGPU under US guidance, albeit mildly invasive, is simple, safe and less costly than the above modalities of investigations. It is also useful in visualizing the urinary tract in order to detect the site and the possible cause of obstruction. Five cases (23.8%) showed lower end or lower 1/3 uterteric strictures probably due to chronic bilharziasis, as this disease is not uncommon in southern Iraq, although their KUBs were normal except one who

showed faint bladder wall calcification which is the single most significant sign of bilharziasis. One of the patients was a 35-year old male, his PAGP showed severe hydrocalyces and a contracted, irregular small renal pelvis suggestive of TB. The latter diagnosis was confirmed by surgery and histopathological examination.

By this technique, urine also can be aspirated before contrast injection, to be sent for laboratory investigation such as cytology and culture and sensitivity. This procedure opacified the renal collecting system and the ureter clearly as shown in figures 1 to 8, which is very important for proper management in cases of obstructive uropathy. It was proved to be useful even in children between 1 month and 8 years of age and others recommend this method before pyeloplasty in cases of congenital pelvi-ureteric obstruction¹².

PAGP is particularly valuable in patients whose US reveal moderate to severe hydronephrosis who have a

contraindication to IVU with no access to CT or MRI and who are not fit for retrograde ureteropyelography.

The number of patients in this study is relatively small because it is only needed in few cases as the majority of patients can be assessed by IVU with or without the need for double dose of contrast and delayed films up to 24 hours. But international literature includes studies that evaluated as low a number as 6 cases; all stressing its value and safety¹².

Not a single complication was recorded. Only one PAGP was failed due to morbid obesity causing poor US image. The only contraindication for this procedure is bleeding tendency and all patients with such a disorder were excluded.

In conclusion, this method of investigation should be considered in those few cases with obstructive uropathy where the diagnosis is critical for management and difficult with the usual imaging procedures.



Fig.1. Left ureteric stricture



Fig.2. Radiolucent stone



Fig.3. Congenital PUJ obstruction



Fig. 4. Distal Rt. ureteric stricture



Fig. 5. Radiolucent ureteric stone



Fig. 6. Radiolucent ureteric stone.



Fig.7. Lt. lower 1/3 radiolucent ureteric stone.



Fig.8. Rt. congenital PUV obstruction.

References

1. Roth CS, Bowyer BA, Berequist TH. Utility of the plain radiograph for diagnosis ureteral calculi. *Ann Emerg Med* 1985; 14: 311.
2. Muttgi A, Williams JW, Nettleman M. Renal colic. Utility of the plain abdominal roentgenogram. *Arch Intern Med* 1991; 151: 1589-1592.
3. Levine JA, Neitlich JD, Vegra M, et al. Identification of ureteral calculi on plain radiographs in patients with flank pain: Correlation with helical CT. *Radiology* 1997; 204: 27-31.
4. Platt JF, Rubin JM, Ellis JH. Acute renal obstruction: Evaluation with intrarenal duplex doppler and conventional US. *Radiology* 1993; 186: 685-688.
5. Erwin BC, Carroll BA, Sommer FG. Renal colic: The role of ultrasound in

- initial evaluation. *Radiology* 1984; 152: 147-150.
6. Aerts P, Van Hoe L, Bosmans H, et al. Breath hold MR-urograph using the HASTE technique. *Am J Roentgenol* 1996;166:543-5.
7. Low RN, Martinze AG, Stienberg SM, et al. Potential renal transplant donors: Evaluation with gadolinium-enhanced MR angiography and MR urography. *Radiology* 1998; 207: 165-172.
8. Smith RC, Rosenfield AT, Choe KA, et al. Acute flank pain: Comparison of non-contrast enhanced CT and intravenous urography. *Radiology* 1995; 194: 789.
9. McGahan JP. International abdominal ultrasound. In: Mittelsteadt CA (ed). *General ultrasound*. New York. Churchill Livingstone, 1992: 1189.
10. Sommer FG, Jeffery RB, Rubin GD, et al. Detection of ureteral calculi in patients with suspected renal colic: Value of reformatted non-contrast helical CT. *AJR* 1995; 65: 509.
11. Mazen S, Ritval LV, Kaarina P, et al. Patients with acute flank pain: comparison of MR urography with unenhanced Helical CT. *Radiology* 2002; 223: 98-105.
12. Rohatgi M, Bajpai M, Gupta DK, et al. Role of ultrasound guided percutaneous antegrade pyelography (USPCAP) in the diagnosis of obstructive uropathy. *Indian Pediatr* 1992; 29(4): 425-31.