Original Article

Magnetic resonance urography in evaluation of cases of clinically proven obstructive uropathy

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Abstract

Introduction: Magnetic resonance (MR) urography comprises an evolving group of techniques with the potential for allowing optimal noninvasive evaluation of many abnormalities of the urinary tract. MR urography is clinically useful in the evaluation of suspected urinary tract obstruction, hematuria, and congenital anomalies, as well as surgically altered anatomy, and can be particularly beneficial in pediatric or pregnant patients or when ionizing radiation is to be avoided.

Aim And Objective: The present study is conducted to evaluate the cases of clinically proven obstructive uropathy using magnetic resonance urography.

Materials and methods: The study was carried out in ASRAM Medical College and General Hospital. A total of 35 patients during JAN 2011 to DEC 2013 having signs and symptoms of obstructive uropathy based on the clinical background was selected. Magnetic resonance (MR) urography was conducted in these patients to study the cause, the degree and the level of obstruction.

Results: In our study with the help of Magnetic resonance (MR) urography it is found in majority of patients the commonest cause of hydronephrosis is calculus diseases. The second common cause is Pelvi-ureteric junction obstruction. Unilateral hydronephrosis is more common than the obstruction bilateral hydronephrosis. Most common location of calculi is in the upper ureter, found in 53.86% of patients suffering from calculus diseases.

Keywords: Magnetic resonance (MR) urography, UPJ – Uretero pelvic junction, Obstructive uropathy.

Introduction

Magnetic resonance (MR) urography comprises an evolving group of techniques with the potential for allowing optimal noninvasive evaluation of many abnormalities of the urinary tract. MR urography is clinically useful in the evaluation of suspected urinary tract obstruction, hematuria, and congenital anomalies, as well as surgically altered anatomy, and can be particularly beneficial in pediatric or pregnant patients or when ionizing radiation is to be avoided.

Standard intravenous urography (IVU) has long been used to evaluate the urinary tract. Over the years, use of excretory urography has become less common as a result of cross sectional imaging techniques but it has remained in general use because of its low cost, availability and ready acceptability by urologic surgeons. Despite these trends IVU can produce problems in patients who tolerate iodinated contrast media poorly or have renal failure. The use of ionizing radiation may also be an issue especially in children and young adults. Developments of magnetic resonance imaging (MR) of static fluid has led to the emergence of MR urography (MRU) as a potential imaging technique of the urinary system. The accuracy in the detection of urinary tract dilatation and the localization of the level of obstruction is excellent. MR Urography has been shown to be highly sensitive to the diagnosis of urinary tract obstruction. Demonstration of peri-nephric and peri-ureteric edema in obstruction helps in the differentiation of acute from non-acute urinary obstruction.

The main purpose of our study was to evaluate the role of MR-Urography in detecting the cause, the degree and the level of obstruction in cases of the hydronephrosis and hydrourer. This was done in respect to the cause, the site and level of obstruction, extent of hydronephrosis along with examination of the distal urinary tract.

Materials And Methods

STUDY SETTING: The study was carried out in ASRAM Medical College and General Hospital.
SAMPLE SIZE: A total of 35 patients having signs and symptoms of obstructive uropathy based on the clinical background was selected.

STUDY PERIOD: JANUARY 2011 to DECEMBER 2013.

Case selection

Cases were selected after elaborate discussion with them and after getting informed consent. The most important criteria for case selection were clinically suspected cases of obstructive uropathy.

Inclusion criteria are:

a) Patients presented with acute urinary symptoms like renal colic, frequency, urgency, dysuria and haematuria.

b) A second criterion was biochemical abnormalities. Some of the important biochemical markers are serum and urine calcium, uric acid, electrolytes, urea, creatinine, urinary pH, volume, oxalate, citrate and any history of chronic drug usage were considered.

c) Third criterion was cases with non-conclusive radiological investigations like Plain KUB radiograph or USG abdomen can hardly diagnose patients who have mid-ureteric calculi or ureteric stricture.

Exclusion criteria are:

a) Patients with metallic implants in their bodies.

b) Patients with prosthetic heart valves or pace-marker

c) Patients with suspected metallic foreign body and any organ of the body, especially eye.

d) Those cases of obstructive uropathy where the cause is distal to the urinary bladder, e.g., in the urethra or in the prostate.

E) Some cases are contraindicated for radiography, specially female patients in child bearing age.

Some specific data regarding 1.5 Tesla MRI equipment in our study were:

- Main magnetic field strength = 1.5 Tesla.
- FOV (Field of view) = 15 cm.
- Maximum magnetic field (frequency) = 1.500000 T
- Unchanged magnetic field at null = 1.500000 T

Results and discussion:

Out of 35 cases, 14 cases were female (40%) and rest 21 cases were male (60%). Majority of the patients were in the age group of 21 - 30 years and 31-40 years i.e.45.71%.

The causes for the dilated collecting system in our study were mainly classified into 2 broad groups - Calculus diseases (37.14%) and non-calculus disease (62.86%). Patients with calculi were further classified according to the site of calculus.

CALCULUS DISEASE

Out of total 35 patients, 13 patients with dilated urinary tract had calculi in their urinary tract.

Out of these 13 patients, 08 patients (61.54%) had ureteric calculi and 05 patients (38.46%) had renal calculi. The most common presentation was only pain abdomen (46.16%) and almost all cases were male (84.62%). Ureteric calculi were proved to be a very common cause of hydronephrosis and hydroureter. Renal calculi, if small almost always asymptomatic and do not cause hydronephrosis and hydroureter.

Magnetic resonance urography in calculus diseases:

In our study, MR Urography could be able to identify all of the 13 cases of urinary tract calculi, with exact location of the calculus, size of the calculus and the uphill pressure effects of the obstruction. The degree of dilatation, i.e. hydronephrosis and hydroureter was found to be directly related to the size of the calculus. The largest calculus found was of 65 mm and the smallest calculus was 6 mm. Most of the calculi were found in the upper ureter, most commonly at the pelvi-ureteric junction.

NON-CALCULUS DISEASES

Out of 35 total cases studied, 22 cases (62.85%) were found to have other causes than calculi. Among the other causes, commonest cause is the Pelvi-ureteric junction obstruction, which comprises 17.14% of the total study group.

Magnetic resonance urography in pelvi-ureteric junction obstruction

Out of 22 cases of non-calculus urinary tract obstruction, 06 cases (17.14%) were found to have congenital pelvi-ureteric junction obstruction and this observation is emphasized in Das Text book. Out of these 06 cases, only two were male, rest all four patients were female patients.

In our study, almost all cases of Pelvi-ureteric junction obstruction were found to be unilateral. Out of total 06 cases, only one cases was bilateral (16.66%), rest five were unilateral, of which the common site was right side (50%).
Most patients (66.71%) with Pelvi-ureteric junction obstruction were presented with moderate degree hydronephrosis. The most common symptom among them was only pain abdomen (83.33%). None of the patients complained of urinary problem.

**Magnetic resonance urography in stricture ureter:**

Out of the total 35 cases, 02 cases were found to have ureteral stricture (5.71%). Out of the 02 cases, all cases were female (100%). No cases were found to have congenital ureteric stricture, which is extremely rare and thought to happen due to intra uterine ischaemia, thereby supporting the previous literature.

In our study, out of 02 cases of stricture ureter, all (100%) showed the mid ureteric stricture. No case was found to have lower ureteric stricture.

**Magnetic resonance urography in ureterocele:**

Out of the total 35 patients, only 03 patients (08.57%) showed the evidence of ureterocele are in the age group of 11 - 40 years andtwo were females.

Out of these 03 cases, two cases (66.67%) showed the evidence of mild degree dilatation of pelvi-calyceal system and the other one showed moderate degree dilatation it is supported by standard literature.

**Magnetic resonance urography in multiple renal cystic diseases:**

Out of 35 patients, 04 cases were found to have multiple renal cysts with hydronephrosis and hydroureter. The typical features of renal cysts were found on MR Urography, like rounded homogeneous mass with imperceptibly thin wall and sharp interface with parenchyma.
Magnetic resonance urography in malignant diseases:
Out of total 35 cases, 03 patients (08.57%) were found to have malignancy of the urinary bladder, ureteral orifice and distal ureters were involved. Magnetic Resonance Urography could be able to demonstrate the invasion into the lower ureter as well. The exact character of the lesion was depicted better with the exact site of origin and extent. Thus MR Urography is the investigation of choice in the diagnosis of extrinsic malignant masses infiltrating the ureter.

Figure 4: MRUrogram image of 60yr old male shows huge hypo intense filling defect (arrow) in right side of bladder, partially infiltrating VUJ (arrowhead).

Conclusions
Hydronephrosis is more commonly unilateral (80%) and the commonest age group of presentation is between 21-30 years. The commonest cause of hydronephrosis is calculus diseases found in 37.13% of patients. The second common cause is Pelvi-ureteric junction obstruction found in 17.14% of patients.

The commonest cause of bilateral hydronephrosis is calculus disease (42.85%), followed by Pelvi-ureteric junction obstruction (14.28%). Majority of bilateral hydronephrosis are presented with moderate degree obstruction (71.42%). Most of the patient with calculi presented with mild hydronephrosis, 46.15%. Most common location of calculi is in the upper ureter, found in 53.86% of patients suffering from calculus diseases. Most of the calculus is found on the right side, found in 69.24% of patients suffering from calculus diseases. Thus MR Urography plays an important role in evaluation of cases of clinically proven obstructive uropathy.

References