UpDated Role Of Magnetic Resonance Urography In Evaluation Of Obstructive Uropathy In pediatrics

Essay

Submitted for partial fulfillment
of Master degree in radiodiagnosis

Presented By

Eman Ghazy Ibrahim El Shenawy

M.B.B.CH

Supervised By

Prof. Dr.Rania Ali Maorouf

Assistant professor of Radiodiagnosis
Faculty of Medicine
Ain Shams University

Dr. Mona Ali Nagi

Lecturer of Radiodiagnosis

Faculty of Medicine
Ain Shams University

2017

بسم الله الرحمن الرحيم

قالوا

سبحانك لا علم لنا
إلا ما علمتنا إنك أنت
العليم الحكيم

صدق الله العظيم

سورة البقرة الآية: ٣٢

List of Contents

Title	Page No.

List of Tables

List of Figures

Fig. No.	Title	Page No.

List of Abbreviations

Abb.	Full term

Abstract

MRU has intrinsic high soft tissue contrast resolution and multiplanar 3D reconstruction capabilities, without the use of radiation. Additionally, MRU allows quantification of numerous renal functional parameters including transit times, an index of glomerular filtration rate (GFR), and differential renal functions. To date, MRU may serve as the most comprehensive and definitive study in the evaluation of urinary tract obstruction, complex genitourinary anomalies, and infection.

Although existance of few limitations in MRI such as the need of sedation for young children, inability of sedated patients to completely empty their bladder, small renal calculi may be not seen in MR so CT remains the gold standard for the detection of small urinary tract calculi and new recommendations of making every effort to avoid administering gadolinium based contrast material in patients with moderate to severe renal insufficiency (GFR <30 mL/min)to avoid linkage between the disorder nephrogenic systemic fibrosis (NSF) to gadolinium administration, there has been great expectation that dynamic contrast enhanced MRI would be able to substitute to both renal ultrasonography and scintigraphy. It has the ability to provide very detailed anatomical description combined with a functional evaluation and identifying other pathology that could influence prognosis.

Finally, MR urography represents the next step in the evolution of uroradiology in children by combining superb anatomic imaging with quantitative functional evaluation in a single examination that does not use ionizing radiation**.**MR imaging has inherently greater soft-tissue contrast than other imaging techniques.

Keywords: ultrasonography- dynamic contrast material–enhanced- Magnetic Resonance Urography In Evaluation

INTRODUCTION

Urinary tract obstruction is a relatively common problem. The obstruction to urinary flow may be acute or chronic, partial or complete, unilateral or bilateral, and may occur at any site in the urinary tract.Obstructive uropathy with resultant hydronephrosis is the eventual outcome of most urological disorders. In patients with normal renal function, excretory urography(IVP) remains the investigation of choice for imaging the detailed anatomy of the pelvicalyceal system and ureters ***(Rose and Black,1988).***

In patients with abnormal renal function, IVP is contraindicated and the traditional methods of diagnosing obstructive uropathy start with noninvasive plain abdominal X-ray (KUB) combined with abdominal gray-scale ultrasonography (US).Alternative methods of visualizing the upper urinary tract, such as retrograde or antegrade pyelographyor ureteropyeloscopy, are invasive. In the last few years some recent noninvasive investigations have been introduced for the diagnosis of obstructive uropathy as non-contrast helical computerized tomography (NCCT) ***(Vieweg et al., 1998)*** and magnetic resonance urography (MRU) ***(Shokeir et al., 2004).***

The recent development of fast sequences has extended the use of MRI to antenatal diagnosis.MRI can accurately show many urinary tract anomalies in third-trimester fetuses. It may bea useful complementary tool in the assessment of bilateral urinary tract anomalies of fetuses, particularly in cases with inconclusive sonographic findings ***(Cassart et al., 2004).***

The most common MR urographic techniques for displaying the urinary tract can be divided into two categories: static-fluid MR urographyand dynamic MR urography.

Static-fluid MR urography allows the study of the tract without the need of a paramagnetic contrastagent, offering an image similar to that obtained during IVU. Furthermore, MRU allows the evaluation of the tissues adjacent to the urinary tract, providesinformation about the state of the renal parenchymaand abdominal organs, and reliably assesses nonexcreting kidneys, increasing the quality of themorphologic study when compared with IVU ***(Muthusami et al., 2013).***

Dynamic pulse sequences performed after injection of an intravenous bolus of gadolinium chelates(ie, dynamic contrast material–enhanced [DCE] MR urography) have been used to calculatethe percentage of split renal function from time-intensity curves ***(Claudon et al., 2014).***

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 inpediatric or pregnant patients or when ionizing radiation is to be avoided ***(Leyendecker et al., 2008).***

AIM OF THE WORK

The aim of this work: to evaluate updated role of magnetic resonance urography in evaluation of obstructive uropathy in pediatrics.

Chapter 1

ANATOMY OF THE URINARY SYSTEM

The structure of the urinary system include the kidneys,ureters,urinary bladder and urethra.Those that are located within the abdomen are the kidneys and ureters. The urinary bladder and urethra are located in the pelvis ***(Anderson and Michel, 2011).***

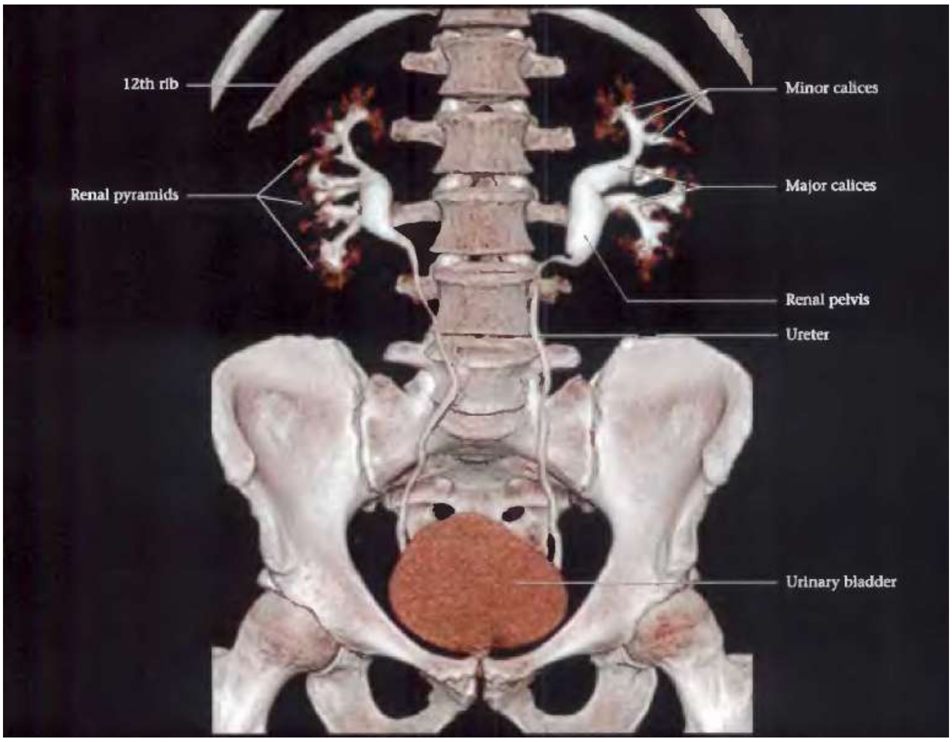
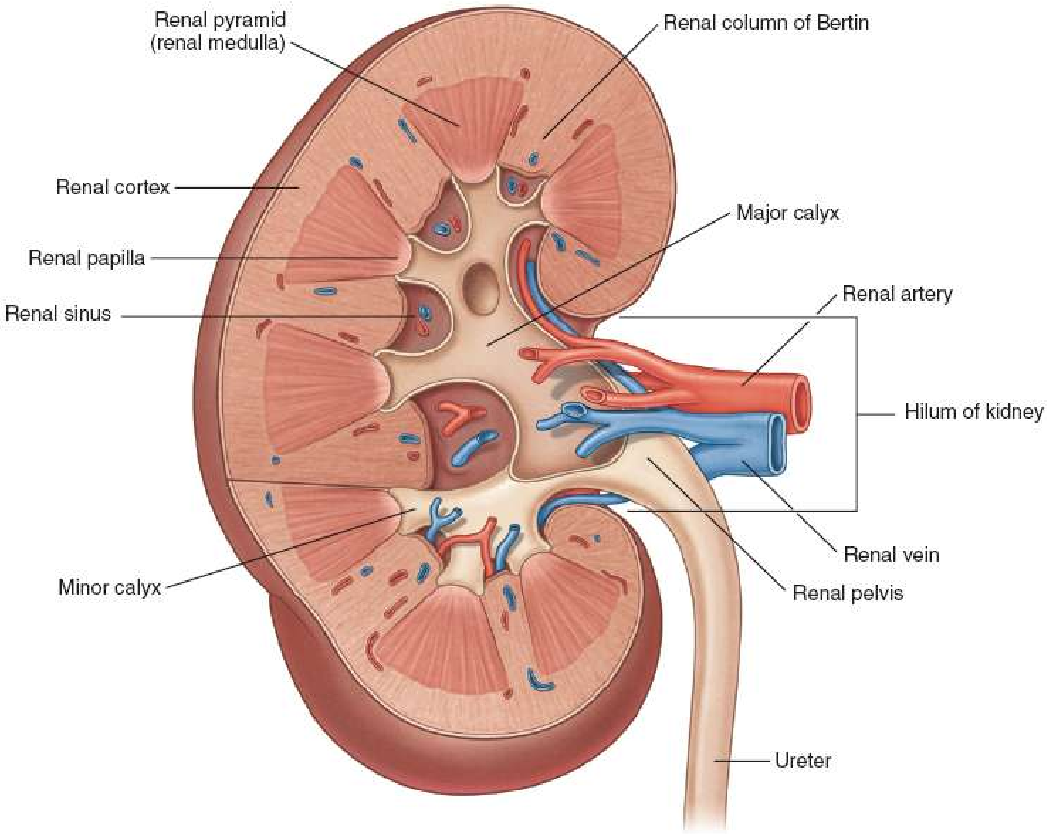


Fig (1.1): the urinary system include the kidneys,ureters,urinary bladder and urethra ***(Federle et al., 2016).***

The Kidneys

The kidneys are located at the posterior wall of the abdomen in the retroperitoneal region. They are located on each side of the spine between T12-L4 and are embedded in perirenal fat.The right kidney is located slightly lower than the left due to the large size of the liver. The external or lateral border is convex, whereas the internal border is concave, and contains a deep notch, which is known at the hilum of the kidney.

The kidney is covered by a fibrous capsule, which is closely applied to the renal cortex. The renal cortex forms the outer third of the kidney. Columns of cortex(columns of Bertin)extend medially into the medulla between the pyramids. The renal medulla lies deep to the cortex and forms the inner two thirds. It contains the renal pyramids, which are cone shaped, with the apex(the papilla)pointing into the renal hilum. The medulla rays run from the cortex into the papilla. Each papilla projects into the cup of renal calyx which drains via an infundibulum into the renal pelvis. The renal pelvis is funnel shaped structure at the upper end of ureter. It normally divides into two or three calyces, upper and lower calyces and in some cases a third calyx between those at each pole. Each major calyx divides into two or three minor calyces, which have a cup shape, indented by the apex of the accompanying renal pyramid. The renal hilum contains the renal pelvis, the renal artery,the renal vein and lymphatics, all of which are surrounded by renal sinus fat ***(Butler et al., 2012).***



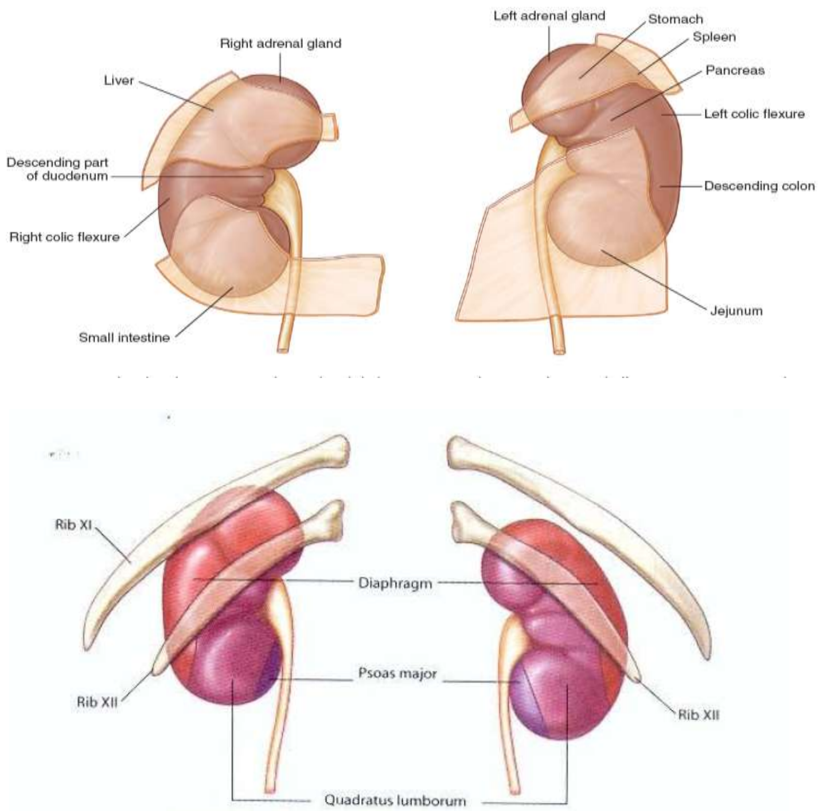
Fig(1.2): Internal structure of the kidney ***(Drake et al., 2015).***

Relations of the kidneys:

The right kidney: Anteriorly, has a relation with the inferior surface of the liver with peritoneal interposition and with the second portion of the duodenum without any peritoneal interposition since the second portion of the duodenum is retroperitoneal ***(Quaia, 2014).***

The left kidney: Anteriorly, has a relation with the pancreatic tail, the spleen, the stomach, the ligament of Treitz, small bowel, the left colic flexure and left colon. Over the left kidney, there are two peritoneal reflections, one vertical corresponding to the splenorenal ligament(connected to the gastrodiaphragmatic and gastrosplenic ligaments)and one horizontal corresponding to the transverse mesocolon ***(Quaia, 2014).***

Posteriorly, both kidneys present a relationship with the diaphragm, the lateral margin of the psoas muscle, the aponeurosis of the transverse abdominis muscle, and the lumber muscle. **Superiorly**, both kidneys have a relation with the adrenal glands ***(Quaia, 2014).***



Figure(1.3): (a) Scheme of the anterior anatomical relations of the kidneys: right and left (**b**) Scheme of the posterior anatomical relations of the kidneys: right and left ***(Drakle et al., 2014).***

Fascial spaces around the kidneys

A true fibrous capsule surrounds the kidney. This, in turn, is surrounded by perirenal fat, which separates the kidney from the surrounding organs including the adrenal gland. A condensation of fibroareolar tissue around this fat forms t**he renal fascia**. Thus the retroperitoneum is divided into three compartments: the **perirenal space** within the renal fascia, and