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Original Article

Role of static fluid MR urography in detecting post urinary diversion complications

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ABSTRACT

Aim of work: The aim of the study was to assess the diagnostic performance of static MR urography in detection of post cystectomy complications & the ability of static fluid MR urography in visualization of urinary tract segments.**Material & methods:** We prospectively reviewed 21 MR urograms with urinary diversion. The most common surgical procedures included Ileal conduit & Ileocecal neobladder diversion.**Material & methods:** Magnetic resonance urography examinations were performed with 1.5-T MR scanners. T2 weighted (static fluid) MR urography techniques were done, in addition to conventional T1- and T2-weighted axial and coronal sequences. Urinary tract was divided in different parts: pelvicalyceal systems, upper, mid and lower ureteric segments & the reservoir or conduit. Imaging features of the urinary collecting systems were evaluated for their visualization and complications detection.**Results:** T2-weighted MR urography could demonstrate 95% of urinary tract segments & together with conventional MR sequences all urinary tract segments can be visualized. Urinary diversion related complications were encountered included in 15 patients (71.4%) & no urological complications were seen in 6 patients (28.6%).**Conclusion:** Comprehensive T2-weighted MR urography is an effective imaging method for the visualization of the urinary system and detection of early and late postoperative complications in patients with urinary diversion.© 2017 Alexandria University Faculty of Medicine. Production and hosting by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

1. Introduction

Bladder cancer represents 2–4% of all malignancies. It is a disease of elderly with a peak incidence during the seventh decade. Bladder cancer is three times more common in men than women.¹

Bladder cancer are divided into superficial & muscle invasive bladder cancer. Surgery plays major role in management of invasive urinary bladder cancer. Radical cystectomy is the standard operation for treatment of muscle invasive cancer bladder (stage T2 or higher) & superficial bladder carcinoma resistant to local treatment.²

The expectations of post radical cystectomy has evolved from simple diversion to body preserving continent urinary diversion.³

Radical cystectomy is a major operation. Various early and late complications may be seen following urinary diversion procedures.⁴

Strict post-operative radiologic follow up starting at early post-operative period to assess integrity of diversion & detection of possible early complications. Later follow ups are needed to assess the capacity of the reservoirs, evaluation of upper urinary tract changes & detection of potential late complications of the procedure.¹

No post urinary diversion follow-up imaging protocols have been established. Different imaging modalities have been described as excretory urography, fluoroscopy-guided retrograde contrast studies, Ultrasonography & Computerized tomography urography.⁵

MR urography is an evolving and promising technique in the evaluation of the urinary tract. MR urography is currently

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considered the method of choice for imaging of the renal parenchyma and the collecting systems in patients who cannot undergo routine radiographic studies such as patients with impaired renal function.⁶

An MRI examination of the urinary collecting system is performed by two main methods: static-fluid urography with T2-weighted sequences, as used for MRCP, and excretory urography with T1-weighted sequences after IV contrast administration.⁷

T2-weighted MR urography technique can visualize static fluids. It does not depend on renal function & does not require intravenous (I.V.) contrast so it can be used to evaluate urinary systems in poorly functioning kidneys.⁵

Static MR urograms are obtained heavy T2-weighted sequences that exploit the long T2 relaxation time of urine. Sequences used closely resemble those used for T2-weighted MR cholangiopancreatography (MRCP). Heavily T2-weighted static-fluid MR urograms provide similar images to those obtained from conventional excretory urograms giving an overview of the urinary tract & quickly identifying the level of urinary tract obstruction.

Further conventional MRI sequences are needed to characterize the cause of obstruction.⁸

The aim of the study was to assess the diagnostic performance of static MR urography in detection of post cystectomy complications & the ability of static fluid MR urography in visualization of urinary tract segments (Fig. 1).

2. Materials and methods

Institutional review board approval was obtained for this prospective study. The requirement for informed consent was waived.

21 patients underwent radical cystectomy & urinary diversions were examined using a 1.5 MR scanner (Acheiva, Philips Medical

Systems, Netherlands) by using phased-array body coils. Our source was the surgical oncology department which referred urinary diversion patients presenting with a clinical complaint (e.g. decreased urine output).

The study was conducted at a specialized oncology Institute in the period from February 2013 to April 2014.

The patient's age ranged from 34 to 79 years old.

Estimated glomerular filtration rate (eGFR) values of all patients were calculated before the MR urography study using the Modification of Diet in Renal Disease Study Group equation in case of contrast injection was needed.

Demographics of the patients are illustrated in Table 1.

MRI examinations started with localizing sequences & continued with T2-weighted MR urograms obtained by single thick slab or maximum-intensity-projection (MIP) views generated from multiple thin slice three dimensional (3D) T2-weighted images. Conventional MRI sequences including axial and coronal T1 & T2-weighted were done if an abnormality was seen.

Single-shot fast spin-echo images were obtained each in 10 s, which allows multiple images of the urinary tract in different projections to be obtained sequentially in a relatively short period of time. Projections were obtained in coronal plane & each side of the urinary tract in sagittal plane.

3D high resolution T2 sequence is obtained via acquisition of multiple overlapping slices with slice thickness 1 mm & 0 gap then images are processed using Maximum intensity projection (MIP) parallel to vertical axis of the urinary tract with 10–20 degree angulation.

MR urography sequences allowed localization of the level and degree of obstruction (Table 2).

For characterization of the presumed pathology conventional MR sequences were used axial T1 & T2 WIs as well as coronal T1 & T2 WIs.

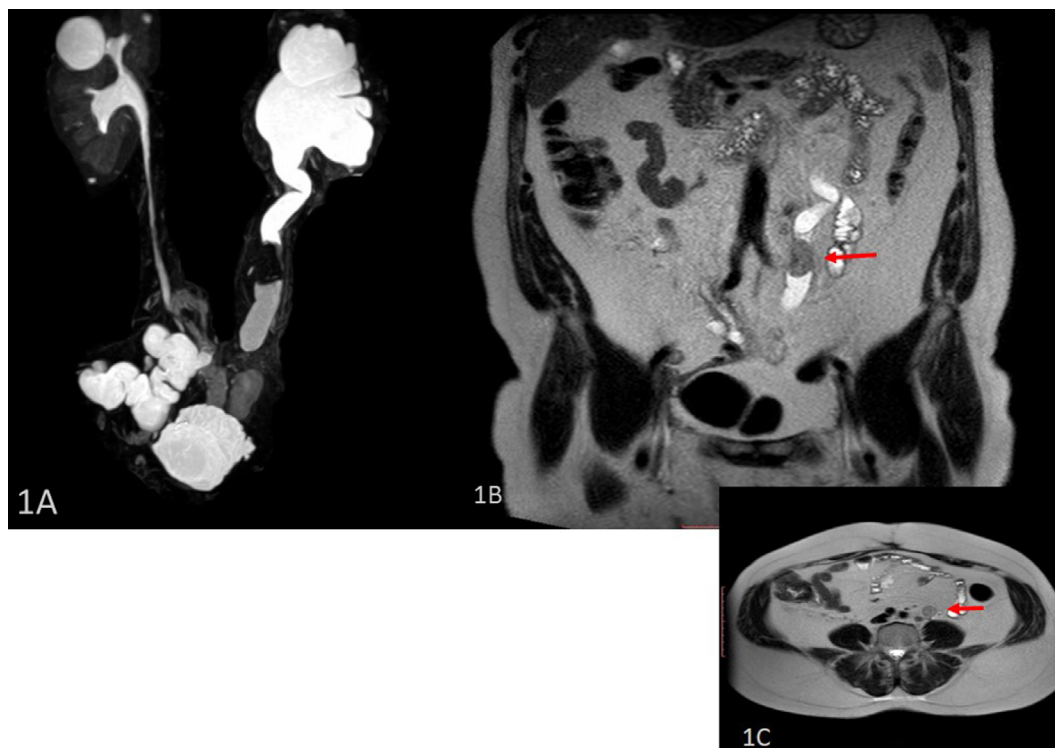


Fig. 1. A 54 years old male with urinary bladder cancer (Invasive TCC, grade III), underwent radical cystectomy and urinary diversion (ileal conduit). Follow up MRU 2 years postoperative was done. (1A) Coronal maximum intensity-projection MR urography images obtained from three-dimensional (3D) T2 turbo spin echo, (1B) coronal T2 WI & (1C) axial T2 WI sequences show a left intra-ureteric defect elicited in conventional MR sequences as soft tissue lesion (arrows) likely meta-synchronous Lesion (proved pathologically to be TCC grade III) with subsequent hydroureter & hydronephrosis .A pelvic cystic fluid collection is also noted.

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