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Case report

Vesicouterine fistula: MRI diagnosis

J.M. Murphy¹, G. Lee², S.D. Sharma³, A. Doble², D.J. Lomas¹

¹ Department of Radiology, Addenbrooke's Hospital and University of Cambridge, Hills Road, Cambridge CB2 2QQ, UK

² Department of Urology, Addenbrooke's Hospital and University of Cambridge, Hills Road, Cambridge CB2 2QQ, UK

³ Department of Urology, Peterborough NHS Trust Hospital, Peterborough PE3 6DA, UK


Dr. Shanggar a/l Kuppusamy
Pensyarah (Urologi)
PTj Surgeri
Pusat Perubatan Universiti Malaya

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Abstract. A case of vesicouterine fistula in a young woman following caesarean section is presented. The diagnosis was established successfully using heavily T2-weighted MRI which clearly demonstrated fluid within the fistula, obviating the need for conventional radiographic contrast examination.

Key words: MRI – Fistula – Pelvis

Introduction

Vesicouterine fistulae are rare and typically occur during pregnancy as a complication of delivery. They may be clinically overt with urinary incontinence or relatively occult with intermittent cyclical haematuria. Imaging may assist the diagnosis of occult cases and hystero-graphy or cystography have been used successfully to demonstrate such fistulae.

Magnetic resonance imaging of abdominal and pelvic fistulae has been limited mainly to the perineum owing to the available techniques [T2-weighted multi-shot rapid acquisition with relaxation enhancement (RARE), T1-weighted spin echo] requiring an imaging time of several minutes. Recently, rapid heavily T2-weighted single-shot RARE sequences have been widely applied for imaging fluid-filled structures, such as the salivary ducts, cerebrospinal fluid, the urinary tract and pancreatic and biliary ducts [1, 2, 3, 4, 5]. We report the use of this technique in a patient with a vesicouterine fistula not demonstrated by prior imaging or cystoscopy.

Case report

A 33-year-old female patient presented with a 3-year history of cyclical haematuria following the resumption of menstruation after the birth of her second child by

caesarean section. Menstrual bleeding was associated on each occasion with 2–3 days of haematuria and occasional dysuria and frequency. Cystoscopy, performed 1 year after the onset of symptoms, revealed hyperaemia of the bladder wall but no evidence of endometriosis. Danazol 200 mg twice daily, which was commenced for possible endometriosis, controlled the cyclical haematuria until it had to be discontinued due to side effects of hirsutism and weight gain. Physical examination was normal.

A repeat cystoscopy demonstrated an 8- to 10-mm mucosal-lined diverticulum at the dome of the bladder but no evidence of endometriosis or a fistula. An intravenous urogram and CT of the pelvis were also performed and demonstrated no significant abnormality. The patient continued to have symptoms and an MRI was performed. A whole-body 1.5-T system (GE Signa 5.6, General Electric, Milwaukee, Wis.) was used with a pelvic phased-array coil. Initial sagittal images (fast spin echo; TR 3500 ms, TE 85 ms, matrix 256 × 256, 5 mm/2.5 mm, FOV 24 cm, acquisition time 3 min, 55 s) demonstrated a retroverted uterus and suggested a possible fistula between the level of the uterine scar and the bladder dome (Fig. 1 a). This was confirmed with heavily T2-weighted single-shot RARE sagittal images (TR infinite, TE 850, matrix 256 × 256, FOV 24 cm, slice thickness 10 mm, no. of excitations 0.5, acquisition time 2 s/section) which clearly demonstrated a vesicouterine fistula (Fig. 1 b). In retrospect this was at the site of the diverticulum observed at cystoscopy.

The fistula was closed surgically via a transperitoneal approach interposing omentum between the bladder and the uterus. The patient recovered well post-operatively and remains asymptomatic.

Discussion

Vesicouterine fistulae, which occur usually post-lower-segment caesarean section, are the least common fistulae that affect the female genital tract. Tancer reviewed

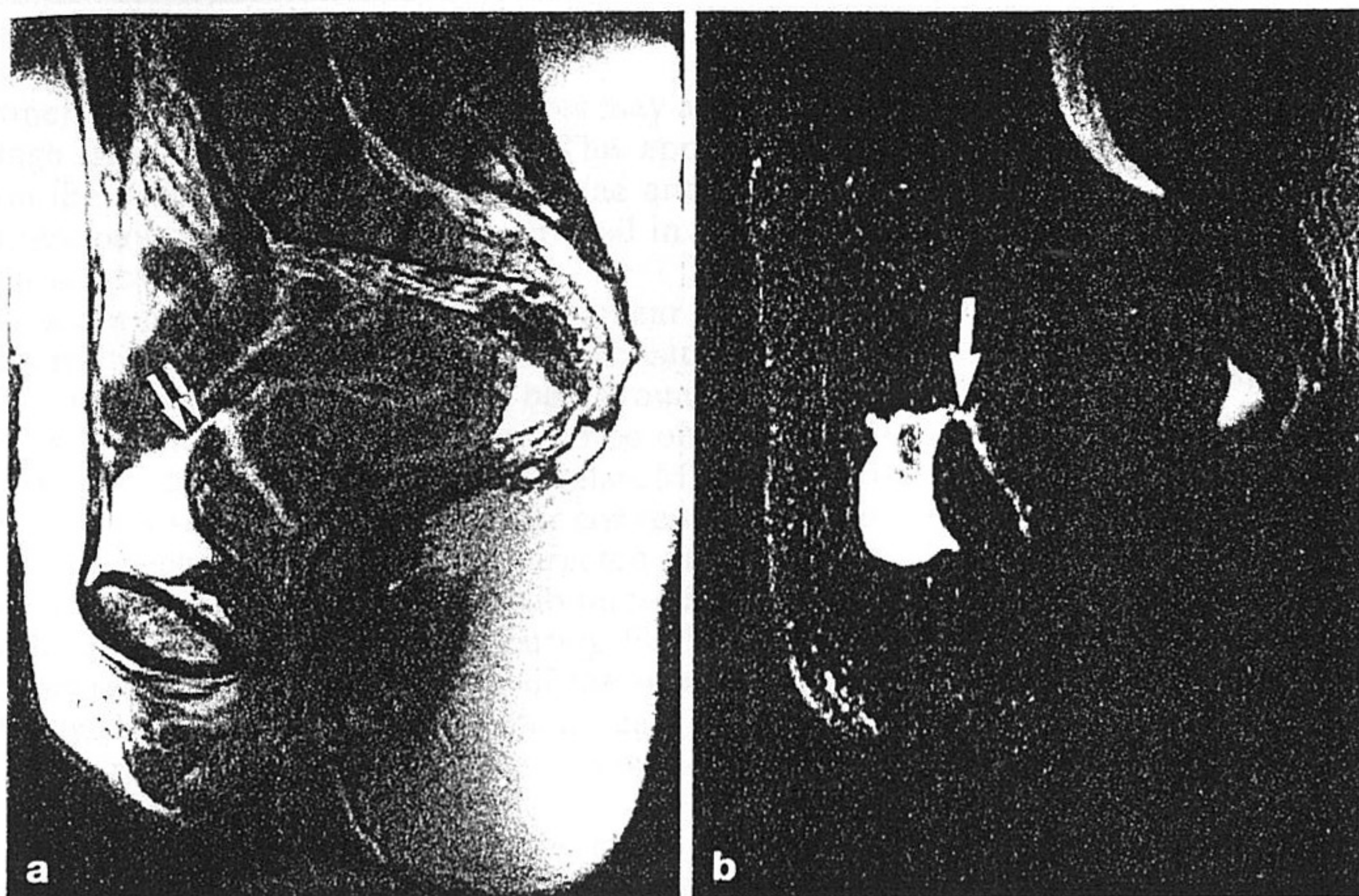


Fig. 1 a, b. Pelvic sagittal sections at the same location with **a** conventional T2-weighting (FSE TR 3500, TE 85, 256 × 256, 5 mm/2.5 mm, FOV 24 cm, acquisition time 3 min, 55 s) demonstrating the retroverted uterus and probable lower uterine defect (*arrows*), and **b** extended T2-weighting (TR infinite, TE 850, 256 × 256, FOV 24 cm, slice thickness 10 mm, NEX 0.5, acquisition time 2 s/section) confirming fluid within a vesico-uterine fistula (*arrow*)

92 cases of vesicouterine fistulae reported in the world literature between 1908 and 1986 [6]. Since 1947 vesicouterine fistulae are most commonly associated with bladder injury during a lower-segment caesarean section. In most cases the related bladder injury at caesarean section is occult and the vesicouterine fistula only becomes apparent post-operatively. Infection of the endometrium, urinary tract or peritoneum does not appear to be a major aetiological factor [6]. Bladder injury during caesarean section may arise as a result of blunt or sharp dissection between the bladder wall and lower uterine segment, and the inclusion of the bladder wall in sutures placed when closing the lower uterine segment [6]. Vesicouterine fistulae have also been reported following obstructed labour with rupture of the uterus and bladder [7] and following intrauterine contraceptive device placement [6, 8].

Patients with vesicouterine fistulae usually present with total urinary incontinence, cyclical haematuria or both [6, 7]. The presence or absence of urinary incontinence is related to the level of injury, urinary incontinence resulting if the level of the vesicouterine fistula is below the internal os [7].

Several invasive techniques have been used to demonstrate vesicouterine fistulas. Iloabachie et al. demonstrated the vesicouterine fistula directly in each of nine patients by instilling dilute methylene blue into the bladder through the urethra and directly observing the dye flowing into the vagina through the cervical os [7]. A probe or catheter has been passed at cystoscopy through the fistula, down through the cervix into the vagina. Radiographically, both cystography and hystero-graphy have been successfully used to demonstrate vesicouterine fistulae. Tancer found in his review of published reports that hystero-graphy was the most reliable diagnostic technique [6]. Intravenous urography has been reported to demonstrate contrast medium entering

the vagina but found to be of no value in distinguishing vesicovaginal and vesicouterine fistulae [7] and in our case was unhelpful. There are few ultrasound reports, although Huang et al. have demonstrated such a fistula track containing hyperechoic air bubbles on transvaginal ultrasound [9].

To our knowledge, the appearances of vesicouterine fistula diagnosed at MRI have not been reported. Perineal fistulae are, however, well demonstrated using either fat-suppressed T2-weighted multi-shot RARE sequences (FSE, TSE) or pre- and post-gadolinium T1-weighted sequences [10–14]. Elsewhere in the abdomen MR imaging of fistulae has been limited by artefacts secondary to physiological motion (e.g. respiration, cardiac pulsation, bowel peristalsis) which commonly lead to image degradation in both conventional and RARE-based imaging where the imaging time extends over several minutes.

More recently, heavily T2-weighted single-shot RARE sequences which utilise long echo times (150–1000 ms) have been used to delineate fluid-filled structures [1–5]. These techniques combine two important features: firstly, rapid acquisition to prevent motion artefact, and secondly, an extended echo time creating fluid-based contrast and allowing projection or slab images to be obtained. Initial multi-shot RARE sequences could generate images within a 16-s breath-hold but more recently single-shot half Fourier RARE imaging has become feasible allowing data acquisition in less than 1 s per section. This is rapid enough to prevent peristaltic motion of bowel or bladder filling degrading the images.

An extended echo time of > 500 ms combined with fat suppression generates images in which the contrast is based primarily on long T2 value fluid and the signal from other tissues, including artefacts, decays away. This obviates the problem on shorter TE examinations

where neural and vascular structures may also generate high signal in the images [10,13]. This approach relies on the presence of fluid in the fistulae and false negatives may occur when there is no fluid in the track or air is present.

Even simple fistulae may be curvilinear structures in three dimensions, similar to the pancreatic duct, and use of a thick slab with effective background tissue suppression allows projection images to be obtained demonstrating the full extent of such fistulae. Magnetic resonance has several advantages over conventional radiographic techniques by allowing targeted projection images to be obtained by varying slab thickness and plane of acquisition to avoid any obscuring fluid-filled structures resulting in a clear image of the fistula. Alternatively, multiple contiguous sections can be obtained where required to provide three-dimensional information about complex fistulae.

This report demonstrates that rapid heavily T2-weighted MR imaging can be utilised successfully to diagnose an occult vesicouterine fistula. The technique is simple, non-invasive and offers several advantages over other methods.

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