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CASE REPORT

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Magnetic resonance vasography using paramagnetic contrast agent – a case report

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Azoospermia is recognised in 10–15% of men diagnosed due to infertility. Obstructive azoospermia occurs in 20–40% in this group of patients and it is characterised by normal FSH values, testes of normal size, and epididymal enlargement.

Obstructive azoospermia is a common cause of male infertility. Several imaging techniques are used to assess the patency of the seminal tract, including the following: scrotal ultrasound, transrectal ultrasound (TRUS), and scrotal magnetic resonance imaging (MRI), with vasography being considered a gold standard. However, each of these methods has its limitations, and no single test can provide a comprehensive diagnosis.

This article describes an attempt to combine high-resolution multiplanar MRI with functional evaluation of the patency of the seminal tract of classical vasography. A detailed description of the level of spermatic duct obstruction may help decide whether the condition qualifies for surgical treatment.

Key Words: vasoMR ‹› vasography ‹› obstructive azoospermia ‹› experimental MRI technique

CASE REPORT

A 27-year-old male diagnosed with obstructive azoospermia was referred for a scrotal magnetic resonance imaging (MRI) scan.

Anamnesis: in childhood, the patient has been diagnosed with agenesis of the right kidney, and at 8 months of age right inguinal hernia surgery was performed. In addition, right-sided epididymitis was noticed twice at the age of 21 years.

Diagnosis of azoospermia was established according to the European Association of Urology guidelines [1]. Physical examination of the testicles and penis, as well as additional exams, such as semen culture, serum hormone levels, and karyotype, did not reveal any abnormalities. In addition, CFTR gene mutations and Yq microdeletions were excluded. A biopsy of both testicles (TESA – testicular sperm aspiration, large needle) was performed. The pathologist reported advanced spermatogenesis in both testes – level 9 according to Johnsen score (1970), which confirmed the clinical diagnosis of obstructive azoospermia.

MRI of the scrotum was performed on a 1.5T Siemens Magnetom Sola (Siemens Medical) machine using a standard protocol. The exam revealed intact right vas deferens with visible lumen in the abdominal part, while the lumen in the inguinal canal was barely visible, suggesting the possibility of an obstruction (Figure 1). Left vas deferens and seminal vesicles were not visible, presumably due to aplasia. Both testicles and epididymis were unremarkable.

To minimise the volume of gadolinium-based contrast agent used during vasography, several diluted contrast solutions were tried. Solutions of Gadovist (gadobutrol, 1 mmol/ml) were prepared using 0.9% saline in proportions from 1:100 to 1:1000 in increments of 1:100, injected into the phantom

and analysed in the same MRI machine and using the same sequences as were later used during the exam. Dilution of 1:600 was determined to be the lowest that still produced a diagnostic image.

Subsequently, vasography under MRI was performed to assess the patency of the right vas deferens. Following local anaesthesia a small incision was made on the skin on the right side of the scrotum, and the right vas deferens was dissected. After hemivasotomy with an ultrasharp knife, a 20-gauge IV cannula (angiocatheter) was inserted into the lumen of vas deferens, affixed to the skin with sutures, and flushed with a bolus of saline. Dissection on the left side was omitted due to absence of the left vas deferens on MRI.

MRI of the pelvis and scrotum was performed on a 1.5T Siemens Magnetom Sola (Siemens Medical) machine. Prior to contrast injection, T2-weighted images of the lesser pelvis were acquired using a turbo spin echo (TSE) sequence in the sagittal and coronal planes with 3-mm-thick contiguous slices, field of view (FoV) of 240 × 240 mm, matrix size 517 × 576 and 576 × 640, respectively, time of repetition (TR) of 6,380 ms and 4,900 ms and time of echo (TE) of 131 ms and 124 ms. Axial T1-weighted images were obtained using volumetric gradient spin echo (VIBE) sequence (2 mm slice thickness and spacing, 284 × 350 mm FoV, 312 × 384 matrix size, TR of 6.6 ms and TE of 2.4 ms) with fat suppression using the Dixon method before and 150 s after administration of diluted gadolinium-based contrast agent through a cannula in the right vas deferens. During contrast injection, dynamic T1-weighted images were continuously acquired 30 times in 2.64-s intervals using an angiographic sequence (TWIST) with 3.5 mm contiguous slices, FoV of 177 × 288, matrix size 186 × 288, TR of 3.7 ms, and TE of 1.9 ms. Then T2-weighted images of the right vas deferens were obtained using three-dimensional TSE sequence (SPACE) using 0.6 mm slice thickness, 210 × 210 mm FoV, 640 × 640 matrix, TR of 1,400 ms and TE of 187 ms. Next, axial diffusion-weighted images (DWI) using b-values of 50 s/mm^2 and 800 s/mm^2, and apparent diffusion coefficient (ADC) maps of the entire pelvis were obtained (5 mm slice thickness with 6 mm spacing, FoV of 340 × 340 mm, matrix size 340 × 340, TR of 7,100 ms and TE of 85 ms).

The exam revealed the entire right vas deferens and seminal vesicles filling with the contrast agent. Filling of the vestigial orthotopic right ureter was also observed, flow of the contrast agent between right vas deferens and right ureter, alongside small

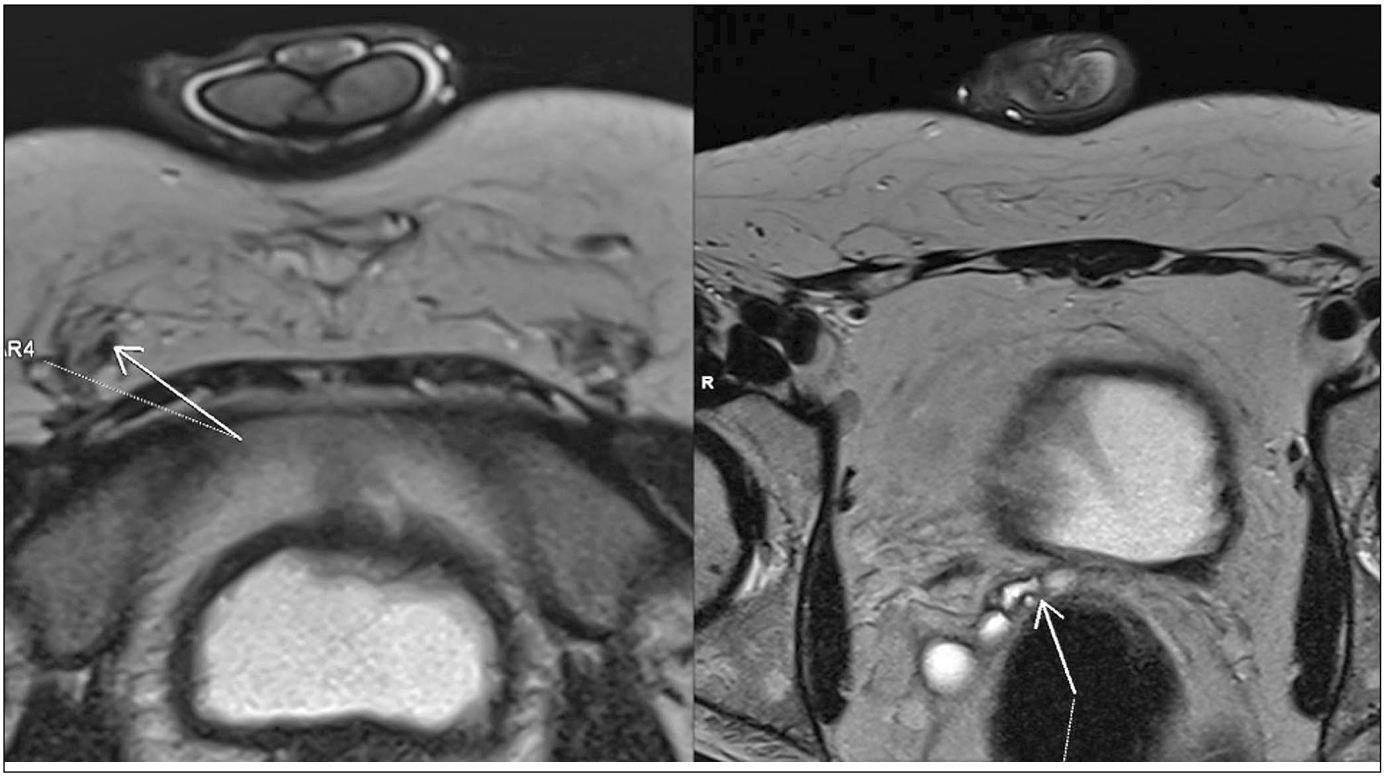

Figure 1. *T2-weighted axial images showing right vas deferens (left) in the inguinal canal and right seminal vesicles (right), contralateral structures were not visible in the study [665 × 362 mm (38 × 38 DPI)].*

air bubbles in the ostium of the right ureter and near the anterior wall of urinary bladder, indicated the existence of a fistula between those structures. To further assess the ureter, additional fat-suppressed T1-weighted images of the abdomen and pelvis were acquired (axial plane with fat-saturation using 3 mm contiguous slices, 309 × 380 mm FoV, 195 × 320 matrix, TR of 4.7 ms and TE of 2.4 ms; coronal plane using the Dixon method with 2 mm contiguous slices, FoV of 363 × 450 mm, 186 × 288 matrix, TR of 7 ms, and TE of 2.4 ms). Lastly axial T2-weighted images of the lesser pelvis were acquired using TSE sequence with 3 mm contiguous slices, FoV of 200 × 200 mm, matrix size of 691 × 768, TR of 7470 ms, and TE of 130 ms (Figure 2).

DISCUSSION

Azoospermia is the most severe form of male infertility and is defined as an absence of spermatozoa in the sediment of a centrifuged sample of ejaculate [1]. Its causes can be divided into pre-testicular, testicular, and post-testicular. The most common post-testicular cause is obstruction of the vas deferens, which accounts for approximately 40% of azoospermia cases [2].

The aetiology of obstructive azoospermia may include developmental anomalies, particularly bilateral absence of vasa deferentia in cystic fibrosis (CBAVD), stricture secondary to infection and inflammation of the epididymis, seminal vesicles, or the prostate, and medical procedures such as vasectomy [3].

There are many different reconstructive techniques for obstructive azoospermia; therefore, determination of the exact location of the obstruction can ensure satisfactory intervention results [4].

We described magnetic resonance vasography, which has proven to be a very effective technique in the diagnosis of obstructive azoospermia. This technique, to the best of our knowledge, was not previously described in the scientific literature. It provides high resolution and high tissue contrast multiplanar images of the spermatic tract, as well as precise location of its obstruction during a single exam. It overcomes the disadvantages of classical vasography, such as exposure to radiation and the limitation to planar projections. Some studies have also shown increased risk of stricture in vas deferens following radiological contrast injection [5].

We acknowledge, however, that our technique has some limitations. First, MRI vasography is relatively expensive and time consuming compared to standard

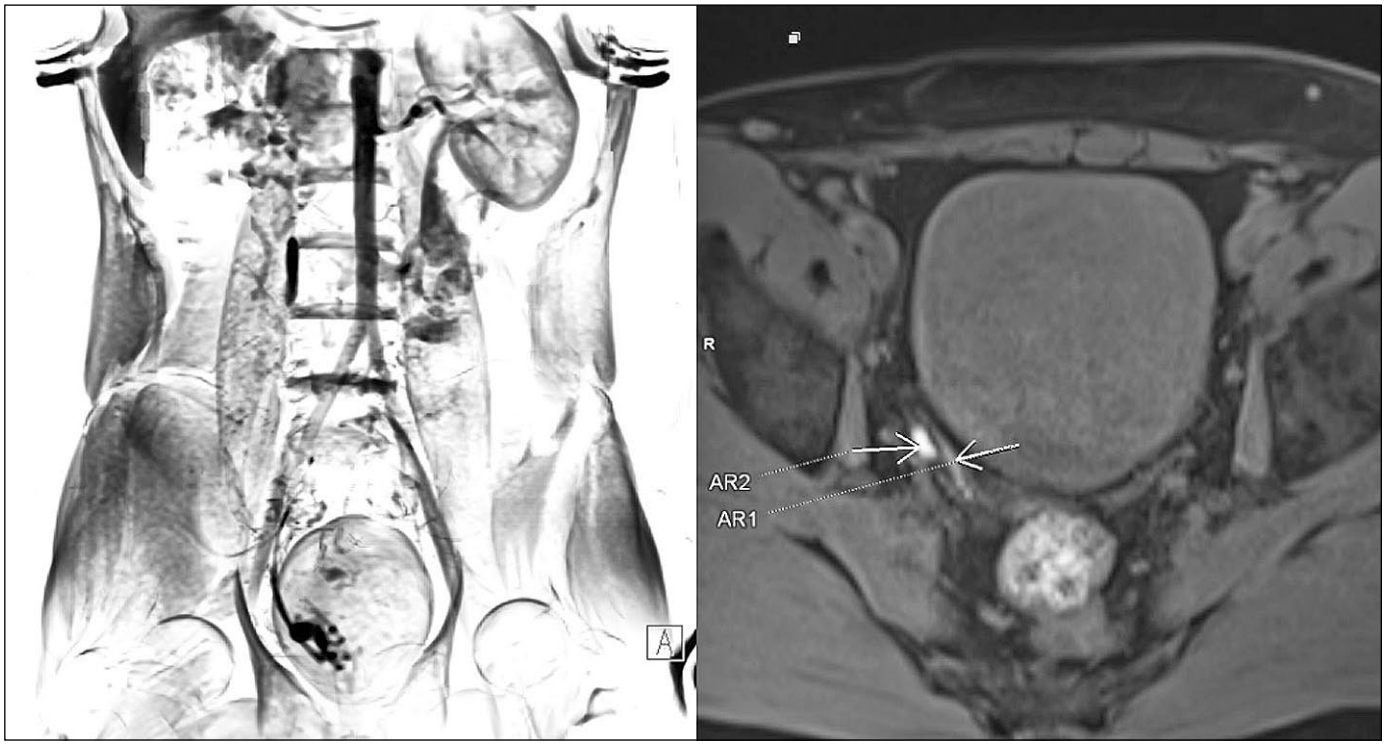

Figure 2. *Inverted T1-weighted fat suppressed vasographic image using MPR in the coronal plane (left) showing paramagnetic contrast in the right vas deferens, seminal vesicles, and vestigial right ureter. Also, notably, the left kidney is visible, with the right kidney being absent. Axial T1-weighted fat-suppressed vasographic image (right) showing right vas deferens (AR1) and the right ureter (AR2) [665 × 362 mm (38 × 38 DPI)].*

vasography. Second, it requires cooperation and involvement of a radiologist and a urologist. Third, little is known about the safety of intravasal injection of gadolinium-based contrast agents, so more studies are needed before widespread implementation. However, it must be noted that the contrast solution is highly diluted, and the actual amount of gadolinium compounds injected is minimal.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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ETHICS APPROVAL STATEMENT

The ethical approval was not required.

References

1. Salonia A, Bettocchi C, Capogrosso P, et al. Male infertility in: EAU Guidelines on Sexual and Reproductive Health, European Association of Urology 2024, www.uroweb.org
2. Sharma M, Leslie SW. Azoospermia. 2023 May 30. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023.
3. Wosnitzer M, Goldstein M, Hardy MP. Review of Azoospermia. Spermatogenesis. 2014; 4: e28218.
4. Baker K, Sabanegh E Jr. Obstructive azoospermia: reconstructive techniques and results. Clinics (Sao Paulo). 2013; 68 Suppl 1 (Suppl 1): 61-73.
5. Levi d'Ancona CA, Netto NR Jr, Filho AC, Stedile JA, Billis A. Vasography: experimental study. Int Urol Nephrol. 1989; 21: 73-79. ■