SMRT Student Scope Submission

Title and Author(s)

Title: Urethral Diverticulum

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Date of Submission: January 25, 2007

Introduction or Patient History

A 40-year-old female complained of pelvic pain possibly because of a urinary tract blockage. She experienced frequent urinary tract infections with urinary leakage. The patient had no prior studies done at this facility for comparison. Her gynecologist sent her for an MRI after noticing an abnormal mass during her exam. The patient history on the exam form stated urethral diverticulum but it was unknown to the patient of what could be causing her problem. One month following this MRI, a voiding cystourethrogram was performed.

Patient Preparation and Scan Set up

The patient was identified regarding her birth date, last name, and type of exam to ensure the proper study was to be performed. An MRI screening form was filled out and signed, in which she marked stainless steel surgical clips from a previous surgery. The clips were considered MRI conditional, and the patient was cleared for the procedure. Once finished screening, the patient was brought into the scan room for further explanation of the procedure.

It was explained to the patient that she would be supine for the study with her feet entering the magnet first. A cervical coil would be inserted to ensure more signal around the area of interest. The patient was given the option to have the technologist insert the coil or the patient could insert the coil herself, which she chose to do. The coil was coated with surgilube, and once inserted, 60 ML of air were injected into the syringe that led to the balloon to help keep the coil in place. The cervical coil was plugged into the phased array coil. The phased array coil was underneath the patient with a small rectangular component that comes up between the legs to rest on the pelvis. It was placed midway between the iliac crest and pubic symphysis and was strapped to the patient to prevent it from moving.

This gave more signal when the entire pelvic region was imaged. The patient was given blankets, a pillow, and ear- plugs that ensured protection from the damaging noise the gradients created.

The patient was scanned on a 1.5T General Electric Signa magnet. Upon entering the magnet, the patient was land marked to the center of the phased array coil that rested on the pelvis. Then the patient was moved to the center of the magnet and the procedure began.

The phased array body coil is composed of several decoupled surface coils. A surface coil obtains maximum signal, but a phased array allows a larger area to be imaged. Surface coils obtain signal in an area measured from half of the diameter of the surface coil, which allows for greater signal in a specific area. The phased array coil was used in this study to obtain the T1 and T2 images of the pelvis. When using a phased array coil, a larger FOV is used to obtain a greater signal to noise ratio. Spatial resolution is sacrificed because of the larger FOV that is selected. The cervical coil is inserted via the vagina and is used to obtain greater signal to noise around the urethra, bladder, and the areas under concern. The cervical coil is made for the 1.5 Tesla GE Interface Device and weighs 2.1 pounds measuring 13.2 cm x 14.3 cm x 9.5 cm. (Medrad, Ecoils) When using the cervical coil, a smaller FOV is used to obtain greater spatial resolution. Better spatial resolution is wanted because of the smaller anatomy that is being viewed with the cervical coil. The sensitive volume of the cervical coil for sagittal, axial, and coronal images is 10 to 20 centimeters.

MR Imaging Parameters

AX= Axial COR= Coronal SAG= Sagittal
SS= Single Shot FSE= Fast Spin Echo
FMP= Fast Multi Planar

Sequence	Type	TR	TE	FOV	T/S	Matrix	NX	Band width	Slice Thickness
3 Plane Loc		90.2	1.5	44	8/3	256x256	1.0	0	8
SAG T1	SS-FSE	1009.1	92.5	48	6/0	512x512	0.57	31.25	6
AX T2	FSE	7900.0	134.2	12	3/1	256x256	1.0	20.83	3
AX	FMP	260.0	4.2	12	3/1	256x256	1.0	15.63	3
SAG	FSE	4400.0	146.5	12	4/1	256x256	1.0	20.83	4
COR	FSE	5300.0	137.2	12	3/1	256x256	1.0	20.83	3
AX T1 Pelvis	FSE	700.0	13.2	24	5/1	256x256	0.5	15.63	5
AX T2 Pelvis	FSE	7066.7	80.4	24	5/1	256x256	1.0	20.83	5

Findings and Discussions

The MRI report stated that there was a saddle urethral diverticulum present. A diverticulum is an abnormal pouch that extends through a defect in the wall of the urethra. These

diverticula can be found in both the urethra and the bladder. A diverticulum is formed primarily by inflammation or rupture of the paraurethral glands. This leads to cystic dilation and obstruction between the gland and the urethra. These glands are located between the vagina and the urethra. The obstruction or mass enlarges and perforates through the urethral lumen to create this diverticulum. Stones and infection may develop because of stagnant urine that may lie in these areas. Saddle refers to the shape of the diverticulum as it straddles the urethra on three sides. It extended around the urethra measuring 1.3 x 2.2 x 1.6 cm. The superior aspect is approximately 1.2 cm inferior to the neck of the bladder. Within the diverticulum, there was no mass or any filling defect. The patient had previous surgery on a diverticulum because those surgical clips were noticed in the area where the cervical coil received signal. It is unknown whether this is the same diverticulum returning or if it is a new diverticulum that has formed. The bladder appeared normal along with her ovaries. The uterus is retroverted but is otherwise normal. A normal uterus sits in the body with its fundus slightly anterior to the cervix. However, in a retroverted uterus, the fundus is tipped backwards and posterior to the cervix. Usually there is a 90-degree angle between the vagina, cervix, and uterine body; this no longer exists with a retroverted uterus. (Siegleman, p.353-354)(Linn-Watson, p.141)

One month after the pelvic MRI, this patient had a voiding cystourethrogram study because she was complaining of urinary leakage. The bladder was filled at a rate of 60ml/min demonstrating normal compliance and sensations. The patient was not able to make a volitional void; dynamic images could not be obtained. There was no evidence of urinary incontinence with Valsalva maneuvers, and the bladder appeared normal.

Conclusions

This female patient who presented with pelvic pain and urinary tract blockage was later shown to have a saddle urethral diverticulum. MRI was the superior modality in detecting and demonstrating the urethral diverticulum in this case because of the high spatial resolution offered from the surface coil. The patient was sent for a voiding cystourethrogram one month following the MRI, but due to the lack of a volitional void, dynamic images could not be obtained to further diagnose the patient. The treatment options for this patient are unknown. Possible treatment options to explore are surgical excision and transvaginal marsupialization.

References

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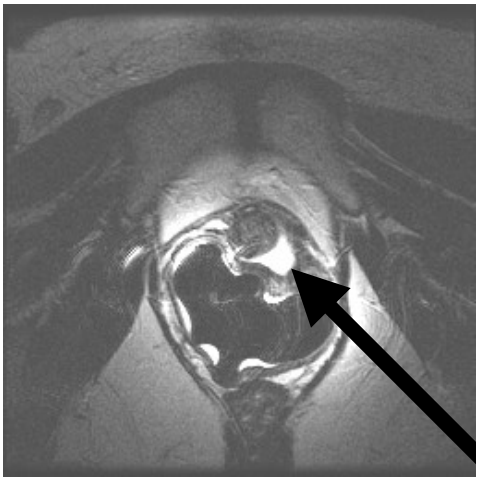
http://www.itee.uq.edu.au/~joeli/phasearray.htm

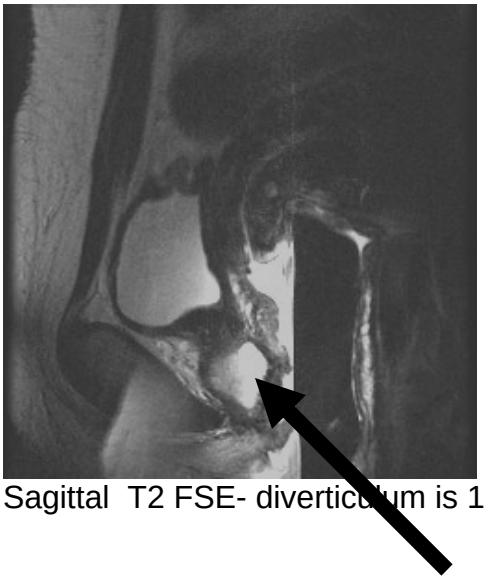
Linn-Watson. *Radiographic Pathology.* Chapter 6, 7 W.B. Saunders Company, Philadelphia, PA 1996.

Siegelman MD, Evan S., Banner MD, Ramchandani MD, Schnall MD. "Multicoil MR Imaging of Symptomatic Female Urethral and Periurethral Disease." *Radiographics,* Vol 17, 349-365, Copyright 1997: Radiological Society of North America.

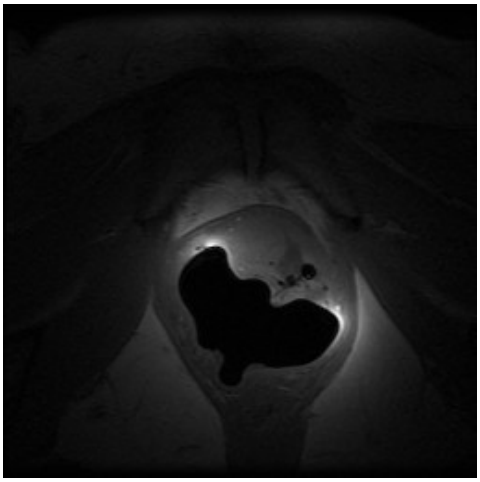
Images



Axial T2 FSE- saddle diverticulum on the patient's left side of the urethra



Sagittal T2 FSE- diverticulum is 1.2 cm below the bladder



Axial T1 FSE showing surgical clips within the diverticulum

Axial T2 FSE of the entire pelvis also showing the diverticulum at lower spatial resolution.

Medrad cervical coil used (Medrad)