Urogenital fistulas: a pictorial review

Poster No.: C-2062
Congress: ECR 2013
Type: Educational Exhibit
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Keywords: Urinary Tract / Bladder, Fluoroscopy, CT, Cystography / Uretrography, Complications, Fistula
DOI: 10.1594/ecr2013/C-2062

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Learning objectives

To describe the radiological findings of the most common urinary tract fistulas at retrograde and voiding cystourethrography.

Background

Anatomy

The superior surface of the bladder is covered by peritoneum, which reflects over the uterus to form the vesicouterine pouch and continues posteriorly as the rectouterine pouch. The vagina and uterus are interposed between the bladder and rectum, so that the bases of the urethra and bladder lie on the anterior vaginal wall.

The ureters course anterior to the psoas muscle and cross over the common iliac vessels to enter the pelvis at the level of the bifurcation of the iliac arteries. Rarely, the right ureter crosses behind the inferior vena cava. The right ureter runs close to the terminal ileum, cecum, appendix and ascending colon and their mesenteries; the left ureter to the descending and sigmoid colon and their mesenteries. Both may be injured during abdomino-pelvic surgery (Fig.1).

Definition

An urinary tract fistula is an abnormal communication between the urinary tract (urinary bladder, urethra or ureter) and the genital tract (vagina, cervix, uterus or perineum) or the gastrointestinal tract (rectum, colon, anal canal or small bowel) or abdominal wall.

Classification

They may generally be classified into those that involve the upper urinary tract (kidney, ureter), the lower urinary tract (bladder, urethra) and the female reproductive tract (vagina, uterus).

Urogenital fistulas are also divided into obstetric fistulas, more frequent in developing countries, and iatrogenic fistulas (resulting from surgery or radiation therapy), that constitute the bulk of the cases of fistulas in developed countries.

The two most common types of fistula are vesicovaginal and ureterovaginal fistulas, meanwhile less common varieties include ureterocutaneous, urethrovaginal fistulas and fistulous communications between the genitourinary and gastrointestinal tracts.
Etiopathogenesis

The most common cause of lower urinary tract fistula in the developed world is gynecologic surgery, with abdominal and vaginal hysterectomies accounting for approximately 75% of reported cases, other common causes are birth trauma, urologic procedures, malignancies and pelvic irradiation.

In poor developing countries are very common (76%) the obstetric fistulas that result from long, difficult labor and childbirth, especially in very young girls.

The frequency of these lesions is much lower in men than in women because of the different anatomic relationships and fistulas in men can be associated with some of the same predisposing factors as in women, such as a history of recent abdominal or pelvic surgery, urologic procedures, trauma and inflammatory bowel disease.

Clinical onset

- **Vesicovaginal fistula**: occurs between the urinary bladder and vagina and causes leakage of urine from the vagina, resulting in frequent vaginal and bladder infections.
- **Ureterovaginal fistula**: occurs between the distal ureter and vagina, and leakage of urine per the vagina represents the dominant symptom.
- **Urethrovaginal fistula**: occurs between the urethra and vagina and causes leakage of urina from the vagina during urination.
- **Rectovesical/vesicoenteric fistula**: occurs between the urinary bladder and rectum or large/small intestine; their clinical presentation may include recurrent cystitis, pneumaturia, fecaluria, fever, and abdominal pain.
- **Vesicocutaneous fistula**: occurs between the urinary bladder and skin; it causes leakage of urine from a superficial wound and is usually associated with abscesses.

As above mentioned urogenital fistulas are usually associated with urine leakage, which is socially distressing and disabling.

Fistulas can occur immediately after surgery or delivery, in the post-operative period; however, they typically manifest 10-20 days after the procedure. Radiation therapy-induced fistulas may manifest up to 20 years after the original treatment.

Imaging

Diagnosis of genitourinary tract fistulas usually requires different radiologic studies depending on the anatomic sites of origin and termination of the fistula and in most cases the diagnostic workup requires the integration of fluoroscopic and cross-sectional radiological imaging.
Retrograde and voiding cystourethrography are central in the study of the lower urinary tract.

Intravenous urography and pyelography are used for upper urinary tract investigation.

Fistulography is the most direct means of visualizing a fistula and should be considered when feasible (cutaneous fistulas).

Computed tomography (CT) is used for diagnosis, definition of leakage site and pathway of the fistula.

Differential diagnoses

The main clinical differential diagnoses includes urinary incontinence secondary to vesical or urethral dysfunction and congenital anomalies such as ectopic insertion of the ureter.

Treatment

Management approaches depend on the type of fistula and vary from conservative observation (rarely effective) to percutaneous or surgical repair.

Unfortunately urogenital fistulas can be difficult to treat because the factors that lead to the formation of fistulas often increase their complexity or preclude surgical repair.

Images for this section:
Imaging findings OR Procedure details

Between November 2010 and November 2012, 1110 patients underwent retrograde and voiding cystourethrography. In 12/1110 (1.1%) an urogenital fistula was found: 8 (66.7%) were iatrogenic secondary to abdominal or gynecological surgery [1 urethrovaginal (12.5%), 2 vesicovaginal (25%), 2 rectovesical (25%), 1 ureterovaginal (12.5%), 1 enterovesical (12.5%) and 1 vesicocutaneous (12.5%)] and 4 cases of unknown origin [3 urethrovaginal (75%), 1 vesicovaginal (25%)]. No obstetric fistulas were observed.

*Urethrovaginal fistula* (Fig.2): cystourethrography shows in 4 patients the filling of contrast medium in the vagina from the urethra (Fig.3-5 A,B; 7) and in 2 cases a further CT exam was required to define the leak site and the pathway of the fistula (Fig.6 A,B; 8 A,B).

*Vesicovaginal fistula* (Fig.9): in 3 cases, cystourethrography shows contrast medium in the vagina from the urinary bladder, usually from the posterior wall, (Fig.10; 11 A,B; 12) and only one patient underwent a CT exam (Fig.13).

*Ureterovaginal fistula* (Fig.14): 1 case of opacification of a vaginal swab during cystourethrography (Fig.15 A,B); the patient underwent a CT scan to define the pathway of the communication between the ureter and vagina (Fig.16).

*Rectovesical fistula* (Fig.17): in 2 patients the contrast medium filled the rectum from the urinary bladder (Fig.18). In one of them cystourethrography shows only an anomaly of the posterior bladder wall (Fig.19) and the fistula could be demonstrated by a iodine rectal enema (Fig.20) and a CT scan detects the rectovesical fistula and defines its pathway (Fig.21).

*Enterovesical fistula* (Fig.22): in 1 patient cystourethrography shows leakage of contrast medium from the bladder into the ileum (Fig.23) and a further CT exam defines the pathway of the fistula (Fig.24).

*Vesicocutaneous fistula* (Fig.25): in 1 patient cystourethrography demonstrates leakage of contrast medium from urinary bladder to the skin (Fig.26) and a further CT exam defines the leak site and the pathway of the fistula through the anterior abdominal wall (Fig.27).

Images for this section:
IMAGING FINDINGS

- URETHROVAGINAL FISTULA

Fig. 2
**Fig. 3:** Case 1: a 69 years-old woman with a history of radical hysterectomy for cervical cancer with urinary incontinence and recurrent cystitis. Voiding cystourethrogram: leakage of contrast medium in the vagina from the urethra.
**Fig. 4:** Case 2: a 77 years-old woman with urinary incontinence. Voiding cystourethrogram: fistula between the middle third of the urethra and anterior wall of the vagina.
**Fig. 5:** Case 3: a 79 years-old woman with urinary incontinence. A) Oblique view: leakage of contrast medium in the vagina. B) Voiding cystourethrogram: fistula between the urethra and vagina.
Fig. 6: Case 3: a 79 years-old woman with urinary incontinence. A) Axial CT image: opacification of the vagina. B) Sagittal CT image: continuity between the urethra and vagina.
Fig. 7: Case 4: a 71 years-old woman with urinary incontinence. Lateral cystogram: leakage of contrast medium in the vagina from the urethra.
**Fig. 8:** Case 4: a 71 years-old woman with urinary incontinence. A) Axial and B) sagittal CT images confirm the presence of contrast medium into the vagina.
IMAGING FINDINGS

- VESICOVAGINAL FISTULA

Fig. 9
**Fig. 10:** Case 5: a 48 years-old woman with a history of hysterectomy for uterine fibroids with urinary incontinence. Voiding cystourethrogram: leakage of contrast medium in the vagina from the posterior bladder wall.
**Fig. 11:** Case 6: a 84 years-old woman with urinary incontinence. A) Oblique view during the Valsalva manoeuvre: vesicovaginal fistula. B) Voiding cystourethrogram: fistula that originates from the posterior bladder wall.
**Fig. 12:** Case 7: a 77 years-old woman with a history of radical hysterectomy and radiotherapy for cervical cancer with urinary incontinence. Antero-posterior view: presence of contrast medium in the vagina.
Fig. 13: Case 7: a 77 years-old woman with a history of radical hysterectomy and radiotherapy for cervical cancer with urinary incontinence. Sagittal CT image demonstrates that the vesicovaginal fistula originates from a diverticulum of the posterior bladder wall.
IMAGING FINDINGS

● URETEROVAGINAL FISTULA

Fig. 14
**Fig. 15:** Case 8: a 50 years-old woman with previous hysterectomy for uterine fibroids and now with urinary incontinence. A) Oblique view: opacification by contrast medium of a vaginal swab. B) Voiding cystourethrogram: presence of an anomaly of the posterolateral bladder wall.
**Fig. 16:** Case 8: a 50 years-old woman with previous hysterectomy for uterine fibroids and now with urinary incontinence. Axial CT image confirms the presence of a little ureterovesical fistula.
IMAGING FINDINGS

- RECTOVESICAL FISTULA

Fig. 17
Fig. 18: Case 9: a 80 years-old man with previous abdominal surgery with pneumaturia and fecaluria. Oblique view: leakage of contrast medium in the rectum through a fistula with the bladder.
**Fig. 19:** Case 10: a 74 years-old man with previous anterior resection and radiotherapy for rectal cancer with pneumaturia. Oblique view: presence of an anomaly of the posterior bladder wall.
Fig. 20: Case 10: a 74 years-old man with previous anterior resection and radiotherapy for rectal cancer with pneumaturia. The infusion of contrast medium into the rectum confirms the fistula between the urinary bladder and rectum.
**Fig. 21:** Case 10: a 74 years-old man with previous anterior resection and radiotherapy for rectal cancer with pneumaturia. Sagittal CT image confirms the leakage of contrast material into the rectum and large intestine.
IMAGING FINDINGS

- ENTEROVESICAL FISTULA

Fig. 22
Fig. 23: Case 11: a 73 years-old woman with an history of abdominal surgery with fever and fecaluria. Antero-posterior view: leakage of contrast medium from the bladder into the ileum.
Fig. 24: Case 11: a 73 years-old woman with a history of abdominal surgery with fever and fecaluria. A CT Multiplanar Reconstruction confirms and defines the pathway of the fistulous connections between the urinary bladder and ileum.
IMAGING FINDINGS

- VESICOCUTANEOUS FISTULA

Fig. 25
**Fig. 26:** Case 12: a 70 years-old man with a history of anterior resection for rectal cancer with an abscess of the anterior abdominal wall. Lateral view: leakage of contrast medium from the urinary bladder to the skin.
**Fig. 27:** Case 12: a 70 years-old man with a history of anterior resection for rectal cancer with an abscess of the anterior abdominal wall. A) Axial and B) sagittal CT images confirm the presence of the fistula and define its pathway through the anterior abdominal wall.
Conclusion

Genitourinary tract fistulas are variable in anatomical features and clinical presentation, and represent a rare finding in cystograms.

Imaging plays a crucial role in delineating the anatomy and extent of the fistulous tracts that should be correctly detected and characterized, for the appropriate treatment planning and prevention of major complications.

References


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