Magnetic Resonance Imaging in Perianal Fistulas

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Learning objectives

To provide an overview on the evaluation of perianal fistulas and to describe the typical MRI findings of the various types of fistulas with their classification.
Background

Perianal fistula is an inflammatory condition that affects the region around the anal canal. It is characterized by a connection between the anal canal and the skin of the perineum.

Perianal fistulization is an uncommon process, with a prevalence of 0.01%, although it causes significant morbidity and often requires repeated surgical treatments due to its high tendency to recur. It predominantly affects young males, with a male-to-female ratio of 2:1. The most common presenting symptom is discharge (65% of cases), but local pain due to inflammation is also common [1].

A proper knowledge of the anatomy of the anal sphincter complex and of the surrounding spaces is crucial for image interpretation. The anal canal extends from the anus to the rectal ampulla and is 2-5 centimeters long. It is surrounded by two sphincter muscles: the internal and external anal sphincters.

The internal sphincter is the inferior extension of the inner circular smooth muscle of the rectum and is primarily responsible for resting involuntary anal continence.

The external sphincter is composed of striated skeletal muscle, which is contiguous with both the levatorani and puborectalis muscles superiorly and is primarily responsible for voluntary continence.

At approximately 2 cm in the anal canal lies the dentate line, where the epithelium becomes transitional, and there is histological junction between the anal squamous epithelium and the rectal columnar epithelium. Around the dentate line there are the anal glands, that release their secretions into the anal sinuses. The glands are primarily located within the intersphincteric space or the internal sphincter [2] (figure 1).

According to the cryptoglandular hypothesis, the majority of idiopathic anal fistulas result from an infection that arises in the anal glands at the dentate line when the draining duct becomes blocked by infected debris, as an intersphincteric infection. This abscess may resolve by means of spontaneous drainage into the anal canal or may progress to an acute anorectal abscess. Anal fistula develops when an intersphincteric infection continues. Perianal abscess is an acute manifestation and fistula-in-ano a chronic condition of the same disease [3].
Fig. 1: Anatomy of the anorectal region. (1) External sphincter (ES) is a continuation of the pelvic floor musculature - levator ani (2a) and puborectalis (2b) -; (3) Internal sphincter (IS) is a continuation of the inner circular muscle layer of the lower rectum (4); (5) Dentate line, site of anal valves. Proximal to each anal valve there is an anal crypt or sinus; the anal glands release their secretions into these crypts.

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Findings and procedure details

The major MRI indication in perianal fistula is preoperative classification. MRI allows a direct visualization of the fistulous tracts and abscesses, combined with high soft tissue resolution. MRI help to classify accurately fistulous tracts but also to identify the entire extent of the disease that otherwise would have been missed.

The most appropriate MR protocol used for evaluation of perianal fistulas consists of: oblique axial T1 and T2-weighted FSE, oblique axial and coronal fat-suppressed T1 and T2-weighted FSE, oriented perpendicular or parallel to the long axis of the anal canal, with large and small FOV.

T1-weighted images provide an excellent anatomic overview of the sphincter complex, levator plate, and ischiorectal fossa. Fistulous tracks, inflammation, and abscesses appear as areas of low to intermediate signal intensity and may not be distinguished from normal structures.

On T2-weighted images fistulous tracks have high signal intensity and can be well distinguished from sphincters and muscles that have low signal intensity. Abscesses also have high signal intensity on T2 due to the presence of pus in the central cavity.

T1-weighted contrast-enhanced fat-suppressed MRI sequences can help differentiate inflammation from abscess. Although the use of intravenous contrast-enhancement produces images that are visually appealing, it may not be essential for all the cases and its additional value is not yet determined.

Initial classification of perianal fistulas was based on surgical anatomy described by Parks et al. They described the course and relationship of the perianal fistulas primary tract's to the external and internal sphincters with reference to the coronal plane. There were four categories: intersphincteric, transsphincteric, suprasphincteric and extrasphincteric [4] (figure 2).

MR imaging findings are not included in the Parks classification, so an MR imaging-based classification was proposed by radiologists: The St James's University Hospital Classification. It consists of five grades and relates the Parks surgical classification to anatomy seen at MR imaging in both axial and coronal planes. The classification considers the primary fistulous track but also the secondary ramifications and associated abscesses. It is easy to use because it utilizes axial anatomic landmarks familiar to radiologists.
**Grade 1**: simple linear intersphincteric fistula. The fistulous track extends from the anal canal through the intersphincteric space to reach the skin of the perineum. There is no ramification of the track within the sphincter complex. The fistulous track is always observed in the intersphincteric space (figure 3).

**Grade 2**: intersphincteric with abscess or secondary track. The primary track and a secondary track or abscess occur in the intersphincteric space, they never cross the external sphincter. Secondary fistulous tracks may be of the horseshoe type, crossing the midline or they may ramify in the ipsilateral intersphincteric plane (figure 4).

**Grade 3**: transsphincteric. These fistulas extends through both layers of the sphincter complex and reaches the skin through the ischiorectal and ischioanal fossae. They are not complicated by secondary tracks or abscesses (figure 5).

**Grade 4**: transsphincteric with abscess or secondary track in ischiorectal or ischioanal fossa. These fistulas are similar to Grade 3 but complicated by an abscess or a secondary extention in the ischiorectal or ischioanal fossae (figure 6).

**Grade 5**: supralelevator and translevator. Perianal fistulous disease extends above the insertion point of the levator ani muscle.
Fig. 2: Schematic representation of the anal canal in the coronal plane shows the Parks classification of perianal fistulas.

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**Fig. 3:** Grade 1: simple linear intersphincteric fistula (arrows). Axial (a) and coronal (b) fat-suppressed T2-weighted MR images.

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**Fig. 4:** Grade 2: intersphincteric fistula (arrows) with an abscess (arrowheads). Axial (a) and coronal (b) fat-suppressed T2-weighted MR images.

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**Fig. 5:** Grade 3: transsphincteric fistula (arrow). Coronal fat-suppressed T2-weighted MR image.

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Fig. 6: Grade 4: transsphincteric fistula (arrowheads) with an abscess in the left ischiorectal fossa (arrows). Axial fat-suppressed T2-weighted MR image (a) and axial T2-weighted FSE MR image (b).

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Conclusion

MRI plays a crucial role in preoperative evaluation of perianal fistula, providing accurate definition of the fistulous track, its extension, its relationship to pelvic structures, and identification of secondary fistulas or abscesses.

MR imaging provides accurate information for appropriate surgical treatment, decreasing the incidence of recurrence and allowing side effects such as fecal incontinence to be avoided [5].

By using the St James's University Hospital classification, an MR imaging-based grading system validated by surgical exploration and longterm clinical outcome, the radiologist can alert the referring clinician to the presence of complex disease that may require expert surgical management to prevent recurrences [6].
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