MR imaging evaluation of perianal fistulas

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Learning objectives

The purpose of the study is to describe using MR imaging different types of perianal fistulas according to the surgical classification.

We will provide detailed anatomical diagrams of the perianal region to make easier the identification, localization and the precise extent of the primary fistulas tracts, the site of any expansions-secondary extensions or abscesses, and their relationship with the anal sphincter complex and muscle planes boundering the anatomical compartments of the pelvic-perineal region.

Background

Fistula means an abnormal connection between two structures or organs, or between an organ and the skin surface. In particular, the perianal fistula is defined as a connection between the anal canal and the perineal skin.

Perianal fistulas are uncommon disease with a prevalence of 0.01%, and predominantly affects young adults, with a male-to-female ratio of approximately 2:1. It, however, has a tendency to relapse though adequate surgery.

It is a disease condition with inflammatory origin mostly resulting from a chronicization of a sepsis of anal glands within the subepithelial layer with opening ducts in correspondence of the anal canal, at the bottom of the crypts of Morgagni (cryptoglandular hypothesis).

Other causes that can lead to the development of perianal fistulas are: perineal trauma at birth, Crohn’s disease, diverticulosis, anal fissures, pelvic malignancy, radiotherapy, actinomycosis, tuberculosis and infections by Chlamydia.

Nowadays MR imaging represents the best choice in imaging, playing a crucial role in defining the relationship between infected tracts and anal sphincter complex, leading to the best surgery approach and reducing significantly recurrence and surgery related pitfalls such as incontinence.

MR for its characteristics of multiplanar and multiparametric examination, with sequences at high anatomic definition and contrast, is the technique useful to detect the fistula starting point in the anal canal and the fistula path; in order to make easier the diagnosis, the anal canal is considered in the axial plane, like a clock (”anal clock”) where at the 12 o’clock position is the anterior perineum, the natal cleft is at the 6 o’clock position, and 3 o’clock refers to the left lateral aspect, and 9 o’clock the right lateral aspect of the anal canal. (Fig. 1)
The different classifications of perianal fistulas are based on the relationship between them and the anal sphincter muscles, and in particular with the external anal sphincter and puborectalis muscle.

In our study we used the classification of St. James’s University Hospital, which relates both the surgical classification of Parks and MR imaging in the coronal and axial plane.

There are four different perianal fistulas in Parks classification (Fig. 2):

1. inter-sphincteric,
2. trans-sphincteric,
3. supra-sphincteric,
4. supra-elevator.

All types of fistula may complicate with abscesses or extensions-secondary tracks within the intersphincteric space, in the ischiorectal-ischioanal (most commonly) pit, or in the supranelevator-pararectal space. These complications can also spread in the intersphincteric space, or into the ischiorectal fossa giving rise to horseshoe-like ramifications.

Images for this section:
**Fig. 1:** Anal clock. Axial T2-weighted MR image of perineum shows the anal clock diagram used to correctly locate perianal fistula.

**Fig. 2:** Coronal scheme of the anal canal showing different types of perianal fistulas of Parks classification.
Imaging findings OR Procedure details

In our institution, MR exams for the study of perianal fistulas are performed on 1T open magnet, using body surface or phase array coil and require no patient preparation. Endoanal coils are not used because the poor tolerance and the limitations related to the size of the field of view.

We usually first acquire advance turbo spin echo T2-weighted sequences, on sagittal plane panoramic views, which provide the correct orientation of the axial and coronal planes on the axis of the anal canal (Fig.3).

The protocol require TSE T1-weighted, TSE T2-weighted, fat sat T2-weighted or STIR sequences, oriented on axial and coronal planes to the anal canal, fat sat 3D T2-weighted, and fat sat T1-weighted or fat sat gradient eco T1-weighted sequences both before and after paramagnetic intravenous contrast medium.

Perianal fistulas classification in MR imaging, like the Parks perianal fistulas surgical classification, divide them into five grades according to the course and relationship of the perianal fistula to the sphincter muscle complex in consideration of both axial and coronal planes.

This classification examines the primary fistula track but also the secondary ramifications and associated abscesses.

<table>
<thead>
<tr>
<th>CLASSIFICATION OF THE PERIANAL FISTULAS</th>
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<tr>
<td>(St James University Hospital)</td>
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<tr>
<td>GRADE 0</td>
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<tr>
<td>NORMAL APPEARANCE</td>
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<tr>
<td>GRADE 1</td>
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<tr>
<td>SIMPLE LINEAR INTERSPHINCTERIC FISTULA</td>
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<tr>
<td>GRADE 2</td>
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<tr>
<td>INTERSPHINCTERIC FISTULA</td>
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<tr>
<td>WITH INTERSPHINCTERIC ABSCESS</td>
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<tr>
<td>OR SECONDARY FISTULOUS TRACK</td>
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<tr>
<td>GRADE 3</td>
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<td>TRANS-SPHINCTERIC FISTULA</td>
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<td>GRADE 4</td>
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<tr>
<td>TRANS-SPHINCTERIC FISTULA WITH</td>
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<td>ABSCEESS OR SECONDARY TRACK</td>
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WITHIN THE ISCHIORECTAL OR ISCHIOANAL FOSSA

GRADE 5
SUPRALEVATOR AND TRANSLEVATOR DISEASE

GRADE 1: this grade defines a simple linear intersphincteric fistula, whose fistula track extends from the skin of the perineum or natal cleft to the anal canal, without involvement of ischiorectal and ischioanal fossa, and with no tract ramification within the sphincter complex.

The course of the fistula is visible in the plane between the sphincters and it is entirely limited by the external sphincter. (Fig.4)

GRADE 2: this grade defines an intersphincteric fistula with an abscess or secondary track. Occasionally these features can have horseshoe type morphology, crossing the midline or they may ramify in the ipsilateral intersphincteric plane.

On T2-weighted images, pus, like edema and inflammation, has an high signal intensity, but gas within abscesses has a low signal intensity similar to that of the anorectal lumen.

As viewed in all three planes, the fistula is walled by the external sphincter and the ischiorectal fossa is unaffected. (Fig.5)

GRADE 3: this grade defines the transphincteric fistulas that crosses both sides of the sphincter complex and then arcs down to the skin through the ischiorectal and ischioanal fossa.

These fistulas can be distinguished by the location of the enteric entry point, that is generally at the middle third of the anal canal, as can be observed in the coronal images.

Since these fistulas compromise the integrity of the sphincter, the fistula must be excised by dividing both layers of the sphincter, with the risk of fecal incontinence. (Fig.6)

GRADE 4: the grade four defines the transphincteric fistula complicated by abscess in the ischiorectal or ischioanal fossa.

Axial and coronal dynamic contrast-enhanced MR imaging clearly identify a transphincteric abscess, which typically has a central area of pus caracterized by low signal intensity.

The track may assume a "dumbbell" configuration that crosses the external sphincter. (Fig.7)
GRADE 5: these grade represent supra- and extra-sphincteric fistulas; in rare cases, perianal fistulous disease may spread over the insertion of the levator ani muscle.

Suprasfincteric fistulas extend upward of the intersphincteric plane and beyond the top of the levator ani muscle to pass into the ischio rectal fossa.

Extrasphincteric fistulas is consistent with the extension of primary pelvic disease that pierce down through the levator plate without envolvement of the sfinteric muscles complex.

Such fistulas pose problems to the management of the patient, because require further evaluation to detect the pelvic sepsis. The coronal images clearly highlight the envolvement of the elevator muscle plan.

Images for this section:
Fig. 3: Sagittal T2-weighted TSE images. This sagittal plane is necessary to obtain oblique axial and coronal images, orthogonally and parallel oriented to the anal canal respectively.
Fig. 4: GRADE 1: Simple linear intersphincteric fistula on the right side of the anal canal (at 9 o’clock position), seen on axial T2-weighted TSE images, and coronal and axial fat sat T2-weighted TSE images.
**Fig. 5:** GRADE 2: Inter-sphincteric fistula with an abscess. Coronal and axial T2-weighted TSE images and fat sat T2-weighted TSE images show an inter-sphincteric fistula with a left postero-lateral abscess (at 3 to 6 o'clock position).
Fig. 6: GRADE 3: trans-sphincteric fistula is seen in coronal and axial images on T2-weighted TSE, fat sat T2-weighted TSE and contrast-enhanced fat sat T1-weighted TSE. IV contrast medium provide enhancement of fistula wall made of granulation tissue.
**Fig. 7:** GRADE 4: coronal T2-weighted and fat sat T2-weighted images reveal trans-sphincteric fistula with an abscess in the right anterior ischio-rectal fossa. Axial contrast-enhanced fat sat T1-weighted TSE image detect the abscess with non-enhancing pus.
**Fig. 8:** GRADE 5. Extrasphincteric fistula is seen in coronal and axial images on T2-weighted TSE, Fat Sat T2-weighted TSE and contrast enhanced Fat Sat T1-weighted TSE.
Conclusion

So far MR is the best imaging technique for evaluating perianal fistulas, because it provides an accurate assessment of the anal canal, anal sphincter complex, and allows detection of any fistula.

MR imaging technique can detect involvement of pelvic structures, and can provides identification of secondary fistulas or abscesses, and their relationship with the plane of the levator ani muscle.

A careful MR study of fistula is crucial to plan the best surgical treatment and decrease the recurrence of this disease condition and the fecal incontinence.

References


**Personal Information**