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**| RESEARCH ARTICLE**

## **Magnetic Resonance Imaging Patterns of Complex Anal Fistula: A Case Series- MRI of complex anal fistula**

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**| ABSTRACT**

Complex anal fistula requires accurate preoperative mapping because unrecognized secondary tracts, supralelevator extension, and abscesses increase the risk of persistent sepsis and recurrence. Magnetic resonance imaging (MRI) is central to defining fistula anatomy and guiding surgical planning. Case presentation: We describe four male patients aged 17-46 years who presented with persistent or recurrent perianal discharge. Pelvic MRI demonstrated transsphincteric fistulas in all cases. The imaging spectrum included multiple internal openings, bilateral external openings, branching secondary tracts, extension to the levator ani, pelvic sidewall or periprostatic region, circumferential perirectal inflammatory collections, perineal abscess close to the corpus spongiosum, gas-containing fistulous tracts, and horseshoe abscess involving the intersphincteric and supralelevator spaces. MRI consistently depicted low signal intensity on T1-weighted images, high signal intensity on T2-weighted and fat-suppressed T2-weighted images, and marked rim or wall enhancement after gadolinium administration. Surgical management was individualized and included abscess drainage, excision of fibrotic fistula tracts, seton placement, and laser fistula treatment. Conclusion: This case series highlights the wide anatomical variability of complex anal fistulas and the practical value of MRI in demonstrating occult branches and abscesses. Structured MRI reporting using clock-face location, relationship to sphincters and levator ani, internal and external openings, and associated collections can improve communication between radiologists and surgeons.

**| KEYWORDS**

Anal fistula; perianal fistula; magnetic resonance imaging; transsphincteric fistula; horseshoe abscess

**| ARTICLE INFORMATION**

**ACCEPTED:** 21 April 2026

**PUBLISHED:** 22 May 2026

**DOI:** 10.32996/jmhs.2027.7.7.13

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### **1. Introduction**

Anal fistula is an abnormal tract connecting the anal canal or rectum to the perianal skin or adjacent spaces. Complex fistulas are clinically important because they may traverse a substantial portion of the sphincter complex, have multiple tracts or openings, extend above the levator ani, or coexist with abscesses. Inadequate recognition of these features can lead to incomplete drainage, recurrence, and sphincter injury. The Parks classification remains a foundational surgical framework, whereas MRI-based classifications, including the St James's University Hospital system, translate cross-sectional findings into clinically useful categories (Morris et al., 2000; Parks et al., 1976). MRI has become a key modality for evaluating suspected complex anal fistula. It can define the internal opening, primary tract, secondary extensions, abscesses, and relationships to the internal and external sphincters and levator ani. Current expert consensus supports MRI for patients with suspected anal sepsis, particularly when disease is complex, recurrent, or not fully characterized clinically (Halligan et al., 2020). We present four cases of complex anal fistula with representative MRI findings, emphasizing how MRI findings can be converted into a concise surgical map.

### **2. Case Series**

This manuscript is based on a retrospective description of four patients with clinically suspected complex anal fistula who underwent pelvic MRI. Patient identifiers were removed. MRI descriptions were organized according to internal opening, course

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of the tract, sphincter relationship, secondary extensions, abscesses, signal characteristics, enhancement pattern, and operative management. Redundant imaging panels from the source material were removed; only representative non-duplicated composite figures are retained.

Table 1. Clinical and MRI summary of the four cases

Case	Age/sex	Clinical background	Key MRI findings	Treatment
1	46/M	Perianal discharge; previous anal fistula; type 2 diabetes; HbA1c 8.9%.	Two transsphincteric fistulas sharing an internal opening at 6 o'clock near the anorectal angle; right tract with two branches, including extension to the right levator ani; contralateral tract to left natal cleft; gas within first tract.	Abscess drainage and excision of fibrotic fistula tract.
2	17/M	Perianal discharge; leukocytosis and neutrophilia; afebrile.	Two bilateral transsphincteric fistulas; left internal openings at 1-2 and 4-6 o'clock near the anal verge; right internal opening at 7-8 o'clock; bilateral external openings in the natal clefts.	Excision of fibrotic tract and seton placement.
3	25/M	Perianal discharge; afebrile; routine tests within normal range.	Three anterior transsphincteric fistulas; two internal openings at 12 o'clock and one at 1-2 o'clock; perineal abscess close to the corpus spongiosum with gas; branching along the left side of the prostate.	Excision of fibrotic fistula tract.
4	26/M	Recurrent anal fistula after three previous operations.	Transsphincteric abscess-forming fistula; internal opening at 5 o'clock, approximately 25 mm from the anal verge; two distal branches toward the left gluteal soft tissue; horseshoe abscess in the intersphincteric and supralelevator spaces; gas within abscess.	Laser fistula treatment.

Case 1

A 46-year-old man with previous anal fistula and type 2 diabetes presented with perianal discharge. He was afebrile; leukocyte and neutrophil counts were within the reference range, and HbA1c was 8.9%. MRI showed two transsphincteric fistulas. The first tract had an internal opening at 6 o'clock at the anorectal angle, crossed the sphincter complex to the right, and divided into two branches. One branch descended posteriorly along the right side of the anal canal to an external opening at the right buttock or natal cleft; the other extended cranially to the right levator ani. The second tract originated from the same internal opening, crossed the sphincter complex, and descended posteriorly along the left side of the anal canal to the left natal cleft. The first tract contained small gas foci. Both tracts were hyperintense on fat-suppressed T2-weighted imaging and showed strong wall enhancement after contrast. The patient underwent abscess drainage and excision of fibrotic fistula tissue (Figure 1).

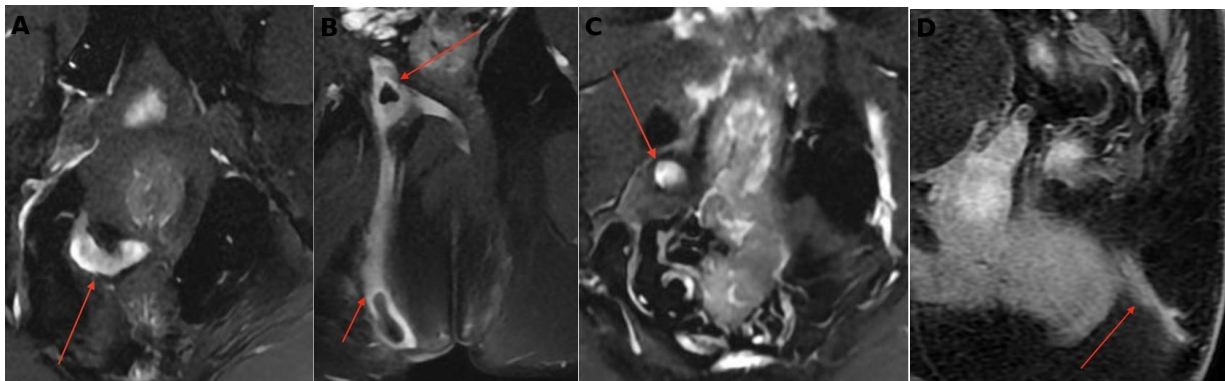


Figure 1. Case 1. MRI shows an abscess-forming transsphincteric tract with branching, including a branch extending to the right levator ani, and a contralateral tract. The retained panels demonstrate the main tract, secondary branches, gas foci, and post-contrast enhancement.

#### Case 2

A 17-year-old male presented with perianal discharge without fever. Laboratory tests showed leukocytosis and neutrophilia. MRI demonstrated two transsphincteric fistulas. The left tract had internal openings at the 1-2 o'clock and 4-6 o'clock positions near the anal verge, approximately 4 mm from the anal margin, and extended obliquely downward and posteriorly along the left natal cleft to an external opening at 5-6 o'clock. The right tract had an internal opening at the 7-8 o'clock position at the level of the anal verge and extended obliquely downward and posteriorly along the right natal cleft to an external opening at 6 o'clock. The tracts were T1 hypointense, T2/fat-suppressed T2 hyperintense, and strongly enhancing after gadolinium. Excision of fibrotic fistula tissue and seton placement were performed (Figure 2).

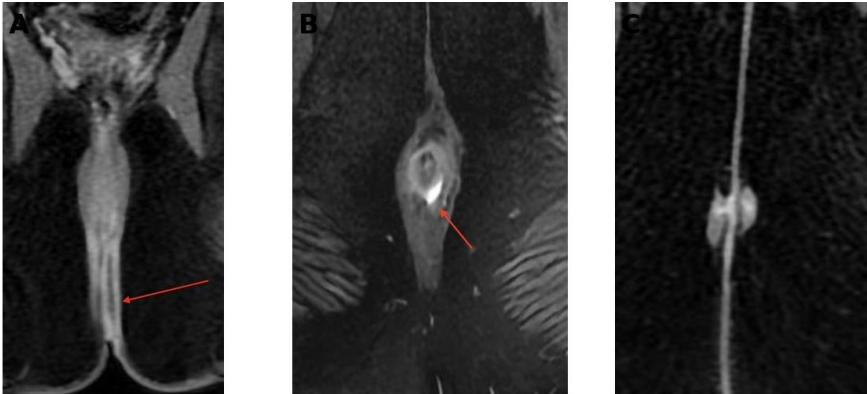


Figure 2. Case 2. Bilateral transsphincteric fistulas in a 17-year-old male. Representative panels show the enhancing left tract, bilateral external openings in the natal clefts, and the right tract on axial imaging.

#### Case 3

A 25-year-old man presented with perianal discharge without fever; routine laboratory tests were within the reference range. MRI identified three anterior transsphincteric fistulas. The first had an internal opening at 12 o'clock approximately 4 mm from the anal verge and extended anteriorly toward the perineum. The second had an internal opening at 12 o'clock approximately 17 mm from the anal verge, extended left-anteriorly toward the perineum, and formed a gas-containing perineal abscess close to the corpus spongiosum. The third had an internal opening at 1-2 o'clock approximately 30 mm from the anal verge and divided into three branches that extended cranially and anteriorly along the left side of the prostate. The tracts were T1 hypointense, T2/fat-suppressed T2 hyperintense, and strongly enhancing after contrast, with surrounding enhancing inflammatory tissue. Excision of fibrotic fistula tissue was performed (Figure 3).

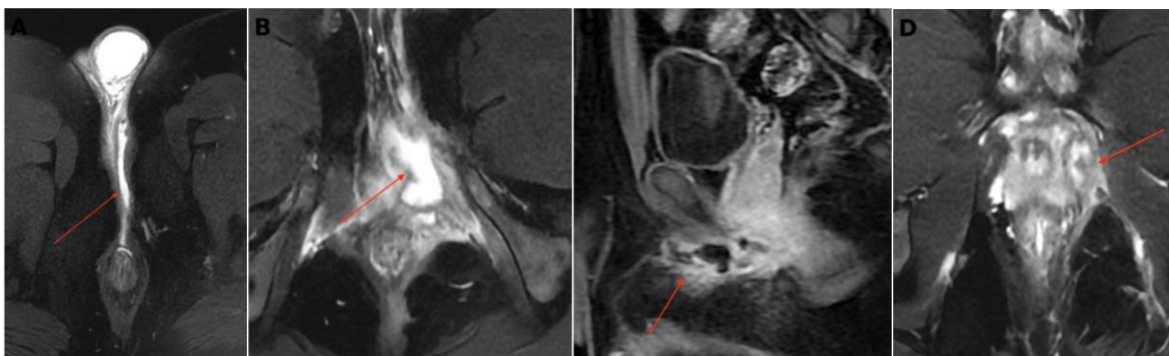


Figure 3. Case 3. Three anterior transsphincteric fistulas. Representative panels show the anterior tract, the abscess-forming tract extending close to the corpus spongiosum, enhancement of surrounding inflammatory tissue, and branching along the left side of the prostate.

**Case 4**

A 26-year-old man with a history of three prior operations for anal fistula presented with recurrent disease. MRI revealed an abscess-forming transsphincteric fistula with an internal opening at 5 o'clock on the anal canal wall, approximately 25 mm from the anal verge. The tract crossed the sphincter complex and divided into two branches toward the left gluteal soft tissues; no definite external opening was visualized. The tract communicated with a horseshoe abscess involving the intersphincteric and supralelevator spaces around the posterior anus and low rectum. The fistula and abscess were T1 hypointense, T2/fat-suppressed T2 hyperintense, and strongly rim-enhancing after contrast; gas was present within the abscess. The patient underwent laser fistula treatment (Figure 4).

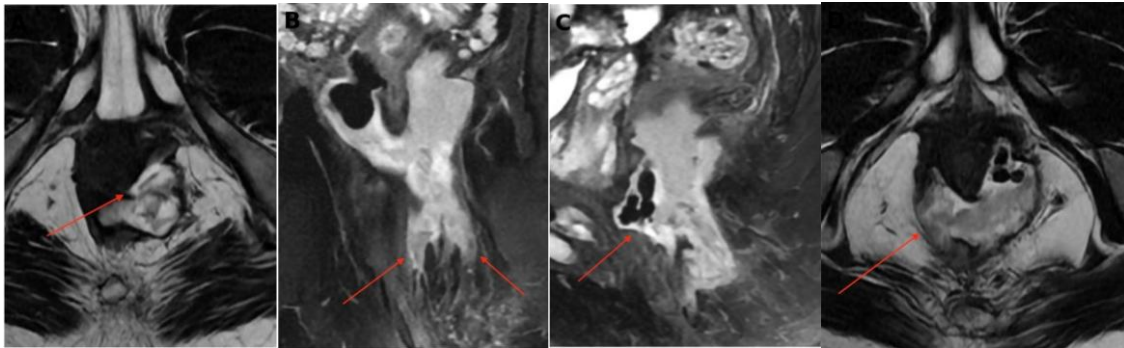


Figure 4. Case 4. Recurrent transsphincteric abscess-forming fistula with a horseshoe abscess. Representative panels demonstrate the internal opening, two distal branches toward the left gluteal soft tissues, intersphincteric/supralelevator horseshoe abscess, gas within the collection, and post-contrast enhancement.

**4. Discussion**

This series demonstrates several MRI patterns that are especially relevant to operative planning: multiple internal openings, bilateral tracts, branching secondary extensions, supralelevator or levator ani involvement, periprostatic or pelvic sidewall extension, and horseshoe abscess. Although all four patients had transsphincteric disease, the anatomical complexity differed substantially among cases. This variability supports the need for systematic MRI interpretation rather than reporting only the presence or absence of a fistula.

The clock-face description of the internal opening is useful because it provides surgeons with a reproducible orientation at the anal canal. In addition, reporting the distance from the anal verge can help anticipate operative exposure. MRI signs of active fistula and abscess in this series included hyperintensity on T2-weighted and fat-suppressed T2-weighted images and marked wall or rim enhancement after gadolinium. Gas foci within a tract or collection, as seen in cases 2, 4, and 5, supported abscess-forming disease. These findings are consistent with established descriptions of active perianal fistula and abscess on MRI (de Miguel Criado et al., 2012; Halligan et al., 2020).

Complex anatomy can change management. For example, a high branch reaching the levator ani may require a different drainage strategy than a low tract. A horseshoe abscess may be missed if the evaluation is limited to the external opening. Likewise, anterior extension toward the prostate or corpus spongiosum may not be apparent clinically but is important for operative planning and avoidance of iatrogenic injury. Current ASCRS guidance indicates that imaging is not required for every simple fistula, but it is appropriate in selected patients, particularly those with recurrent or complex disease, occult abscess, or conditions in which anatomy is uncertain (Gaertner et al., 2022).

A practical structured MRI report for complex anal fistula should include: (1) number and clock-face position of internal openings; (2) relationship of each primary tract to the internal and external sphincters; (3) number and direction of secondary branches; (4) external openings; (5) extension above or through the levator ani; (6) abscess location, size if measured, and gas; (7) relationship to adjacent organs; and (8) features suggesting active inflammation or fibrosis. Such reporting can reduce ambiguity and facilitate multidisciplinary communication.

This report has the inherent limitations of a small retrospective case series. Long-term follow-up, recurrence rates, continence outcomes, and standardized surgical correlation were not available in the source material. The cases were selected to illustrate imaging patterns rather than estimate prevalence or compare treatment strategies. Future studies should combine standardized MRI reporting with operative findings and longitudinal outcomes.

## 5. Conclusion

MRI provides a comprehensive map of complex anal fistula, particularly when disease includes branching tracts, supralelevator extension, periprostatic or perineal spread, and horseshoe abscess. In this four-patient case series, MRI clarified the relationship of fistula tracts to the sphincter complex, levator ani, and adjacent pelvic structures, supporting individualized surgical planning. A structured MRI report can improve communication between radiologists and surgeons and may reduce the risk of missed secondary tracts or abscesses.

### Declarations

Ethical approval: Ethical approval was not required for this case series because the hospital does not require ethics committee approval for single case reports or small case series based on anonymized clinical and imaging data. All patient identifiers were removed before manuscript preparation.

Consent for publication: To be completed by the authors. Suggested wording: Written informed consent for publication of anonymized clinical and imaging data was obtained from all patients or their legal guardians, as applicable.

Availability of data and materials: The anonymized data used to prepare this case series are available from the corresponding author upon reasonable request, subject to institutional and ethical regulations.

Competing interests: The authors declare that they have no competing interests.

Funding: This research received no external funding.

Authors' contributions: CPN conceptualized the case series, collected the clinical and imaging data, interpreted the MRI findings, drafted the manuscript, revised it critically for important intellectual content, and approved the final version for submission.

Acknowledgments: The authors thank the clinical and imaging teams involved in patient care.

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