

3T MRI IN PERIANAL FISTULAS: ROAD MAPPING THE TRACKS

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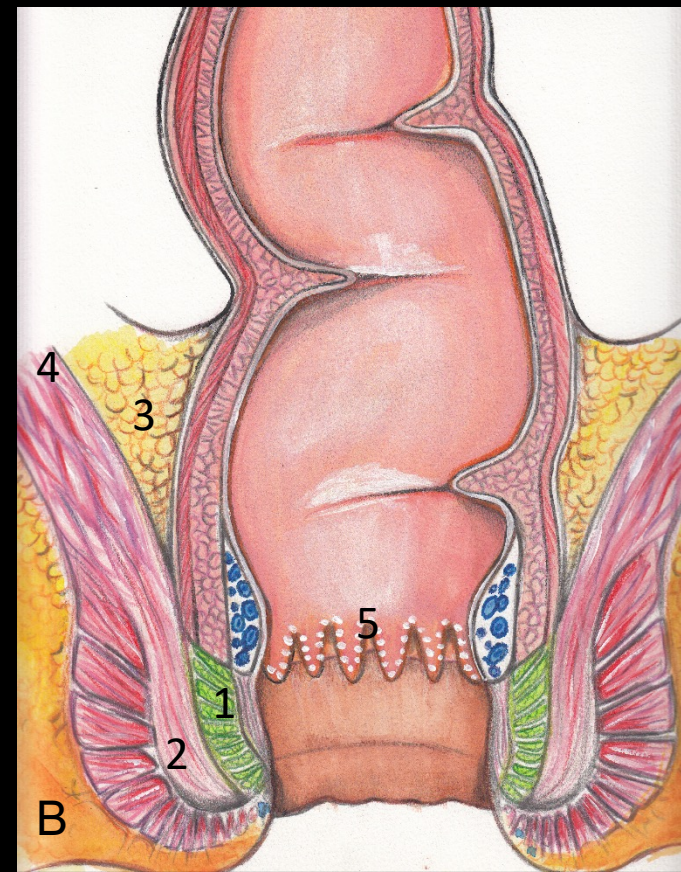
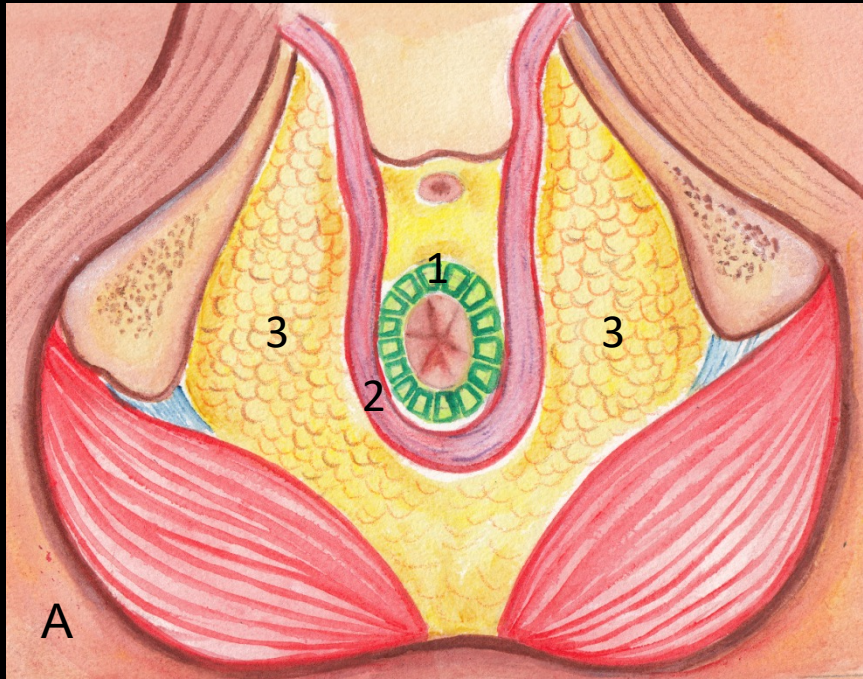


INTRODUCTION

- Detailed knowledge of relevant pelvic anatomy and various types of perianal fistulas is required for interpretation of these fistulas.
- Recurrence is common due to incomplete treatment, leading to significant morbidity.
- MRI gives exquisite detail of perianal anatomy and perianal fistulas due to high spatial resolution and multiplanar capabilities.
- MRI is useful in detection of perianal fistulous tracts, their extent and course, fistulous tract activity and associated complications.

PERIANAL ANATOMY

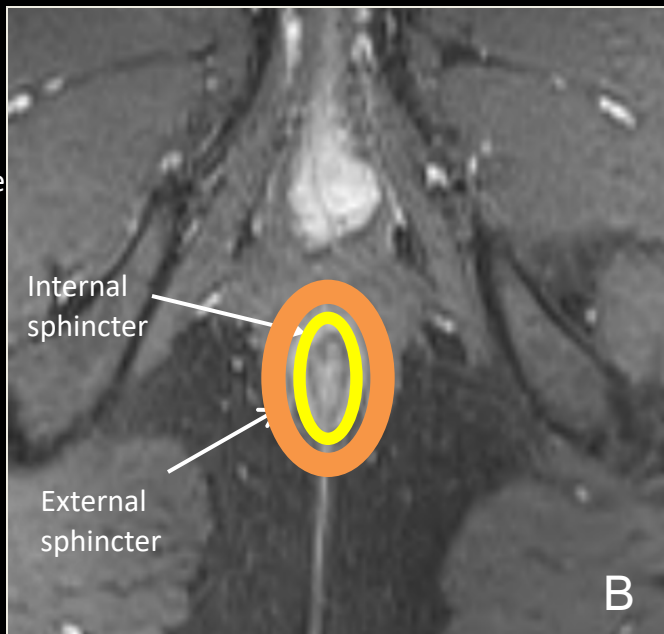
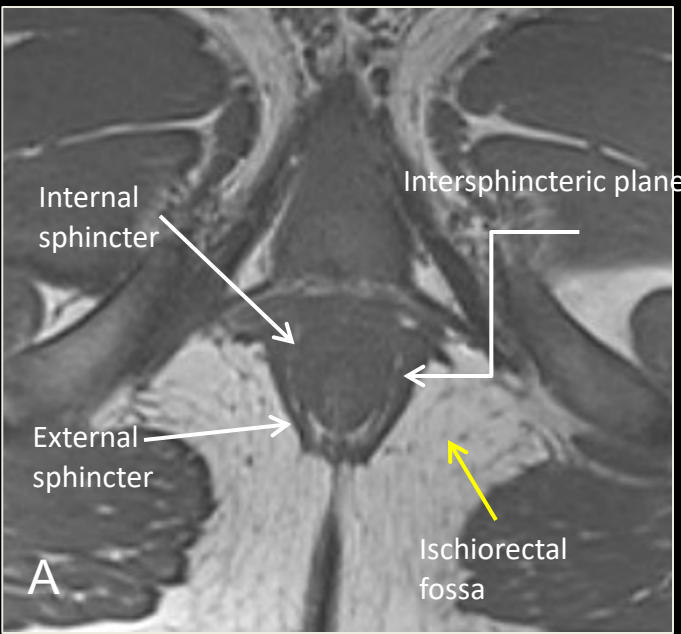
- **Anal canal** : Space surrounded by internal and external anal sphincters, extending from the levator ani muscle cranially to the anal verge caudally.
- **Internal sphincter (IS)** : Inferior extension of the inner circular smooth muscle of the rectum . It is responsible for resting involuntary anal continence .
- **External sphincter (ES)** : Composed of striated skeletal muscle. It is contiguous with both the levator ani and puborectalis muscles, superiorly . It is responsible for voluntary continence. Injury to the external sphincter can lead to fecal incontinence.
- **Intersphincteric space (ISS)**: Space between internal and external sphincters, composed of loose fat-containing areolar tissue.
- **Ischioanal and ischioanal spaces**: Contiguous, pyramidal fat-containing lateral spaces.



Diagrammatic representation, Axial A and Coronal B :
 Showing normal perianal anatomy and anal sphincters

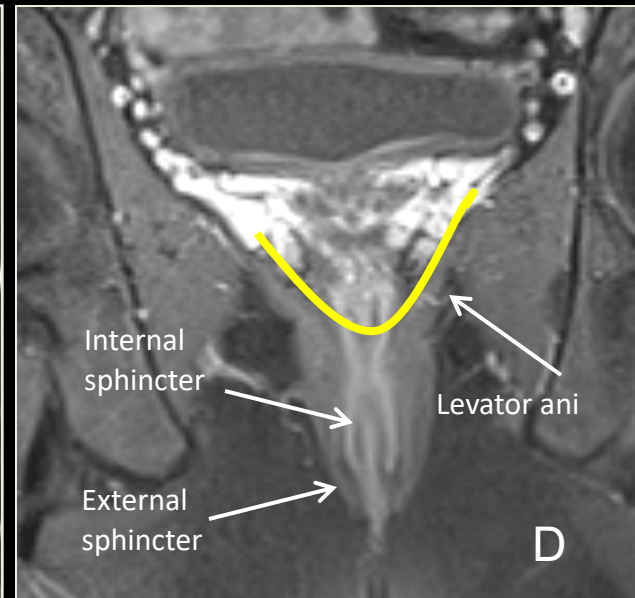
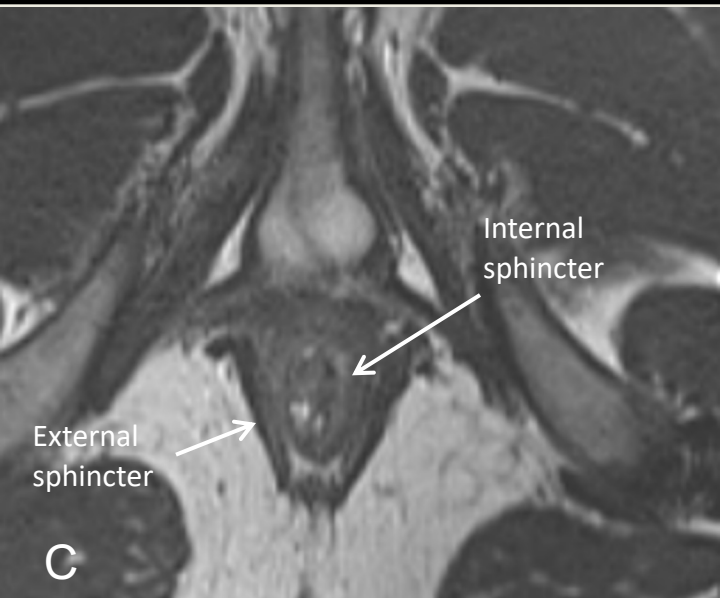
1. Internal sphincter
2. External sphincter
3. Ischioanal fossa
4. Levator ani muscle
5. Dentate line

NORMAL ANATOMY OF ANAL SPHINCTERS



Axial T1(A), axial T2(C): Shows hypointense internal and external sphincters. Hyperintense intersphincteric plane (stepped arrow in A). Ischiorectal fossa (yellow arrow)

Axial FS T1 C+ (B): Normal enhancing internal sphincter (yellow ring on click), Non enhancing external sphincter (orange ring on click)



Coronal FS T1 C+ (D): Normal enhancing Internal sphincter, non enhancing external sphincter. Levator ani (yellow line on click).

PATHOPHYSIOLOGY

- 90% of perianal fistulas arise secondary to infection and impaired drainage of the anal glands, leading to acute perianal abscesses.
- These abscesses can drain into various planes, creating fistulous tracts.
- Other fistulas (10%) may be secondary to Crohn's disease, diverticulitis, pelvic infection, tuberculosis, trauma, anorectal cancer or radiation therapy.
- On MRI, these tracts appear hyperintense on T2WI and usually show enhancement.

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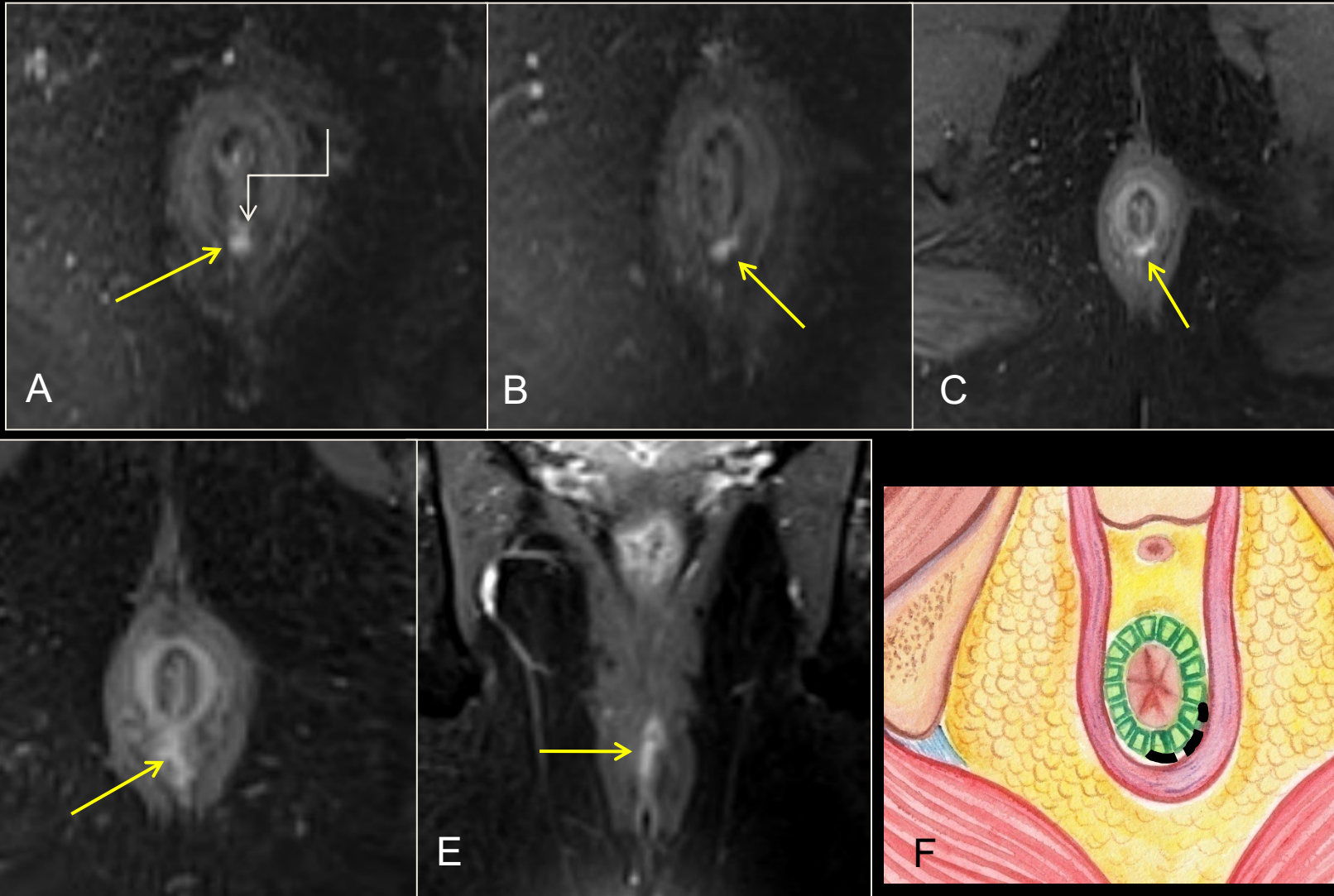
CLASSIFICATION OF PERIANAL FISTULAS

- Grade 1: Simple linear Intersphincteric fistula.
- Grade 2: Intersphincteric fistula with Intersphincteric abscess or secondary fistulous tract.
- Grade 3: Transsphincteric fistula.
- Grade 4: Transsphincteric fistula with abscess or secondary tract within the Ischioanal or Ischiorectal fossa.
- Grade 5: Suprlevator and Translevator disease.
- Others : (Not specifically described in the Parks or St. James' classification).

MATERIALS AND METHODS

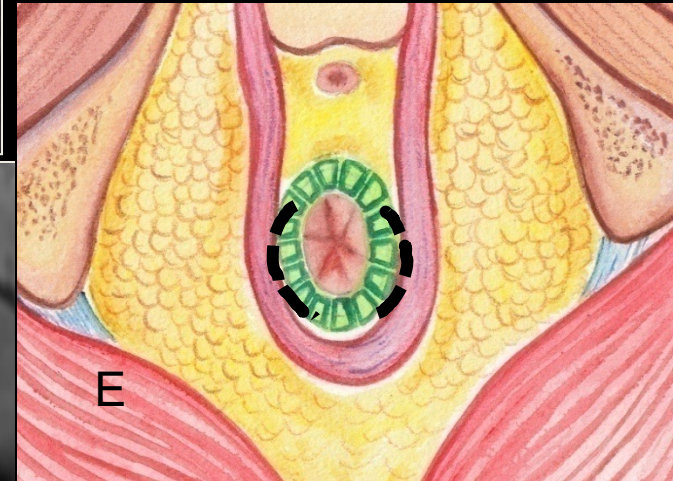
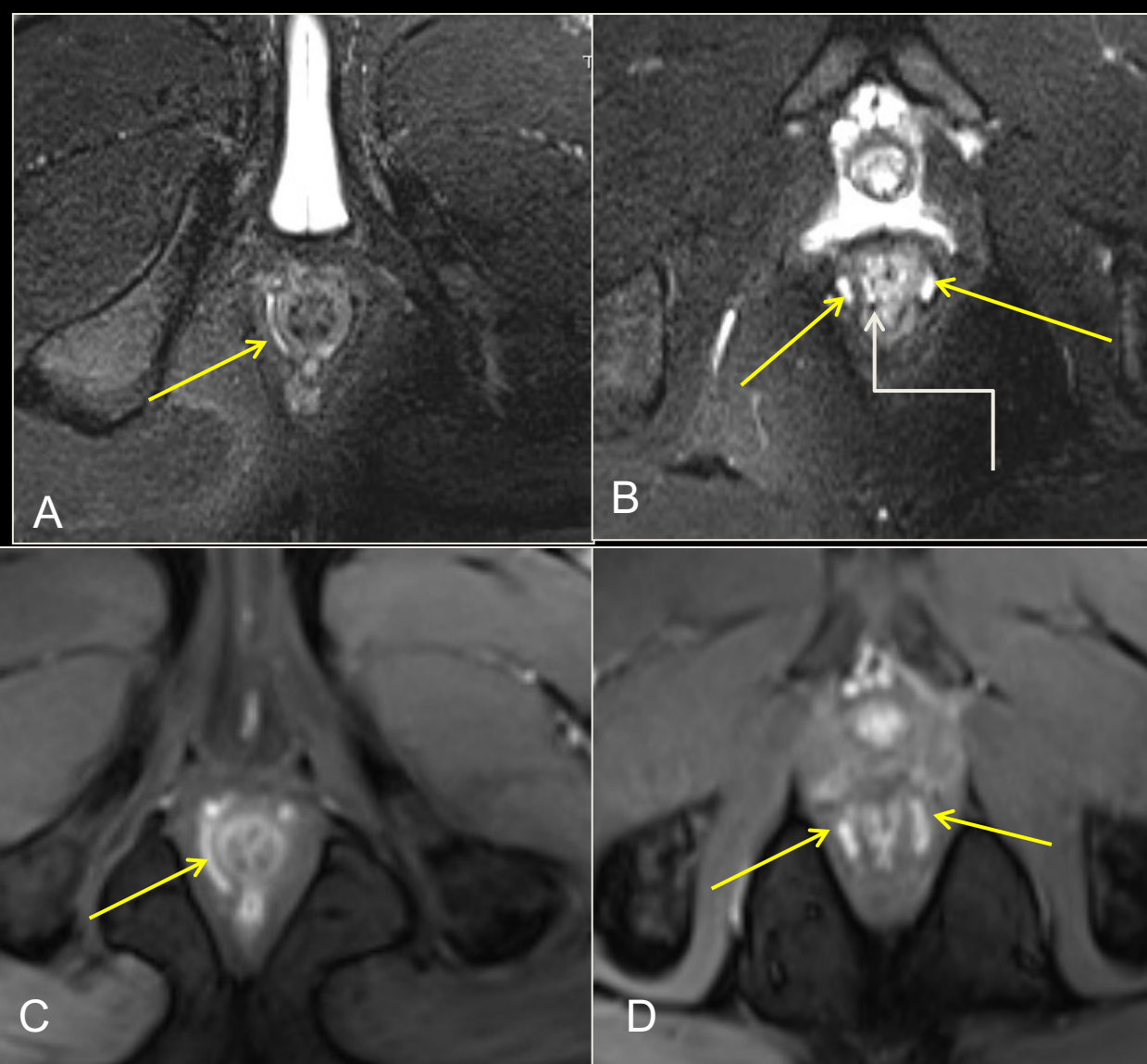
- Retrospective review of 63 cases of perianal fistulas scanned between January 2010 to January 2014 on 3T MRI revealed a spectrum of findings.
- Studies were performed on 3 T Siemens MRI unit MAGNETOM VERIO using Axial T1, Axial T2, Axial T2 fat sat, Coronal STIR, Coronal T2 fat sat, DWI, Post contrast fat sat Axial, Coronal and Sagittal sequences.
- We present various observations in isolation and / or variable combinations.

INTERSPHINCTERIC FISTULA



Axial T2 FS (A and B); Post contrast Axial (C and D); Post contrast T1 Coronal (E); Diagrammatic representation (F):
Shows T2 hyperintense and enhancing tract involving Internal sphincter (yellow arrows in A,B and C), internal opening in anal canal at 6 o'clock (stepped arrow in A), intersphincteric tract (arrows in D and E).

BILATERAL INTERSPHINCTERIC FISTULAS

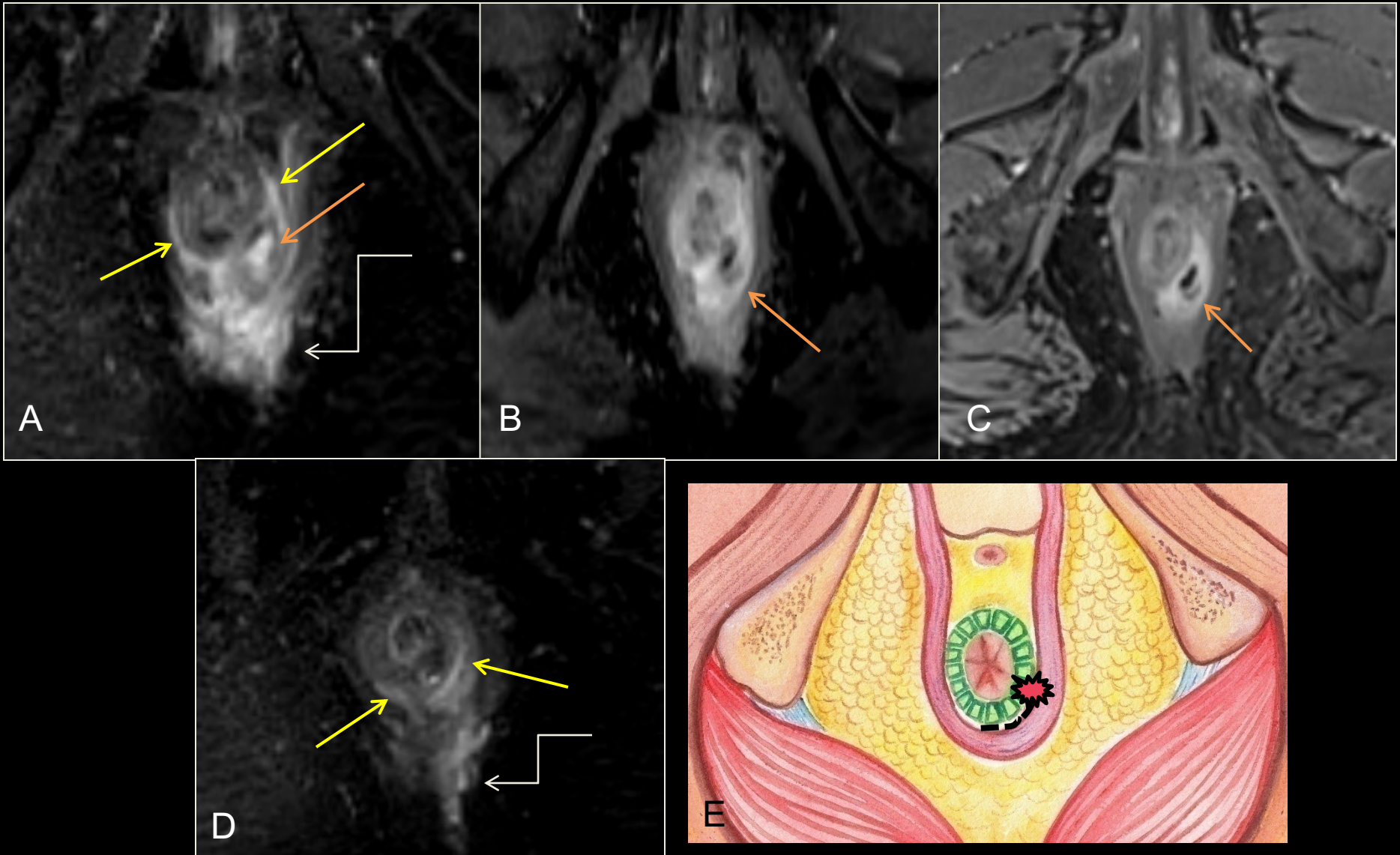


Axial T2 FS (A and B); Post contrast Axial FS (C and D):

Shows T2 hyperintense and enhancing bilateral intersphincteric fistulas (yellow arrows), internal opening at 9 o'clock position (stepped arrow).

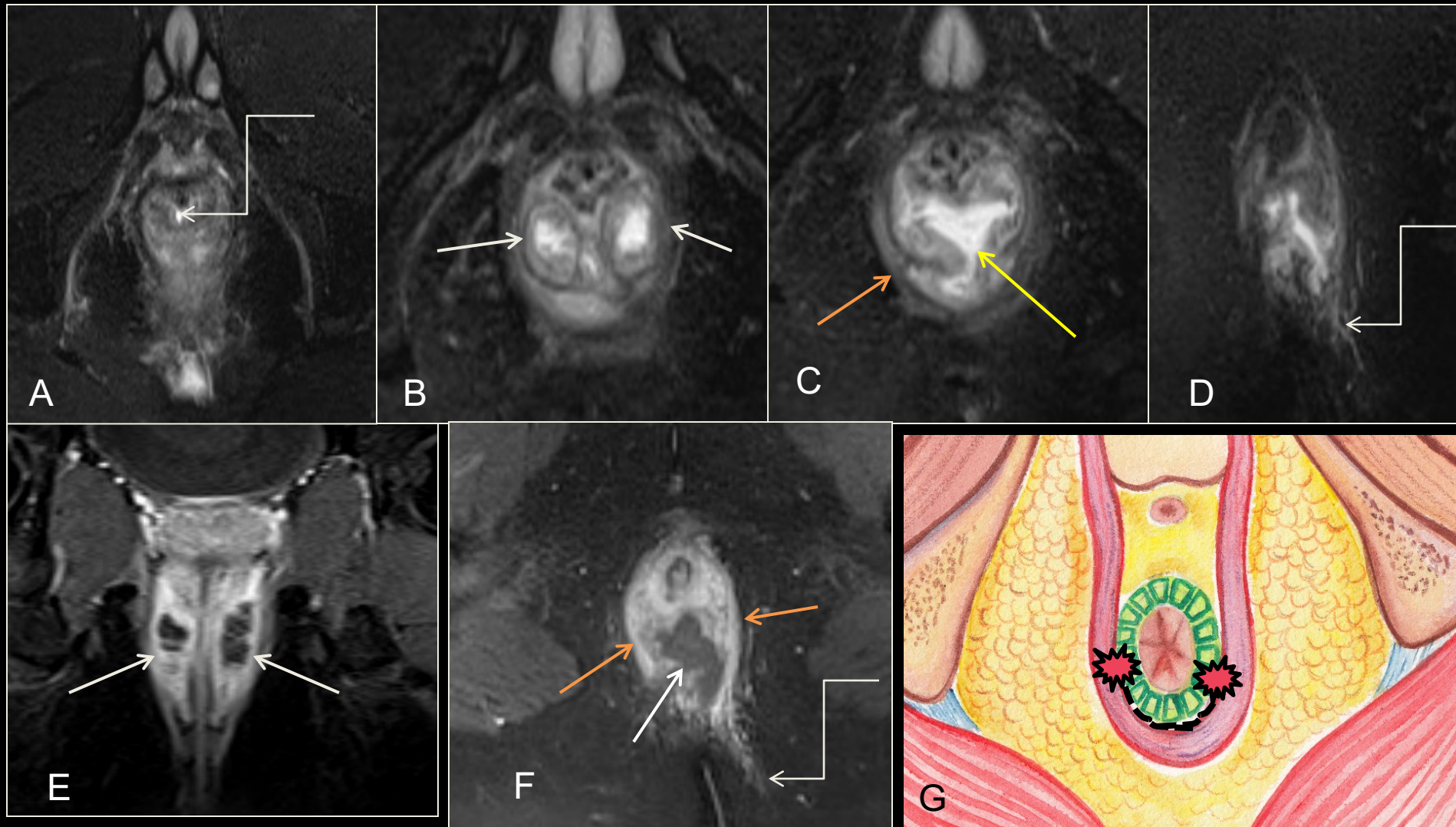
Diagrammatic representation (E) : shows bilateral intersphincteric fistulas.

INTERSPHINCTERIC FISTULA WITH ABSCESS



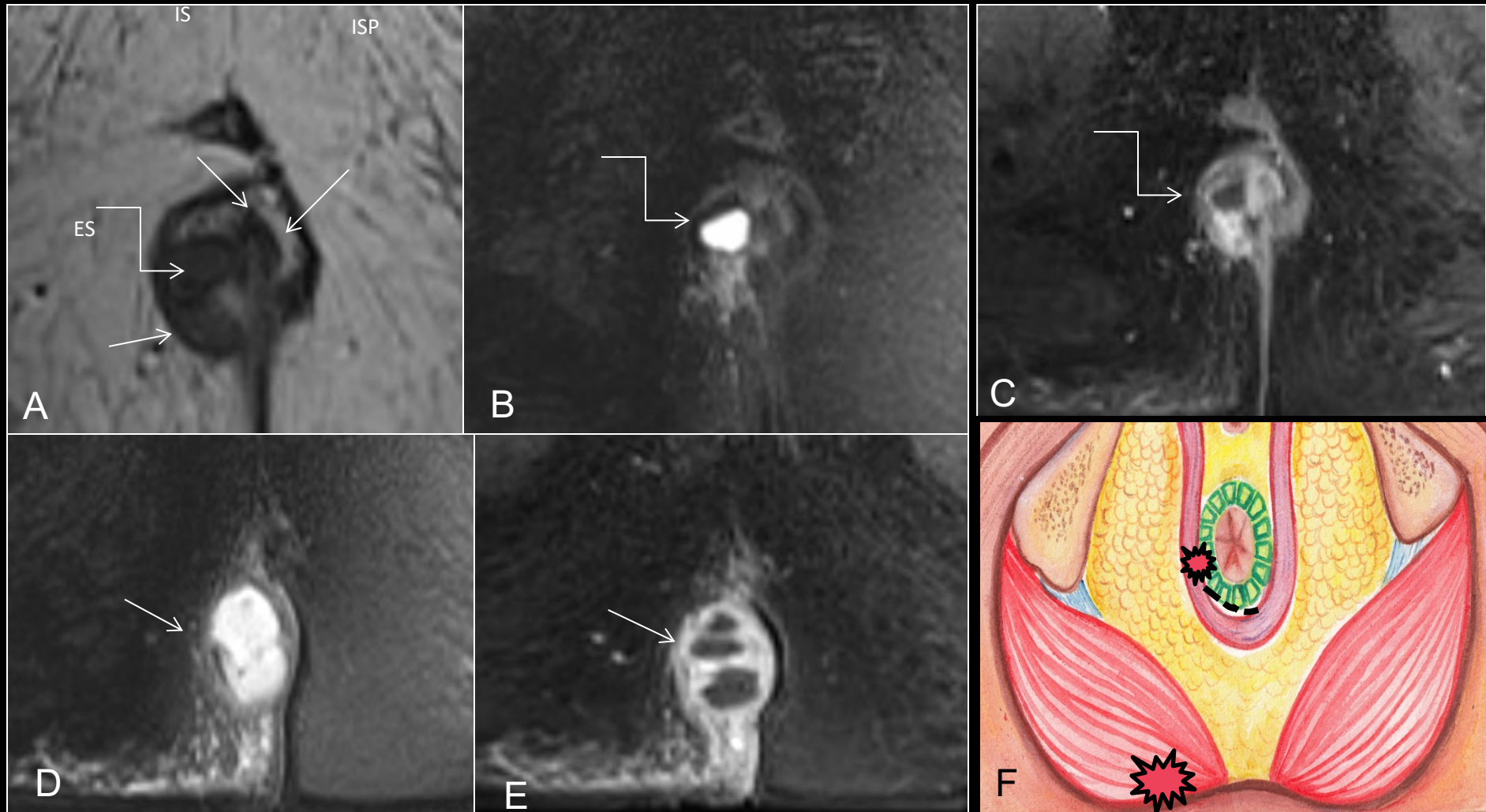
Axial T2 fat sat (A and D); Post contrast axial (B ,C and D); Diagrammatic representation (E): Shows T2 hyperintense intersphincteric tracts (yellow arrow) with intersphincteric abscess(orange arrow). Perianal inflammation (stepped arrow in A and D) .

BILATERAL INTERSPHINCTERIC FISTULAS WITH ABSCESES



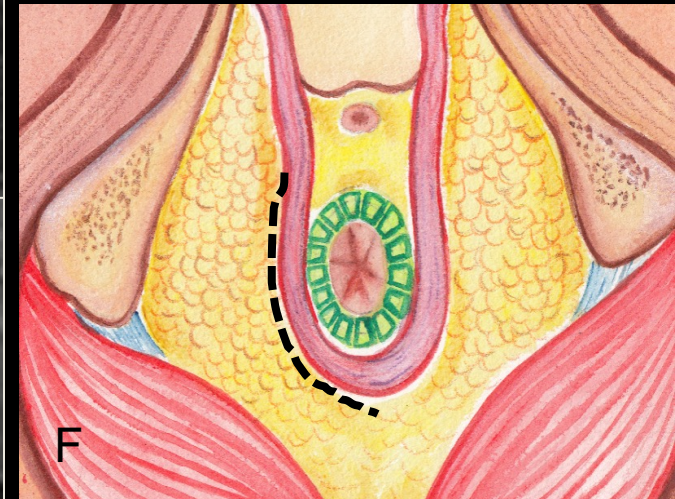
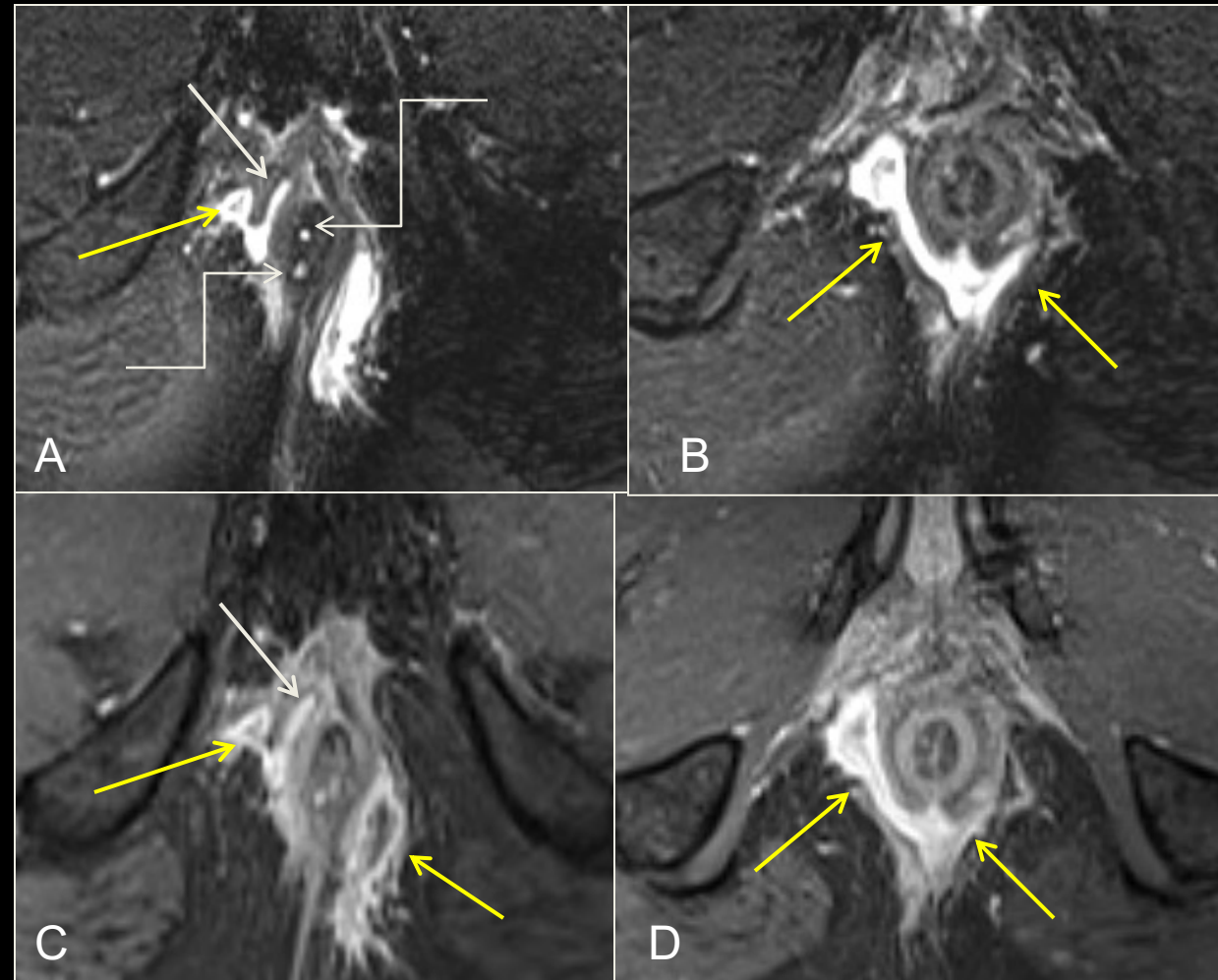
Axial T2 FS (A to D), Post contrast FS Coronal (E), Post contrast Axial FS (F): Shows T2 hyperintense and peripherally enhancing intersphincteric abscesses (white arrows in B,E,F), internal opening in anal canal at 12 o'clock (stepped arrow in A). Bilateral intersphincteric tracts are seen communicating posteriorly (yellow arrow in C). Disruption of external sphincter posteriorly with abnormal T2 hyperintense signal and abnormal enhancement (orange arrows in C and F). Significant perianal inflammation (stepped arrow in D). **Diagrammatic representation (G):** Shows bilateral intersphincteric abscesses.

INTERSPHINCTERIC ABSCESS PERIANAL ABSCESS



Axial T1(A),Axial T2 FS(B),Post contrast T1 FS (C):
Show intersphincteric abscess with peripheral enhancement (stepped arrow) .
Axial T2 FS (D), Post contrast T1 FS (E):
Shows peripheral enhancing perianal abscess (arrow) in same patient.
Diagrammatic representation (F) :Shows intersphincteric fistula and abscesses

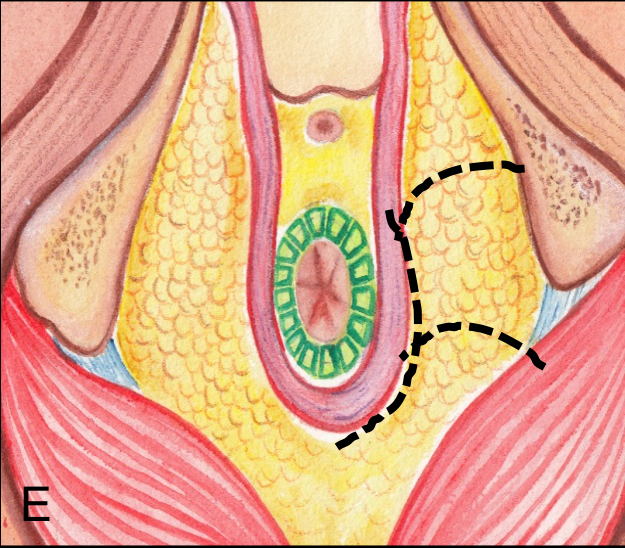
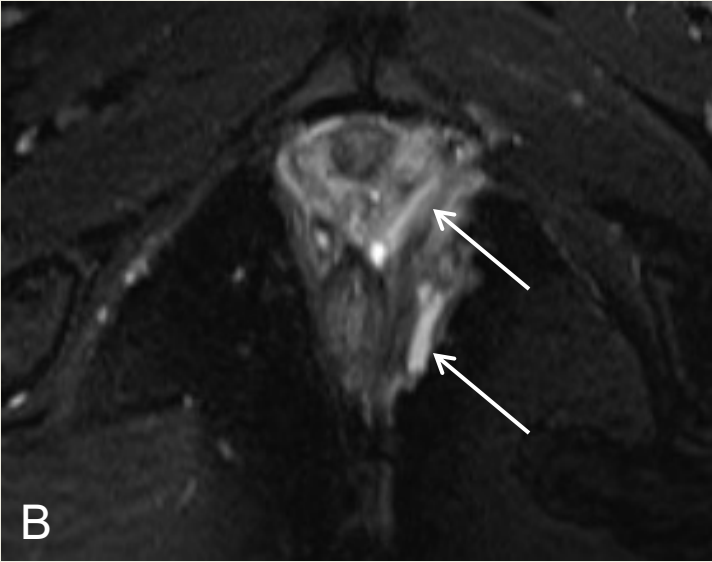
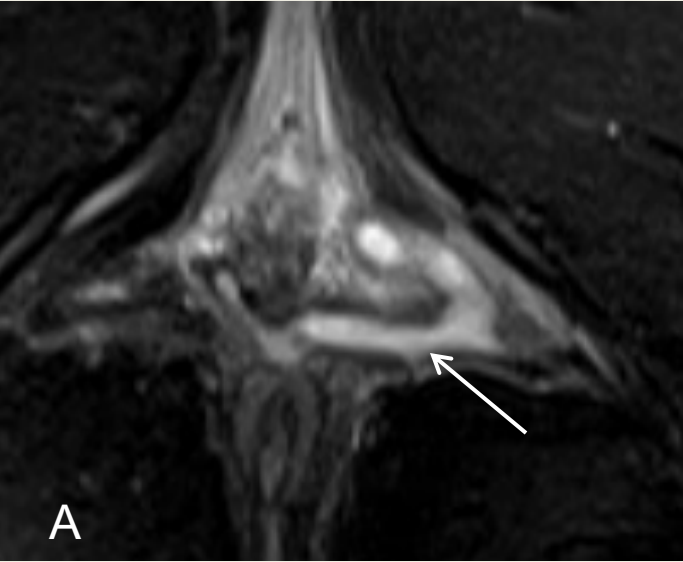
EXTRASPHINCTERIC FISTULA



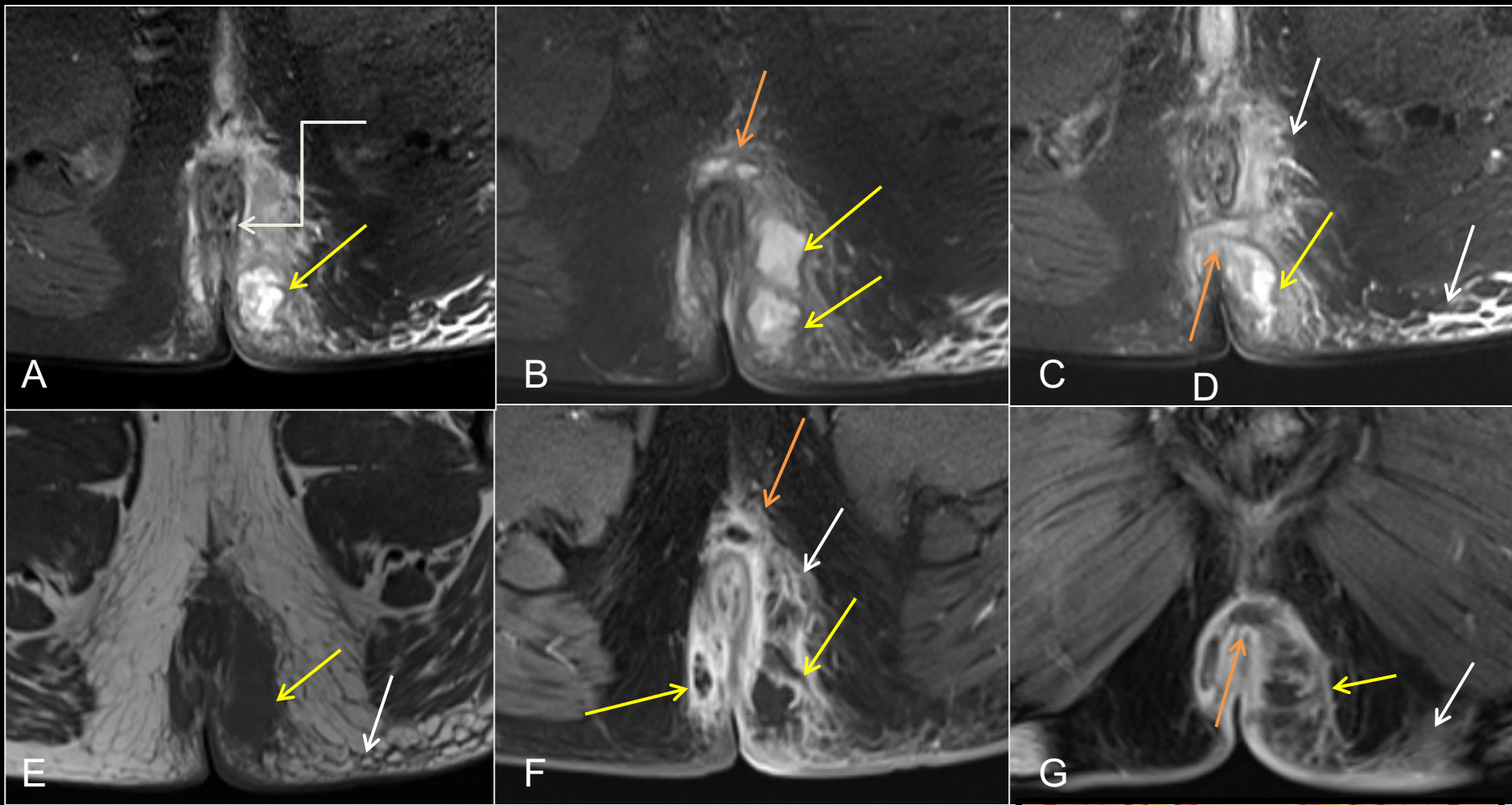
Axial T2 FS (A and B); Post contrast Axial FS (D and E); Diagrammatic representation (F): Shows T2 hyperintense and enhancing tract in intersphincteric plane (white arrows in A and D), internal opening in anal canal at 6 o'clock and 12 o'clock positions (stepped arrows in A). Right extrasphincteric tract is seen in communication with right intersphincteric tract with extension of extrasphincteric tract towards the left side (yellow arrows).

EXTRASPHINCTERIC TRACTS WITH MULTIPLE SIDE BRANCHES

Axial T2 FS (A to D) and Diagrammatic representation (E): Show multiple extrasphincteric tracts with multiple side branches (arrows).



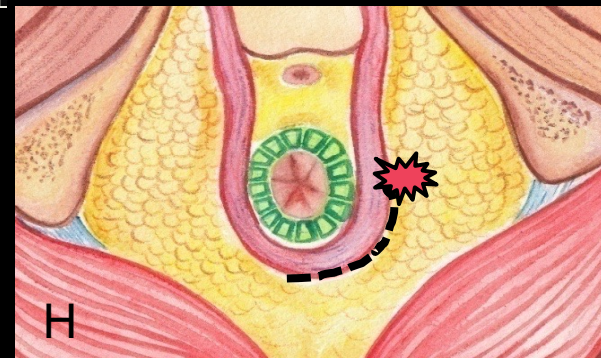
EXTRASPHERINCTERIC FISTULA WITH ABSCESS



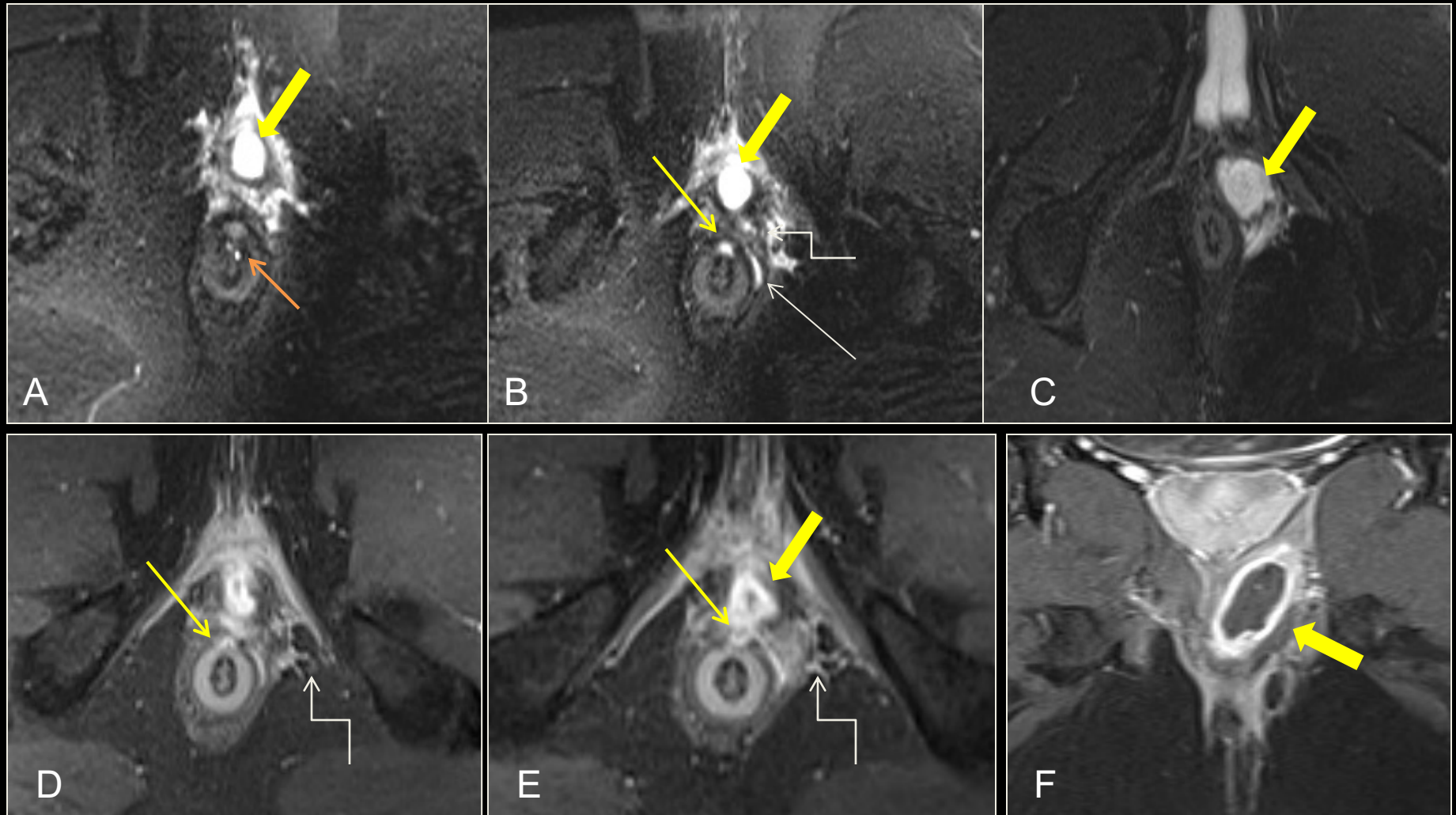
Axial T2 FS (A to C); Axial T1(E), Post contrast Axial FS (F and G):

Shows internal anal opening at 5 o'clock position(stepped arrow), T2 hyperintense and peripheral enhancing anterior and posterior extrasphincteric tracts (orange arrows) with extension across midline, multiple bilateral perianal abscesses (yellow arrows) and significant perianal fat inflammation (white arrows).

Diagrammatic representation(F): Shows extrasphincteric fistula with abscess.



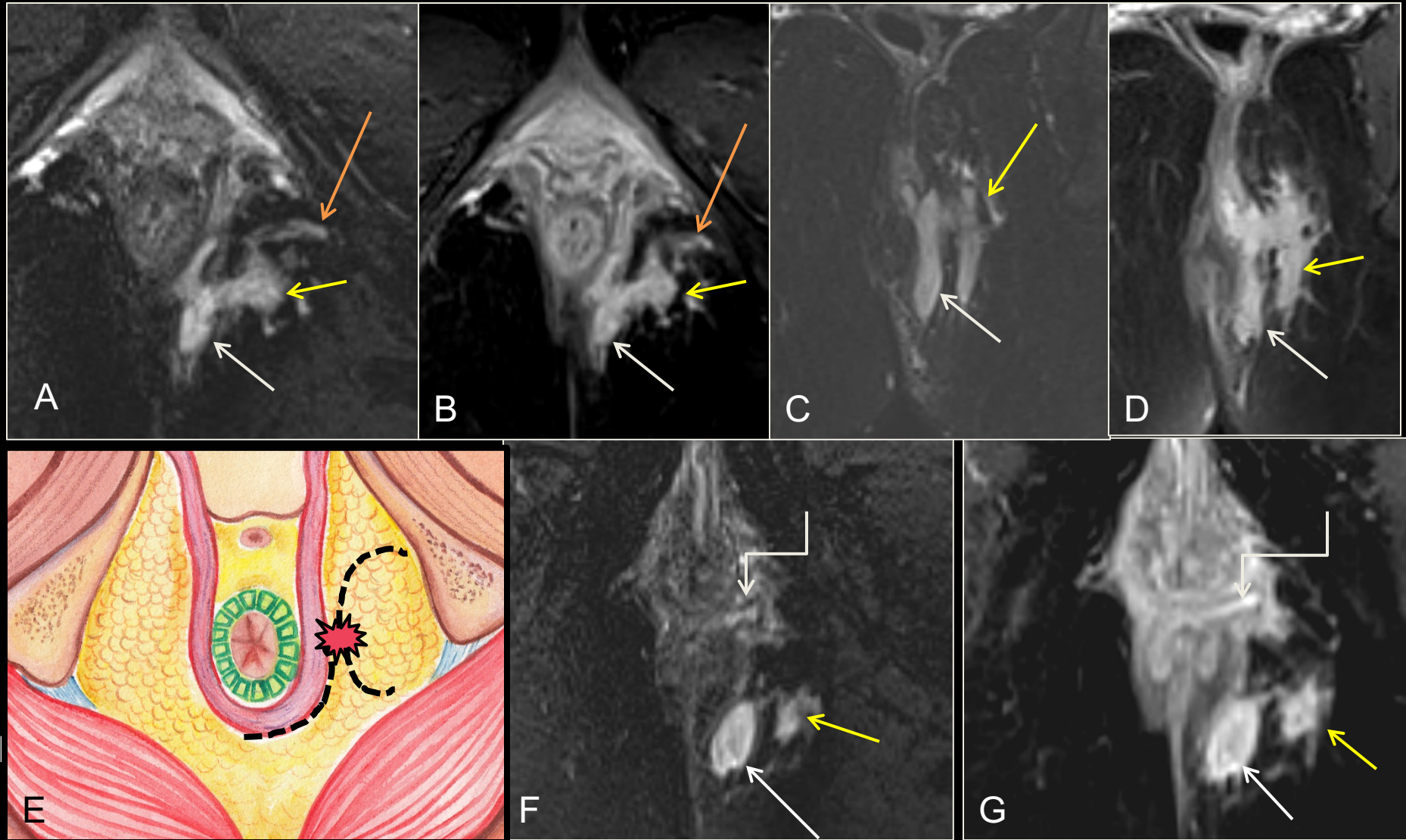
TRANSSPHINCTERIC FISTULA WITH EXTRASPHINCTERIC ABSCESS



Axial T2 FS (A, B and C), Post contrast T1 FS Axial (D and E) and Coronal (E):

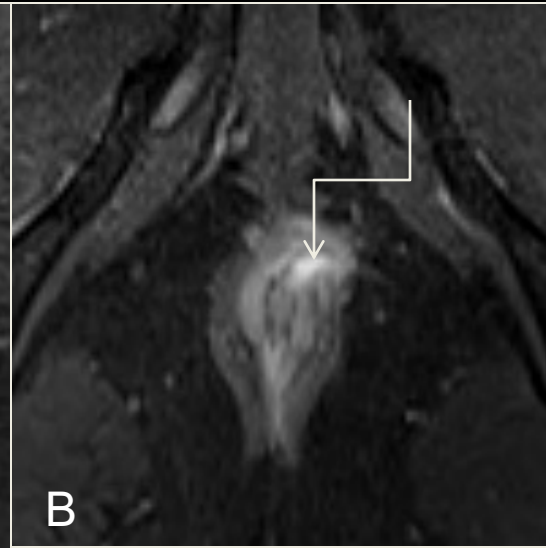
Shows anal opening at 12 – 1 o'clock position (orange arrow in A), transsphincteric fistula with enhancement (yellow arrows in B, D and E). Intersphincteric tract (arrow in B). Extrasphincteric abscess (bold yellow arrows), perianal fat inflammation (stepped arrow). An abscess is seen in the infralevator region. No extension noted into the supralevator compartment.

BRANCHING EXTRASPHINCTERIC FISTULA WITH ABSCESS



Axial T2 FS (A); Coronal T2 FS (C and F); Post contrast Axial FS (B); Post contrast FS Coronal (D and G): Shows T2 hyperintense and enhancing Extrasphincteric fistula (white arrows), abscess in Ischiorectal fossa (yellow arrows), Transsphincteric fistula (stepped arrow), side branches (orange arrows).
Diagrammatic representation (E): Shows branching extrasphincteric fistula with an abscess

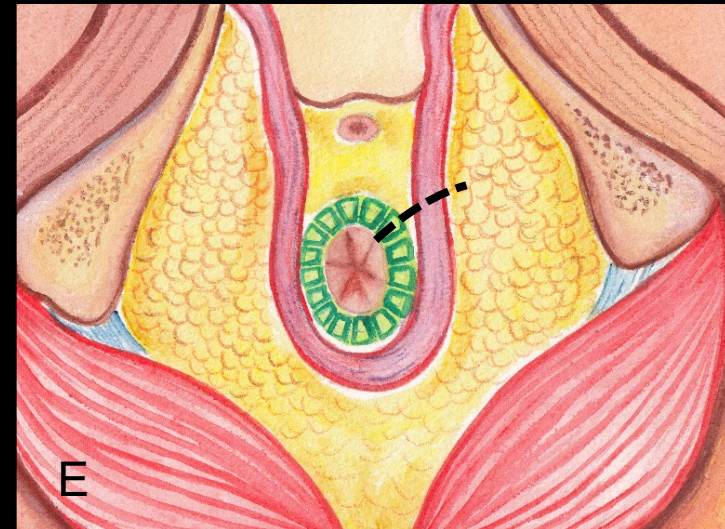
TRANSSPHINCTERIC FISTULA



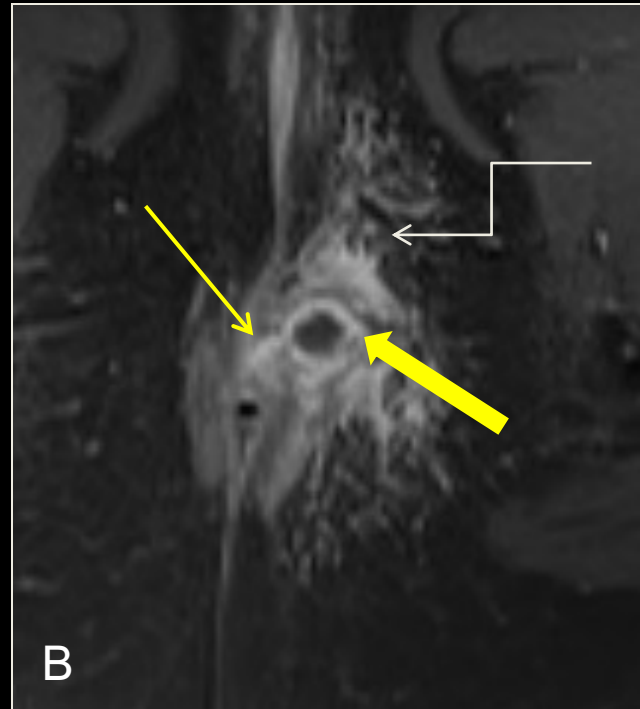
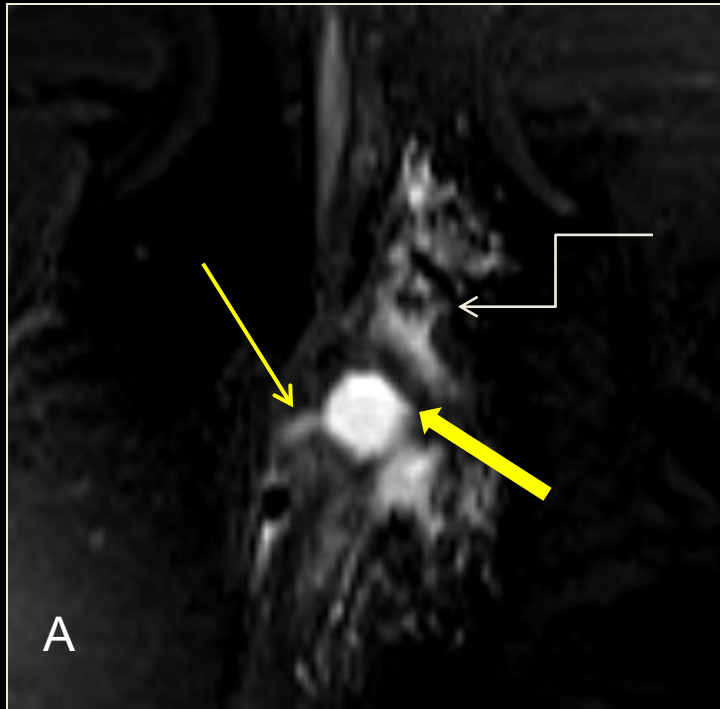
Axial T2 FS (A), Post contrast T1 FS (B):
Shows transsphincteric fistula with enhancement (stepped arrow) .

Axial T2 FS (C) and post contrast T1 FS (D) :
Shows anal opening of tract in A, seen as T2 hyperintense signal at 6 o'clock position (arrow in C), with enhancement (arrow in D).

Diagrammatic representation (E) :
Shows transsphincteric fistula.

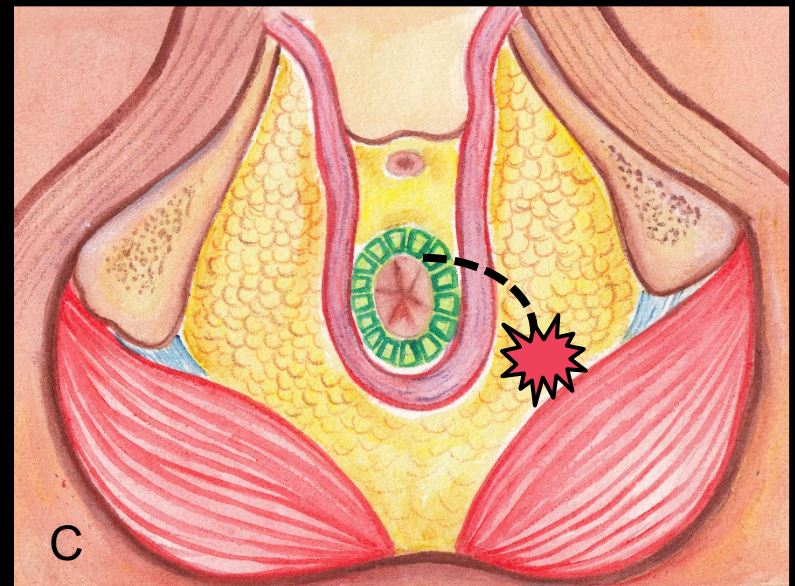


TRANSSPHINCTERIC FISTULA WITH ABSCESS



Axial T2 FS (A), Post contrast T1 FS (B):
Shows transsphincteric fistulous tract with enhancement (yellow arrow), extrasphincteric abscess (bold yellow arrow). Significant perianal inflammation (stepped arrow in A and B).

Diagrammatic representation (C):
Shows transsphincteric fistula with extrasphincteric abscess.



BILATERAL INTERSPHINCTERIC AND LEFT TRANSSPHINCTERIC FISTULA

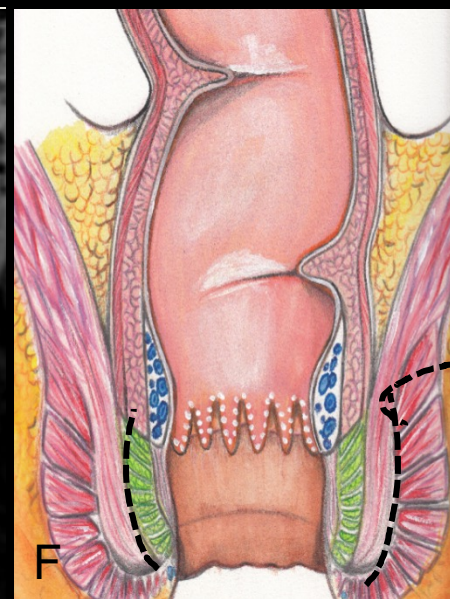
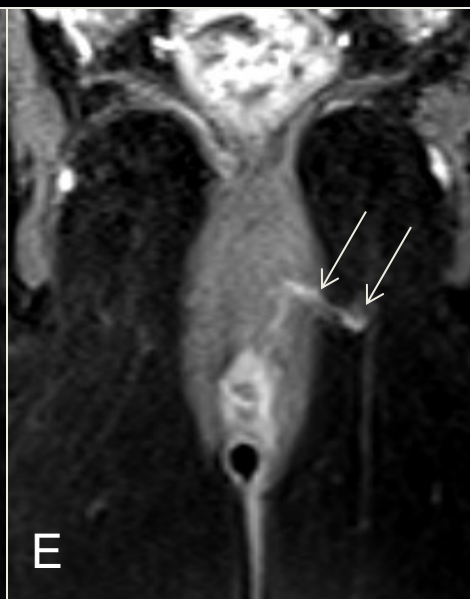
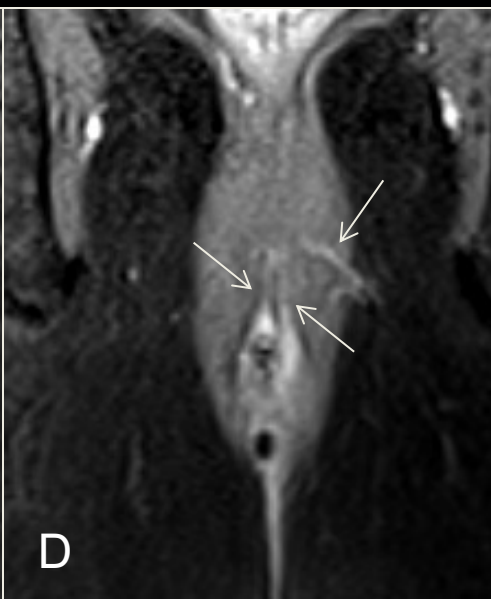
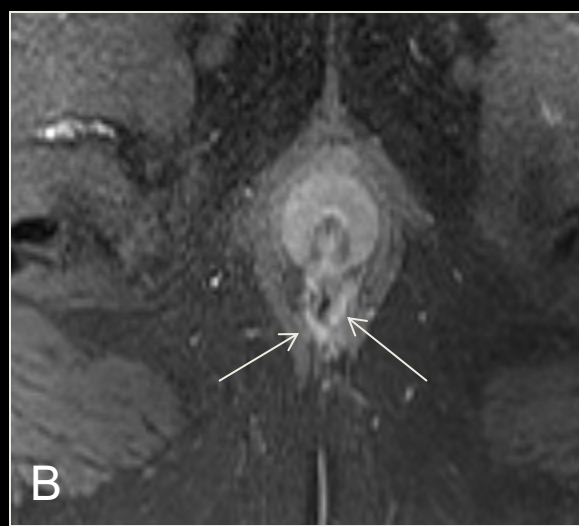
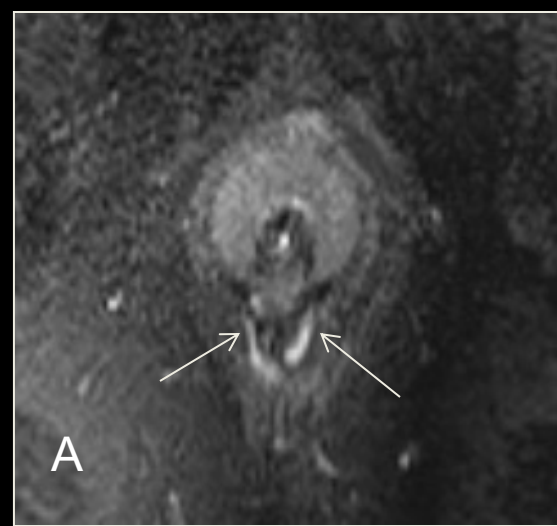
Axial T2 FS (A), Post contrast T1 FS (B):
Show bilateral T2 hyperintense intersphincteric fistulas (arrows in A) with enhancement (arrows in B).

Axial T2 FS (C) and Post contrast Coronal T1 FS (D and E):

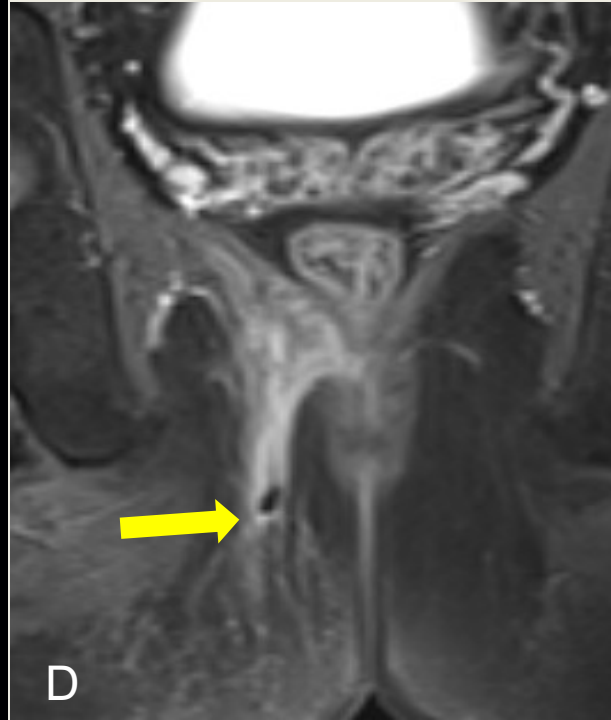
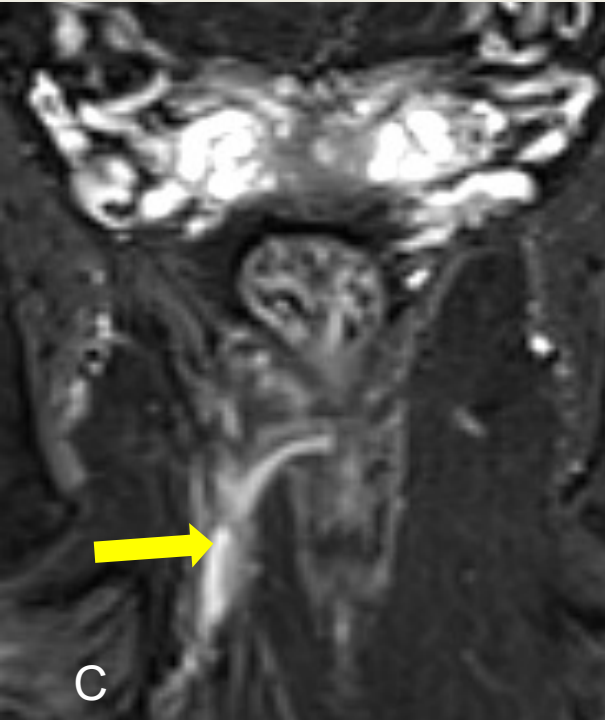
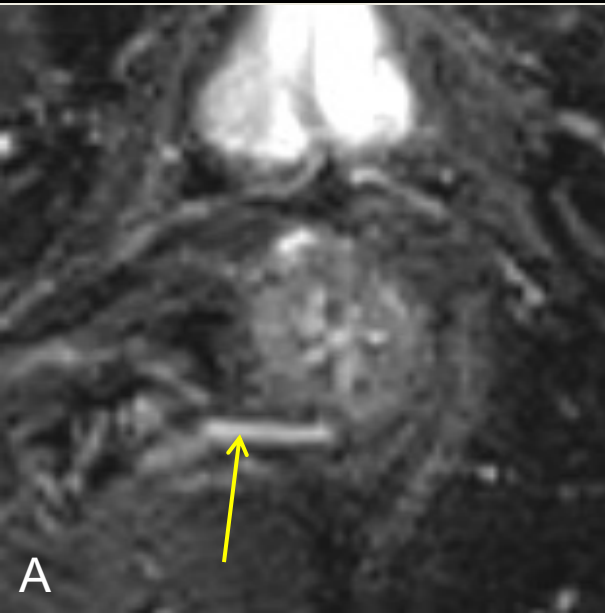
Shows T2 hyperintense and enhancing transsphincteric tract traversing across external sphincter with extension into left ischioanal space (arrows in C and E).

This transsphincteric tract is in continuation with intersphincteric tract (arrows in D).

Diagrammatic representation (F).



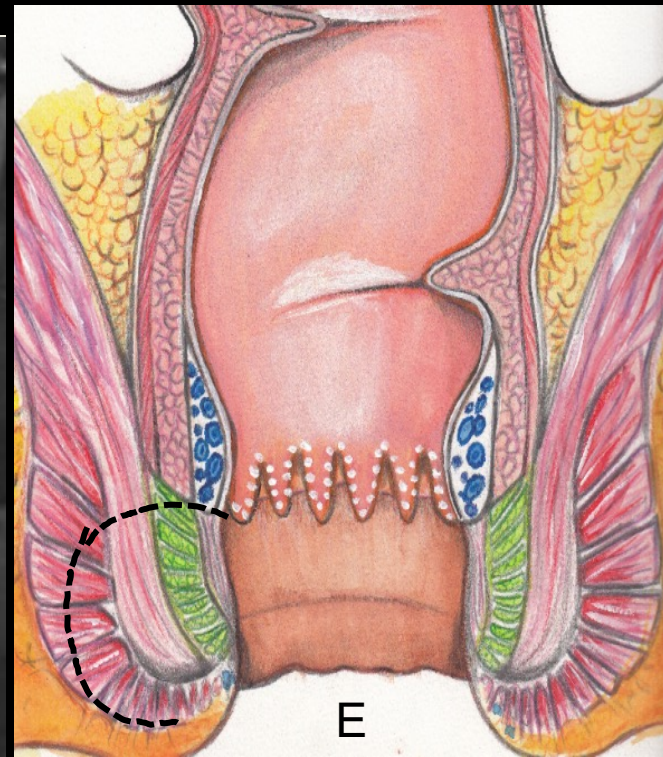
TRANSSPHINCTERIC FISTULA COMMUNICATING WITH EXTRASPHINCTERIC TRACT



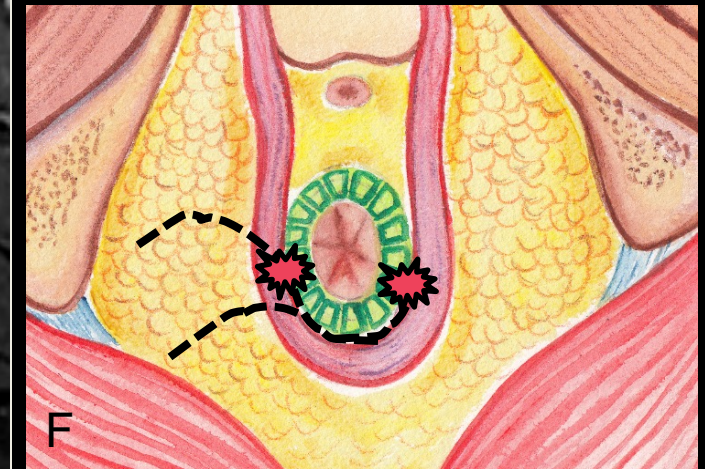
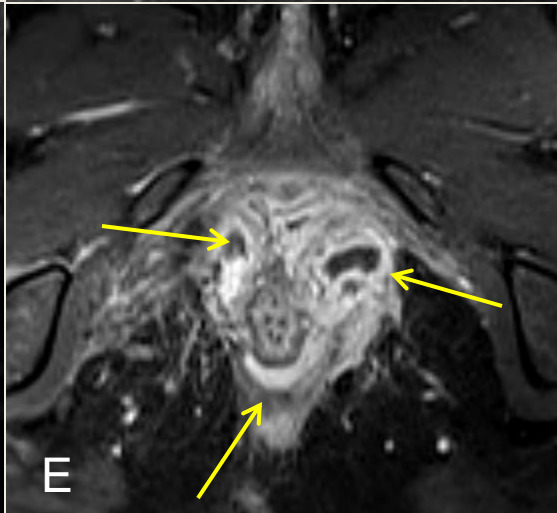
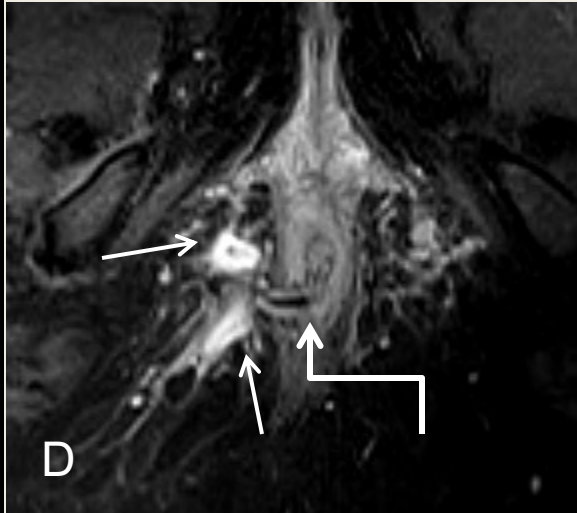
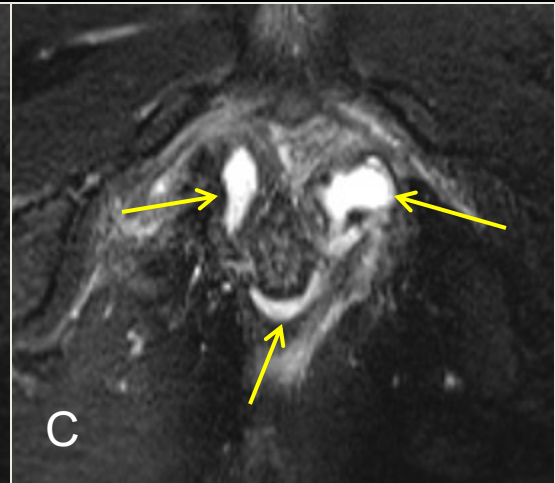
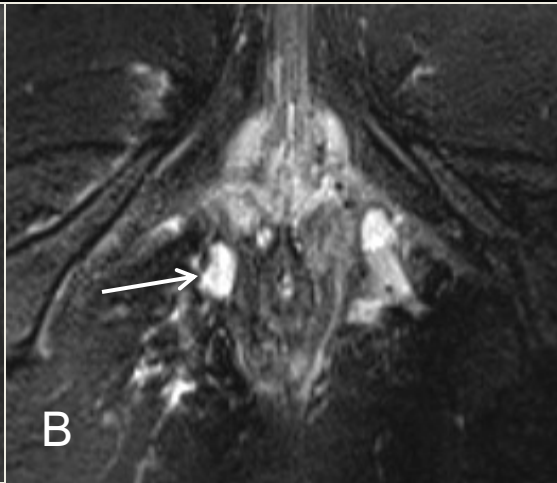
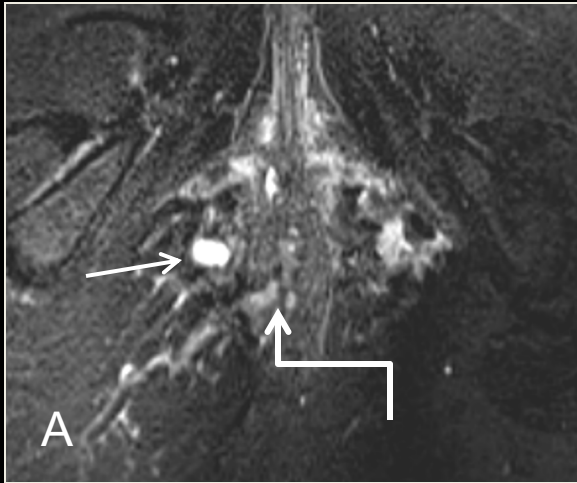
Axial T2 FS(A), Post contrast T1 FS (B):
Shows transsphincteric fistula with enhancement (yellow arrow).

Axial T2 FS(C) and post contrast T1 FS (D):
Shows extrasphincteric tract (bold yellow arrows).

Diagrammatic representation (E):
Shows transsphincteric tract in continuation with extrasphincteric tract.

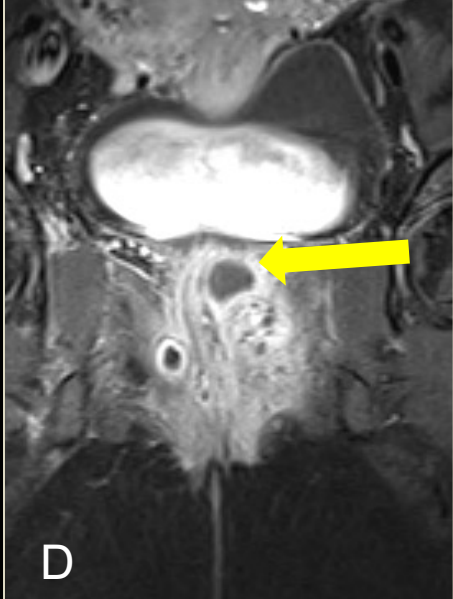
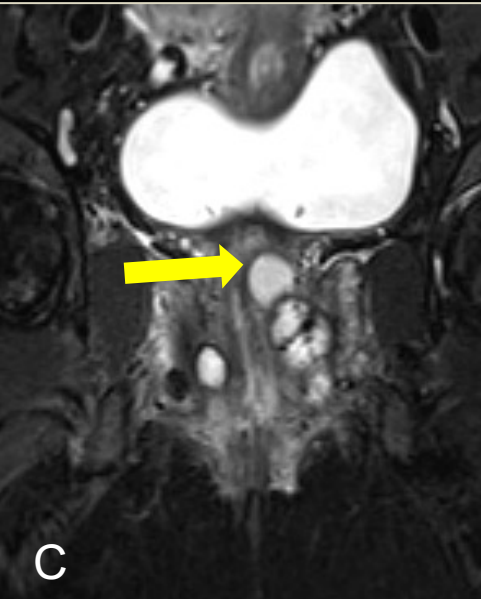
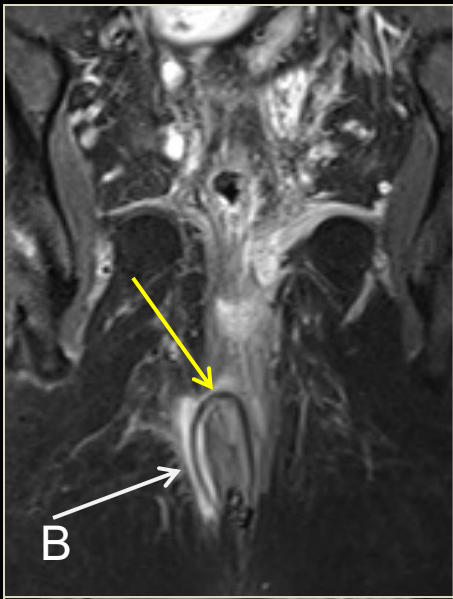
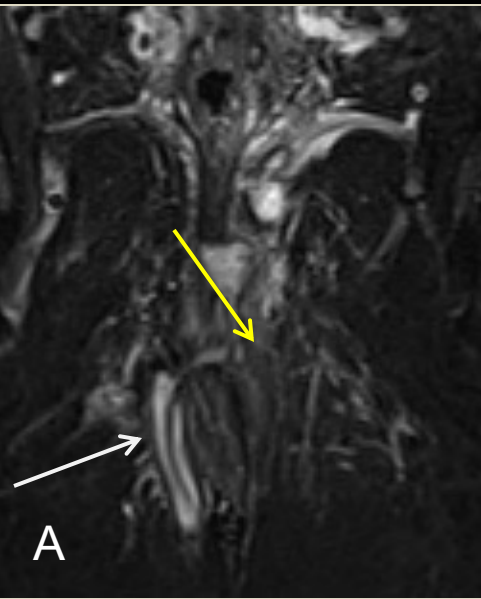


HORSESHOE INTERSPHINCTERIC FISTULA WITH ABSCESES, EXTRASPHINCTERIC AND TRANSSPHINCTERIC TRACTS



Axial T2 FS (A, B, C and D) and Axial T1 FS Post contrast (E): Show transsphincteric tract (stepped arrow), extrasphincteric tracts (white arrows) and horseshoe intersphincteric fistula with abscesses (yellow arrow),supralelevator extension (orange stepped arrow).
Diagrammatic representation (F).

TRANSSPHINCTERIC AND EXTRASPHINCTERIC TRACTS WITH SUPRALEVATOR EXTENSION AND ABSCESS

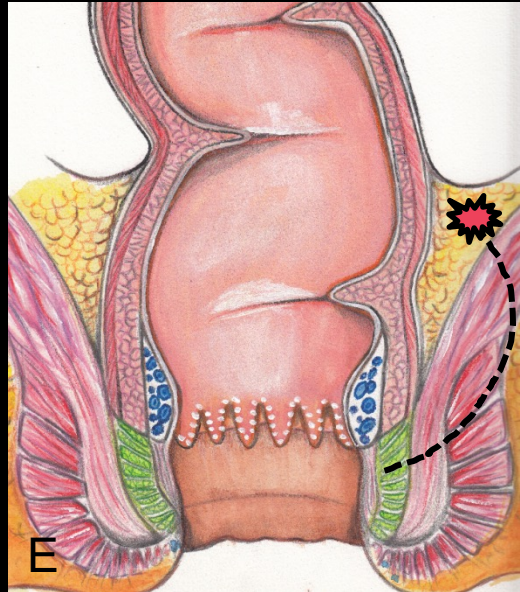


Coronal T2 FS (A and C) and Post contrast T1 FS (B and D):

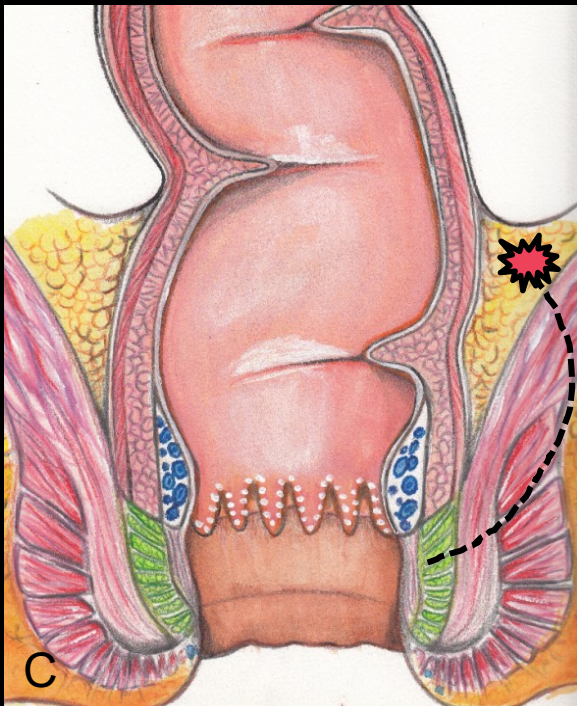
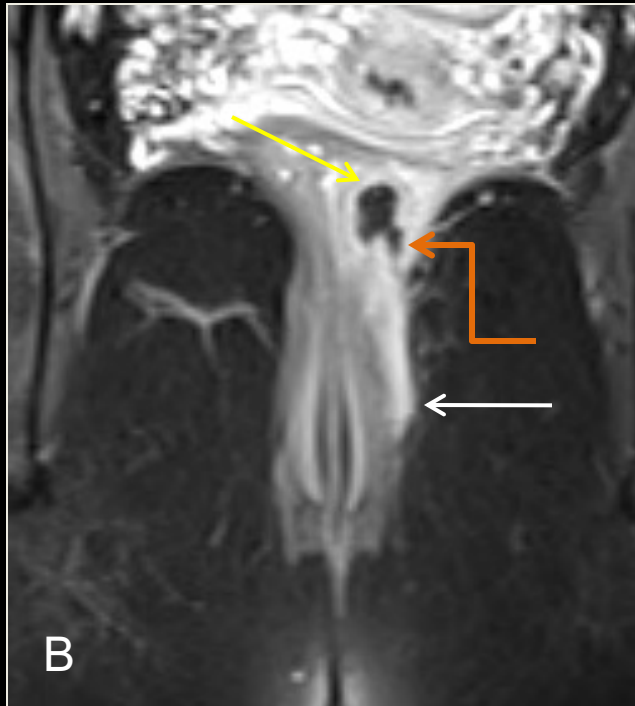
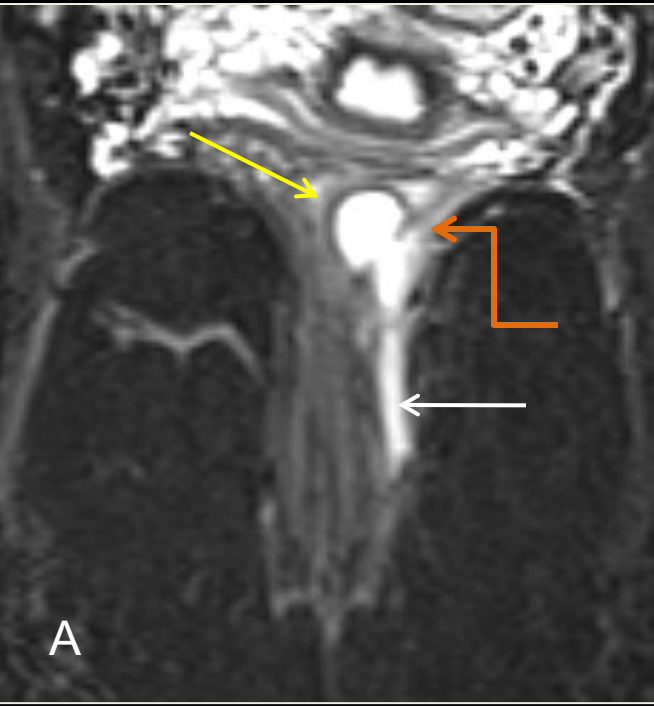
Shows transsphincteric fistula with enhancement (yellow arrow), extrasphincteric tract (white arrow). Perianal abscess with supralelevator extension (Bold yellow arrow).

Diagrammatic representation (E):

Shows communicating transsphincteric and extrasphincteric tracts with supralelevator extension and abscess.



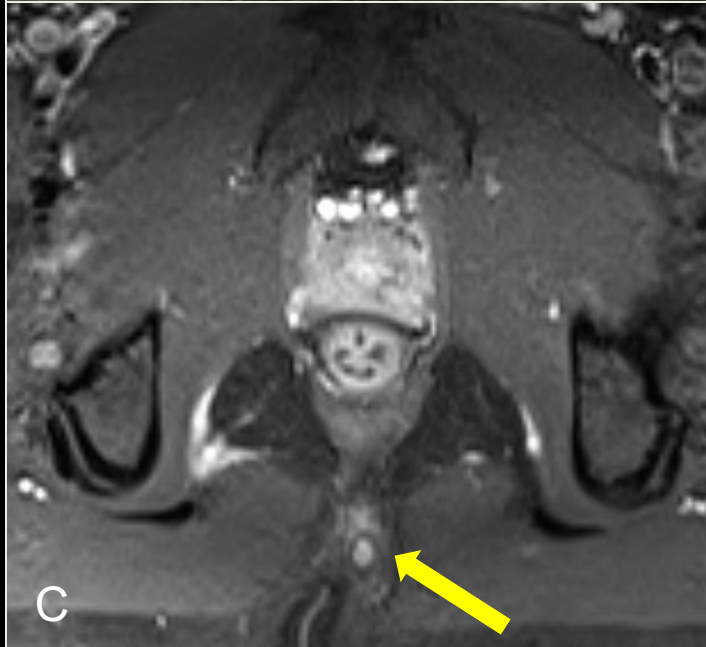
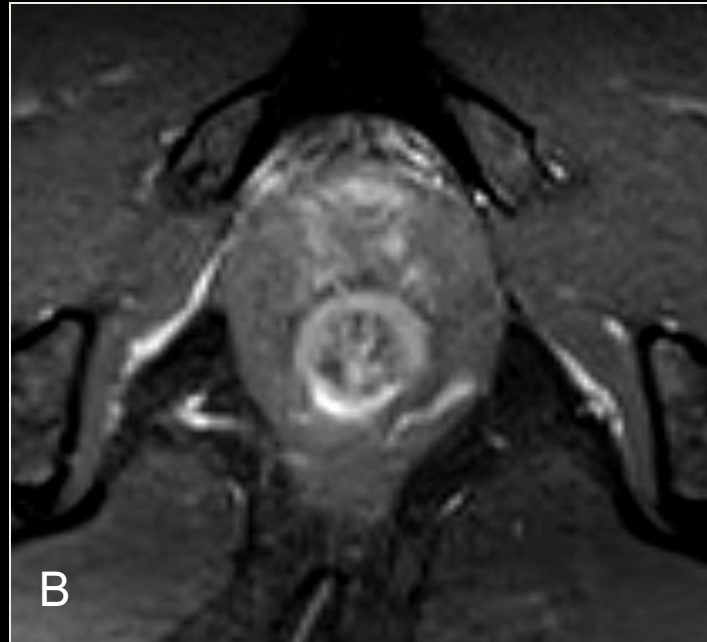
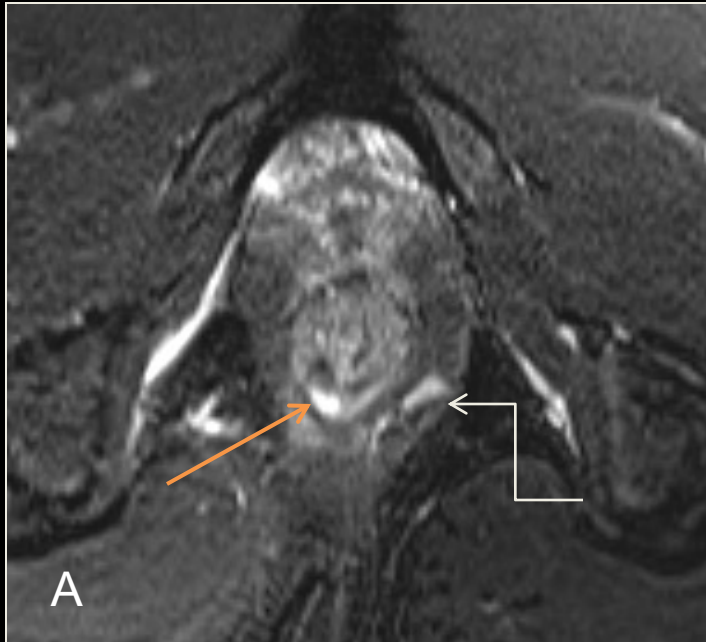
EXTRASPINCTERIC TRACT WITH SUPRALEVATOR EXTENSION



Coronal T2 FS (A) and Coronal T1 FS Post contrast (B):
Show extrasphincteric tract (white arrows) with supralelevator extension (orange stepped arrow).

Diagrammatic representation (C): Shows supralelevator extension.

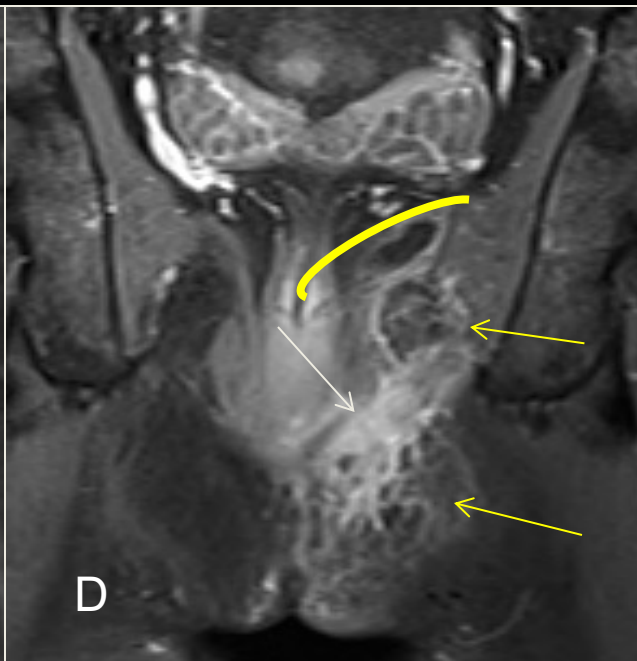
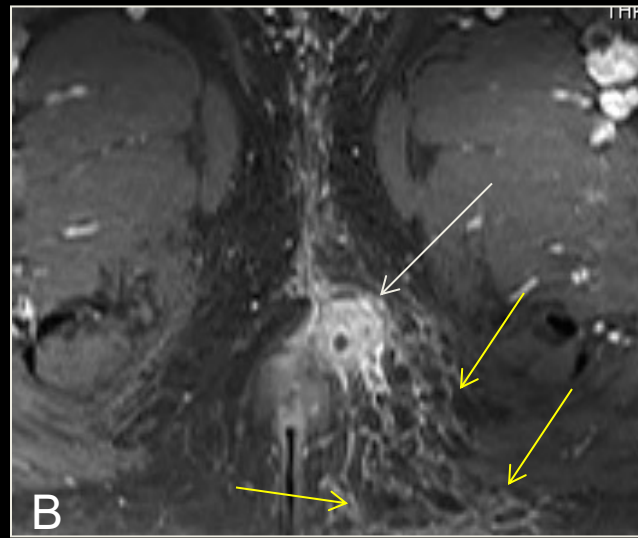
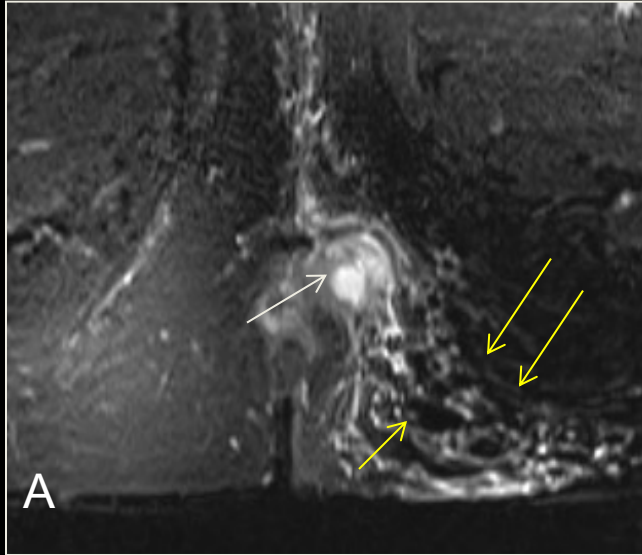
ABNORMAL SPHINCTER ENHANCEMENT



Axial T2 FS (A), Post contrast T1FS (B):
Shows T2 hyperintense signal involving internal sphincter at 7 o'clock position, abnormal enhancement involving internal sphincter from 5 o'clock to 7 o'clock position (orange arrow). Abnormal hyperintense signal in external sphincter with abnormal enhancement(stepped arrow).

Axial Post contrast T1 FS (C):
Shows abnormal enhancement on perianal region(bold yellow arrow).

PERIANAL ABSCESSSES



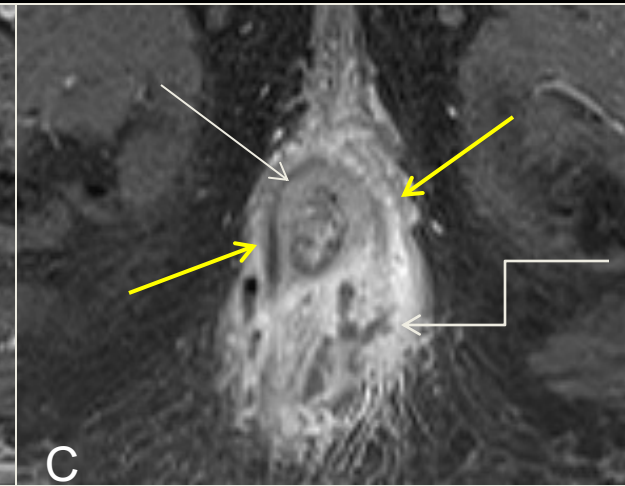
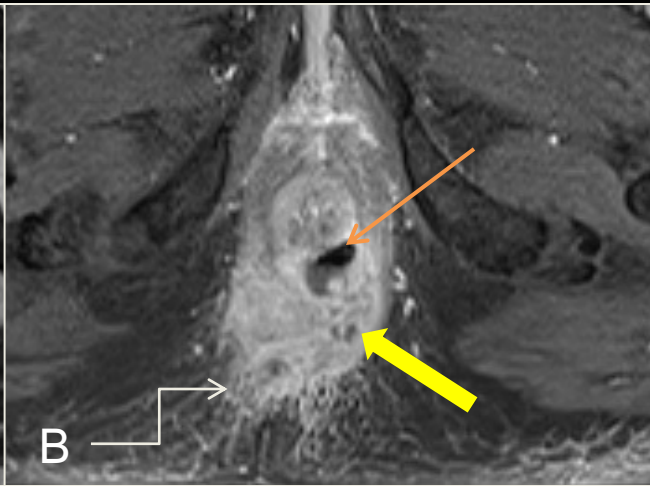
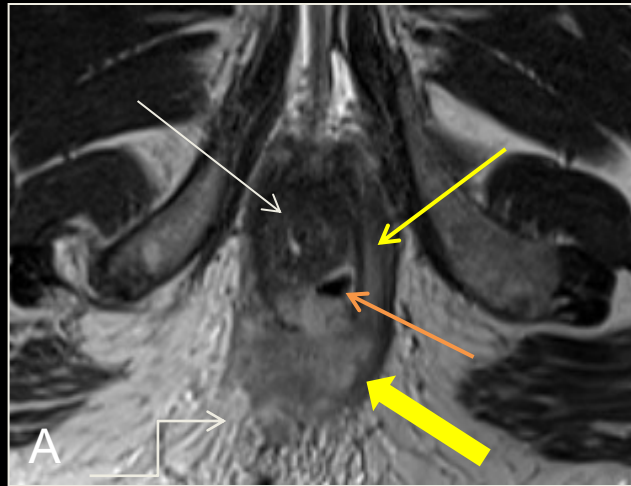
Axial T2 FS (A), and Coronal T2 FS (C), Post contrast T1 FS (B) and Post contrast Coronal T1 FS (D) :

Show T2 hyperintense perianal abscess (arrows in A and C) , central T1 hypointensity with thick peripheral enhancement (arrows in B and D) .

Significant inflammation is noted in the perianal and perirectal fat, seen as ill defined T2 hyperintensities (yellow arrows in A and C) and abnormal enhancement (yellow arrows in B and D) .

The perianal and perirectal fat inflammation is seen to extend upto the left levator ani (curved yellow line). No abnormality is noted in the supralelevator region.

PERIANAL ABSCESS



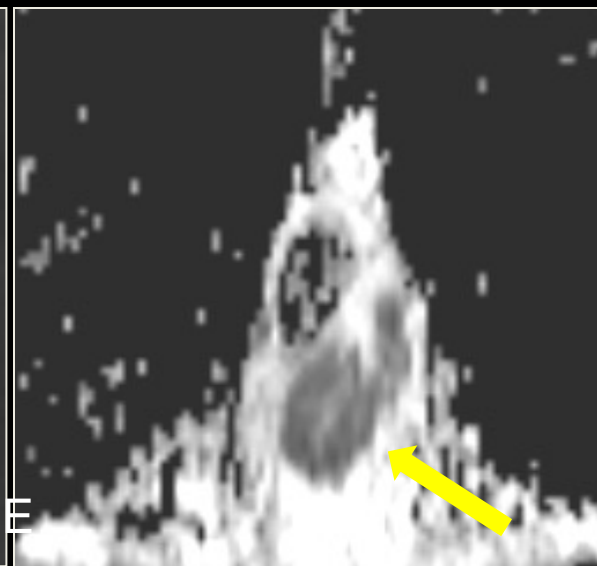
Axial T2(A), Post contrast T1 FS (B): Shows an abscess in the posterior perianal region and intersphincteric space (bold yellow arrow). T2 and T1 hypointense focus is noted within, suggestive of air (orange arrow in A and B).

Axial Post contrast T1 FS (C):

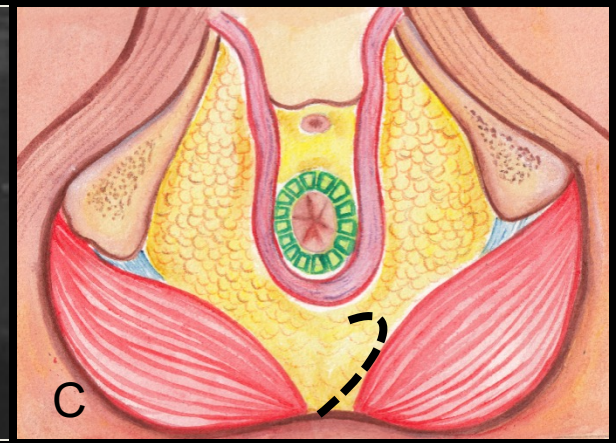
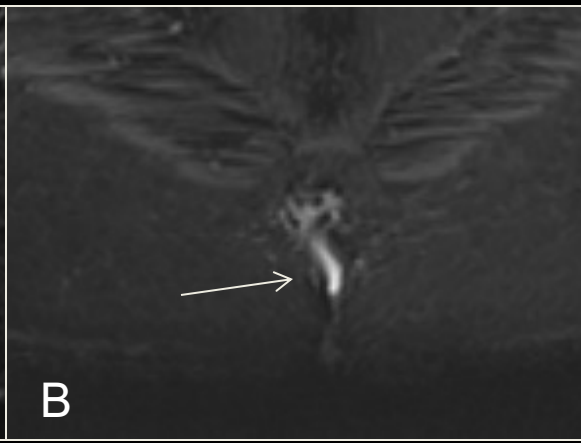
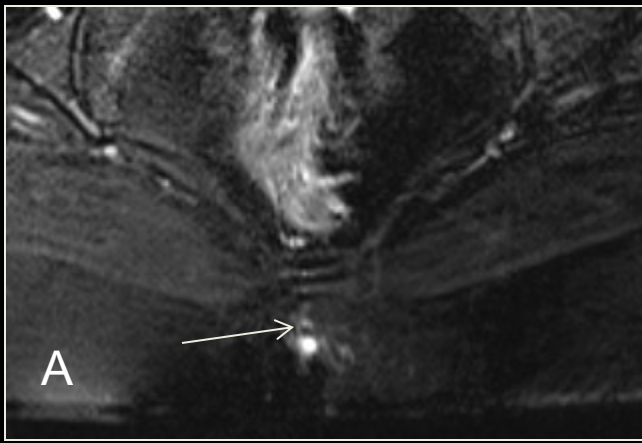
Shows destruction of the posterior aspect of the internal and external sphincters. Internal sphincter (white arrow); external sphincter (yellow arrow).

Abnormal T2 hyperintense signal (yellow arrow in A) and abnormal enhancement (yellow arrow in C) are also noted in the external sphincter.

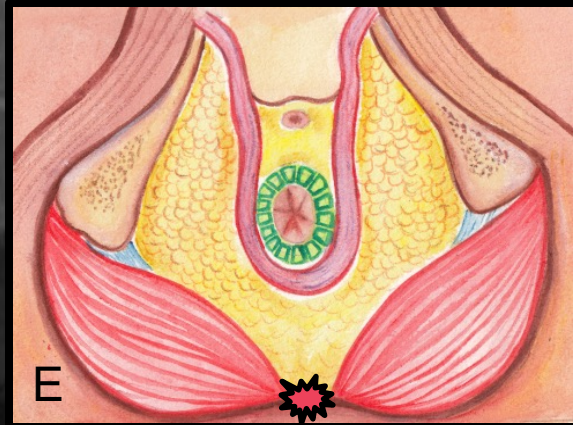
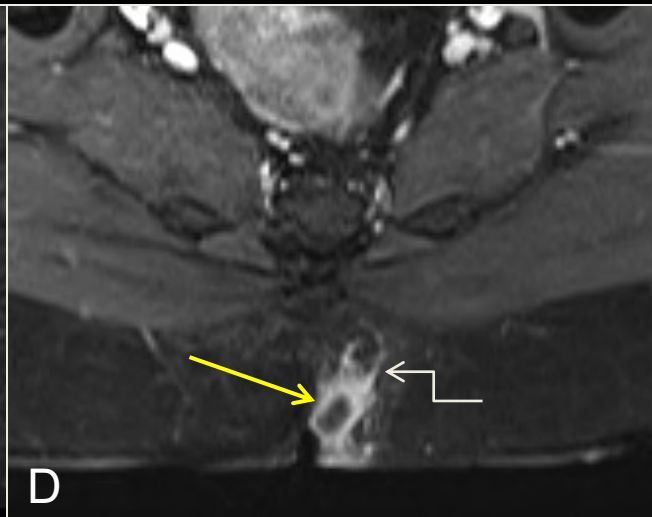
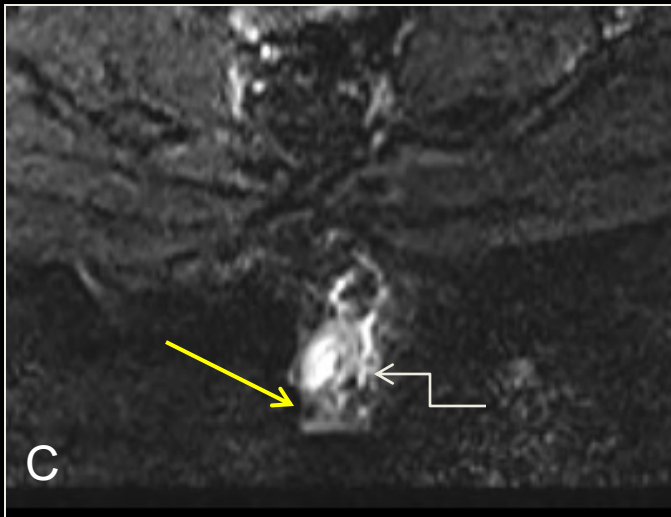
Significant perianal inflammation (stepped arrow in A, B and C)



DWI and ADC (D and E): Show significant restriction on diffusion.

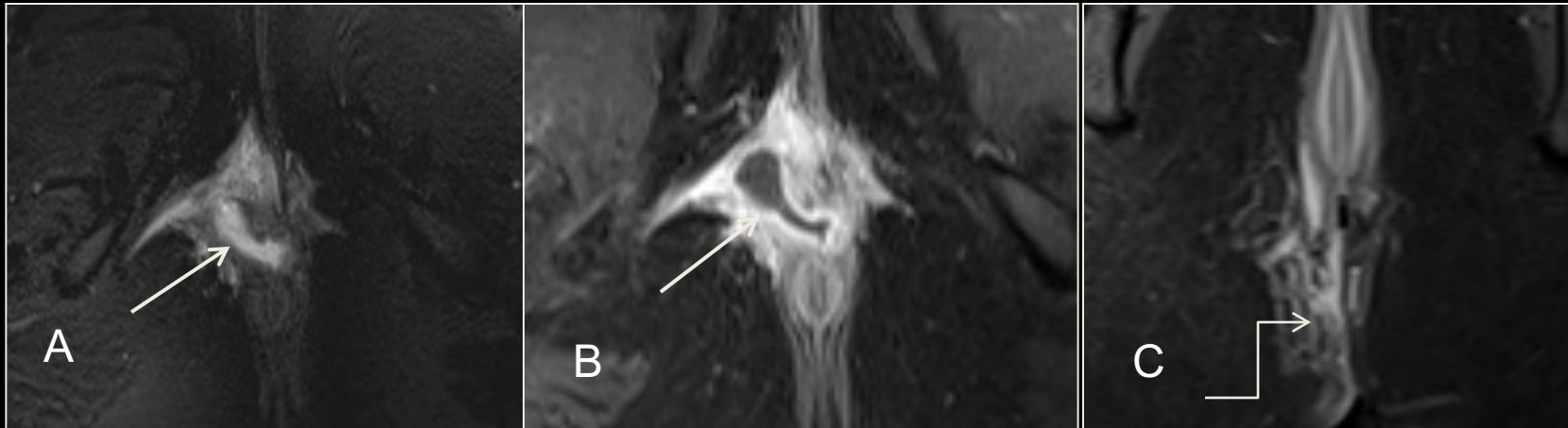


Axial T2 FS(A), Coronal T2 FS(B), Diagrammatic representation (C):
Show perianal sinus. No communication with anal canal was observed.



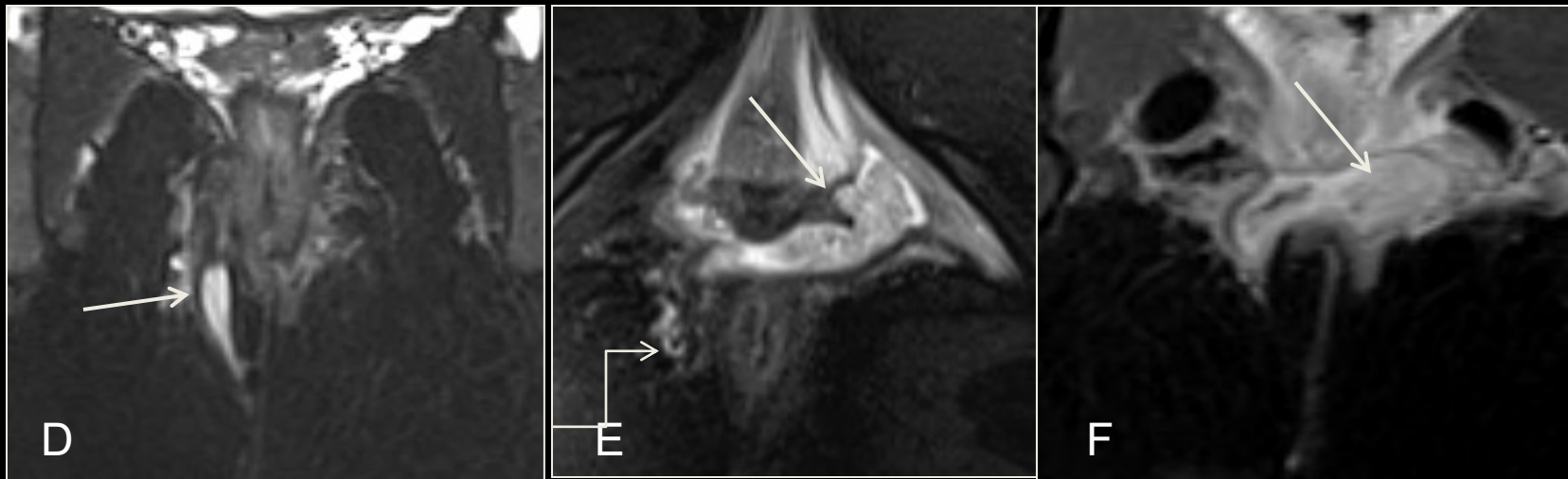
Axial T2 FS(C) and Post contrast T1 FS (D); Diagrammatic representation (E):
Shows T2 hyperintense and peripheral enhancing abscess (yellow arrow) with perianal fat inflammation (stepped arrow). No communication with anal canal was observed.

PERIANAL SINUSES



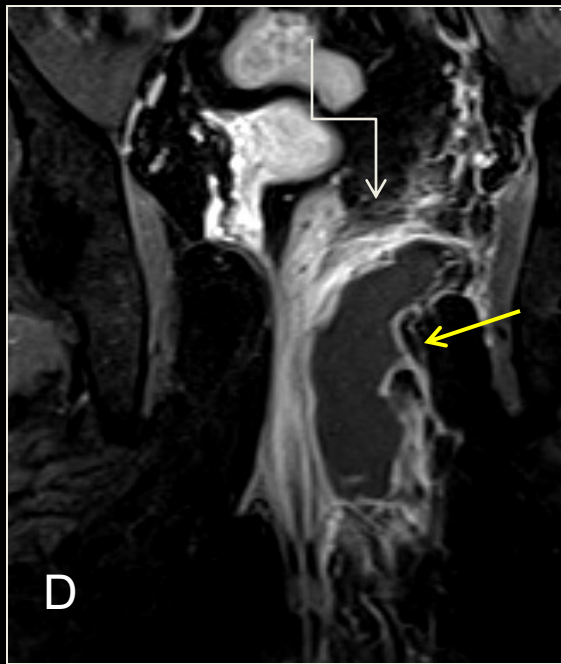
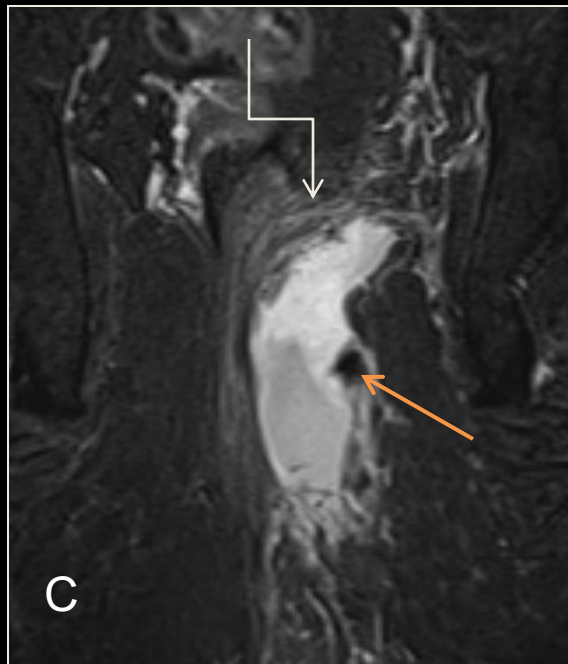
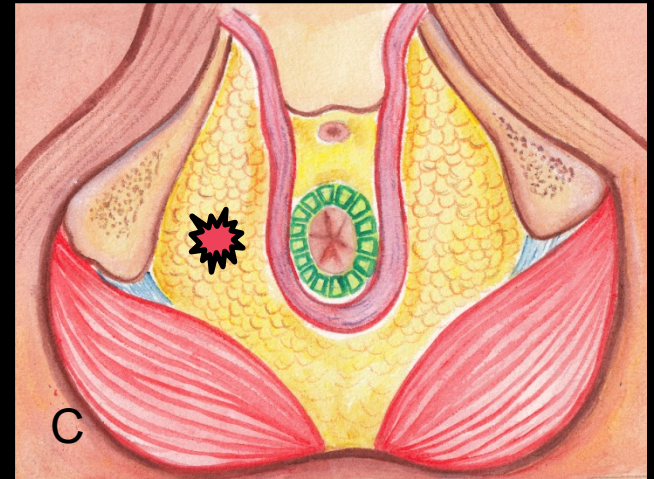
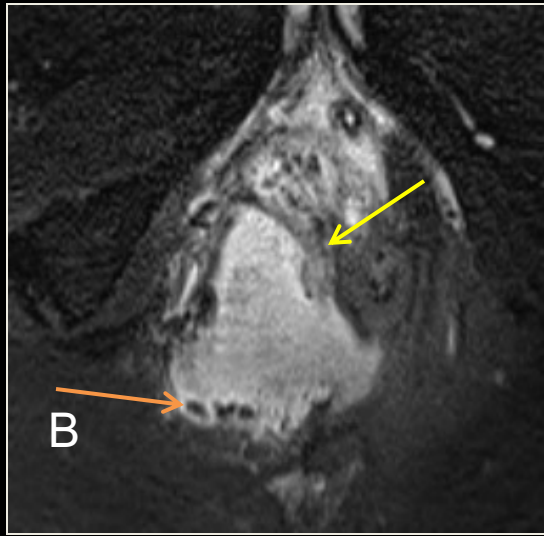
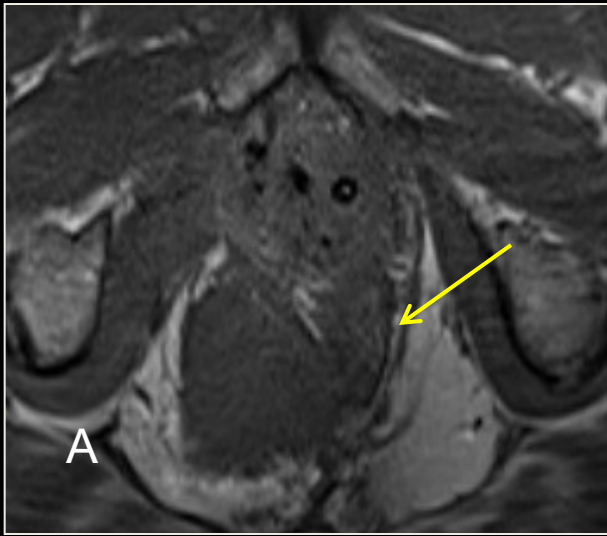
Axial Post contrast Axial (A and B); Post contrast Coronal (C):

Shows an enhancing tract in the extrasphincteric space (arrow), no internal opening is appreciated. Perianal inflammation is noted (stepped arrow in C).



Coronal T2 FS (D and E), Post contrast Coronal (F):

Shows an extrasphincteric tract and abscess (arrow), no internal opening is appreciated. Perianal inflammation is noted (stepped arrow in E).



Axial T1 (A) and Axial T2 (B), Diagrammatic representation(C): Show a right ischioanal fossa abscess with significant mass effect and left lateral shift of anal canal. Air pockets are noted within (orange arrow).

T2 coronal (C) and Post contrast T1 FS Coronal (D): Shows a hyperintense and peripherally enhancing right ischioanal fossa abscess with oedema and inflammation involving the right levator ani muscle (stepped arrows). Air pockets are noted within (orange arrow).

RESULTS AND OBSERVATIONS

- Age group : 23 to 61 years

Average age : 36 years

- Females : 15 (23.8%)
- Males : 48 (76.2%)
- Intersphincteric tracts were seen in 39 patients (61 %).
- Extrasphincteric tracts were seen in 24 patients (38 %).
- Transsphincteric tracts were seen in 15 patients (23%) .

RESULTS AND OBSERVATIONS

- Combined Transsphincteric and extrasphincteric tracts were observed in 12 cases.
- Ischioanal + Ischiorectal abscesses were seen in 10 patients(15%).
- Most commonly ,the tracts were curvilinear; horseshoe shape was observed in 4 patients(6%).
- Most commonly, the tracts were unilateral .However, bilateral tracts were observed in 15 patients(23 %).
- The thinnest tract observed in our study, was only 0.5 mm in thickness.

CONCLUSION

- 3T MRI enables better understanding of perianal anatomy.
- Perianal fistulas may have complex appearances. MRI helps in accurate delineation of primary and secondary fistulous tracts and their anatomical extent.
- MRI is a valuable tool enabling radiologists to road map fistulous tracts and identify associated complications, helping in pre operative surgical planning and favorable outcome.

THANK YOU