

REVIEW ARTICLE

Imaging of Peri-anal Sepsis

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ABSTRACT

Keywords: Peri-anal fistula, MRI, Peri-anal abscess, Perianal sepsis, Colorectal diseases, x-ray fistulogram, Endoanal ultrasonography

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Background: Anal fistula is one of the most frequently reported anorectal disorders that has a propensity to recur, particularly in complex cases usually because of un-detected sepsis at operation time. The aim of our review was to assess the diagnostic validity of pelvic MRI with MR Fistulogram in the diagnosis, assessment and classification of Peri-anal fistula. **Main text:** A broad literature review has been done, searching the electronic databases including Google Scholar and PubMed using keywords like perianal fistula, MRI, and anorectal sepsis, in addition to the standard text-books of colorectal diseases. Contrast X-rays, CT scans, anal endo-sonography, and MRI are the methods utilized for pre-operative scanning of fistula in ano. Because of its low accuracy, X-ray fistulography seldomly utilized for imaging of peri-anal fistula. CT fistulography may be more precise in patients presented with acute inflammation, abscess or the fistulae connected with inflammatory bowel diseases. Anal endo-sonography and MR-imaging are commonly utilized and dependable imaging methods for fistula in ano. The usage of 3D technologies has upgraded the precision of anal endo-sonography. MR-Imaging is now considered the favorite option. But, several researches have showed similar accuracies for both MR-Imaging and anal endo-sonography with similar sensitivity. However, with more MRI specificity. **Conclusion:** MRI is extremely effective in preoperative classification of Peri-anal fistulae, thus enabling selection of correct surgical procedure and preventing recurrence.

INTRODUCTION

Peri-anal fistula is an abnormal tract formed by granulation tissue connecting outer dermal opening in the peri-anal area to inner opening in the anal canal. The tract may be blind-ended (i.e., not connected to another dermal superficial or hollow surface), thus called a sinus tract (1).

Perianal fistula is regarded as a cause of morbidity and a poor quality of life especially if related to fecal incontinence (2).

Idiopathic fistulae denote the chronic stage of anal sepsis. But, peri-anal fistulae can as well result from other disorders like Crohn's disease, tuberculosis, pelvic infections, radiation, child-delivery traumas, and pelvic malignancies (3).

Crypto glandular infections and obstructions accounts for around 90% of patients, while other reasons of Peri-anal fistula are less frequent . Post-operative traumas represents (3%), inflammatory bowel diseases (3%), and TB (<1%) (4).

Conventional fistulo-graphy was the first line of diagnosis for peri-anal fistula (1). The major disadvantage of that technique is the incapability to assess the anal sphincter composition and secondary ramifications of the fistula in addition to anatomic sections and muscular structures (5).

MRI has been shown to be very beneficial in operation planning, bearing in mind its high accuracy in the depiction of peri-anal anatomy, permitting the characterization and sorting of the fistula in relation to the anal sphincter, outlining its extension and recognising foci of infections and playing a role in effective operative intervention and avoiding recurrences (6).

The majority of the fistulae (about 90 percent) are non-specific and are of crypto-glandular origin, which happens as a consequence of infection. The remaining patients (about 10 percent) are because of a definite aetiology such as tuberculosis, Crohn's disorder, pelvic infection, radiation, ulcerative colitis, carcinoma, and trauma to the anorectal area (7).

Also, MRI can differentiate active inflammation from fibrosed fistulous tracts; the two appear the same on digital rectal examination. Notably, MR-Imaging can assess deep tissue healing, which couldn't be clinically evaluated (8).

MRI is the optimal method for evaluation and follow-up of peri-anal fistulae. Its sensitivity is estimated to be 100% and its specificity is about 86% at detection of Peri-anal fistulae (9).

For effective management of fistula, it is quite significant to define its comprehensive anatomy, which comprises the exact identification of the inner aperture, the prime location of crypto-glandular infections, and the course of the main tract and of secondary ramifications or abscesses, if any, to avoid recurrence (10).

MRI anatomy of the sphincteric complex:

The external sphincter is made of skeletal muscles. On axial MRI scans, it appears as an outermost circular coating of the anal duct. It looks hypo-intense on T1WI, T2WI, and fat-suppressed images (Fig 1, 2). And it does not enhance after IV contrast agents as much as the internal sphincter. On 3T MRI, its mean thickness is around 4 mm (11).

In accordance with the traditional explanation, the external sphincter has 3 distinct muscle fiber bundles: deep, surface, and subcutaneous. On high-resolution T2WI, it is possible to distinguish these components (12).

On axial MRI scans, the internal sphincter looks like an internal circular layer of the anal duct. It is homogenous, hyper-intense on T2WI, fat-suppressed images, and enhances following IV contrast agents (Fig 3, 4, 5). It is seen as a longitudinal band in the coronal plane. Its mean width is around 3.5 mm, at 3T MRI, achieved with a phased-array coil. Using

endoanal coils (which allow undistorted measurement of IS dimensions), the mean thickness of the internal sphincter is found to be 3.20 ± 0.70 mm in females and 2.90 ± 0.70 mm in males. It increases in width with age due to infiltrations of the connective tissues rather than of true muscle hypertrophy (6).

Puborectalis muscle thickness on phased-array MRI is 4.28 ± 0.13 mm. The absence of puborectalis muscles in the superior aspect of the anal duct may lead to inherent weakness in this location. The inter-sphincteric space on axial T1WI and T2WI is seen as a thin, hyper-intense area (12).

The anorectal angle is one of the essential parameters of the anorectal configuration. The lines moving from the posterior rectal wall and via the midpoint of the anal duct are utilized to measure the anorectal angle. Its normal range is between 93° and 108° , as determined by resting MR measurements (13).

The perineal body is a small fibromuscular tissue in which several perineal muscles insert or converge, keeping the pelvic floor structurally and functionally intact. In females, it is present within the anovaginal septum, between the anal canal and the vagina, and provides anterior support of the anal duct. On MRI, the perineal body appears to be a hypo-intense structure (11).

The dentate line demonstrates the place of squamo-columnar junction. While the dentate line is not directly recognized by MRI, when we correlate it with colonoscopy or physical examination findings, we get the impression that the dentate line is situated at the level of the muscular plane between deep and superficial external sphincter (14).

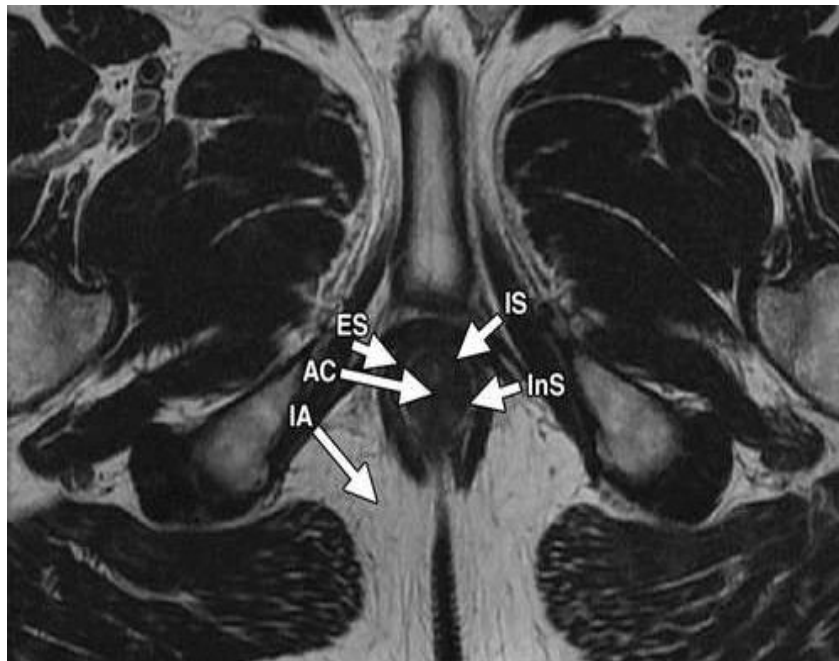


Figure (1): Oblique axial T2WI MRI shows the anal sphincter anatomy (15).

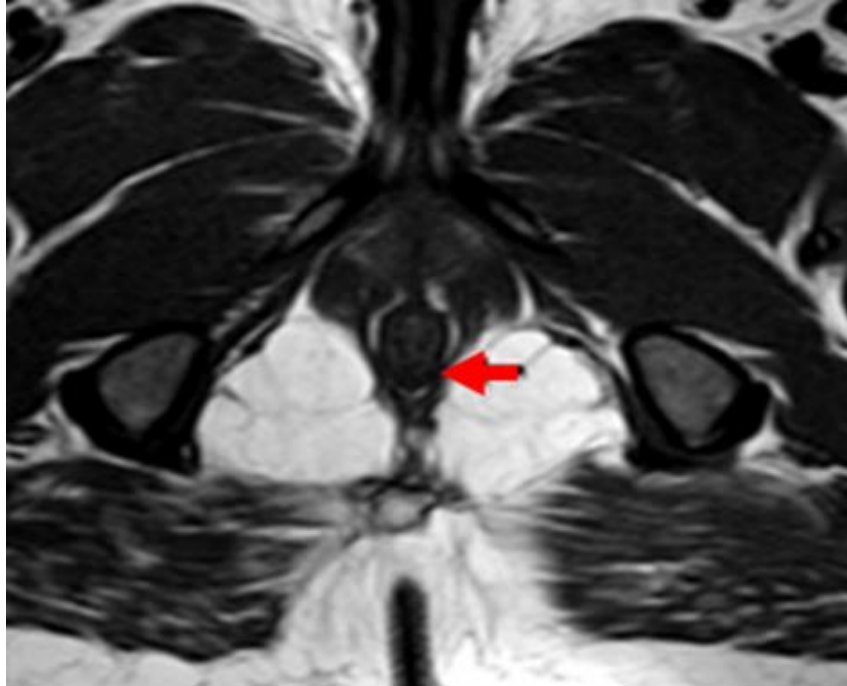


Figure (2): An axial T1W image reveals that the external sphincter muscle (red arrow) has a hypointense signal (16).

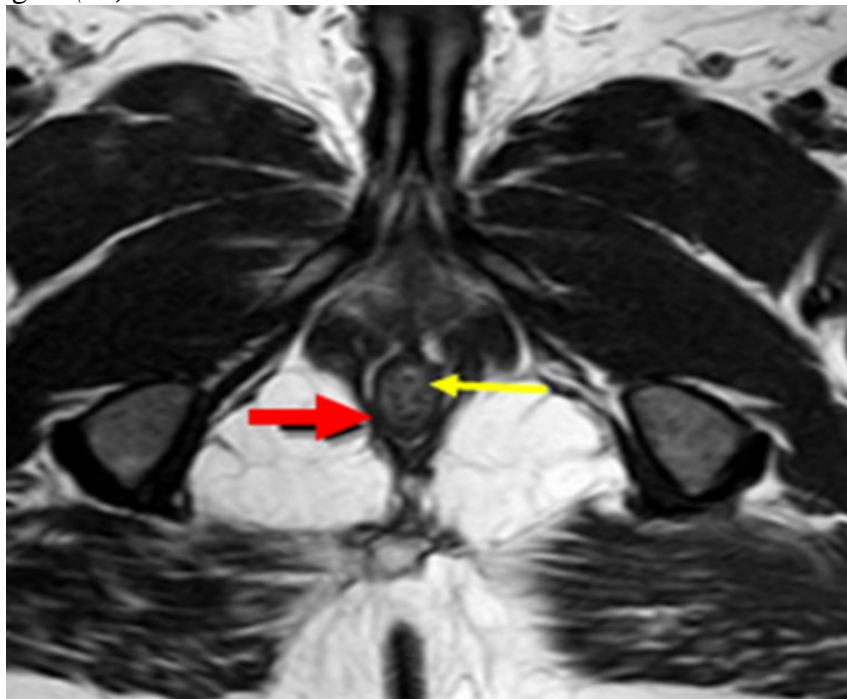


Figure (3): The axial T2W image shows the external sphincter muscle (red arrow) appears with a hypo-intense signal and the internal sphincter (yellow arrow) appears with a relatively hyper-intense signal (16).

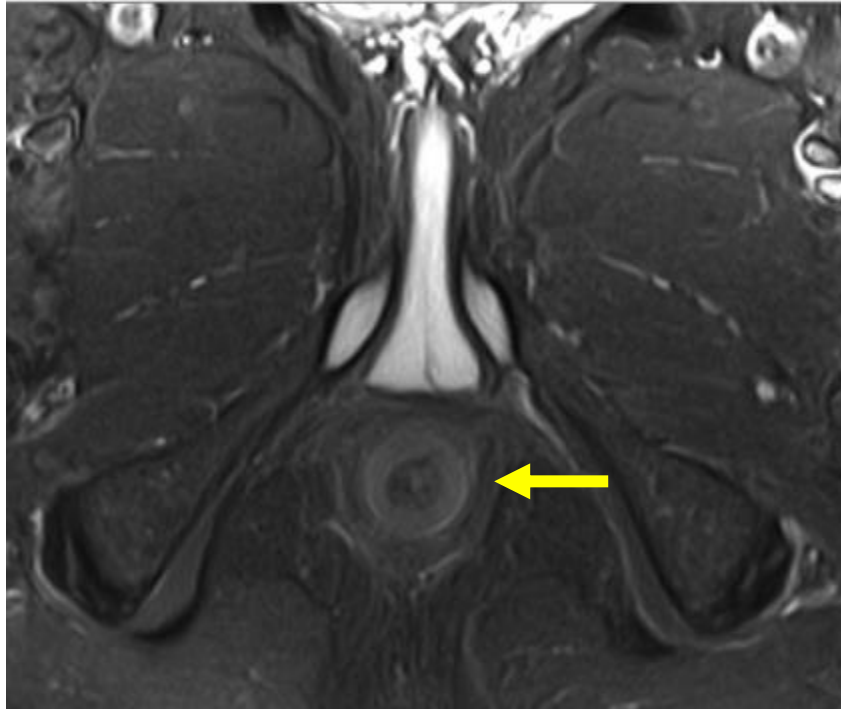


Figure (4): The axial STIR image shows: the internal sphincter (yellow arrow) appears with a relatively hyper-intense signal (17).

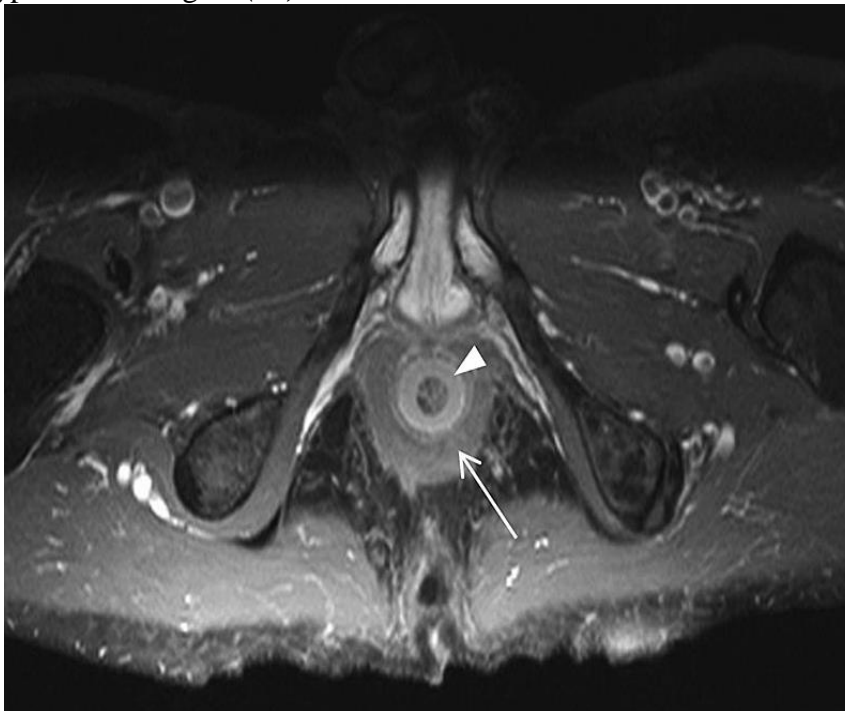


Fig (5): Structure of the anal sphincter on post-contrast axial T1W image Notice the high grade of enhancement of the interior sphincter (arrow-heads) in comparison to the middle signal intensity of the exterior sphincter (arrows) (18).

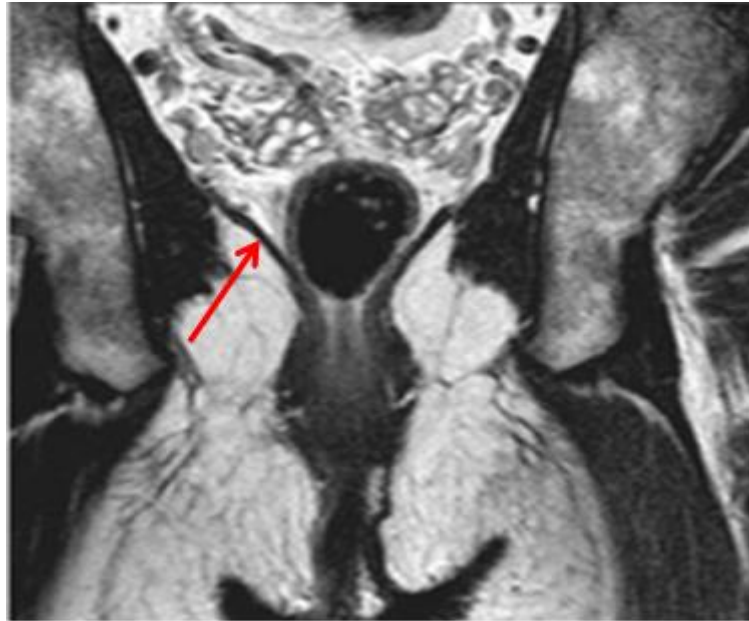


Figure (6): Coronal T2W image show : The levator ani muscles (red arrow) shape the higher boundary of the ischio-anal fossa and are combined inferior with the puborectalis, which continues as the exterior sphincter muscles (17).

Pathogenesis of peri-anal fistula

Multiple etiologies may lead to peri-anal fistula formation: Firstly, it is connected to obstruction and infection of the anal glands: When anal glands become occluded, an infection of the contents can grow, causing the development of a small abscess. Since the internal anal sphincter is a barrier for contradiction of bacterial contamination, chronic infections of an anal gland may only cause a Peri-anal abscess or fistula when it spreads into the inter-sphincteric space (2).

Extension may also happen in the horizontal plane, and these are known as horseshoes, only when there is a sepsis branching on both sides of the inner opening. Extension is the main cause of recurrent disorders as they are commonly left untreated and thus allow infections to remain (5).

Acute glandular infections commonly present as severe peri-anal abscesses, which are easily identified clinically and are well-known to any operative resident. While quick incisions and drainage provide significant symptom relief, cases frequently progress to a subsequent fistula. (19)

It is known that a substantial number of cases with Crohn's disorder develop peri-anal disease, and it can also be their first presentation before any diagnosis (20).

Other less common reasons for peri-anal fistula comprise fistulations from adeno-carcinoma or squamous cell carcinomas of the anus or less frequently as a side effect of high-dose pelvic radiotherapy, while other infections are identified to lead to peri-anal fistulations, counting actinomycosis and human immuno-deficiency virus (HIV) infections (21).

Epidemiology: Peri-anal fistulae happen in about 10 out of 10.000 individuals. It frequently happens in adult males with more frequency between 30–50 years old (22).

Peri-anal fistulae are rare in patients <20 or > 60 years of age, with a male-to-female ratio of 2:1. Peri-anal fistulae impact up to 30% of cases with Crohn's disorder (23).

Peri-anal fistula is a mutual side-effect in Crohn's disorder; about 13–27 percent of cases develop peri-anal fistulae throughout the progression of their disorder, with an assessed increasing danger from 26 to 28% after 2 decades and a recurrent rate of 34% of cases. In about 17% of cases with peri-anal Crohn's disorder, peri-anal fistula is the primary presentation (24).

Successful operative intervention of peri-anal fistula is mandatory to stop recurrences. However, the difficulty in identifying the interior aperture and the courses of the fistula territory may make successful operation occasionally challenging (25).

Symptoms: the majority of peri-anal fistulae are accompanied by periodical episodes of pain, particularly when the exterior aperture of the fistula is blocked. Underneath these situations, signs might as well comprise pyrexia. Some patients will report purulent discharges, either from the anus or the exterior aperture. Pruritus and anal haemorrhage are commonly stated but are highly specific signs. However, cases with peri-anal fistula can be entirely symptomless (26).

Imaging of Peri-anal fistula: Numerous imaging methods were utilised for peri-anal fistula evaluation, including X-ray fistulogram, endoanal US, CT fistulography, and MR-Imaging fistulogram.

X ray fistulo-graphy: Contrast fistulo-graphy comprises catheterizing the exterior aperture with a fine cannula and inserting water-soluble contrast, and scans are taken to view the fistula (Fig 7) (27).

Fistulo-graphy is beneficial for visualising the main duct. The sensitivity ranged between 24 and 50% (24). The supplementary branching areas are frequently filled with granulation tissues and not with contrast material. As compared to surgical results, fistulo-graphy was variable, with only 16 percent of concordances and 12 percent of false positive results of high extension and rectal aperture (28).

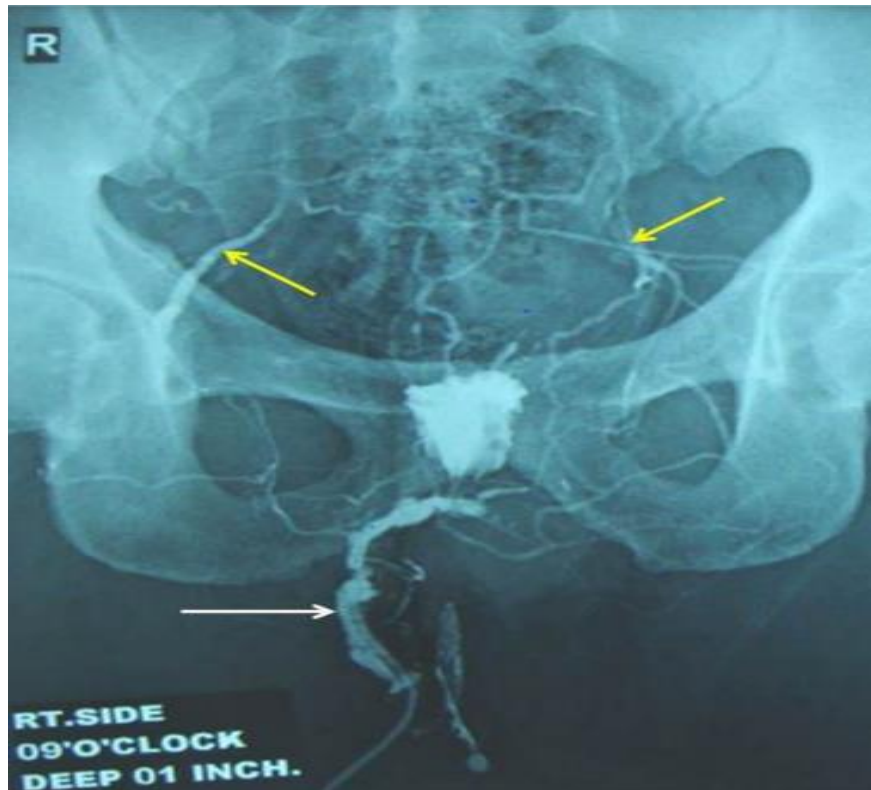


Figure (7): X-ray fistulogram (AP view) showing injection of contrast media into the right perianal fistulous track (white arrow) with associated contrast media in the venous circulation due to forceful injection (yellow arrows) (29).

Endoanal ultrasonography (EAUS) is a newly developed method for imaging peri-anal fistulae. That has the benefit of improved definition of the fistulous tract and its association with sphincter muscle (Fig 8). The sphincter mechanism and inter-sphincteric plane are well visualised with trouble in some people. Endo anal US is also beneficial for rectal wall imaging (30).

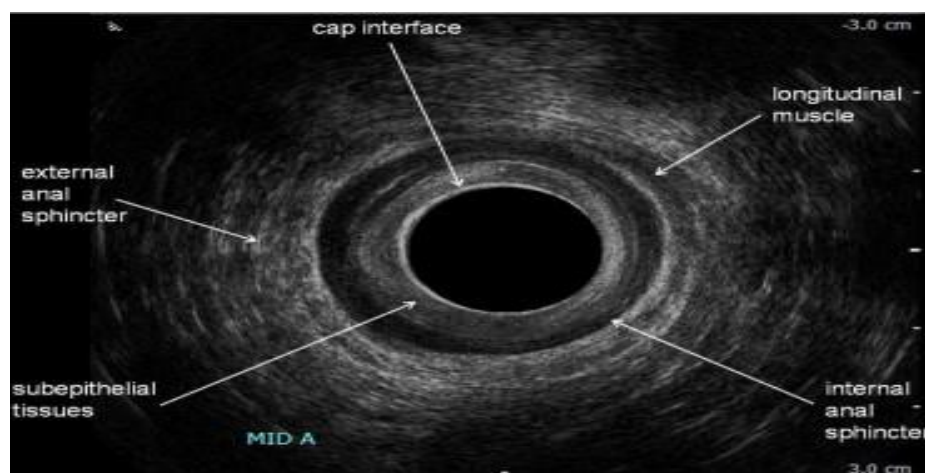


Figure (8): Display the ordinary anatomy of the anal duct by EAUS (31).

The drawbacks are ; the method is operator dependent, provides restricted view with no scanning in coronal plane. As well, infection could not be discriminated from fibrosis and

disappointment to recognize secondary ramifications and distant sepsis. EAUS cannot display high pathological lesion as supra-sphincteric lesion, sub-cutaneous lesion, horse-shoe types lesion and smaller extra branches (32).

In current 3D EAUS, the diagnosis is frequently performed via a long, tubular transducer comprising a 360-degree rotating probe of frequencies from 6 to 16 MHz at its frontal end (imaging head), which is accompanied by a water stand-off system to give improved scans of the rectal and peri-rectal structures. The diagnosis is frequently accomplished in the left side location, knee-chest, or prone location (33).

On EAUS investigation, the structure of the rectum and anal duct is scanned as zones or layers of hypo or hyper-echogenicity. The anatomy of the rectum is observable as five layers. (A) the inmost hyper-echoic line represents the border of the balloon, followed by (B) the inner hypo-echoic layer representing the mucosa and muscularis sheaths, and (C) a slightly thicker hyper-echoic submucosal layer, followed by (D) the external hypo-echoic layer representing the muscularis propria, followed by (E) the outmost hyper-echoic coating which signifies the perirectal fatty tissues (33).

EAUS is predominantly well suited for the identification of interior apertures (34). On EAUS examinations, a perianal fistula may appear to be changing echogenicity depending on the interior composition or grade of inflammation. Whereas an active fistula can comprise fluid-like materials (Fig 9), inactive fistulae are frequently cylindrical, fibrotic bands with no fluid content (35).

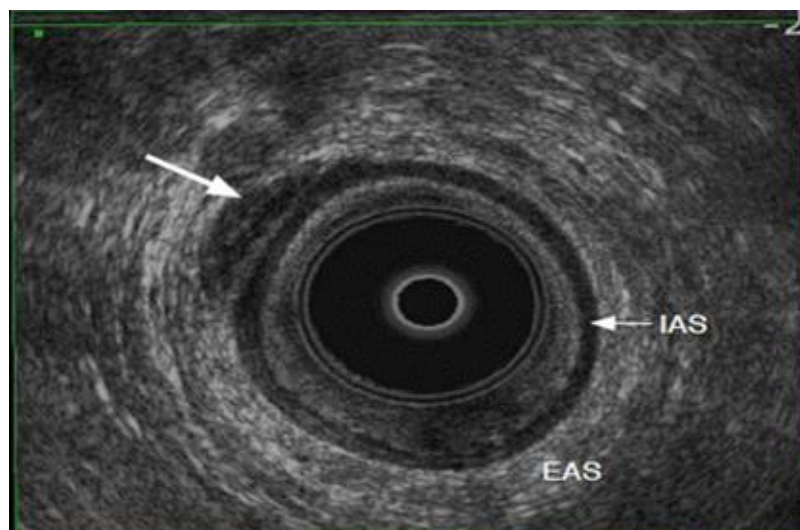


Figure (9): The hypo-echoic tract (arrows) is seen amid the interior (IAS) and exterior anal sphincters (EAS) (Inter-sphincteric Peri-anal fistula)(33).

CT Fistulo-graphy:

CT has spatial and contrast resolutions greater than X-rays; it isn't much more beneficial in fistula scanning. It may recognize the presence of fistular paths either via nonionic water-soluble contrast introduced per rectum or via the exterior aperture, but it is still insufficient for a comprehensive examination of relative fistular structure so as to categorizes it precisely (36).

CT with IV and local contrast material may be utilized to examine anal fistulae, predominantly those in the rectal zone and presumed perirectal abscess (15).

The sphincter complex, levator ani, fibrosed areas, and active fistulae are nearly comparable, so that it is hard to discriminate between these assemblies. Because of the low resolution of soft tissues (Fig. 10), CT fistulography was unsuccessful in describing subtle fistulas and abscesses (Fig. 13) (37).

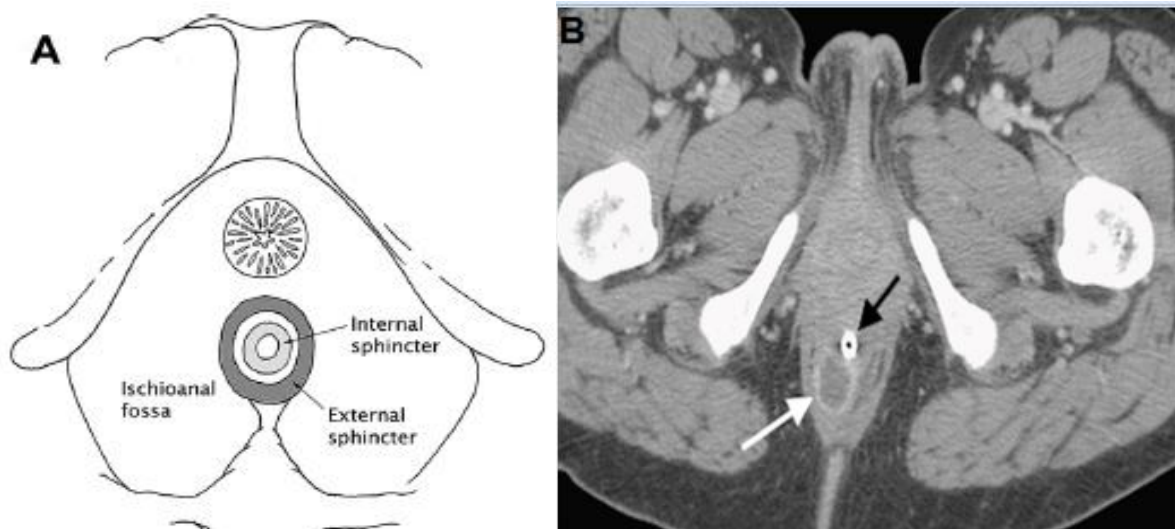


Figure (10): Anal canal and ischioanal fossa diagram (A). Axial CT scans at the plane of the anus (B) show a right inter-sphincteric abscess (white arrows). Notice the rectal duct in the lumen of the anus (black arrows) (37).

MRI Fistulogram:

MRI has been confirmed to have a significant role in peri-anal fistula evaluations and is presently being taken into consideration to be the gold standard technique (38).

A large prospective study found that MRI accuracy outperformed endoanal US and clinical examinations in the classification of fistulae (90%, 81%, and 61%, respectively) (32,39).

MRI revealed to establish precisely the structure of the peri-anal area, the anal sphincter mechanisms, the connection of the fistula to the pelvic layer (levator plate) and the ischioanal fossa (39).

The purposes of execution and interpretation of the MRI investigation for peri-anal fistulae are to find out the association of any fistula to the sphincter complex. Is the sphincter enrolled? Does the track cross both sphincter sheets (trans-sphincteric) or only the interior sphincter (inter-sphincteric), as well as any secondary fistular paths and the locations of any abscess hollows? Failures to notice and eradicate these can cause relapses and thus treatment failures. (40)

An optimum MRI uses both endoluminal in addition to exterior body superficial coils. The use of endo-anal coils was intended to improve diagnostic accuracy. But, this method is inadequately accepted in symptomatic cases, and while anatomical particulars of the anal

sphincter are brilliant, this method is restricted by a small view field and is unsuccessful in delivering the overview essential for operative treatment (41).

MRI with body surface coils only is well tolerated, involves no special case preparations, and delivers adequately good outcomes (42).

Imaging protocols

The pelvic MRI protocols for peri-anal fistula evaluations consist of spin-echo T1W, spin-echo T2W, and short TI inversion recovery (STIR) sequences to define the sphincter structure and identify fistular areas and cavities. Fat-suppressed T1W precontrast and postcontrast protocols are attained to evaluate the existence and grade of inflammation and to identify abscess. Scans are mostly attained at the axial and coronal levels. The exact site of the fistula is best observed on axial scans. The interior aperture is also displayed on this level. Coronal scans best depict the levator plate. The extent of the interior aperture from the anal verge is well valued on coronal scans (43).

To accomplish the precise orientations, a sagittal fast spin-echo (FSE) T2W sequence must be performed primarily, delivering an overview of the pelvis and viewing the degree and axis of the anal duct (40).

The precise orientation of the anal canal for MRI may have resulted from this episode, delivering accurate axial and coronal scans laterally along the long axis of the anal duct and allowing precise valuation of peri-anal fistulae. The levator plate and the whole perineum must be comprised to recognize zones of sepsis and diseased paths that could cause recurrences (27).

The most suitable protocol utilised for assessment of peri-anal fistulae contains the following sequence: oblique axial T1W FSE; oblique axial T2W FSE; and oblique axial and oblique coronal fat-suppressed T1W FSE after gadolinium injection, oriented vertical or parallel to the long axis of the anal duct (14).

The advantages of MR-Imaging are: No ionizing radiation exposures, brilliant soft-tissues contrast resolutions, could simply deliver all the essential data, both structural and functional valuation may be performed at once if essential and better cases compliances in comparison with conservative fistulo-graphy and endoanal US (30).

The drawbacks are: time-consuming, expensive, slight accessibility, and in some cases, feeling claustro-phobia and not being able to co-operate in the investigation (44).

Pathological appearances of peri-anal fistula: In the immediate postoperative period, T1WI aids in the distinction of remaining paths from hemorrhage. Un-enhanced T1WI gives an excellent anatomical outline of the sphincter complex, levator plate and ischio-rectal fossae. T2WI delivers good contrast amid hyper-intense fluids in the track and the hypo-intense fibrous wall of the fistula. Fistula and active granulation tissues show strong enhancements on fat suppressed T1WI with contrast administration, while fluids in the path remain hypo-intense (45).

The fistula and abscess display intense enhancements with contrast administration. Reserved pus displays no enhancements, and ring enhancement patterns are seen in the abscess. T1W systems with fat saturation post intravenous gadolinium administrations are beneficial in the detection of tracts that aren't visualised in T2W systems (43).

Location of fistulae using clock position: "the anal clock" Surgeons define the place and track of the fistula by raising the "anal clock", that is, the sight of the anal area with the case in the lithotomy location frequently used for fistula operation. At 12 o'clock is the frontal perineum, and at 6 o'clock refers to the posterior perineum (natal cleft); 3 o'clock is the left side feature, and at 9 o'clock refers to the right of the anal canal. (Fig. 11). Fortunately, this description matches precisely with the sight of the anal duct on axial MRI, and it is beneficial for surgeons if the radiologists relate the MRI results to the anal clock (46).

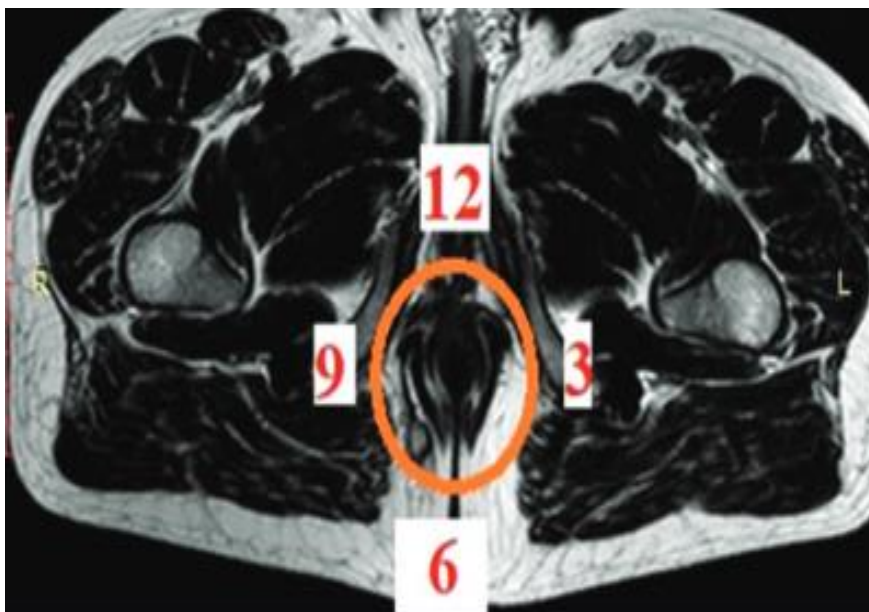


Figure (11): Axial T2W TSE scan with ring and numbers interposed over it, representative "anal clock." At 12 o'clock, represents the frontal perineum, and at 6 o'clock, represents the natal cleft; at 9 o'clock, refers to the right lateral, and at 3 o'clock to the left lateral of the anal duct (47).

Classification system:

Two sorting schemes are frequently utilised for peri-anal fistulae:

The Parks classifications: Fistulae can be sorted in accordance with the sequence of the fistula from the anal duct to the skin as well as its relationship to the interior and exterior sphincters (13).

In this arrangement, four kinds of peri-anal fistulae have been defined in the coronal plane (Fig 12).

The Saint James's University Hospital sorting: this arrangement comprises related results from MRI and defines the primary fistula in addition to the secondary ramifications and related abscesses (46).

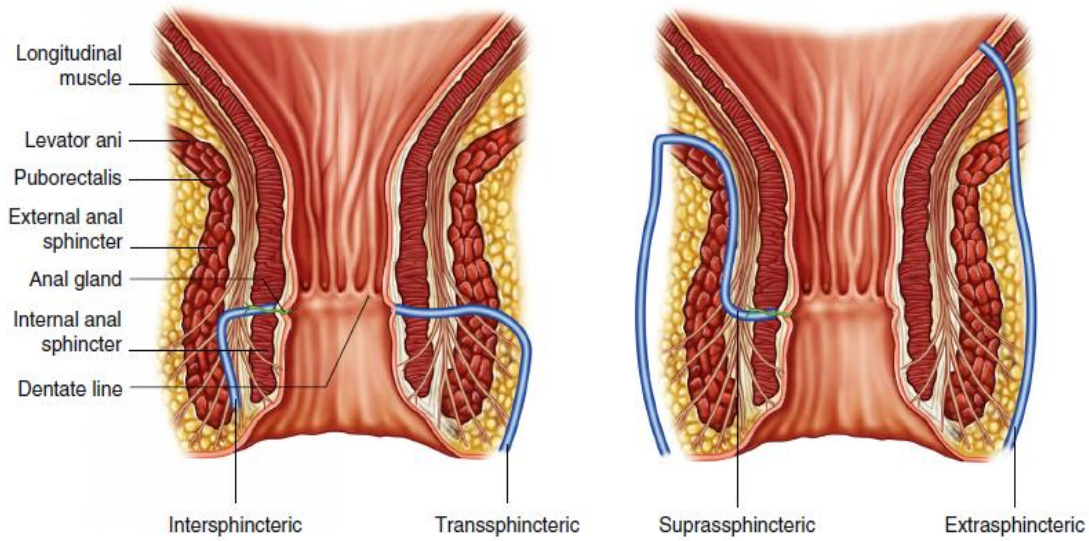


Figure (12): Coronal illustrations of the anal duct display significant anatomic landmarks and the Parks classification of fistula-in-ano (27).

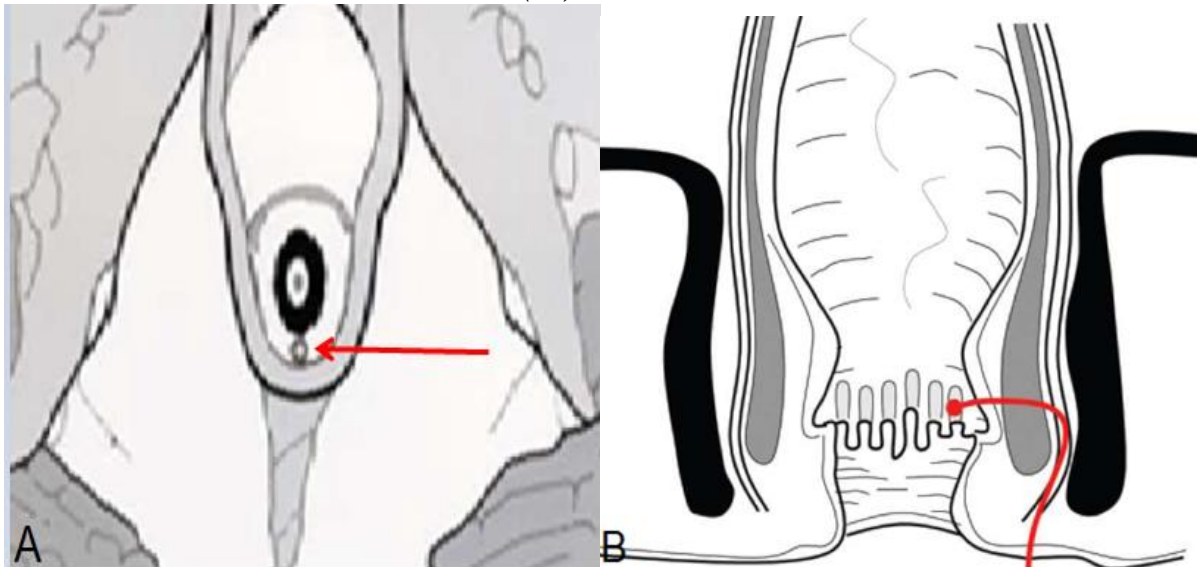


Figure (13): Axial (a) and coronal (b) diagrams of the anal canal show the inter-sphincteric fistula passes inbetween interior and exterior sphincters (red arrows point to the course of the inter-sphincteric fistula) (17).

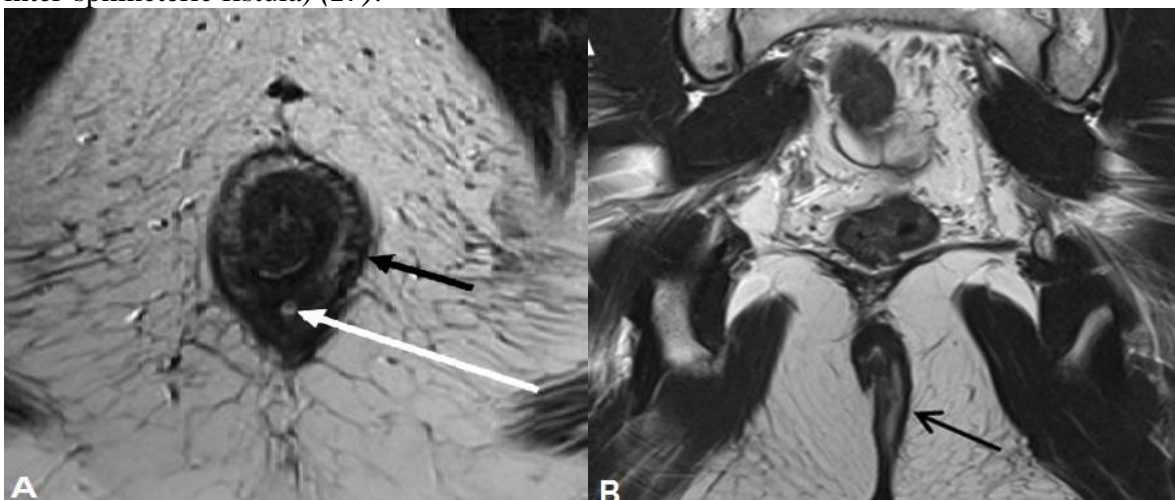


Figure (14): Axial T2WI (A) shows an inter-sphincteric fistula (long white arrow). The fistula lies within the inter-sphincteric plane. Coronal T2WI (B) shows an inter-sphincteric fistula passing in between interior and exterior sphincters (27).

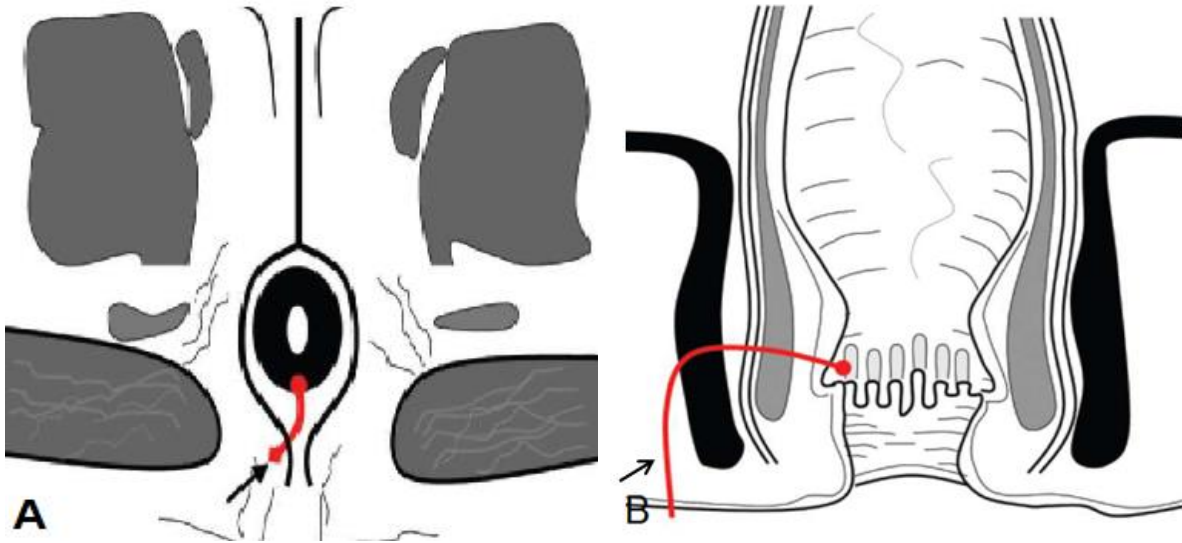


Figure (15): Axial (a) and coronal (b) diagrams of the anal canal show transsphincteric fistula. Arrows (red lines) point to the course of the transsphincteric fistula (18).

St James classification (Fig 16)

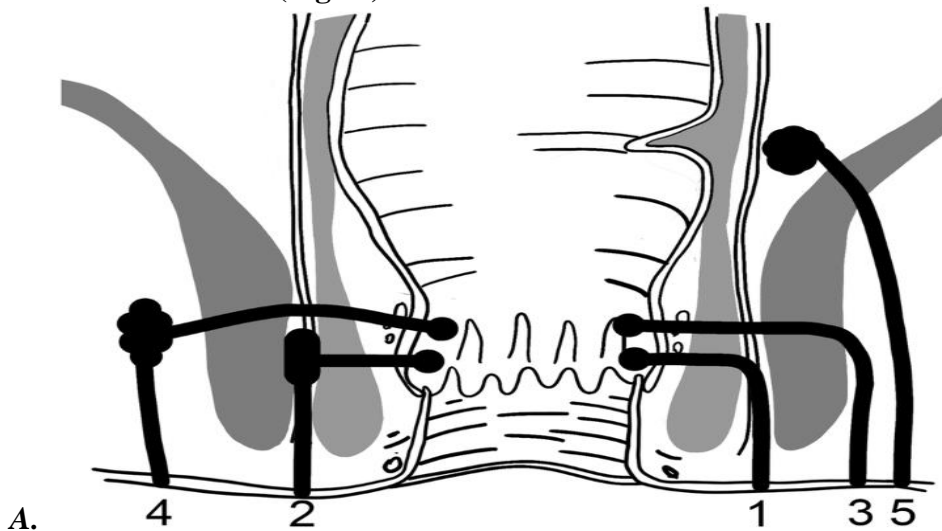


Figure (16): The graphic schema of the St. James's Sorting 1) A simple linear fistula of grade 1 with no paths and no extensions above the levator ani. Grade-2 inter-sphincteric area with the existence of secondary tracts that can cross the midline. 3), Grade-3 trans-phincteric fistula. Trans-phincteric fistula with secondary areas and/or abscess in grade 4. 5). Supra-levator and extrasphincteric fistulae of grade 5 (8).

Contrast enhancements within the tract: If there are no enhancements in the fistula (only marginal enhancements) and the area is of high T2 signal, then the fistula is active and fluid-filled. When the fistula is of high T2 signal but establishes interior enhancements, then the

tract establishes healing boosting granulation tissues (Fig 17, 18) (8). If the fistula is of low T2 signal and doesn't improve following contrast medium injections, it demonstrates chronic fibrosed tracts. Loss of hyper-intense signal on T2W scanning as well as lack of contrast enhancements is an expectable sequence of morphologic variations happening with fistula tract curing (48).

While contrast injections add cost and time, they permit differentiation of fluids within a fistula from granulation tissues, as an abscess establishes rim enhancement with central non-enhancement (from the fluids within it) (49,50).

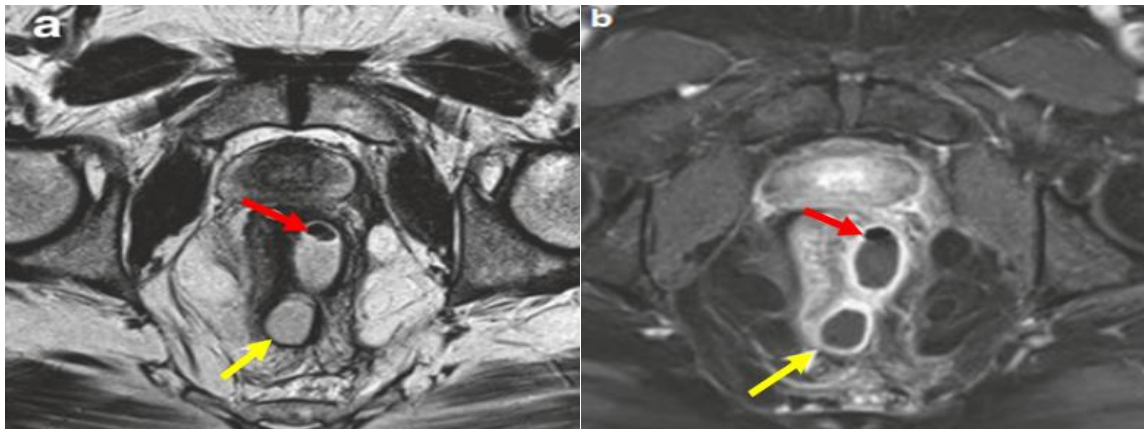


Figure (17): An abscess (yellow arrow) on axial oblique sequences: comparatively hyper-intense on T2WI (a), and peripheral enhancement with a hypo-intense content on post-contrast T1WI (b). On every sequence, gas is observable frontally as a hypo-intense zone in the abscess (red arrows) (49).

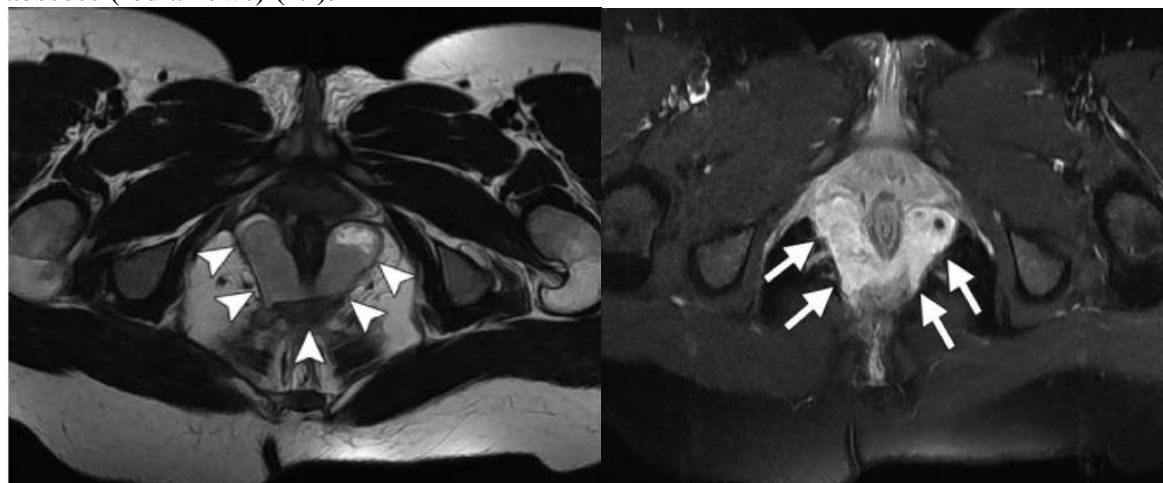


Figure (18): Enhancement pattern within the tract. (a) Axial T2WI displays a horse-shoe tract with a fluid-fluid plane at bilateral ischioanal fossa (arrowhead). (b) contrast-enhanced fat sat T1WI demonstrate improvement within the mainstream of the tract demonstrating underlying granulations tissues(arrows) (8).

Differential diagnosis:

Pilonidal sinus is caused by inflammation of the hair follicles with subsequent folliculitis, abscess and sinus tract at the location of the natal cleft. Position of pilonidal sinus far from and backward to the anal duct, at the location of the natal cleft is clinically pathognomonic (Fig 19). Therefore, imaging is not mandatory for definite diagnosing. But, when accomplished, it is normally visualized as inflammatory variations in the surface tissues round

the coccyx and sacrum. The absence of inter sphincteric zone involvements on imaging is a main feature to discriminate pilonidal sinus from Peri-anal fistulae (3).

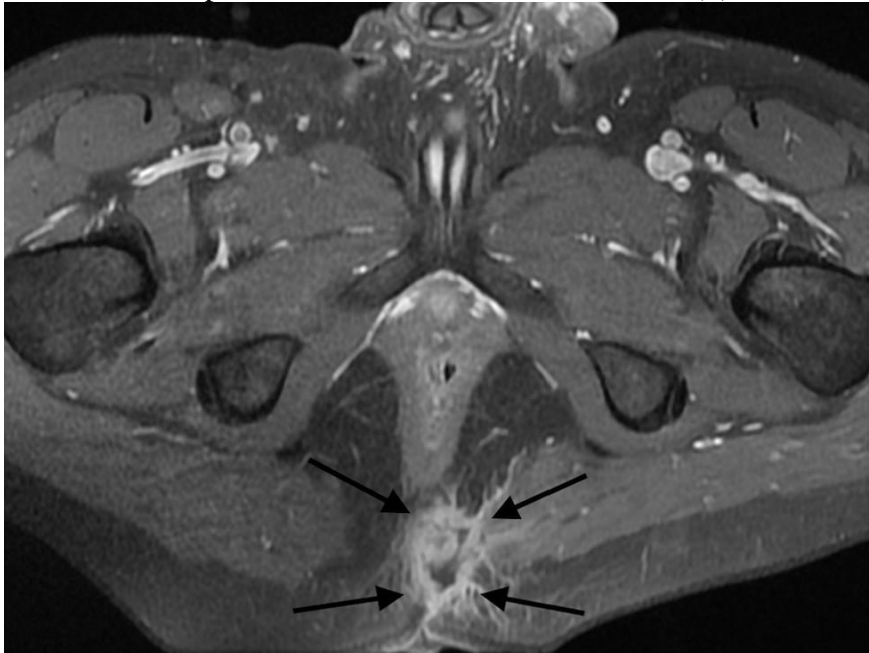


Figure (19): Axial contrast-enhanced fat sat T1WI shows superficially enhanced pilonidal sinus (*black arrow*). The sinus area has communication with the skin at the plane of the natal cleft (27).

It is important to recognise post-operative results in cases assessed post fistula operation, such as fat packing (hyper-intense on T1W images), seton threads (hypo-intense on T1WI and T2WI), and air foci (focal low signal on T1WI and T2WI). Defects of the sphincter complex must be measured in the differential diagnosis of peri-anal fistulae as they can be encountered after surgical treatment. Postsurgical defects of the anal canal may mimic mostly Tran's sphincteric fistula as they may traverse both internal and external sphincters. However, the appearance of low signal strength on T2W scans may be helpful to differentiate postsurgical wall defects since peri-anal fistulae are usually present with high T2 signal strength (17).

Treatment: The aim of management of peri-anal fistula is to control infections and then heal the fistula area and preserve continence. Numerous issues have been reported as non-dependent risk factors accompanying a poor outcome postoperatively and a higher risk of recurrences, including earlier fistula operation, complex fistula, lack of identification of the interior fistular aperture, incorrectly identified primary tracts, and lost secondary ramifications. (50).

Operative treatments focus primarily on abscess drainage and the administration of steroids to keep areas open for drainage; controlling inflammations while the case is under biological therapy; and, in selected patients, more definitive operative procedures such as locking the interior aperture with a mucosal advancement flap (MAF operation) or Ligation of Inter-sphincteric Fistulae Tract (LIFT operation). *Peri-anal fistulae may result in significant illness if not controlled sufficiently. The majority of these fistulas are treated surgically, which is complicated by the risk of recurrent disease and faecal incontinence due to anal sphincter injury (51).*

The main options are:

Fistulotomy is the most common kind of operation for anal fistulae. This includes cutting along the entire extent of the fistula to open it up so it heals as a flat scar. It's commonly only appropriate for fistulae that don't pass via much of the sphincter muscle, as the danger of incontinence is lowest in these patients (52).

Seton methods: If the fistula passes over a significant part of the anal sphincter muscles, introducing seton is suggested. A seton is a part of an operative thread that's left in the fistula for many weeks to make it open. This permits it to drain and heal while avoiding the necessity to cut the sphincter muscle. Loose setons permit fistulae to drain, but don't heal them. To cure a fistula, tighter stitches can be used to gradually cut over the fistula (53).

MAF operation: can be considered if fistulae pass over the anal sphincter muscle and having a fistulotomy has an elevated risk of incontinence. This includes wounding or scraping out the fistulae and casing the interior aperture with a flap of tissue taken from the rectum. This has a lower rate of success than a fistulotomy but avoids the necessity to cut the anal sphincter muscle (54).

The LIFT operation is an intervention for fistulae that pass over the anal sphincter muscle where a fistulotomy can be very dangerous. Throughout the management, a cut is made in the skin overhead, the fistulae and the sphincter muscle are moved apart. The fistula is then wrapped at the two ends and cut open so it lies flat (55).

Endoscopic ablation: In this procedure, an endoscope (a tube with a camera on the end) is put into the fistula. An electrode is then passed through the endoscope and utilised to seal the fistula. Endoscopic ablation works well and there are no serious concerns about its safety (51).

Laser surgery involves using a small laser beam to seal the fistula. There are uncertainties around how well it works, but there are no major safety concerns (37).

Fibrin glues: Treatments with fibrin glue are presently the only non-surgical choice for anal fistulae. It consists of inserting glue into the fistula. The glue aids in sealing the fistula and inspires its healing. It's commonly less effectual than fistulotomy for simple fistulae and the outcomes mayn't be lifelong, but it can be a valuable choice for fistulae that pass via the anal sphincter muscle as they don't want to be cut (56).

Medical Treatment: Peri-anal fistulae related to Crohn's disease are frequently managed medically, and the key aim of treatment is to accomplish and preserve disorder remission. *Antibiotics:* by means of antibiotics (metronidazole, ciprofloxacin) is the common first step of treatment. While therapy with oral metronidazole causes better signs in 50% of cases, the clinical healing rate from antibiotic treatment is only 50%, and signs for the majority of patients will recur if antibiotics are reserved (37).

Immuno-suppression: Azathioprine and 6-mercaptopurine (6-MP) are the most frequently utilised immuno-suppressants for induction and maintenance of remission in fistulizing diseases. A meta-analysis of five RCTs established a healing rate of 54% in cases who received 6-MP and azathioprine, in comparison to 21% of the controls (placebo treated) (37).

Tumor necrosis factor (TNF) antagonists: TNF antagonists are operative in accomplishing remissions in fistulizing diseases. The most commonly utilised anti-TNF antibody to treat Crohn's disease (20).

Case No. (1)

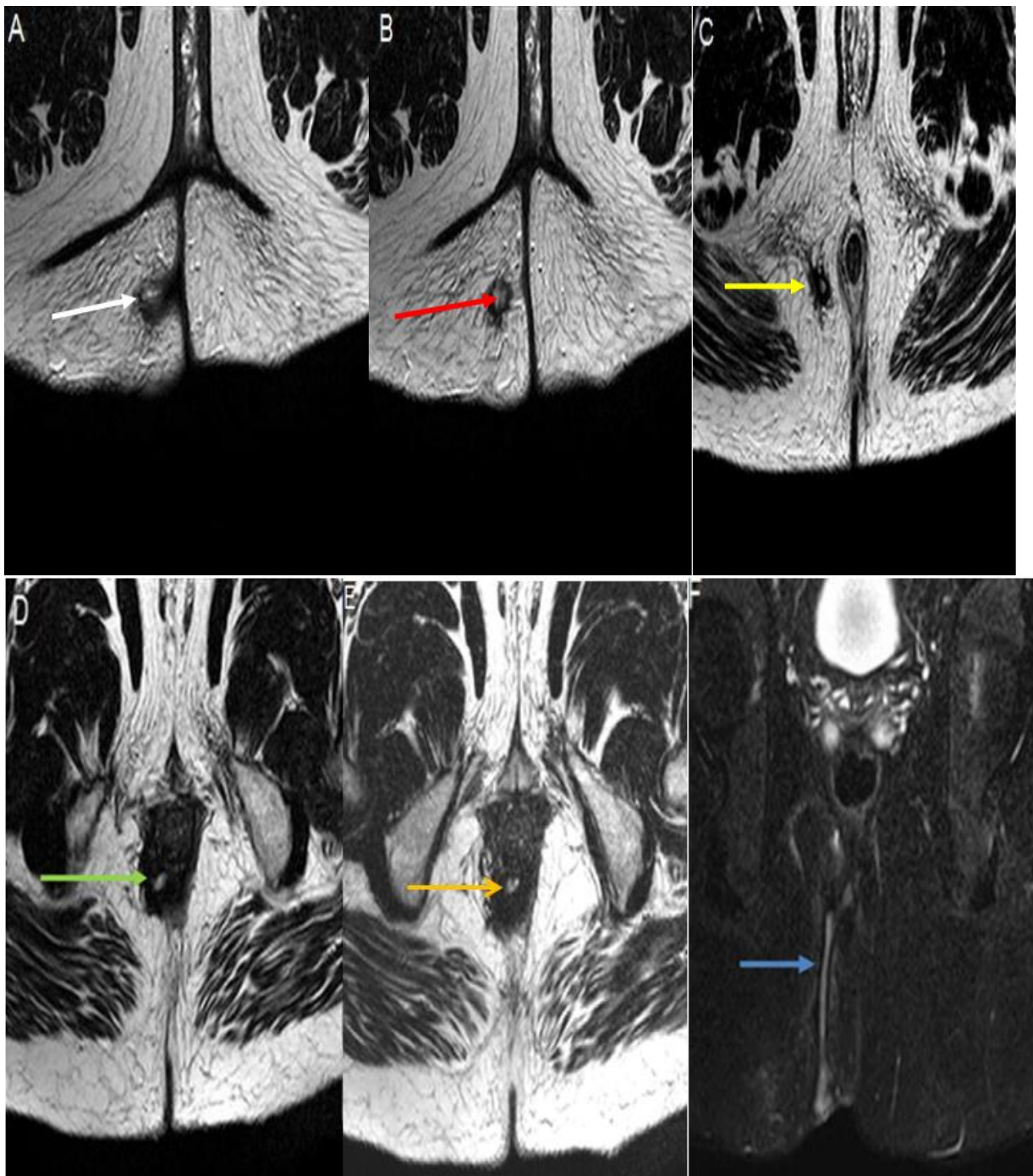


Figure (20): A 57-year-old male patient presented with right peri-anal itching and discharge. An MRI examination using local saline injection revealed: **Axial T2 images (A, B, C, D, E) show:** external cutaneous aperture of the fistular tract (white arrow), non-branching simple tract at the right ischioanal fossa (red arrow), the tract seen ascending upward outside the external and internal sphincters (yellow arrow), the tract seen traversing the external sphincter (green arrow). Internal mucosal aperture at the anal canal at 6 o' clock (orange arrow) and Coronal STIR image show hyper intense signal of the right transsphincteric fistula (blue arrow)

Case No. (2)

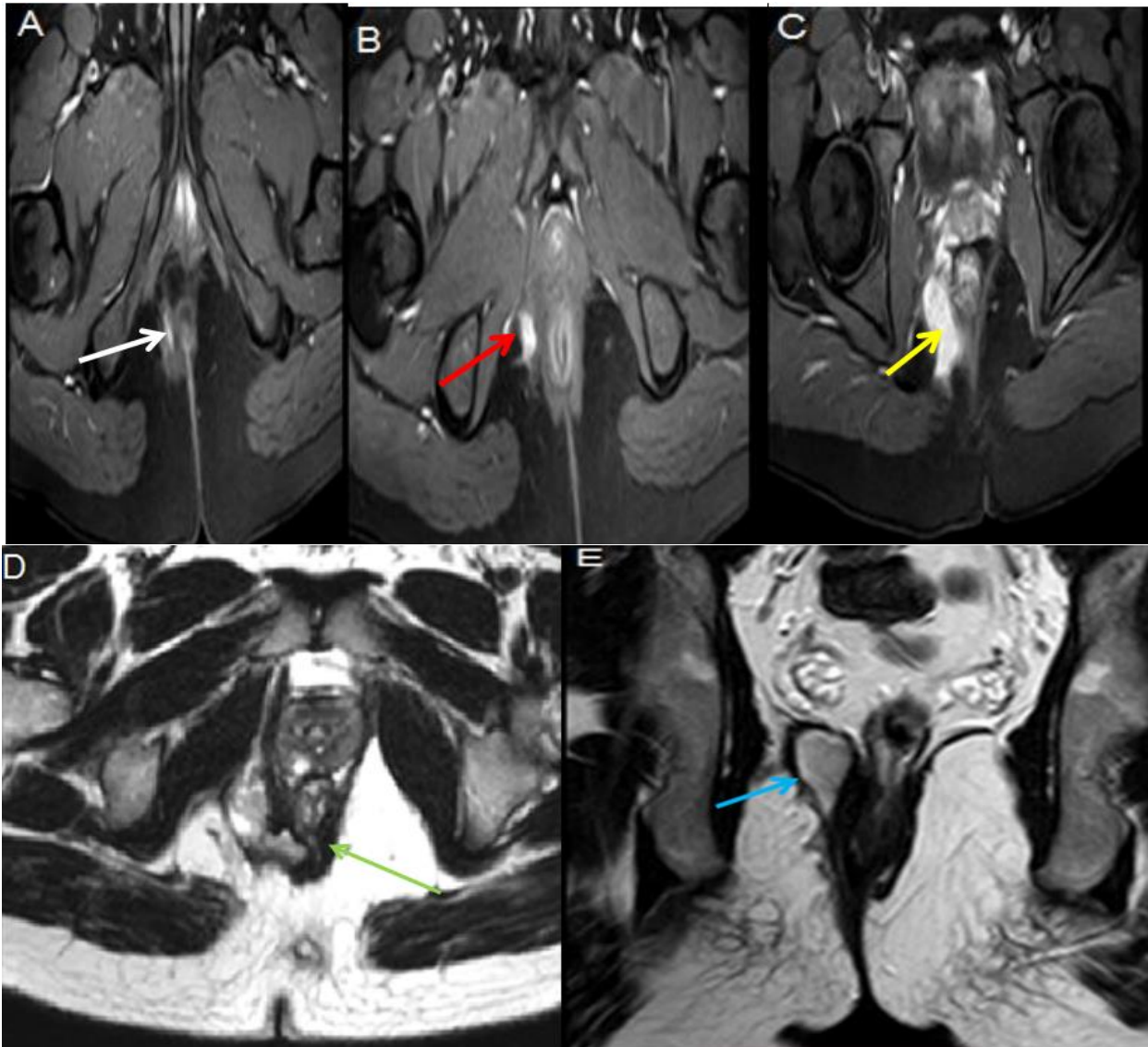


Figure (21): A 23-year-old male patient complains of recurrent fistula after surgery.

MRI examination in the form of multiple pulse sequences revealed: **Axial T2 FATSAT images show:** external cutaneous aperture of the fistulous tract at the right peri-anal region (white arrow), fistula at the right ischioanal fossa (red arrow), distension of the fistulous tract forming an abscess cavity that traverses the right levator ani muscle (yellow arrow), **axial**

T2W image shows the internal mucosal aperture at the rectum at 6 o'clock (green arrow) and **coronal T2W image shows** the supralelevator extension of the abscess. (blue arrow)

Summary

MRI was taken into consideration as the 'golden standard' method for the preoperative valuation of peri-anal fistulae. Accurate and detailed information about primary, secondary, and associated abscesses plays a vital part in defining operative outcome and reducing complications, like faecal incontinence, in addition to recurrence lesions. For the detection of perineal fistulae, MRI has been the best choice because of its better contrast resolution and capability to delineate the perineum and pelvic structure in an orthogonal axis, therefore conferring good demonstrations of anatomic and pathologic features of the paths.

MRI was found to be better than other imaging modalities in defining the extension of diseases and has high accuracy, with stated sensitivity and specificity for assessing fistula and abscesses of > 90%.

Recurrent fistulae in ano must undergo preoperative scanning to improve understanding of the nature and course of the disorder to decrease the chance of recurrence. The use of conventional radiography, EUS, and CT scans is no more favoured unless in definite conditions. Though MRI is the best option for scanning fistulae in ano.

Conclusion:

MRI is the method of choice in the evaluation of peri-anal fistula and has a significant role in the identification of primary fistulous tracts, abscesses, and secondary ramifications. It is essential for accurate pre-operative assessment of peri-anal fistulae and permits selection of the most suitable operative treatment, thus reducing the probabilities of recurrence or complication.

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