

PRE SURGICAL IMAGING OF FISTULA IN ANO

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INTRODUCTION

In 1976, Parks, Gordon and Hardcastle published their article entitled 'A classification of Fistula- in ano.' Their classification was based on the identification of four types of fistula: inter sphincteric, trans sphincteric, supra sphincteric and extra sphincteric. An intersphincteric fistula runs downwards between the internal and external sphincters. The trans sphincteric fistula runs from the intersphincteric space, through the external anal sphincter into the ischiorectal space¹. The supra sphincteric fistula runs upward between the internal sphincter and external sphincter and then bends around the pubo rectalis muscle and penetrates the pelvic floor, to traverse downwards through the ischiorectal fossa.

An extra sphincteric fistula passes through the external anal sphincter and then branches out into two tracks- one extending cephalad penetrating the pelvic floor and finally ending in rectum and the other extending caudally ending in the external opening. Although this classification does not take into account the circumferential extend of the disease it is widely used because of its simplicity. Another reason is that this classification relates the anatomical relation of the fistulous track to the anal sphincters which is relevant for the choice of treatment.

SURGICAL APPROACHES

Surgical management of perianal fistulae depends on the nature of the primary fistula and any secondary fistulous tracks or associated abscesses. For simple intersphincteric fistulae, the surgeon performs a fistulotomy or fistulectomy, in which the internal opening is divided to lay open the track. Alternatively in patients with perianal abscesses, the surgeon performs a simple incision and drainage first.

Preservation of fecal continence is the most important surgical concern and the treatment strategies aim to preserve the integrity of the external sphincter². It is the right balance between eradication of infection and preservation of function that is the art of fistula surgery. To achieve this, two surgical questions need to be answered preoperatively: (a) What is the relationship between the fistula and the anal sphincter (i.e., can the tract be safely laid open with only a low risk of postoperative incontinence), and (b) are there any extensions from the primary tract that need to be treated to prevent recurrence, and, if so, where are they? The key to solving these questions is accurate pre-operative assessment.

PRE-OPERATIVE ASSESSMENT

INSPECTION

The location of the external opening provides important information regarding the type of fistula. Usually the external opening of an intersphincteric fistula is located near the anal canal whereas the distance between the external opening of a trans-sphincteric fistula and the anal verge is several centimeters or more.

GOODSALL'S RULE

Goodsall, in the early 20th century described the relationship of the cutaneous opening to the expected site of the internal opening. The rule states that the cutaneous opening anterior to the transverse anal line are associated with direct radial fistulous track into the anal canal whereas openings posterior to the line have tracks that enter the canal at midline posteriorly³. Recently several studies have cast doubts about the reliability of this rule.

PREOPERATIVE IMAGING OF FISTULA IN ANO

CONVENTIONAL FISTULOGRAPHY

Contrast material-enhanced fistulography was the first radiological modality to be used in imaging of fistula in ano. In fistulography, the external opening is catheterized with a fine cannula, and a water-soluble contrast agent is injected gently to define the fistula tract.

Unfortunately, fistulography has two major drawbacks. First, extensions from the primary tract may fail to fill with contrast material if they are plugged with debris, are very remote, or there is excessive contrast material reflux from either the internal or external opening.

Second, the sphincter muscles themselves are not directly imaged, which means that the relationship between any tract and the sphincter must be guessed. Furthermore, an inability to visualize the levator plate means that it can be difficult to decide whether an extension has a supra- or an infralevator location. Similarly, the exact level of the internal opening in the anal canal is often impossible to determine with sufficient accuracy to help the surgeon. The net result is that fistulographic findings are both difficult to interpret and unreliable⁴.

Very little has been written on fistulography for fistula in ano. Kuijpers and Schulpen attempted to determine its value by retrospectively reviewing fistulographic images in 25 patients⁵. The authors based on this concluded that fistulography was "inaccurate and unreliable," although they admitted prior bias against the technique⁵. In contrast, Weisman and co-workers found

fistulography to be more useful, in that it provided helpful information in nearly half of the 27 subjects in their study ⁶.

ANAL ENDOSONOGRAPHY

Anal endosonography, developed by Clive Bartram, was the first technique to directly depict the anal sphincter complex in detail ⁸. The technique has attracted considerable attention because of its ability to demonstrate the presence and extent of anal sphincter disruption, notably after vaginal delivery ⁹. Anal endosonography has also been extensively used for the preoperative classification of fistula in ano.

The examination is simple, rapid, and well tolerated by patients. The patient lies in the left lateral position or in the prone position if female ¹⁰. The probe is gently inserted into the distal rectum and then withdrawn through the anal canal. The internal sphincter is visualized as a hypoechoic ring encircling the anal canal, whereas the external sphincter is of mixed echogenicity. The intersphincteric space and longitudinal muscle lie between these and are of mixed echogenicity and are easily identified by using modern 10-MHz transducers.

Endosonography is particularly well suited to identification of the internal opening, because this opening is usually positioned right at the probe surface. It is important to realize, however, that a tract extending up to the anal mucosal surface is rarely seen. Although a breach in the subepithelial layer of the anal canal is occasionally present, it is more common for the position of the internal opening to be revealed as a hypoechoic focus in the intersphincteric space that abuts the internal sphincter, often with a small corresponding defect in the internal sphincter. Because intersphincteric fistulae do not stray beyond the intersphincteric space, they are usually very well visualized at anal endosonography. Trans sphincter fistulae are revealed by tracts that cross the external sphincter to reach the ischioanal fossa. As would be expected, extensions are revealed as hypoechoic fluid collections.

TRANSPERINEAL SONOGRAPHY (TPUS)

Rubens et al described TPUS as a valuable tool for imaging perianal inflammatory disease ¹¹. Stewart et al described TPUS using a combination of transvaginal and transperineal approaches in female patients and transperineal ultrasonography in male patients to detect perianal fistulae and abscesses ¹². In a recent study, Mallouhi et al showed a high correlation between perineal ultrasonographic findings and surgical examination ¹³.

TPUS has the potential to become the initial and most cost-effective investigation for fistula disease, which may alleviate the need for MRI in most patients ¹⁴. Its advantages are as follows: It has excellent detection rates of primary and secondary tracts and their course and extent, even in blocked tracts, which cannot be evaluated by fistulography. The levator ani and external sphincter can be evaluated well. Muscle mobility can also be judged. The suprasphincteric type can be identified easily. It allows good detection of perianal abscesses.

Air in the fistula tract and increased vascularity are reliable signs of an active fistula. It can be performed in patients with anal stenosis (Endoanal ultrasonography cannot be performed in these patients.) It allows real-time visualization (which computed tomography and MRI lack). It has multiplanar capability. It can be used intraoperatively to delineate the tracts. No specialized equipment is needed. It is inexpensive and readily available especially when immediate action is necessary. It allows rapid evaluation, is easily reproducible, and is easy to perform. It is painless and an ideal tool for follow-up cases with no patient preparation requirement¹⁴.

MR IMAGING OF FISTULA IN ANO

The ability of MR imaging helps to accurately classify tracts and also identify disease that could have been missed. It has effect on surgical treatment and patient outcome.

ST JAMES'S UNIVERSITY HOSPITAL MODIFICATION OF PARKS CLASSIFICATION FOR FISTULA IN ANO

Parks et al described the course and relationship of perianal fistulae to the sphincter mechanism with reference to the coronal plane. St James's university classification is a modification of Parks's classification. It consists of five grades and relates the Parks surgical classification of anatomy seen at MR imaging in both axial and coronal planes. This classification deals with not only the demonstration of primary fistulous tracks but also with secondary ramifications and associated abscesses. This system has been validated with surgical proof and has been shown to correlate better than initial surgical assessment with long-term outcome.

Grade 1: Simple Linear Intersphincteric Fistula: - In a simple linear inter sphincteric fistula, the fistulous track extends from the skin of the perineum or natal cleft to the anal canal, and the ischiorectal and ischioanal fossae are clear. There is no ramification of the track within the sphincter complex. The enhancing track is seen in the plane between the sphincters and is entirely confined by the external sphincter. Fistulous tracks arising behind the transverse anal line, which are by far the most common type, enter the anal canal in the midline posteriorly

Grade 2: Intersphincteric Fistula with Abscess or Secondary Track: - Intersphincteric fistulae with an abscess or secondary track are also bounded by the external sphincter. Secondary fistulous tracks may be of the horseshoe type, crossing the midline, or they may ramify in the ipsilateral intersphincteric plane. On T2-weighted images, pus has high signal intensity and thus cannot be reliably distinguished from edema and inflammation, but gas within abscesses has low signal similar to that of the anorectal lumen⁴. Intersphincteric abscesses and secondary fistulous tracks are well shown by dynamic contrast-enhanced MR imaging. On these contrast-enhanced images, the pus in the central cavity has low signal intensity and is surrounded by a brightly enhancing rim. A horseshoe fistula, in which the process extends to the opposite side, is best demonstrated in the axial plane.

Grade 3: Trans-sphincteric Fistula:- Instead of tracking down the inter sphincteric plane to the skin, the trans-sphincteric fistula pierces through both layers of the sphincter complex and then arcs down to the skin through the ischioanal and ischioanal fossae. Thus, a transsphincteric fistula may disrupt the normal fat of the ischioanal and ischioanal fossae with secondary edema and hyperemia. These fistulae are distinguished by the site of the enteric entry point in the middle third of the anal canal (i.e., corresponding to the position of the dentate line), as seen on coronal images. Because these fistulae disrupt the integrity of the sphincter mechanism, their tracks must be excised by dividing both layers of the sphincter, thus risking fecal incontinence ⁴.

Grade 4: Trans-sphincteric Fistula with Abscess or Secondary Track within the Ischioanal Fossa - A trans-sphincteric fistula can be complicated by sepsis in the ischioanal or ischioanal fossa. Such an abscess may manifest as an expansion along the primary track or as a structure distorting or filling the ischioanal fossa. Axial and coronal dynamic contrast-enhanced MR imaging clearly depicts a trans-sphincteric abscess. As with grade 3 lesions, the key anatomic discriminator of a grade 4 fistula is the track crossing the external sphincter.

Grade 5: Supralelevator and Translevator Disease: - In rare cases, perianal fistulous disease extends above the insertion of the levator ani muscle. Suprasphincteric fistulae extend upward in the intersphincteric plane and over the top of the levator ani to pierce downward through the ischioanal fossa. Extrasphincteric fistulae reflect extension of primary pelvic disease down through the levator plate. Coronal dynamic contrast-enhanced MR imaging elegantly demonstrates breaches of the levator plate, which is clearly shown in this plane. In some translevator fistulae, horseshoe ramifications to the contralateral side may occur.

EFFECT OF PREOPERATIVE MRI ON SURGERY AND OUTCOME

MRI, has revolutionized the treatment of patients as it can be used to classify fistulae preoperatively with high accuracy and also alert the surgeon of underlying disease ^{15, 16}. Spencer and colleagues independently classified 37 patients into those with simple or those with complex fistulae on the basis of MR imaging and EUA and found that MR results were the better predictor of outcome, with positive and negative predictive values, respectively, of 73% and 87% for MR and 57% and 64% for EUA ¹⁹.

Beets-Tan and colleagues extended this hypothesis by investigating the therapeutic effect of preoperative MR imaging; MR imaging provided important additional information that precipitated further surgery in 12 (21%) of 56 patients, predominantly in those with recurrent fistula or Crohn disease ²⁰.

Buchanan and co-workers ²¹ hypothesized that the therapeutic influence and, thus, beneficial effect of preoperative MR imaging would be greatest in patients with recurrent fistula, since these patients had the greatest chance of harboring occult infection, while such fistulae were also the most difficult to evaluate clinically. They found that postoperative recurrence was only 16% for surgeons who always acted if MR findings suggested that areas of infection had been missed,

whereas recurrence was 57% for those surgeons who instead always chose to ignore imaging results.²¹

Ever since the results of Lunniss et al²² suggested that EUA might be an imperfect reference standard with which to judge MR imaging. It is now well recognized that surgical findings at EUA are often incorrect with frequent false-negatives. In a recent comparative study of endosonography, MR imaging, and EUA in 34 patients with fistula due to Crohn disease, Schwartz and co-workers²³ found that a combination of the results of at least two modalities was necessary to arrive at a correct classification. Spencer and colleagues¹⁸ independently classified 37 patients into those with simple or those with complex fistulae on the basis of MR imaging and EUA and found that MR results were the better predictor of outcome, with positive and negative predictive values, respectively, of 73% and 87% for MR and 57% and 64% for EUA.

Beets-Tan and colleagues²⁴ extended this hypothesis by investigating the therapeutic effect of preoperative MR imaging; the MR imaging findings in 56 patients were revealed to the surgeon after he or she had completed an initial EUA. MR imaging provided important additional information that precipitated further surgery in 12 (21%) of 56 patients, predominantly in those with recurrent fistula or Crohn disease²⁴.

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Ever since the results of Lunniss et al²⁶ suggested that EUA might be an imperfect reference standard with which to judge MR imaging, comparative studies have been plagued by the lack of a genuine reference standard. In a recent comparative study of endosonography, MR imaging, and EUA in 34 patients with fistula due to Crohn disease, Schwartz and co-workers²⁶ found that a combination of the results of at least two modalities was necessary to arrive at a correct classification. Indeed, it is well established that many false-negative surgical results will only reveal themselves during long-term clinical follow-up, and, at this point in time, comparative studies that ignore clinical outcome are likely to be seriously flawed.

IMAGING FOR DIFFERENTIAL DIAGNOSIS

Not all cases of perianal sepsis are due to fistula in ano. While clinical examination results are often conclusive, this is not always the case and imaging may help with the differential diagnosis. The cardinal feature of fistula in ano is intersphincteric infection, which is not generally found in other conditions. Whenever imaging suggests that infection is superficial rather than deep seated

and that there is no sphincteric involvement, other conditions such as hidradenitis suppurativa should be considered.

The possibility of underlying Crohn's disease should always be considered in patients who have a particularly complex fistula, especially if the history is relatively short. Small-bowel imaging may be used to search for Crohn's disease when it is suspected, and the possibility of underlying pelvic disease should be considered in any patient with an extrasphincteric fistula, whether thought due to Crohn's disease or otherwise¹⁵.

Pre-operative imaging helps in better delineation and characterization of fistula-in ano. This in turn helps in preventing recurrences which occur usually due to failure to eradicate all the associated sites of infection. The right balance between eradication of infection and preservation of anal continence is the art of fistula surgery. Pre-operative imaging helps to achieve this goal.

Various imaging modalities have been tried for the preoperative imaging of fistula-in ano. But MRI proved to be superior in classifying the fistulae, assessing the relation with the sphincter complex, diagnosing supralevator extension and demonstrating the distance of intact sphincter above the level of internal opening, which in turn are of crucial importance to the operating surgeon.

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