Value of Magnetic Resonance Imaging in the Surgical Management of Perianal Fistulas

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Abstract

Background: To understand the surgical options for treating fistulous disease, one must first consider the anatomy, function of the anal sphincters and the causes of perianal fistulas.

Aim of the Work: Was to evaluate the use of (MR) imaging in diagnosis of perianal fistulous disease and its relationship to the anal sphincter, pelvic diaphragm (levator plate) and the ischiorectal fossae.

Material and Methods: This study was performed at MRI unit of Radiology Department and Surgery Department of the Zagazig University Hospitals at period from July 2008, to October 2010. During this study period 47 cases with clinical diagnosis of perianal fistula, were referred to MRI scan. Of the 47 patients, 37 were males (79%) and 10 females (21%).

Results: In this study the sensitivity of MR in detection of fistula type was 97.87%, specificity 88.46%. The sensitivity and specificity for detection of associated abscesses were 94.73% & 89.47% respectively. The sensitivity and specificity for detection of horse shoe extension were 100%. For detection of internal opening the sensitivity and specificity were 97.87% & 85.10% respectively.

Conclusion: MRI can accurately identify the fistula track in relation to the sphincter complex. This may provide more accurate anatomical information about the amount of sphincter above the track, the position and level of the internal opening there by increasing the likelihood of rapid successful surgical treatment.

Key Words: Fistula – MRI – Perianal.

Introduction

FISTULAE are intimately related to the anal sphincter complex, so that incision and drainage may damage those muscles to a variable degree with the risk of anal incontinence. The correct balance between eradication of infection and maintenance of continence depends upon accurate pre-operative assessment of fistula geographically [1]. The surgical approach to complicated perianal fistulas depends on the extent and ramifications of the fistula. Inspection, palpation, and probing, may help to identify the internal and external openings and the direction of the fistula course [2]. Conventional radiography and procto–sigmoidoscopy are often insufficient to demonstrate the extra intestinal extent of the disease caused by the transmuraly penetrating nature of the inflammatory process. MRI is now generally available and high quality examination does not require special equipment. It suffers from none of the drawbacks associated with other imaging modalities and for these reasons it could be argued there is little reason to request anything else when assessment of a complex fistula is required. The added advantage of multi-planar imaging enables fistula anatomy to be imaged in a way that is directly related to surgical planes and exploration. MR imaging is so pre-eminent for fistula classification [3].

Material and Methods

This study was performed at MRI unit of Radiology department and Surgery department of the University Hospitals at period from July 2008, to October 2010. During the study period 47 cases with clinical diagnosis of perianal fistula, were referred to MRI scan. Of the 47 patients, 37 were males (79%) and 10 females (21 %). Their ages ranged from 10 to 77 years (mean 43.5 y). All MR scans were performed at 1.5 Tesla, superconducting magnet (Philips-Achieva). All patients with the clinical diagnosis of anal fistula who were scheduled for surgical exploration were considered candidates for inclusion. All patients were subjected to the following: History taking, general and local examination, the procedure of MRI is simply explained to the patient. Then consent was taken for the study.

Patient position:

Patient’s positioning is important for optimizing both patient comfort and the quality of MR images.
The patient is placed supine on the magnet, head first with the pelvis centered on the proximal part of the coil.

**Coil:**

Body coil was used in all patients.

**Image orientation:**

The most useful information for evaluation of perianal fistula can be obtained in axial and coronal planes. Sagittal images sometimes can add information especially in cases extension of infection to retrorectal space. Because the anal canal is tilted forward from the vertical by approximately 45°, straight transverse and coronal images will fail to achieve this alignment because of marked partial volume effect. Oblique transverse and coronal planes oriented orthogonal and parallel, respectively, to the anal sphincter are therefore necessary and are most easily planned by using a midline sagittal image. Examinations with the rectal axis may be needed in complex cases of an internal opening high in the rectum. It is important that the imaged volume extend several centimeters above the levators and include the whole presacral space, both of which are common sites for extensions. The entire perineum should also be included. On occasion, tracts may extend for several centimeters, even leaving the pelvis, and any tract visible must be followed to its termination if this has not been included on the standard image volume. The precise location of the primary tract (e.g., ischioanal or intersphincteric) is usually most easily appreciated by using transverse images; the radial site of the internal opening is also well seen on images in this plane. Coronal images best depict the levator plate, which helps distinguish supra from infralevator infection. The height of the internal opening may also be best appreciated on coronal images, with the caveat that the anal canal must be imaged along its entire craniocaudal extent.

On selected cases, both sets of axial and coronal T1 weighted images were repeated after i.v. administration of 0.1 mmol of gadopentate dimeglumine per kilogram body weight. Imaging parameters were identical to those described earlier. Imaging commenced immediately after i.v. injection of contrast material. The main interval between acquisitions of the two sets of contrast enhanced images was 9 min (range, 5-15 min). Both sets of axial and coronal T2 weighted images were done after saline injection through external opening when it was wide enough. T2 WI with fat suppression may be used, giving the same information as STIR.

**Image evaluation:**

The MR images were prospectively evaluated. Based on Park et al. [1]; the images were evaluated for the presence and site of primary fistula track, of any external and internal opening, and of any abscess, ramification or horseshoe extension.

**Surgery:**

Surgery was performed by a general surgeon (through two weeks after MR was done) with experience in complicated fistula. Surgical assessment was performed with the patient under anaesthesia and in the lithotomy position. The extent of the disease was established. The presence and site of a primary fistula track, the site of any external and internal opening, the presence and site of any abscess or horseshoe fistula, and the Parks classification were recorded.

While the patient was still under anesthesia, the surgical results were compared with the MR imaging results. When MR imaging findings suggested more extensive disease, the surgeon went back to verify these additional MR imaging findings. These findings were considered true-positive additional MR imaging findings only when they were confirmed and led to additional surgical drainage.

**Results**

This study included 47 consecutive patients, 37 were males (79%) and 10 females (21%).

Their ages ranged from 10 to 77 years (mean age 43.5) Fig. (1-Diagram).

The main clinical presentations of those patients (Fig. 2-Diagram) were 27 presented with discharge (57.44%), 10 patients with pain (21.27%), 6 with swelling (12.76%) and 4 presented with bleeding (8.51%).

According to MR & surgical findings and based on Park’s Classification (Table 1). Perianal fistula were classified into the following types; Superficial submucosal (2 cases), intersphincteric (25 cases) (Figs. 1,2), trans-sphincteric (14 cases), (Fig. 3) suprasphincteric (4 cases) and extrasphincteric (2 cases). (Fig. 4) the fistula is considered complicated when there is secondary track, horseshoe extension or abscess formation.

There were no false results regarding presence of the horseshoe extension between The MR and the surgical finding, (Fig. 5).

Three cases of sinuses were considered as fistulae. (Table 4) shows comparison of the MR and surgical finding regarding the internal opening.
Fig. (1A,B,C,D): Female patient, 45 years old, presented with perianal fistula. Sagittal, Coronal & axial T2 WIs and Fat Suppression. The arrows point to the bright signals of left intersphincteric fistula. The arrow in (C) point to the left external hypointense external anal sphincter.

Fig. (2A,B): Female patient, 45 years old, presented with perianal fistula. Axial and Coronal T2 WI with saline injection. (Two selected caudo-cranial images).
Fig. (3A,B): Female patient, 38 years old, presented with recurrent perianal fistula. Sagittal and Coronal FSWI showing bright signal of the right intersphincteric track.

Fig. (4A,B): Male patient, 51 years old, complaining of discharging perianal fistula. Coronal and Sagittal T2 WIs showing retrorectal abscess is seen with air fluid level. The air appears as signal voids (arrow) & fluid appears bright.

Fig. (5A,B,C): Male patient, 34 years old, complaining of discharging perianal fistula. Coronal T2 WI. (Three selected postero-anterior images). Track on the right ischiorectal fossa (arrow). Horse shoe extension (curved arrow). Abscess on the left intersphincteric space (arrow).
Table (1): Type of the fistula in comparison of the operative findings.

<table>
<thead>
<tr>
<th>Primary track</th>
<th>MR imaging findings</th>
<th>Final surgical findings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>True positive</td>
<td>False positive</td>
</tr>
<tr>
<td>Reference standard</td>
<td></td>
<td></td>
</tr>
<tr>
<td>True positive</td>
<td>97.61 % (41/42)</td>
<td>87.23 % (41/47)</td>
</tr>
<tr>
<td>False positive</td>
<td>(46/47)</td>
<td>(47/52)</td>
</tr>
<tr>
<td>False negative</td>
<td>(40/47)</td>
<td>(46/53)</td>
</tr>
<tr>
<td>True negative</td>
<td></td>
<td></td>
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Table (5): Accuracy of MRI in comparison to operative findings.

<table>
<thead>
<tr>
<th>MR imaging findings</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>PPV</th>
<th>NPV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary track</td>
<td>97.87%</td>
<td>88.46%</td>
<td>97.61%</td>
<td>(41/42)</td>
</tr>
<tr>
<td>Abscess</td>
<td>94.73%</td>
<td>90%</td>
<td>89.47%</td>
<td>(17/18)</td>
</tr>
<tr>
<td>Horse shoe extension</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Internal opening</td>
<td>97.87%</td>
<td>86.79%</td>
<td>97.56%</td>
<td>(40/41)</td>
</tr>
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</table>
Discussion

To understand the surgical options for treating fistulous disease, one must first consider the anatomy and function of the anal sphincters and the causes of perianal fistulas. The internal sphincter is involuntary and is composed of smooth muscle continuous with the circular smooth muscle of the rectum. It is responsible for 85% of resting anal tone. In most individuals, it can be divided without causing a loss of continence. The external sphincter is composed of striated muscle and is continuous superiorly with the puborectalis and levator ani muscles. It contributes only 15% of resting anal tone, but its strong voluntary contractions resist defecation. A division of the external sphincter can lead to incontinence [2].

Several imaging modalities have been used in the past to delineate the fistulous track including fistulography, endoanal ultrasound and CT scanning. Magnetic resonance has the potential to replace conventional imaging methods diagnosing perianal fistula. Multiplanar images permit direct anatomic and pathologic discrimination in axial, coronal and sagittal planes.

In this study the MR images were prospectively evaluated by a radiologist who was experienced in reading pelvic MR images. Based on Parks and false positive results. In this study the sensitivity for abscess detection was 94.73% (18/19) and specificity was 89.47% (17/19). For detection of horseshoe extension, the sensitivity and specificity were 100% (8/8).

MRI can accurately identify the fistula track in relation to the sphincter complex. This may provide more accurate anatomical information about the amount of sphincter above the track and the position and level of the internal opening thereby increasing the likelihood of rapid successful surgical treatment and potentially reducing the need in some cases for multiple procedures.

Magnetic resonance has the potential to replace conventional imaging methods diagnosing perianal fistula. Multiplanar images permit direct anatomic and pathologic discrimination in axial, coronal and sagittal planes. It provides unparalleled visualization of the perianal region including sphincter complex, perianal spaces and levator ani and is the imaging method of choice in patient with perianal fistula [3].

47 cases with clinical diagnosis of perianal fistulae were included in this study. Of 47 patients, 37 were males (79%) and 10 females (21%). Their ages ranged from 10 to 77 years (mean 43.5). The MR images were prospectively evaluated by a radiologist who was experienced in reading pelvic MR images. Based on Parks et al. [1] and colleagues; the images were evaluated for the presence and site of primary fistula track, of any external and internal opening, and of any abscess, ramification or horseshoe extension. The final surgical findings after correction with MR imaging were accepted as the reference standard against which the MR imaging findings were compared. A primary track, abscess, or horseshoe fistula was considered as correctly depicted by MR imaging when both the classification and location were in agreement with the findings at final surgery. An internal opening was considered as correctly identified when it was at the correct level in the anal canal and was within the correct quadrant. The sensitivity, specificity, positive predictive value, and negative predictive value were calculated for MR imaging in predicting the presence and exact location of primary tracks, abscesses, horseshoe fistulas, and internal openings.

Although the sensitivity for detection of primary track on this study was high 97.87% (46/47), the specificity was lower 87.23% (41/47). These figures are near or on agreement with those on other studies including [3,4].

One false negative case found at operation to be short fine track on intersphincteric space (this track is not detected by using the standard protocol employed in this study). The use of small field of view and fat suppression sequence may be of great help to prevent inaccurate interpretation. Five of six false positive cases were found at surgical exploration to be healed fibrotic tracks. Again, the small field of view and careful searching for bright T2 signals may decrease the false positive results.

Nineteen cases found to be containing abscesses after surgery (6 of those cases contain more than one abscess). In our study the sensitivity for abscess detection was 94.73% (18/19) and specificity was 89.47% (17/19). These numbers are near the results of other researcher Regina et al. [4].

Schoefield et al. [5] reported that sensitivity of 33% on abscess detection which may be explained by limited experience on interpretation as assumed by the author. Also the use of single sequence technique (STIR study) may be an additional cause to explain this lower figure. For detection of horseshoe extension, the sensitivity and specificity were 100% (8/8). These figures are around the percent-ages of other studies including [6,7]. These high
figures of sensitivity and specificity of horse-shoe detection can be explained by that; the fistulae with horse-shoe extensions usually complicated and having large tracts which easily seen on T2 WI or fat suppression sequences [8].

The lower figures reported by other authors as Schoefield et al. [5] (66% sensitivity and 50% specificity) can be explained by poor technique (using single sequence). For detection of internal opening the sensitivity and specificity were 97.87% (46/47) and 85.10% (40/47) respectively. These figures are around the percentage of other studies. Spencer et al. [7] report specificity of 77% for detection of internal opening.

Six of seven false positive cases found to be blind tracks (sinuses). The discrepancy between sensitivity and specificity may be explained by method which we are consider for site of internal opening in case when we fail of direct visualization which based on site of maximum sepsis.

Conclusion: MRI can accurately identify the fistula track in relation to the sphincter complex. This may provide more accurate anatomical information about the amount of sphincter above the track and the position and level of the internal opening thereby increasing the likelihood of rapid successful surgical treatment and potentially reducing the need in some cases for multiple procedures.

References