The Egyptian Journal of Radiology and Nuclear Medicine 48 (2017) 1–6

Contents lists available at ScienceDirect

The Egyptian Journal of Radiology and Nuclear Medicine

journal homepage: www.sciencedirect.com/locate/ejrnm

Original Article

Effectiveness of magnetic resonance imaging in grading of primary perianal fistula and its associated findings in correlation with surgical outcome

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ARTICLE INFO

Article history:
Received 17 October 2016
Revised 28 December 2016
Accepted 6 January 2017
Available online 12 January 2017

Keywords:
Fistula in ano
Perianal fistula grading
Pelvic MRI

ABSTRACT

Perianal fistula is a common disorder with high tendency to recur in spite of satisfactory surgery. Pelvic MRI is the preferable imaging modality for recognition and assessment of perianal fistulas.

Aim of the work: To evaluate the effectiveness of MRI in grading of primary perianal fistula and verification of its associated findings in correlation with surgical outcome.

Subjects and methods: This prospective study included 30 patients with age range 14–44 years. Preoperative MR grading was correlated with surgical outcome.

Results: The sensitivity, specificity, PPV, NPV and weighted Kappa of MR grading in correlation with surgery was 95.8%, 83.3%, 95.8%, 83.3% and 0.79 respectively with P value = 0.000

Conclusion: MRI is a valuable modality for grading of primary perianal fistula and its complications. Accurate pre-operative grading may reduce the surgical complications and possibility of recurrence.

1. Introduction

The anal canal comprises 2 muscular cylinders. The internal anal sphincter is the inner cylinder which is 3-cm long thickened extension of the rectal circular smooth muscle and extends from the ano-rectal junction to about 1–1.5 cm beneath the dentate line. The external anal sphincter is the outer cylinder which is a 4-cm long downward extension of the pubo-rectalis muscle [1]. The inter-sphincteric space lies between these two cylinders. The pectinate or the dentate line lies in the middle part of the internal anal sphincter and it separates the rectal transitional and columnar epithelium from the anal squamous epithelium. At this dentate line; the anal crypts are located. Anal glands are seen at the basal part of many of the crypts and infrequently penetrate into the inter-sphincteric space [2].

Peri-anal fistula (Fistula in ano) is a common disorder with high tendency to recur in spite of satisfactory surgery. Recurrence is regularly caused by infection that was not detected by surgery and thus gone untreated [3]. Recurrence rate after surgery is variable depending on the type of the operation, may reach up to (13.3%) with a median time to recurrence of 7.5 months [4].

Interpretation of MRI of perianal fistula necessitates knowledge of pathophysiology, applicable anatomy of the pelvis, and fistula types, classification plus its implication for treatment. A significant morbidity may occur if perianal fistula was incompletely treated possibly due to deep extension and affection of the anal, pelvic musculature and perianal spaces [5].

Theories of the causes of perianal fistulas are supposed to result from obstruction of the anal gland that may lead to 2ry abscess formation and external rupture decompression of the abscess through one of several legitimately expectable routes. The internal origin of the fistula frequently originates from the dentate line, at the middle part of the anal canal [1,6,7].

Pelvic MRI is the preferable imaging modality for recognition and assessment of perianal fistulas as it offers the capacity to achieve high-spatial-resolution and multiplanar images, enabling it to be the preferable imaging modality for recognition and grading of perianal fistulas [5]. It allows detection of the infected tracts and abscesses plus detailed assessment of the relationship between the fistula to the anal sphincter complex [5,7,8].

There are two main classification systems for pei-anal fistula; the classification suggested by Parks et al. in 1976 [9], which was mainly developed for surgical use, and the classification by St.

Peer review under responsibility of The Egyptian Society of Radiology and Nuclear Medicine.

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http://dx.doi.org/10.1016/j.ejrnm.2017.01.003
0378-603X/

James University Hospital that was developed based on an MRI examination [1].

The aim of this study was to evaluate the effectiveness of MRI in grading of primary perianal fistula and verification of its associated findings in correlation with surgical outcome

2. Subjects and methods

This prospective study was carried out during the period from May 2015 to August 2016 after approval of the medical research ethics committee. Informed consent was obtained from all patients. The Study included 30 patients (29 males and one female) with age range 14–44 years and mean (22.5 ± 3 years). All patients complained of local pain and discharge, in addition to associated abscess in 5 of them. MRI was done 3–14 days before doing surgery.

2.1. Inclusion criteria

All patients with initial clinical diagnosis of primary ano-rectal fistula or abscess.

2.2. Exclusion criteria

Recurrent perianal fistula.

2.3. MRI technique

This study was performed using 1.5 T MRI unit (GE medical system, HDE 1.5 T, USA) with phased array surface coil using non-breath-hold sequences. The exam was done in the supine position and the imaging covering area was planned to include the distal rectum and subcutaneous tissue including the anal canal, ischio-rectal fossa, the levator muscle and the supra-levator space.

Initially scout scanning was done, then non contrast scans; including coronal and axial T1-weighted fast spin-echo (T1WFSE) and T2WFSE, then oblique dedicated scans on the fistula site after localizing it at the axial sequence were performed including non-contrast scans with fat suppression; including oblique axial fat suppressed (FS) T1WFSE, axial, coronal and sagittal fat suppression T2WI (FS T2FSE). Contrast-enhanced MRI (CE-MRI) scans were done; including coronal, oblique axial and sagittal fat suppressed T1WFSE. Contrast enhanced sequences were obtained after intravenous injection of 0.1 mmol/kg of gadolinium based contrast; magnevist [gadolinium diethylene-triamine penta-acetic acid (Gd-DTPA); Berlex, Montvale, NJ].

2.4. Image analysis

Three independent radiologists with at least 5 years' experience in pelvic MRI evaluated each MRI on dedicated workstation for: the fistula type, its location in relation to the internal anal sphincter, external anal sphincter affection, the presence or absence of sinus tracts as well as coexisting inflammation.

The location of the internal opening was identified on axial images using the "anal clock" [5].

In grading of perianal fistulae, we adopted St James's University Hospital Classification [1] instead of surgical Parks classification [9]. In this classification the fistulae were graded into five grades:

Grade 1: simple inter-sphincteric linear fistula
Grade 2: inter-sphincteric with abscess or secondary track
Grade 3: trans-sphincteric
Grade 4: trans-sphincteric with abscess or secondary track in the ischio-anal or ischio-rectal fossae
Grade 5: supra-levator and trans-levator.

MRI findings were then correlated with the surgical results. In case of disagreement between the radiologists, a panel of the three radiologists reviewed these controversial findings on the dedicated workstation and the final decision was agreed after conjoint reexamination of the cases.

2.5. Statistical analysis

The collected data were revised; analyzed and tabulated using the statistical package for social sciences (SPSS) for windows version 18.0 software package (SPSS Inc., Chicago, IL).

3. Results

The study included 30 patients, they were 29 males (96.7%) and 1 female (3.3%, Fig. 2), and their age ranged between 14 and 44 years (mean 22.5 ± 3 years). These patients came with initial diagnosis of peri-anal fistula and/or abscess. According to the "anal clock" on MRI axial images, the internal openings of the ano-rectal fistulas were identified in all of our patients and their most common location was at 6 o'clock position (16 patients 53.3%), Table 1.

For statistical reasons owing to small number of patients grade 1 and 2 fistulae were grouped together into group A and grade 3, 4 and 5 fistulae were grouped into group B

The MRI grading revealed that group A (1 and 2 grades) were the commonest type, recognized in 24 patients (80%, Figs. 1 and 2). In group A MR falsely grade patient as grade 2 and revealed by surgery to be grade 3 due to missing of trans-sphincteric extension that was falsely recognized as 2ry track. MR grading of group B (3, 4 and 5 grades, Figs. 3 and 4) revealed the presence of the correct peri-anal fistula grade in 5 patients and falsely over diagnose one patient with stage 3 while surgery reveals it was grade 2 as no trans-sphincteric extension was evident (Table 2).

MRI was able to detect the fistula and its grade as well as its associated findings. Abscess was most common with group B (3,4 and 5 grades, Figs. 3 and 4) found in 16.7% of the study group patients (Table 3) and MRI was able to detect it correctly in correlation with surgery. On the other hand branching fistula was found by MRI in 6 (20%) patients (Table 3), but according to surgical data, branching fistula was present in 7 patients. In that patient the fistula was faint and was missed by MRI (Fig. 2). In our study 24 fistulas (80%) were simple, whereas only 6 fistulae by MRI (20%) showed complications including abscess formation (5 patients 16.7%, Figs. 3 and 4), branching course (6 patients 16.7%, found later to be 7 patients by surgery), and supra-levator extension (3 patients 10%, Fig. 4). Contrast enhanced FS T1WFSE images was able to detect fistulous tracts and active granulation tissue that exhibit intense enhancement, while fluid in the track remains hypointense as well as abscess formation.

The sensitivity, specificity, PPV, NPV and weighted Kappa of MR grading in correlation with surgery was 95.8%, 83.3%, 95.8%, 83.3% and 0.79 respectively with P value = 0.000 (Table 4).

4. Discussion

The main role of radiologists in evaluation of perianal fistulas is to be descriptive and accurate in their reports, as details will be essential in future decisions about medical or surgical treatment [1].

Perianal fistulas are frequently simple and frequently caused by nonspecific cryptoglandular inflammation but may also be caused by specific secondary causes [10].

MRI offers a detailed insight vision of the anal sphincter anatomy, especially when high spatial resolution sequences are performed [11–13].