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Research papers

Typical MR imaging findings of perianal infections in patients with hematologic malignancies

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ABSTRACT

Objective: We aimed to investigate the MR imaging findings of patients with hematologic malignancies who have symptoms suggesting perianal infection and to demonstrate the importance of imaging.

Subjects and methods: The study included 36 patients with hematologic malignancies who underwent anorectal MR imaging in our department between September 2011–May 2016. Two radiologists experienced in abdominal radiology viewed the MR images in consensus. Abscesses, fistulous or sinus tracts, signal alterations and contrast enhancement in keeping with an inflammation and edema in the perianal region were recorded.

Results: Perianal abscess was found in 16 of the 36 patients. In 10 of these 16 patients there was also extensive inflammatory signal alterations in perianal and/or perineal soft tissues.

In six of the 36 patients perianal fistula was detected. A sinus tract was seen at the level of subcutaneous external anal sphincter in one patient. Inflammatory signal alterations in the surrounding soft tissues were present in three of these seven patients.

There were abscesses in labium majus in two patients and in one patient there were perineal abscesses with accompanying inflammatory signal alterations.

In six of the 36 patients no abscess or fistula/sinus tract was seen. There were only inflammatory signal alterations with contrast enhancement in perianal or subcutaneous tissues.

In two patients presenting with perianal pain and hemorrhoids, minimal inflammatory changes were detected on MR images.

There were two patients with normal MR imaging findings.

Conclusion: As digital examination of the anorectum and rectoscopy are avoided in neutropenic patients, MR imaging, which clearly demonstrates the perianal pathology should be preferential.

1. Introduction

Infection has always been a great challenge in cancer patients but with the advances in the diagnostic procedures, in supportive care and in the management of the complications, infection-associated morbidity and mortality rates have decreased significantly [1]. Both the underlying disease and the chemotherapies developed to treat it can facilitate the onset of infections caused by saprophytic microorganisms. Various factors can contribute to the risk of serious infections. Neutropenia is defined as the reduction in the blood neutrophil count, and when neutrophil counts fall to $< 500/mm^3$, endogenous microbial flora can cause infections. Moreover patients with leukemia may have hypogammaglobinemia, or sustained defects in functions of the cells of immune system. In addition to immunocompromise, damage of mechanical barriers, the effects of commensal flora, organ function alterations during theraphy, and even genetic factors can influence the onset and severity of infections in cancer patients [2,3].

Perianal infections can be the cause of sepsis and increased risk of mortality in patients with neutropenia. These infections are one of the most feared complications in neutropenic patients, and the mortality rate is high with 11–57% [4,5]. Although the underlying pathophysiology of perianal infection is believed to be no different from that in immunocompetent patients, the clinical manifestation may be modified by immunocompromise [6]. The clinicians are usually reluctant for digital rectal examination and rectoscopy during neutropenia, hence the clinical diagnosis is a challenge [7].

The management of perianal infection is also critical in these patients. Although evidence of abscess formation identified on imaging studies requires a prompt surgical intervention, the surgical approach in these patients is controversial [8].

Despite the importance of the infection and the need for prompt treatment there is a diagnostic dilemma. Therefore magnetic resonance

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(MR) imaging findings gain importance in the diagnosis and decision making for the treatment of perianal infections in neutropenic patients.

It has been suggested that the appearance of perianal infection on MR imaging can be different in patients with a hematologic malignancy. There may be greater local inflammatory signal alterations and less common fistula tracts [6].

We aimed to investigate the MR imaging findings of patients with hematologic malignancies who have symptoms suggesting perianal infection and to demonstrate the importance of imaging.

2. Subjects and methods

The Institutional Ethics Committee approved this retrospective study protocol and waived informed consent.

2.1. Patient population

The study included 36 patients who underwent anorectal MR imaging in our department between September 2011–May 2016 after being referred by a hematologist. There were 21 male and 15 female patients with a mean age of 40 years (age range 19–67 years). All patients were given a diagnosis of hematologic malignancy according to their electronic medical records and they were referred to our department for the evaluation of perianal symptoms and/or systemic sepsis. None of the patients had a diagnosis of Crohn disease, a previous diagnosis of perianal abscess/fistula, or a nonhematologic malignancy. The histopathologically proven diagnosis was acute myeloid leukemia (AML) in 19 patients, acute lymphoid leukemia (ALL) in 8 patients, non-Hodgkin's lymphoma in 3 patients, aplastic anemia in 3 patients, Hodgkin's lymphoma in 1 patient, chronic myeloid leukemia in 1 patient, and mycosis fungoides in 1 patient. All patients were undergoing chemotherapy at the time of MR imaging or within the last two months. Eight of the 36 patients had previously undergone bone marrow transplantation.

Symptoms provoking MR imaging were fever, perianal or perineal pain, swelling, erythema or tenderness and less commonly discharge.

2.2. MR imaging protocol

MRI was performed by using a 3-T system (Magnetom Verio, Siemens Healthcare) in 27 patients with body matrix coil and a 1-T system (Signa LX Horizon; GE Healthcare) in 9 patients equipped with phased-array torso coil.

Sequence parameters for MR systems are detailed in Tables 1 and 2.

The sagittal images were used to plan the oblique axial and oblique coronal images which were perpendicular and parallel to the long axis of the anal canal, respectively.

Postcontrast series were obtained following a bolus intravenous injection of extracellular gadolinium chelate (0.1 mL/kg).

2.3. Image interpretation

Two radiologists with 11 and 25 years of experience in abdominal radiology viewed the MR images in consensus. Four patients had two or more MR imaging examinations, and the most relevant images prior to treatment were taken into consideration.

Abscesses, fistulous or sinus tracts, signal alterations and contrast enhancement in keeping with an inflammation and edema in the perianal region were recorded. An abscess was defined as a rounded collection with fluid signal intensity and capsular ring enhancement distinct from surrounding structures. A fistula tract was defined as a tubular structure representing an abnormal communication between the anal canal and the perianal skin. Fistula tracts were classified according to the classification system of Parks et al. [9]. Consolidated high signal intensity with no clear boundaries or a distinct course on STIR or fat saturated T2 weighted images were regarded as inflammation. Heterogeneity and septations in the subcutaneous fat tissue distinct from that of normal blood vessels were considered as edema. Contrast enhancement in these areas and in other perianal or perineal soft tissues were also investigated.

3. Results

Thirty-four of the 36 patients had neutrophil counts of less than 2.5 × 109/L (0.07 − 2.5 × 109/L). Neutrophil counts were not available for 1 patient and 1 patient who was examined to rule out perianal infection prior to bone marrow transplantation had a normal neutrophil count (3.5 × 109/L).

Perianal abscess was found in 16 of the 36 patients (44%). In 10 of these 16 patients there was also extensive inflammatory signal alterations and contrast enhancement in perianal and/or perineal soft tissues (Fig. 1). One of these patients also had perineal abscesses. Complex perianal fistulas were seen in 5 of the 16 patients.

In six of the 36 patients perianal fistula was detected. There were intersphincteric fistulas in four patients, transsphincteric fistula in one patient, both intersphincteric and transsphincteric fistulas in one patient. A sinus tract was seen at the level of subcutaneous external anal sphincter in one patient. Inflammatory signal alterations in the surrounding soft tissues were present in three of these seven patients with fistula/sinus tracts. None of the patients had a fistula extending superior to the levator plate.

There were abscesses in labium majus in two patients in one of whom an intersphicteric abscess was also detected.

In one patient, there was perineal abscesses with accompanying inflammatory signal alterations and contrast enhancement. The patient had prolonged symptoms of perianal discomfort but initial MR imaging showed only minimal inflammatory changes. Subsequent imaging demonstrated the perineal abscesses.

In six of the 36 patients no abscess or fistula/sinus tract was seen.

Table 1
3.0 T MR imaging pulse sequence parameters used in our study.

	T2W sagittal TSE	T2W axial TSE	T2W oblique axial TSE (HR)	T2W oblique coronal TSE (HR)	T1W oblique axial FS CE TSE	T1W FS oblique coronal CE TSE
Parameter						
Matrix size	384 × 307	320 × 256	320 × 256	320 × 256	320 × 256	320 × 256
Slice thickness (mm)	3.5	5.0	3.0	3.0	3.5	3.5
Distance factor	15%	20%	16%	16%	14%	14%
Repetititon time (m s)	4500	5450	5460	5180	495	495
Echo time (m s)	104	93	58	58	12	12
Echo trains per slice	13	8	12	15	39	39
Flip angle (degrees)	120	150	145	135	140	140
Reduction factor	2	2	2	2	2	2
FoV (mm)	220 × 220	220 × 220	180 × 180	180 × 180	200 × 200	200 × 200
Bandwidth (Hz/Px)	250	260	260	260	260	260

T2W = T2-weighted, T1W = T1-weighted, TSE = turbo spin echo, FoV = field of view, HR = high resolution, FS = fat suppressed, CE = contrast-enhanced.