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Magnetic resonance imaging of anal cancer

S.C. Roach, P.A. Hulse*, F.J. Moulding, R. Wilson, B.M. Carrington

Department of Diagnostic Radiology, Christie Hospital, Manchester, UK

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AIM: The purpose of this study was to evaluate the magnetic resonance imaging (MRI) appearances of primary and recurrent anal carcinoma, and to demonstrate the commonest patterns of local and distant disease spread.

METHODS: A retrospective review was performed of 27 cases of biopsy-proven anal carcinoma, where MRI was used for primary staging (9 patients) or suspected recurrence (18 patients). Two oncological radiologists reviewed the MR images, following a standardized approach. The size, extent and signal characteristics of the anal tumour were documented. Metastatic disease spread to lymph nodes, viscera and bone was recorded. In all, 7 patients with recurrent disease underwent surgery and subsequent histological correlation was performed.

RESULTS: Primary and recurrent tumours were of high signal intensity relative to skeletal muscle on T2-weighted images (T2WI), and of low to intermediate signal intensity on T1-weighted images (T1WI). Lymph node metastases were of similar signal intensity to the anal cancer. Recurrent tumours were more locally advanced than primary tumours and extended into adjacent organs and the pelvic skeleton. Recurrent lymph node disease involved perirectal, presacral and internal iliac nodes more commonly than did primary lymph node disease.

CONCLUSION: MRI can be useful in the primary staging of bulky tumours or of those with a long craniocaudal extent. MR has a role in the preoperative evaluation and surgical planning of cases of recurrent disease following radiotherapy.

Introduction

Squamous cell cancers of the anal canal are rare and are consequently staged and treated at specialist centres in the UK. In the USA in 2000, the estimated incidence of these cancers was 1.1/100,000. The majority of anal cancers in both genders are due to infection with human papilloma virus, particularly HPV16.

The anal canal is divided by the dentate line into an upper part, lined with transitional (urothelial type) or rectal glandular mucosa, and a lower part lined with squamous mucosa. The dentate line lies 2.5 to 3 cm proximal to the anal verge and is visible macroscopically, but not on MRI. Cancers arising below the dentate line are predominately keratinizing squamous cell carcinomas. Cancers arising in the junctional zone at or just above the dentate line are termed non-keratinizing squamous cell carcinomas. This group includes basaloid cloacogenic and transitional subtypes, terms that have now been abandoned. The biological behaviour, management strategies and prognosis of the keratinizing and non-keratinizing types of squamous cell cancer are similar.

Anal cancer is an indolent disease that usually becomes locally extensive before distant metastases occur. For primary tumours, prognosis depends on tumour size, location and depth of penetration. Staging is performed according to the UICC/AJCC TNM classification (2002) (Table 1). At the time of presentation, approximately 50% of patients have a superficial mass (T1 or T2 lesion) and approximately 25% have regional lymph node involvement. The pattern of lymph node metastatic spread depends on the site of origin of the tumour

* Guarantor and correspondent: P.A. Hulse, Department of Diagnostic Radiology, Christie Hospital NHS Trust, Manchester M20 4BX, UK. Tel.: +44 161 446 3981; fax: +44 161 446 8031.
E-mail address: paul.hulse@christie-tr.nwest.nhs.uk (P.A. Hulse).

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Table 1 TNM staging of anal cancer

Primary tumor (T)	
TX	Primary tumor cannot be assessed
T0	No evidence of primary tumor
Tis	Carcinoma in situ
T1	Tumor 2 cm or less in greatest dimension
T2	Tumor more than 2 cm but not more than 5 cm in greatest dimension
T3	Tumor more than 5 cm in greatest dimension
T4	Tumor of any size invades adjacent organ(s), e.g., vagina urethra, bladder
Regional lymph nodes (N)	
NX	Regional lymph nodes cannot be assessed
N0	No regional lymph node metastasis
N1	Metastasis in perirectal lymph nodes(s)
N2	Metastasis in unilateral internal iliac and/or inguinal lymph node(s)
N3	Metastasis in perirectal and inguinal lymph nodes and/or bilateral internal iliac lymph nodes
Distant metastasis (M)	
MX	Distant metastasis cannot be assessed
M0	No distant metastasis
M1	Distant metastasis

From guidelines of the American Joint Committee on Cancer, 2002.

within the anal canal. Above the dentate line, drainage is to the perirectal, internal iliac and retroperitoneal nodes. Below the dentate line, drainage is to the inguinal nodes.

Primary anal cancers are often small and superficial and not amenable to imaging. Determination of the extent and nature of lesions is usually made at examination under anaesthetic and biopsy.

Primary anal cancers are treated by chemoradiation; abdomino-perineal resection is reserved for patients who have persistent tumour on post-radiation biopsy or locally recurrent disease.

Currently imaging has a limited role in the evaluation of primary anal cancer, and there is little published work. Anal endosonography has been involved in the diagnosis, staging and follow-up of anal cancer,[1] but its use is not widespread. CT of the abdomen and pelvis is routinely included to establish lymph node or visceral metastatic disease. MRI with phased-array or endoluminal coils is effective in depicting the structure of the anal canal and its diseases,[2] and it can also be useful in the local staging of primary anal cancer. It may be particularly valuable when assessing large masses whose craniocaudal dimension is the maximum diameter or which protrude beyond the anal verge, as anal endosonography is inadequate in these cases. In addition, MRI may also be useful in the evaluation of recurrent disease before salvage surgery.

The aim of this study was to document the appearance and extent of primary and recurrent anal cancer on MRI. Correlation of MRI appearances with histology was performed when possible.

Materials and methods

A retrospective review was undertaken of 27 MR examinations performed between 1995 and 2003 for 24 individuals (71% men, 29% women, average age 60.6 years, age range 30 to 81 years) with histologically proven squamous cell anal cancer; 9 examinations took place before treatment for patients with primary disease, and 18 examinations were performed for patients with recurrent disease following treatment. Referral for imaging was made because of concern over the size and extent of the lesion or the presence of recurrent disease.

The examinations involved a 1.0 Tesla unit (Magnetom Impact Expert, Siemens, Erlangen, Germany) using the body coil; an initial T1W spin echo coronal sequence (TR400 ms; TE12 ms; matrix 256×512; FOV 490 mm; slice thickness 8 mm; 3 NEX) was performed through the abdomen and pelvis. This was followed by a T1W spin echo transaxial sequence (TR 418 ms; TE 12 ms; matrix 256×512; FOV 380 mm; slice thickness 7 mm; 3 NEX). Additional axial T1WI (TR 486; TE 12; matrix 109×256; FOV 380 mm; slice thickness 10 mm; 7 NEX) were obtained through the upper abdomen in some cases. Using the phased-array pelvic coil, T2W fast spin echo sequences were performed in all three orthogonal planes (TR 4902 to 5383 ms, TE 128 to 132 ms; echo train length 15; matrix 230×256; FOV 200 mm; slice thickness 3 to 5 mm; 3 to 4 NEX). To ensure high-quality scans and to maintain a narrow slice thickness, it was necessary to perform two contiguous transaxial and coronal T2W blocks to achieve coverage in some cases. Occasionally, off-axis T2W images through the pelvis were obtained.