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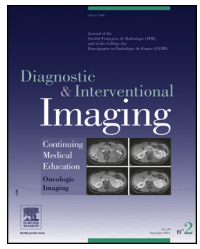

CONTINUING EDUCATION PROGRAM: FOCUS...

Primary rectal cancer local staging

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Abstract The treatment of patients with a malignant rectal tumor has evolved over the past few years. The role of medical imaging techniques, notably MRI, has become increasingly important in the preoperative assessment of rectal tumors. Radiologists are finding that their presence is requested more and more frequently at multidisciplinary team meetings for decision-making on the treatment of these tumors and therefore they must have a grounding in the therapeutic issues involved. Locoregional assessment of malignant rectal tumors may be performed prior to initiating treatment or as a re-evaluation following neoadjuvant therapy. We are interested in the assessment of the initial locoregional extension of these rectal tumors and we place much emphasis on the ability to identify MRI criteria which determine the patient's prognosis and treatment. We will also examine the advantages of MRI as well as its limits in this assessment.

During the past decades, the management of patients with rectal cancer has evolved with a significant reduction in local recurrence rate due to advances in surgical techniques and adjuvant therapies. Radiologist is now part of the decision-making process during multidisciplinary team meetings, both giving an anatomic definition of the tumor for surgical planning and differentiating between good and bad prognosis tumors. This review explains the role of the radiologist in patient management and describes the clinically relevant points radiologists have to notify during primary local staging of rectal cancer patients. It also gives the evidence for the use of magnetic resonance imaging (MRI) in staging these patients, reviews MRI performances in identifying several clinically relevant features, and gives some recommendations for how to perform rectal MR examinations.

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Local staging modalities

The two imaging modalities that are currently being used for local rectal tumor staging are endorectal ultrasonography (ERUS) and magnetic resonance imaging (MRI).

ERUS

Unlike with MRI, using ERUS, all layers of the bowel wall can be examined, with high accuracies reported for T staging [1]. True performances of ERUS are difficult to evaluate because in many initial studies, the patients with stenosing tumors were excluded. However, it is well admitted that ERUS remains the imaging method of first choice for differentiating between T1 and T2 tumors and also for the assessment of T1 tumors before local excision, but that it performs less well in cases of advanced and polypoid lesions [2,3]. The fascia recti and peritoneum cannot be correctly visualized by ERUS so that the circumferential resection margin (CRM) status and degree of peritoneal involvement cannot be assessed accurately (Fig. 1).

As far as T2 versus T3 tumors differentiation is concerned, although sensitivity of ERUS (90—96%) is high, specificity is lower (75—90.6%) [1,2,4], respectively, with the same difficulties as those observed with MRI to discriminate between T2 and small T3 tumors and interpret T2 with desmoplastic stranding in the mesorectal fat. For lymph node involvement, results are comparable to those obtained with MRI [1,2].

Further downside of ERUS is that it is subject to operator's skill and that surgeons or radiotherapists cannot read the images as easily as with MRI or CT.

The use of endorectal ultrasonography is variable throughout Europe, with Holland being one of the countries where it is least widely used. In France, its use depends on its availability and on the preferences of oncologists, but recommendations still advise ERUS as a first-step imaging modality for local staging of rectal cancer, when the tumor is not bulky and/or located in the upper rectum and/or fixed.

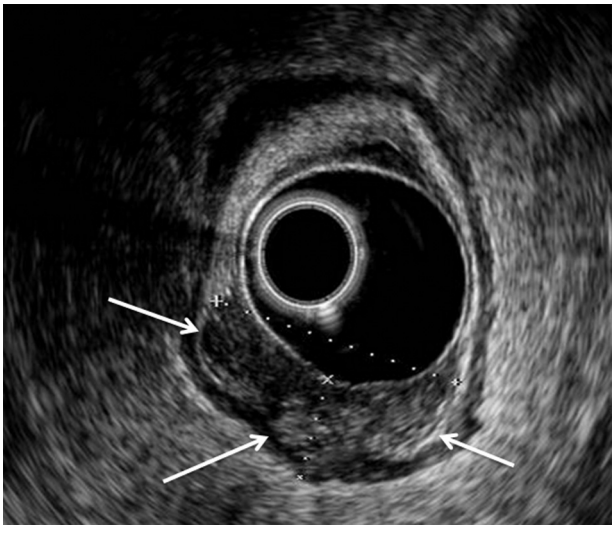

Figure 1. Endorectal ultrasonography (ERUS) image of T3 rectal tumor (arrows). Note the small field of view of the ERUS image.

MRI

A group of 14 abdominal imaging experts from the European Society of Gastrointestinal and Abdominal Radiology (ESGAR) in a recent article [5], as well as ESMO clinical practice guidelines [6] and European rectal cancer consensus conference [7] recommend MRI as crucial for staging the primary rectal cancer. Beets-Tan et al. [5] further report a consensus reached by the panel of European experts that MRI is the imaging technique of first choice for primary staging of rectal cancer but that ERUS remains the first choice imaging modality when local resection is being considered.

In a recent meta-analysis including 21 studies from 2000 to 2011 excluding patients who underwent preoperative long-course radiotherapy or chemoradiotherapy, Al-Sukhni et al. [8] found a good accuracy of MRI for both CRM and T category (sensitivities and specificities of 77% [57—90%; 95% CI] and 94% [88—97%; 95% CI] for CRM — 87% [81—92%; 95% CI] and 75% [68—80%; 95% CI] for T, respectively). In contrast to its performance for T category and CRM, MRI performance was more consistently poor for the assessment of lymph node metastases.

MRI protocol

Some teams use spasmolytic agents (e.g. Buscopan or Glucagon). Routine rectal filling, predominantly with ultrasonography gel, is still a matter of debate. It allows better delineation of the lower pole of the tumor, particularly for readers with less experience and reduces artifacts on diffusion-weighted acquisitions. Conversely, it may compress the mesorectal fat and hamper evaluation of CRM [9] and may be uncomfortable to the patient.

The importance of rectal cancer MRI protocols on interpretation accuracy has been reported [10], particularly in terms of accuracy regarding assessment of anterior organ involvement for low rectal tumors. MR protocol includes 2D T2-weighted sequences acquired in sagittal, axial and oblique planes, with the sagittal sequence being used to determine the longitudinal tumor axis in order to angle the axial and coronal planes as perpendicular and parallel to the tumor axis, respectively. Incorrect plane obliquity leads to blurring of the muscularis propria or to a pseudospiculated appearance. For low rectal tumors, coronal planes should also be angled parallel to the anal canal in order to better evaluate relationship between the tumor and the anal sphincter [11]. Three-dimensional (3D) T2-weighted sequences permit the use of 1—2 mm thin sections with no intersection gap. They are theoretically able to compensate for difficulties to angulation of tumor such as tortuosity and redundancy of the rectum. However, evidence with respect to their superiority compared to 2D T2-weighted sequences is still lacking with contradictory results mainly in terms of contrast resolution and tumor conspicuity, due to many factors such as the type of MR unit used, section thickness and use of parallel imaging [12—14] (Fig. 2). Moreover, multiplanar reformatted images obtained away from the plane of acquisition are frequently blurred and small-FOV images are difficult to obtain.

As far as diffusion-weighted imaging is concerned, although more and more authors use it to improve the