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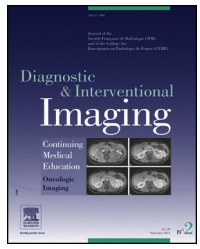

CONTINUING EDUCATION PROGRAM: FOCUS...

Utility of reassessment after neoadjuvant therapy and difficulties in interpretation

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Abstract We describe the main tools for MR assessment of the response of rectal cancer tumors after chemotherapy, before surgery. In locally advanced cases of rectal and lower rectal cancer, MR is useful in allowing the treatment strategy to be adjusted, enabling conservative surgery to be performed if the patient responds well. The different types of response (fibrous, desmoplastic and colloid), their appearances and difficulties in MR interpretation are described. We describe the features and performance of MR after neoadjuvant therapy for T and N staging, assessment of circumferential resection margin and diffusion weighted imaging. Quantitative (change in tumor volume) and qualitative (grade of tumor response) MR assessment can distinguish good responders from poor responders.

Neoadjuvant chemoradiotherapy (CRT) has now become the standard practice to treat local advanced rectal cancers (stages T3c, T3d and T4) [1].

Many trials have shown that these neoadjuvant therapies reduce the risk of local recurrence, enabling complete resection (R0 resection) and achieving better survival [2—5].

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MR has become an essential pretreatment tool, particularly as it provides a detailed assessment of rectal wall extension (T staging) and circumferential resection margins (CRM) which are predictive of complete resection [6,7].

A consensus statement from the European Society of Gastro Intestinal and Abdominal Radiology (ESGAR) was published in 2013, providing MR guidelines for the clinical management of rectal cancer [8]. A reassessment of tumor stage is recommended after chemoradiotherapy and before surgery. It is useful to carry out a local reassessment after neoadjuvant therapy for locally advanced rectal cancers (T3c, T3d and T4) and lower rectal cancers [7]. This reassessment may change the treatment strategy by enabling conservative surgery to replace previously planned abdomino-peritoneal resection for good responders or, conversely, by recommending a more aggressive medical-surgical approach when the tumor remains inaccessible for complete resection.

MR assessment of tumor response was initially based on the tumor response in terms of T stage (downstaging) [6,9,10]. In parallel, other authors have tried to assess changes in the Circumferential Resection Margin (CRM) [11,12]. Several publications have examined volume tumor response (downsizing) [13,14], by recently making use of diffusion weighted images [15].

In addition, qualitative MR response criteria, similar to those used histologically, have been reclassified [16—19].

The aim of this article is to describe the main tools for assessing tumor response after neoadjuvant therapies.

The different types of response after CRT

Changes in treatment after neoadjuvant therapy include fibrotic, desmoplastic, mucinous and inflammatory changes.

Fibrous response

On T2 weighted imaging, areas of fibrosis are hypointense similar to the muscularis propria; conversely, the residual tumor intensity remains the same as that of the initial tumor. Pathologically, the fibrosis is made up of sheets of collagen, fibroblasts and histiocytes.

Desmoplastic response

The desmoplastic response is also called ''reactive fibrosis'' and consists of collagen deposits within the tumor. On initial MR and after CRT, this reaction appears as thin hypointense spicules on T2 weighted imaging.

Colloid response

This is a necrosis of the tumor with mucinous transformation indicating response to treatment and must not be confused with mucinous adenocarcinomas (10% of tumors), the appearances of which on MR after CRT are unchanged compared to the initial MR. These are tumors with a poor prognosis and increased risk of relapse. Acellular mucinous pools are seen as hyperintensities on T2 weighted images.

The MR technique after CRT

The reassessment MR is performed 6 to 8 weeks after CRT has ended. A T2 weighted sagittal image positions an axial T2 weighted image perpendicular to the long axis of the tumor. This is still a key image with fine sections (1 to 3 mm), and is combined with a coronal T2 weighted image. For lower rectal tumors, an additional T2 image is recommended along the coronal plane of the anal canal. Rectal distension is not mandatory but may be useful (ultrasound gel or a mixture of ultrasound gel and Lumirem®) and should not be excessive (less than 100 ml). Gadolinium chelate injection is not essential, except for lower rectal tumors to better examine extension to the sphincter system. Diffusion weighted images are recommended by the ESGAR consensus statement [8]. It is essential to make a comparison with the initial MR, as identifying the tumor may be difficult if it has reduced greatly in size after CRT [7].

Site of the tumor

It is recommended [8] that the distance between the inferior pole of the tumor and the anorectal junction (lower rectum < 2 cm, middle rectum 2 to 7 cm and upper rectum > 7 cm) be measured along the sagittal plane. The circumferential position of the tumor (lateral, anterior or posterior) and its appearance (polypoid, annular, mucinous or ulcerated) should also be reported. The height of the tumor should appear on the report [8].

T staging after chemoradiotherapy: yT stage

General details

The T staging classification is the same after neoadjuvant therapy [6].

Similarly to the initial pretreatment MR, a tumor extending less than 1 mm beyond the muscularis propria carries exactly the same prognosis as a T2 tumor. It is not therefore clinically useful to clearly distinguish a T2 tumor from a T3a tumor. It is, on the other hand, important to measure the extension of the tumor beyond the muscularis propria, as this is a major prognostic indicator [18].

Reliability of MR

The diagnostic performance of MR before neoadjuvant therapy is excellent (85%) although drops to only around 50% after treatment [20,21] (Table 1).

It is, in reality, difficult to determine whether the tumor is still present after CRT.

The presence of a fibrous inflammatory reaction which accompanies the tumor, in which it is impossible to establish