



Perspective

# The quality of total mesorectal excision specimen: A review of its macroscopic assessment and prognostic significance

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## Abstract

As a surgical procedure which could significantly lower the recurrence rate of cancers, total mesorectal excision (TME) has been the gold standard for middle and lower rectal cancer treatment. However, previous studies have shown that the procedure did not achieve the ideal theoretical local recurrence rates of rectal cancers. Some researchers pointed out it was very likely that not all so-called TME treatments completely removed the mesorectum, implying that some of these TME surgical treatments failed to meet oncological quality standards. Therefore, a suitable assessment tool for the surgical quality of TME is necessary. The notion of “macroscopic assessment of mesorectal excision (MAME)” was put forward by some researchers as a better assessment tool for the surgical quality of TME and has been confirmed by a series of studies. Besides providing rapid and accurate surgical quality feedbacks for surgeons, MAME also effectively assesses the prognosis of patients with rectal cancer. However, as a new assessment tool used for TME surgical quality, MAME has an only limited influence on the current guidelines and is yet to be widely applied in most countries. The aims of this review are to provide a detailed introduction to MAME for clinical practice and to summarize the current prognostic significance of MAME.

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**Keywords:** Macroscopic assessment of mesorectal excision (MAME); Quality control; Total mesorectal excision (TME); Coning

## Introduction

In 1982, Heald et al<sup>1</sup> proposed the notion of total mesorectal excision (TME) from the perspective of embryological anatomy; this led to a deeper understanding of the rectal anatomic structure and made scientific and standardized assessments and control of the rectal cancer surgery possible. The local recurrence rates (LRRs) have been reduced from 20%–45% using traditional surgical treatments to less than 10% using

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TME.<sup>2,3</sup> For patients receiving neoadjuvant radiotherapy together with TME, the LRRs could be further reduced to 5%.<sup>4</sup> As a surgical procedure which could significantly lower the recurrence rate of cancers, TME has been the gold standard for middle and lower rectal cancer surgical treatment.

However, not all reported LRRs after TME were lower than 10%; in some studies,<sup>5,6</sup> the LRRs were 11%–19%. Some researchers pointed out it was very likely that not all so-called TME procedures completely removed the mesorectum, which means that some of these TME surgical treatments failed to meet oncological quality standards.<sup>7</sup>

García-Granero et al<sup>8</sup> suggested that the TME quality could be assessed in terms of two aspects: (1) involvement of the circumferential resection margin (CRM) and (2) integrity of the TME specimen. Although the importance of CRM involvement on the prognosis requires no more emphasis, it is very easy for CRM to be affected by the depth of tumor invasion or tumor-node-metastasis (TNM) stage when used for reflecting the surgical quality.<sup>9</sup> Furthermore, if the integrity of the mesorectum cannot be guaranteed even if the CRM was negative for tumor cells, there still may be some micro tumor deposits or positive lymph nodes in the residual mesorectum, which might increase the risk of cancer recurrence. Numerous studies have confirmed the correlation between the prognosis of patients with tumors and the integrity of mesorectal specimens evaluated macroscopically.<sup>6,8,10–15</sup> Therefore, some researchers put forward the “macroscopic assessment of mesorectal excision (MAME)” as a suitable assessment tool for the integrity of mesorectum, which could reflect the quality of TME.<sup>8</sup>

Nagtegaal et al<sup>12</sup> found that in the subgroup of patients with a negative resection margin, patients with incomplete mesorectal resection had a higher overall recurrence rate (ORR) than those with complete mesorectal resection (28.6% vs. 14.9%,  $P = 0.03$ ); further, the overall survival (OS) rate was lower in the group of patients with incomplete mesorectal resection (76.9% vs. 90.5%,  $P < 0.05$ ). Quirke et al<sup>11</sup> also conducted an analysis on a subgroup of patients with negative CRMs and found that the LRR remarkably increased in the group of patients with incomplete mesorectal resection compared with that in the group of patients with complete mesorectal resection (12% vs. 4%). Therefore, the integrity of the mesorectal specimen can be regarded as an independent prognostic factor for patients who received rectal cancer resection. Moreover, MAME is not affected by the T stage, N stage, TNM

stage, or Dukes stage, making MAME a better tool than the CRM for TME quality assessment.<sup>8,11,12,14,16–18</sup>

## Relevant definitions

### MAME

MAME is a method of assessment, by which we can describe the integrity of the mesorectal specimen and assess the quality of TME via visual inspection and use of cross-sectional slices of the segment with tumor (3–5 mm in thick).<sup>6,8,11,12,19</sup> The visual inspection can provide a very clear indication of the quality of the mesorectal specimens, and the cross-sectional slices of the segment with tumor can provide further assessment of the regularity of the CRM, an indicator of the adequacy of the resection.<sup>19</sup>

According to the definitions by the CR07 protocol,<sup>11,15</sup> the quality of mesorectal specimens can be described as follows.

Mesorectal resection (MRR)/good/complete: intact mesorectum and smooth mesorectal surface with only minor irregularities; no defects deeper than 5 mm; no coning of the specimen towards the distal margin; and smooth macro-CRM on slicing.

Intramesorectal resection (IMR)/intermediate/nearly complete: intermediate bulk of the mesorectum with an irregular surface; a defect deeper than 5 mm, and no visible muscularis propria other than inserted levator; intermediate coning; intermediate irregularity of macro-CRM on slicing.

Muscularis propria resection (MPR)/poor/incomplete: small bulk of the mesorectum with a very irregular surface; defect down to the muscularis propria; severe coning; severe irregularity of macro-CRM on slicing.

### Coning

A “coning” (Fig. 1) would form if a surgeon cuts towards the tubular rectum during distal dissection instead of operating outside the visceral mesorectal fascia, leaving the specimen with a tapered, conical appearance. In the clinical practice, such a tendency during operation is not rare, and consequently, the surgical quality is undoubtedly suboptimal. Meanwhile, it is also unacceptable if the surgeon removes the distal mesorectum excessively, i.e., far beyond 5 cm from the distal tumor margin, which would not only have little help in improving the prognosis of patients, but also increase the incidence rate of post-operative complications.<sup>20</sup> Therefore, only when the

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