The Role of Endorectal Ultrasound and Magnetic Resonance Imaging in the Management of Early Rectal Lesions in a Tertiary Center

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Abstract

In early rectal cancer, endorectal ultrasound (ERUS) can be used to determine radical or local excision based on T-stage identification. Analysis of a prospective database of patients (n = 75) who underwent ERUS was carried out over a 37-month period. Its 100% specificity in determining lesions limited to the mucosa or submucosa aided in the assessment of lesions being considered for submucosal resection.

Background: In early rectal cancer, ERUS has a vital role in determining radical or local excision based on identification of T-stage. Transanal endoscopic microsurgery (TEMs) has a reduced morbidity and mortality compared with radical surgery. Correct identification of lesions that can be managed with TEMs is therefore imperative. Our aim was to assess the accuracy of ERUS in identifying mucosal/submucosal lesions and thus their suitability for TEMs. **Patients and Methods:** A retrospective analysis of a prospectively maintained database of patients who underwent ERUS was carried out over an initial 25-month period at a tertiary colorectal center. Our main outcome measures were T-stage measured using ERUS or magnetic resonance imaging (MRI) (indicating suitability for local excision, ie, $\leq$ T1) with correlation with that of the subsequent surgical specimen and improvement in accuracy over time. After data analysis and review, the study was repeated over the subsequent 12 months to establish whether there was a learning curve with the use of ERUS. **Results:** Over the initial period, 52 patients who met the inclusion criteria underwent ERUS. T-staging was accurate in 73.1% (38/52) with identification of $\leq$ T1 lesions having a sensitivity of 70.8% and a specificity 100%. The accuracy, sensitivity, and specificity of MRI was similar to that of ERUS (72.7%, 70.0%, and 100% respectively). Over the subsequent period, 23 patients underwent ERUS with T-staging accuracy improving to 78.3% (18/23) ($P = .777$). **Conclusion:** In our experience, ERUS is a useful adjunct to clinical assessment and pelvic MRI in determining suitability for local excision. Its 100% specificity in determining that a lesion is limited to the mucosa or submucosa aids in the assessment of lesions that are being considered for submucosal resection. Over the time periods assessed, improvement in T-staging accuracy was demonstrated, which might be due to the presence of a learning curve.

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Introduction

In rectal cancer, survival and clinical outcomes are significantly affected by the local extent of disease, lymph node involvement, metastatic spread, and surgical technique. The Royal College of Radiologists recommendations suggest the use of high-resolution magnetic resonance imaging (MRI) to assess the circumferential resection margin and pelvic nodal involvement.[1] It is also recommended that additional assessment to determine whether local resection is appropriate should be performed using endorectal ultrasound (ERUS) to determine tumor depth. The aim of both modalities of imaging is to improve selection of patients suitable for local excision.

The Association of Coloproctology of Great Britain and Ireland recommend that curative local excision of rectal cancer should be

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restricted to T1 cancers that are < 3 cm in diameter with good or moderate differentiation.[2] In addition, the lesion should not demonstrate adverse features such as poor differentiation, lymphovascular invasion, tumor budding, or perineural invasion.[3]

At our institution, local excision is usually reserved as a diagnostic modality for small rectal lesions, in which a diagnosis of cancer is not confirmed, or in patients not fit for major resection.

The use of transanal endoscopic microsurgery (TEMs) has several advantages over radical surgery that include reduced morbidity, including bowel, bladder, and sexual dysfunction and reduced mortality.[4] TEMs has also been shown to have similar local recurrence rates and survival rates compared with total mesorectal excision (TME) in early rectal cancer.[5-7] TEMs only confers oncological equivalence in noninvading tumors and only has a role in defined small cancers with no evidence of invasion into the muscularis propria. Its role in patients with pathological or clinical uncertainty with regard to the depth of invasion should be diagnostic with the knowledge that subsequent salvage surgery might be required.

An alternative procedure is transanal resection of tumor, which can be carried out for rectal villous adenomas within the lower third of the rectum that are accessible using a retractor, providing there are no unfavorable features.[8] However, despite its relative safety, recurrences have been identified in up to 30% of patients.[9]

Endoscopic submucosal dissection (ESD) can also be used to manage superficial lesions by clinicians with specific training in the technique and avoid the requirement of open surgery.[10] A solution is injected submucosally to raise the lesion with the aim of removing the lesion en bloc. A meta-analysis and systematic review of 1314 patients who underwent ESD by Puli et al identified a complete cure en bloc resection rate of 75.39%.[11]

Before TEMs, all lesions are assessed in clinical examination, pelvic MRI, and ERUS. These investigations are used to quantify the depth of invasion of rectal lesions, in an attempt to facilitate decision-making regarding suitability for local excision. The layers of the rectum as seen on ultrasound and MRI are shown in Figure 1.

Currently there is no international consensus on the radiological modalities that should be used when staging rectal cancer. The incongruity in the practice of rectal staging is not only seen in clinical practice, but is also reflected in national guidelines.[12] This disparity in practice is not entirely surprising, because of the varying reported accuracies of ERUS in identifying T-stage.

A large multicenter study, carried out by Ashraf et al, revealed that ERUS was inaccurate at staging early rectal cancers, with an accuracy of 57.1% for T1 cancers and a tendency to overstage and understage disease.[13] This inaccuracy was mirrored in a retrospective study by Kauer et al over a 10-year period.[14] Contrary to this, several single-center studies worldwide have reported highly accurate T-staging after ERUS, with accuracy rates as high as 93%.[15,16]

Several studies have identified an improvement in accuracy with greater experience when using ERUS for T-staging.[15,17-19]

In the staging of advanced cancer (T3 and T4), MRI has been reported to be superior to ERUS, however it has been shown to be less accurate in staging early rectal cancer.[13,20,21]

In our institution, ERUS is predominantly used to identify patients who are suitable for local excision of rectal cancer. Because of the disparity in the reported accuracy of staging early disease, we chose to assess our early experience.

The aim of this study was to assess the accuracy of ERUS in identifying lesions confined to the mucosa or submucosa and thus their suitability for local endoluminal resection.

Patients and Methods

The ERUS service for the assessment of rectal lesions was introduced in 2010. Patients investigated with ERUS and MRI before local excision or formal resection were identified from a prospectively maintained database at a UK tertiary colorectal center (Hull & East Yorkshire Hospitals NHS Trust) over a 25-month period (October 1, 2010-October 31, 2012, inclusive).

After initial review of the data with the clinicians who performed ERUS, data were collected over the following 12-month period

Figure 1 Demonstration of the Layers of the Rectum As Seen Upon T-Staging Using (A) Endorectal Ultrasound and (B) Magnetic Resonance Imaging: (1) Inner Mucosal Layer; (2) Submucosa; (3) Muscularis Propria; (4) Serosa; and (5) Extraserosal Fat