Chapter

Multidisciplinary Management of Early Rectal Cancer

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Abstract

The incidence of colorectal cancers detected at an early stage, that is stage T2 or less, has increased over the last decade, driven primarily by better access to screening and diagnostic pathways. Consequently, timely treatment leads to better outcomes. Early stage rectal cancers (ERC), by virtue of their location, allows for alternative treatment strategies towards organ (rectum) preservation. Local excision techniques have evolved and improved with advances in radiological assessment and minimally invasive surgery. However, decisions on treatment to mitigate local recurrence remain a challenge. This chapter explores the current understanding of the management of ERC and offers insights to the multidisciplinary team to aid treatment strategies.

Keywords: rectal cancer, minimally invasive, multidisciplinary, transanal surgery, TAMIS, TEMS, TEO, radiotherapy, brachytherapy, surveillance, chemotherapy, chemoradiotherapy, intense surveillance

1. Introduction

Since the introduction of bowel cancer screening programs (BCSP) worldwide, the incidence of colorectal cancers (CRC) detected at an early stage, that is T2 or less (TNM Tumour, Node, Metastasis classification) has increased. In fact, 30% of all screen-detected or asymptomatic CRCs are classed as early disease (stage I–II) versus 10% diagnosed at investigation for lower gastrointestinal (LGI) symptoms. Regardless of the diagnostic pathway, the obvious benefit is that early detection leads to timely treatment and better outcomes. This is certainly evident from the improvement in disease-free survival (DFS) and overall survival (OS) outcomes over the last 20 years [1–3].

Early rectal cancers (ERC) are no exception. Fortunately, their location allows for alternative treatment strategies towards organ preservation. Conceptually, local excision began in the 1980s with transanal endoscopic microsurgery (TEMS) and subsequent technological advances in radiological assessment and minimally invasive surgery (MIS) made rectum preservation more feasible.

Overall, the number of patients over 60 years of age with CRC has plateaued. However, the incidence in the younger population (20–39 years) has steadily increased over the last decade, often with advanced disease. This may suggest a change in the biology of CRC amongst this sub-group, the impact of screening for a

family history of CRC and better access to diagnostic pathways. Other factors include 'self-diagnosis' of concerning symptoms through internet search engines, cancer awareness campaigns and social media platforms [1].

Increasing public awareness has led to more patients of all ages seeking assessment of lower gastrointestinal (LGI) symptoms sooner and therefore it is likely the incidence of ERCs will continue to rise. Similarly, the incidence detected at BCSPs will improve with the inclusion of patients from 45 years of age (currently 55–60 years), as advocated by some public health policymakers in the US, in the context of the impact of survival benefits to the wider social and healthcare economy [1].

In primary care there has been more uptake of highly sensitive screening tools, such as faecal immunochemical test (FIT), for symptomatic assessment and to better manage the increasing burden of fast-track pathways. Recently, those pathways were challenged by the SARS-COV2 pandemic as more patients with LGI concerns came forward once the restrictions that limited access to primary care and diagnostic pathways were lifted. FIT became a useful tool to screen those needing urgent assessment, though its impact on investigation and treatment delays are yet to be described [2, 3].

The impact of FIT may also include earlier stage diagnosis. As a quantitative screening tool with sensitivities and specificities above 90%, the higher the faecal occult blood level (2–100 μg Hb/g of faeces) the more likely the presence of significant serrated polyps, high risk adenomas or early CRC [3].

2. Early rectal cancer (ERC)

2.1 Definition of ERC

The definition of ERC remains somewhat controversial but is based on the TNM classification. Overall, it is characterised by invasive adenocarcinoma spreading into, but not beyond, the submucosa or muscularis propria, that is, a TNM of T1 or T2, N0 and M0 [4, 5]. Clinically, ERC may present as a polypoid carcinoma, a focus of malignancy within a large pedunculated or sessile adenoma, or a small ulcerating adenocarcinoma [6]. ERCs have a smaller chance of metastasis to local lymph nodes, due to the lack of lymphatics within the mucosa and therefore are potentially treatable without major surgery that excises the mesorectum to mitigate loco-regional spread [5]. However, not all ERCs are the same and treatment strategies must be determined by prognostic factors such as differentiation status and depth of invasion [1, 5].

At publication, there was no international consensus on the definition of ERC, though it is fundamental in discussing treatment options and prognostication with patients. There are several micro- and macroscopic definitions, however these do not capture the overall clinical impact of the disease. As a result, the European Association of Endoscopic Surgery and the European Society of Coloproctology have defined ERC as "a rectal cancer with good prognostic features that might be safely removed while preserving the rectum and have a very limited risk of relapse after local excision" [5].

As with any cancer, the aim of treating ERC is to offer cure while minimising side effects. This is fundamentally achieved by aiming to preserve the rectum. Organ preservation attempts to mitigate the significant risk of total mesorectal excision (TME) surgery which has a 30-day mortality of 3–7%, morbidity of 35% and risk of poor functional outcomes from low anterior resection syndrome (LARS) of up to 20%. While the evidence supports local excision, TME surgery via anterior resection and

abdominoperineal excisions (APER) remains the mainstay of treatment with the best prospect of cure. Specifically, it removes the mesorectum to aid histological analysis for loco-regional spread and subsequent decisions on adjuvant treatment [1, 7].

2.2 History of ERC surgery

Abdominoperineal resection (APR), described by Miles et al. in 1901, was the standard operation for much of the twentieth century. In the 1970s, high rates of recurrence were recognised but, more so, the complications of any pelvic surgery led to a re-evaluation of the anatomy and embryology by Crapp and Cuthbertson in 'The Book Shelf—William Waldeyer and the Rectosacral Fascia' [8]. This paved the way to revisiting TME surgery, first described by Abel in 1931, and popularised in 1979 by William (Bill) Heald [9]. TME surgery removes the envelop of the lymphovascular mesorectum by following the 'holy' avascular and embryological mesorectal fascia plane. Heald demonstrated a reduction in recurrence, improved survival, and less bladder and sexual dysfunction. TME remains the gold standard for curative surgery worldwide.

Most would agree that TME surgery for ERCs and high-risk adenomas that have a minimal risk of lymphatic or metastatic spread is 'over-treatment', given the risk of significant morbidity. Until the 1980s, local excision of rectal adenomas and ERCs was performed with trans-anal excision (TAE). This involved open excision of the lesion using an anal retractor, but was restricted by poor visibility, confined operating space and suitable for low rectal lesions only. Technical challenges limited complete oncological resection, resulting in high recurrence rates [1].

In 1984, Buess et al. described the novel technique of transanal endoscopic microsurgery (TEM) [10]. This utilised a stereoscopic viewing system within a rigid rectoscope to give the operator 3D binocular view. A specialised insufflation system created a stable pneumorectum, allowing ample workable space, while dedicated microsurgical instruments provided a high level of precision for oncological resections. Initial results endorsed TEM as an effective technique for rectum-sparing resection of adenomas and malignancy, with low rates of recurrence. However, it was not initially popular. Barriers included a steep learning curve, a lack of other minimally invasive surgical techniques, high equipment costs and staff expertise. With the advent of minimally invasive surgery (MIS) in 1989 from the first laparoscopic cholecystectomy and later extended to colorectal surgery, TEM became more acceptable.

Interest grew as technology progressed, including the development of other natural orifice surgeries and single-incision laparoscopic surgery (SILS). In 2008, the technological advances were combined with the TEM concepts to perform Transanal Minimally Invasive Surgery (TAMIS). A single-incision laparoscopic surgery port is inserted into the rectum through which a pneumorectum is established, and laparoscopic instruments can be passed. This technique allows a platform for precise resection, with low cost and routinely available instruments [1].

Radical surgery carries a significant risk of mortality, morbidity and bowel dysfunction [1, 7]. Before attempting an organ preserving approach it is important to distinguish between malignant and benign lesions. Organ preserving surgery demands a multi-factorial considerations. These include surgical experience, pathological stage, anatomical location of tumour, fitness of patient and patient's wishes. Histologically well differentiated adenocarcinomas with the absence of lymphatic invasion, budding,

and submucosal invasion <1 mm are associated with low risk of lymphatic spread [11]. As more treatment options became available, decisions became increasingly complex. Multi-disciplinary team meetings specifically for ERCs and significant polyp and early colorectal cancers (SPECC) are becoming more widely established. In the UK, National Institute of Clinical Excellence (NICE) guidance recommends that all TNM stage 1 rectal cancers are discussed within an ERC/SPECC MDT. This includes all pertinent specialists, i.e. surgeon, radiologist, endoscopist, histopathologist, nurse specialists, and oncologists. MDTs do improve rates of complete resection, operative mortality and patient satisfaction outcomes [4, 11].

2.3 Investigations for ERC

2.3.1 Colonoscopy

ERC may present with rectal bleeding or as an incidental finding during screening. At endoscopic evaluation, macroscopic detection of malignant transformation of any polyp is challenging, and more so the features of spread beyond the muscularis propria. The endoscopist aims to identify the classic changes of cancerous potential by examining mucosal irregularity for pinkness, superficial granularity and nodularity, mucosal fading, depressions, or haemorrhagic spots [6]. Other techniques include magnifying colonoscopy to better examine pit-patterns and air transformation by reducing insufflation pressure to locate depressed areas of invasion. For an ERC, narrow-band imaging and dye techniques, (such as indigo carmine) may reveal the loss of circumferential grooves at the margins of normal mucosa [12, 13].

Tissue biopsy is required unless the tumour can be removed completely via endoscopy. Biopsy and histology are essential for staging and management. However, they frequently under-stage disease due to sampling error from superficial or anatomically challenging locations and inter-observer errors in interpretation of histopathology [12]. Furthermore, biopsies can lead to the "non-lifting sign" from fibrosis, making subsequent local excision more challenging. The authors therefore agree with the recommendation that tissue biopsies should be performed at the most suspicious area of the lesion. Also, where malignancy is unlikely and complete excision is not within the remits of the endoscopist's skill set, biopsy should be avoided to allow subsequent success at excision by a more advanced endoscopist, and unhindered by scarring [4].

2.3.1.1 Kudo classification

Macroscopic classification of adenomas, proposed by the Japanese Society for the Study of Cancer of the Colon and Rectum resembles that of gastric tumours (**Table 1**). Adenomas are subdivided into pedunculated or sessile. Around 42–85% of early colorectal cancers are pedunculated and 15–58% sessile. Adenocarcinomas in pedunculated polyps have less potential to infiltrate the submucosal layer [6, 13].

2.3.1.2 Pit pattern classification

The Pit Pattern Classification (**Table 2**) was first described by Kudo *et al* [6]. Type I and type II lesions have non-neoplastic or benign patterns (*e.g.*, normal, hyperplastic,

Endoscopic features	Type	Description	Example
Protruding Lesions	Ip	Pedunculated	
	Isp	Sub/Semi-pedunculated	
	Is	Sessile	
Flat lesions	IIa	Flat elevation of the mucosa	
	IIb	Flat mucosal changes	
Depressed lesions	IIc	Mucosal depression	
	IIa + IIc	Flat elevation with central depression	
	IIc + IIa	Mucosal depression with elevated margin	
Laterally spreading lesions	LST	Laterally spreading	

Table 1.
Macroscopic classification for early colorectal cancer [6, 13].

inflammatory polyps); types IIIL, IIIs and IV are adenomatous; and type VI and VN are cancerous. Although Type III is considered to exhibit no invasive characteristics, it is a common pit pattern observed in depressed-types of early cancers [6, 13], and type IV lesions often contain characteristics of advanced neoplasia (e.g. high-grade adenomas or villous components).

2.3.2 Radiological imaging

The most sensitive imaging investigation for differentiating between T1 and T2 lesions is endorectal ultrasonography (ERUS), with an accuracy of 81–92%, however it is very user dependent with considerable inter-observer variability [14, 15]. It is also useful in assessing the presence of residual tumour following polypectomy [16]. ERUS is more specific in assessing invasion when compared to MRI, which is 86% *vs* 69% respectively. Both have similarly high sensitivities (94%) to determine spread beyond the muscularis propria [16].

The precision of ERUS in assessing the depth of invasion appears to vary with the T stage, a lower accuracy for T2 cancers, compared with that of early (T1) and advanced (T3–T4) stages [17]. Additionally, ERUS is less likely to consistently distinguish between inflammation surrounding the tumour and transmural tumour infiltration, which may lead to over-staging from T2 to T3 tumours and, subsequently, overtreatment [18–20]. The staging of bulky, distal and/or stenotic lesions with ERUS is also challenging due to the limited field of view and the inability of rigid probes to traverse the lesion [21, 22].

MRI of the anorectum and pelvis is essential to exclude extension into the muscularis propia, as well as locoregional metastases. Both MRI and ERUS, are equally proficient at evaluating lymph node involvement [15, 23]. Lymph nodes over 8 mm in diameter are generally malignant, however, size alone is not reliable as small nodes

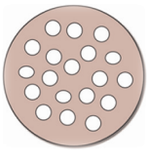
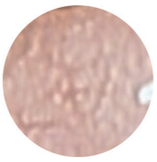
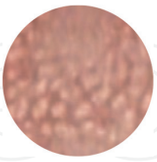
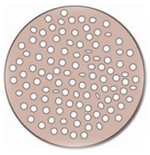
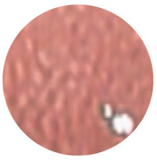
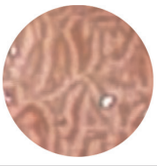
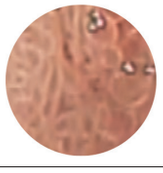
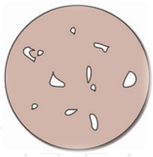
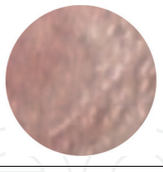
Type	Schematic	Endoscopic	Description	Pathology
I			Round pits	Benign/Normal
II			Stellar or papillary pits	Non-neoplastic (e.g. Hyperplastic)
IIIS			Small tubular or round pits. Smaller than type I pits	Neoplastic
IIIL			Tubular or roundish pits that are larger than type I pits	Neoplastic
IV			Dendrite-like pits	Neoplastic
VI			Irregular arrangement and sizes of type IIIs, IIIL, IV type pit patterns.	Neoplastic (invasive)
VN			Loss or decrease of pits with an amorphous structure	Neoplastic (submucosal invasion)

Table 2.
Pit pattern classification [6, 13].

may contain metastases while large uninvolved reactive ones adjacent to cancers are common [24–26]. Criteria such as the presence of spiculation, indistinct border and mottled heterogenic pattern are indicative of nodal metastasis [27].

Chest, abdomen and pelvis computerised tomography (CT) must be performed to exclude distant metastasis and the entire colon should be assessed to rule out synchronous adenomas or carcinomas. While it is widely available and provides rapid scanning times, it is of limited value in assessing loco-regional spread in early-stage lesions confined to the rectal wall. Additionally, the lower resolution is unreliable to confidently distinguish the layers of the rectal wall and differentiate desmoplastic

or inflammatory changes from tumour infiltration into the mesorectal fat [15]. These limitations often result in a tendency to over-stage early cancers (≤T2) to T3 ones [28].

2.3.3 Lymph node involvement

Lymph node metastasis remains a fundamental prognostic indicator for decisions on adjuvant treatment, specifically chemotherapy, where suitable. It is likely future developments will focus on improving preoperative assessment. Currently, the precision in assessing locoregional spread for T1 tumours suitable for ERC treatment and to differentiate T1 from T2 cancers remain a challenge for the MDT [4, 11].

Immunological localisation and lymph node specific contrast is progressing rapidly, and likely the future for improving staging and management of CRC. Preliminary observations suggest that ultra-small superparamagnetic iron oxide (USPIO) is useful at differentiating normal nodes from ones with metastases [22]. Promising prospects include anti-carcinoembryonic antigen (CEA) antibodies to detect CEA-bearing tumours, recurrent disease, and metastases [27].

Positron emission tomography (PET) is used almost routinely to investigate recurrence and may also detect involved nodes. However, it is not without limitations. The resolution for involved lymph nodes of 1 centimetre or less is inadequate and often indistinguishable to the primary tumour that lies nearby [29].

Endorectal ultrasonography guided needle biopsy of lymph nodes is a minimally invasive and inexpensive technique that may lead to more accurate nodal staging. This technique is not widely used though promising, given the current need to identify local disease and improve decisions for surgery [30, 31].

Unlike breast cancer, the value of sentinel node biopsy in visceral cancers is uncertain. Approximately 20% of patients with node negative disease develop recurrence within 5 years, probably as a consequence of missed micro-metastases by conventional staging [31]. Sentinel node study has the potential to detect micro-metastases and lead to upstaging of the disease and thus reducing tumour related mortality from surgery [32]. Further research of its value in ERC and on the overall effects on survival is needed.

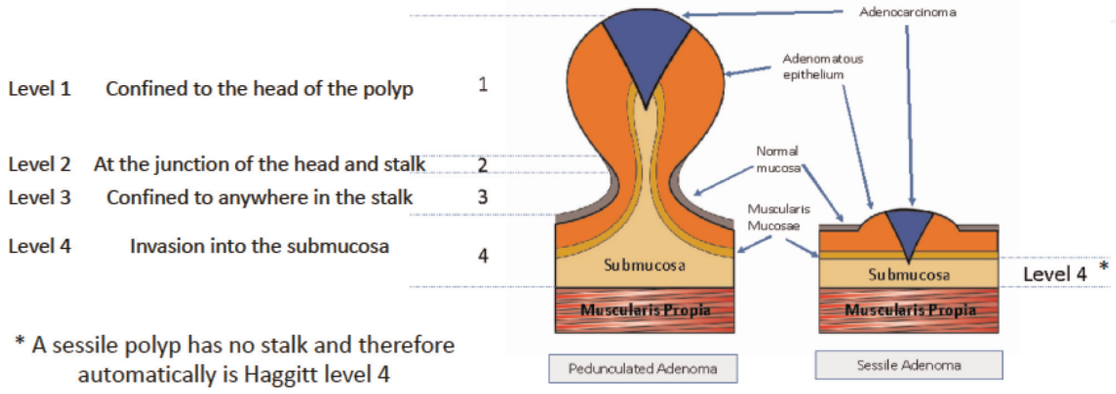


Figure 1.
The Haggitt classification of depth of invasion in malignant pedunculated and sessile polyps [33].

Figure 1 highlights the typical features of a T1 ERC found at colonoscopy and later staged with ERUS and MRI. While the radiology demonstrated a T1 lesion without invasion, the depth into the submucosa is difficult to assess. Unfortunately, this was an SM1 adenocarcinoma with lymphovascular invasion. Overall, In the absence of more accurate staging before resection, we must rely on estimations of the likelihood of undetectable loco-regional spread primarily based on histology.

2.3.4 Histology of ERC

2.3.4.1 Features of malignant transformation of adenomas

Risk factors associated with malignancy include grade of epithelial dysplasia, location and histological type [33]. However, the most significant factor is size. Adenomas of less than 5 mm have almost 0% risk of transformation whereas risk to those >2 cm is around 40% [34, 35]. Adenomas are classified as tubular, tubulovillous and villous. Villous adenomas have the highest risk at 29.8% and tubular the lowest at 3.9%. Epithelial dysplasia is defined as low grade versus high grade. Low grade dysplasia is typically neoplastic change seen only in the epithelial glands. High grade dysplasia shows glandular irregularity, crowding with a cribriform architecture and prominent glandular budding. High grade dysplasia is usually, though not exclusively associated with malignancy. Rectal adenomas have the highest risk of transformation at 23% when compared to the right (6.4%) and left colon (8%) [36].

2.3.4.2 Haggitt classification

Haggitt's submucosal invasion classification within a polyp is widely used. Levels 1, 2 and 3 apply to pedunculated lesions only. An invasive carcinoma in a sessile polyp is an automatic level 4 lesion (**Figure 2**) [37].

2.3.4.3 Kikuchi classification

The limitation of the Haggitt classification is that it is not as suitable for sessile tumours. The Kikuchi classification aims at depicting the extent of submucosal invasion and therefore more practical for these lesions (**Figure 3**) [38].

This classification can be correlated to the Haggitt level: levels 1, 2, and 3 are Sm1. Level 4 can be Sm1, Sm2 or Sm3.

Overall there are 3 histopathology features that inform the risk of local recurrence: SM level, tumour diameter and lympho-vascular (LV) invasion (**Table 3**).

Sm1	Invasion into the upper 1/3 of submucosa	
	Sm1a	Less than a quarter invading upper 1/3 of submucosa
	Sm1b	Quarter to half invading upper 1/3 of submucosa
	Sm1c	More than half invading upper 1/3 of submucosa
Sm2	Invasion into the upper 2/3 of submucosa	
Sm3	Invasion into the lower 1/3 of submucosa	

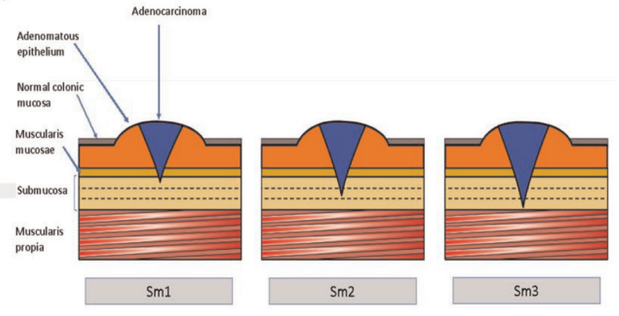


Figure 2.
Kikuchi Classification [38].

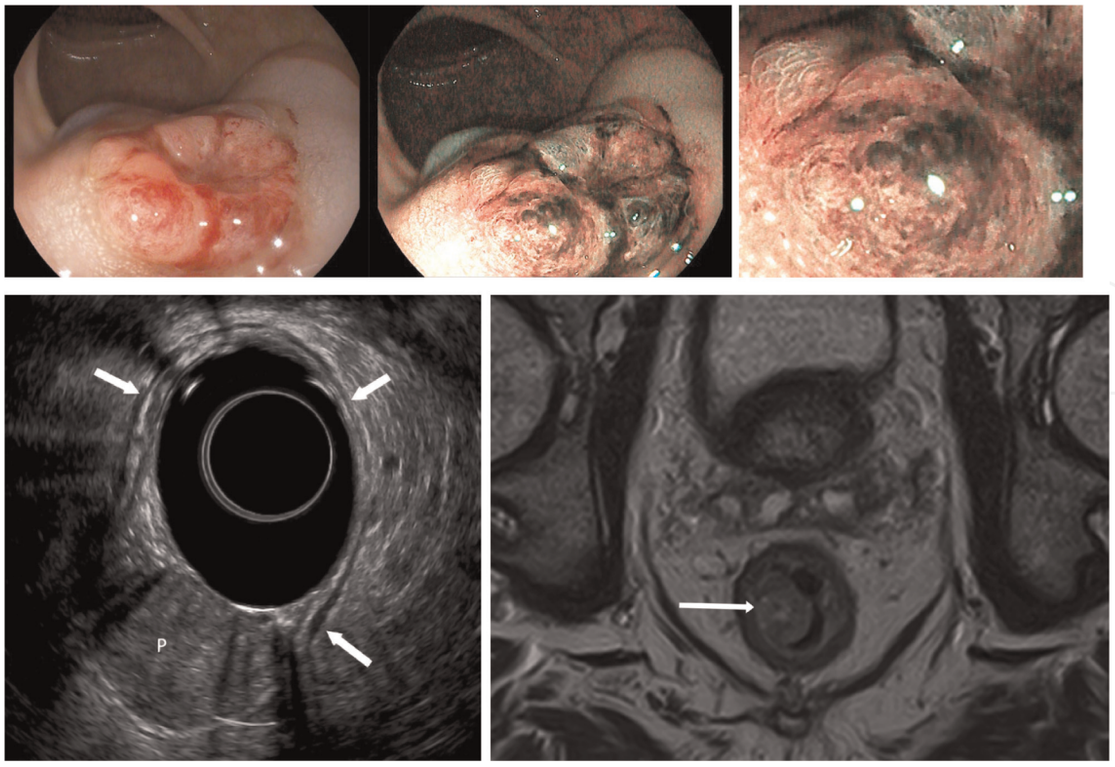


Figure 3.
Upper pictures of an early rectal cancer at colonoscopy, with the middle image showing narrow-band filters (Pentax i-scan) to display type V Kudo pit pattern and magnified in the upper right image. ERUS of the same polyp suggests a T1 cancer, with the arrows identifying the intact muscularis propria, which are also demonstrated on the MRI (lower right image). After TAMIS excision, histology revealed accurate preoperative staging but the presence of lymphovascular invasion.

SM level	LV invasion	Maximum tumour diameter (cm)					
		≤1	1·1–2	2·1–3	3·1–4	4·1–5	≥ 5·1
SM1	No	3·0	3·6	4·4	5·4	6·6	8·1
SM1	Yes	5·2	6·4	7·7	9·4	11·4	13·7
SM2–3	No	10·5	12·7	15·3	18·5	22·1	26·4
SM2–3	Yes	17·8	21·4	25·5	30·3	35·7	41·8

Table 3.
the risk of local recurrence from the histopathology of SM level, tumour diameter and lympho-vascular (LV) invasions [39].

3. Management of ERC

3.1 The multidisciplinary team (MDT)

There are significant challenges for the MDT in treating ERC. As the early stage incidence becomes more common, newer treatments and strategies will emerge to address the complexities in balancing outcomes against morbidity. While this may further complicate decisions, fundamentally the MDT relies heavily on macroscopic and radiological features of the ERC. Once a lesion has been determined as malignant, or at least has suspicious morphology at endoscopy, despite limited histological

evidence, the decision on how best to remove it safely must be made. In recognition of these challenges there has been an increase in polyp-focused MDTs, though significant variations in those treatment decisions exist [5].

Any decision relies on accurate delivery of information to the patients to facilitate their own decisions in their shared care. Discussions must include the tumour characteristics, grade and location, as well as patient factors such as age, sex, comorbidities, and performance status. Patients must then be informed of the MDTs discussion as well and address their concerns on stoma rates, recurrence risks and the incidence of post-operative complications.

With the increasing complexity of those decision and number of patients coming through MDTs, protocol tools have attempted to unify standards, but remain far from perfect [8]. A recent Cochrane review in 2017 demonstrated that the use of these tools can improve a patient's knowledge of risk and, interestingly, seems to increase the likelihood of patients choosing less radical surgery [6].

Therefore, decisions require experienced specialists in MDT meetings aided by accurate staging as possible and formal assessment of patient risk. For individual risk assessment for treatment, prediction models are quite common such as p-possum scoring, performance status and ASA scores. More surgery specific models, such as the American College of Surgeons (ACS) surgical risk calculator, are also available, however the evidence for their use to inform patients of outcomes in ERC is limited. Decisions are made avoiding the methodological limitations of these models and once again rely on the experience of the MDT [9, 10].

3.2 Options for treating ERC

As for any rectal cancer, options for ERC treatment must be patient-centred. The initial workup determines tumour stage, location, circumferential resection margins (CRM) margins, and presence or absence of metastatic disease. Patient fitness and preference, alongside the availability of treatment, including available research trials should also be considered by the MDT.

3.2.1 Traditional TME surgery

For many years TME surgery was the only acceptable curative treatment of any rectal cancer, involving either an anterior resection or abdominoperineal resection. This facilitates full staging of local disease postoperatively as lymphadenectomy will guide the need for adjuvant treatment. However, the significant risk, particularly in frail patients, and that of a stoma when fitted to avoid the risks of anastomotic leak, must be considered and discussed with the patient.

Disease recurrence is very much related to tumour grade, accepted as less than 5% with well to moderately differentiated and node negative cancers [11]. Anastomotic leak and significant complication rates vary depending on pelvic factors, patient health, intraoperative findings, tumour height, previous surgery and neoadjuvant treatment but are typically quoted between 4 and 10%.

3.2.2 Organ preservation techniques

Transanal Endoscopic Microsurgery (TEM), Transanal Endoscopic Operations (TEO) & Transanal minimally invasive surgery (TAMIS).

Historically, local excision was only possible under direct vision, using an anal retractor and towards organ preservation. The TEM platform later emerged as forerunner to definitive treatment for ERCs by MIS with no adverse features [39–41]. This approach should only be considered in patients with cT1 disease with no evidence of lymph node involvement [40]. TEM allows for complete local disease control with accurate, local excision. It allows a full-thickness excision of the affected bowel wall and primary closure. For pT1, SM1, node negative ERCs, it offers comparable oncological results as TME surgery, with significantly less morbidity [42]. The recurrence rates of T1 lesions without adverse features vary but are largely agreed to be in the region of 10–15% (see **Table 3**). However, in T2 lesions, also without adverse features, this jumps to 25% [43]. The same study shows little difference in R1 (involved margin) resection rates, around 5%, when compared to traditional TME surgery. Alternative platforms include TEO and, gaining wider popularity, TAMIS (see **Figure 4**). While there is a steep learning curve for all transanal techniques, TAMIS allows transferable skills gained at laparoscopic resections and the outcomes are similar to TEMS [1].

The ongoing advancement of minimally invasive technology is likely to improve the accessibility of ERC surgery. The transference of robotic skills to TAMIS, known as R-TAMIS, promises to aid accurate dissection and better intraluminal control of suturing to close the rectal wall defect. It may allow repair of perforations that breach the peritoneal reflection which occur on resecting anterior lesions and would otherwise have required abdominal (open or laparoscopic) access [1].

3.2.3 Contact radiotherapy/Brachytherapy

Local radiotherapy (brachytherapy or Papillon, CXB) is effective in some instances [44], and as standalone treatment. It was first popularised by Jean Papillon in France in

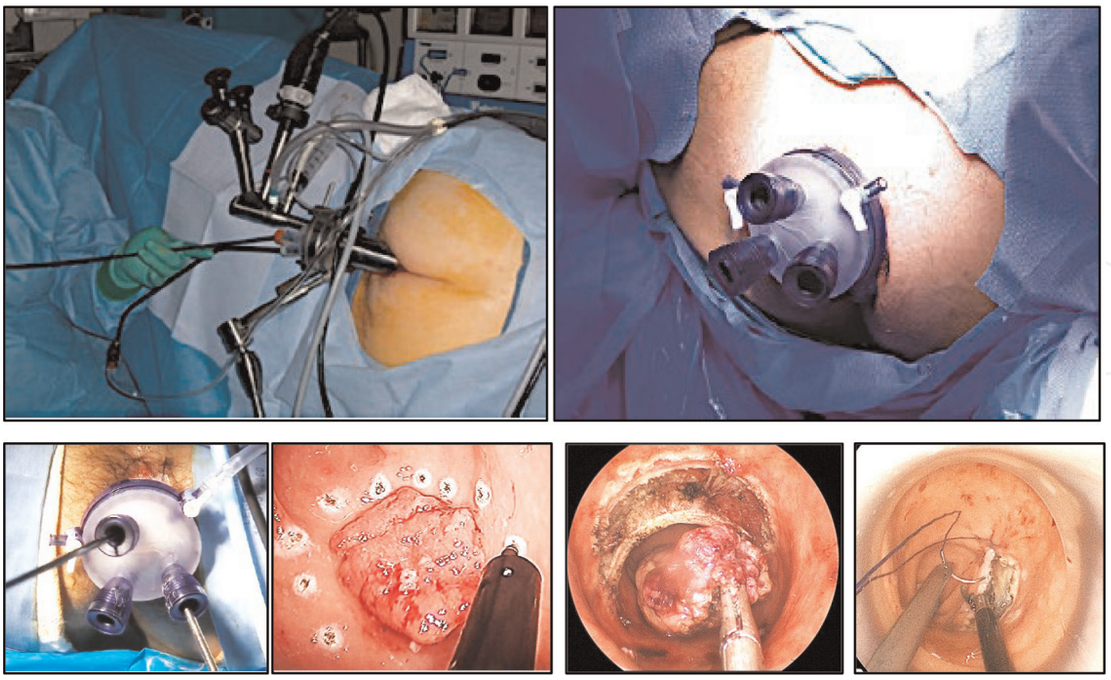


Figure 4.
TEMs (upper left) versus TAMIS (upper right) setup at the anus. While TEMs offers binocular and near 3D views, TAMIS via a less rigid platform allows greater freedom of movement and transferability of minimally invasive skills and tools. Using standard laparoscopic instruments via the GelPOINT Path™ platform (lower left image), a full thickness resection of the ERC is achieved (lower images second and third from left) and the rectal wall defect is sutured with a continuous absorbable, such as a 3–0 PDS suture (lower right).

the 1950s and has gained recent popularity. This strategy can be considered in patients with exophytic, mobile cancers under 3 cm. It is a curative, non-operative approach for some T1 cancers, however primarily suitable for elderly or frail patients unfit for major resections. Its main disadvantage is the lack of histological specimen and failure to treat the mesorectum, unless combined with external beam radiotherapy (EBR). Overall, the complete clinical response rate ranges between 10 and 30% when combined with chemotherapy. Professor Sun Myint et al. outline the criteria for ERCs suitable for CXB that may successfully result in a complete response as follows [45]:

- Inclusion criteria for CXB alone for ERCs with curative intent.

    1. mobile exophytic ERC (cT1).
    2. well to moderately differentiated adenocarcinoma.
    3. tumour size <3 cm.
    4. no evidence of suspicious lymph nodes.
    5. no evidence of distant metastases.
    6. tumour within 12 cm of the anal verge.
    7. patient suitable for long-term follow-up.

- Exclusion criteria.

    1. poorly differentiated adenocarcinoma.
    2. presence of lymphatic or vascular invasion.
    3. bulky rectal cancer involving more than half the circumference (> 3 cm).
    4. fixed rectal adenocarcinoma with deep ulceration (cT3, cT4).

The described regimen involves two weekly outpatient treatments, in which 30 Grey of 50KV is delivered to the target area through a rigid applicator. Standard dosage is 60 Grey in 2 fractions over 2 weeks.

3.2.4 Total neoadjuvant therapy (TNT)

There has been increasing use of the non-operative approach to rectal cancer treatment since Habr-Gama et al. of Brazil published their outcomes. It removes the need for major surgery by aiming to achieve complete clinical response with neoadjuvant chemoradiotherapy and 'watch and wait' monitoring for recurrence by intensive follow-up. It not currently known whether induction chemotherapy followed by chemoradiotherapy or vice versa is the superior regimen, but the inclusion of radiotherapy significantly improves complete pathological response rates. Surgery is only undertaken for recurrent disease [46]. Until recently there were concerns most of the data came from a single centre, though it continues to gain wider

acceptance and currently the subject of RCTs worldwide. As a more focused treatment, there is likely to be greater numbers of patients considering and undergoing TNT [1]. The NCCN recommends FOLFOX or CAPEOX (12–16 weeks) then long course chemoradiotherapy with capecitabine or infusional 5-FU, followed by restaging. MDTs and patients must be aware however, that local recurrence rates are around 30–35% and distant metastases of 15% occur within a year of treatment.

3.2.5 The malignant polyp- endoscopic approach

The endoscopic mucosal resection (EMR) technique involves injecting a solution, traditionally saline, under the lesion to expand the submucosal space and elevate the lesion away from the muscle layer below. If the lesion does not 'lift' then this can be an important feature indicating local invasion. It may also not lift with background colitis and scarring from previous excisions or biopsies. Injections improve resections as flat lesions become more bulbous and easier to grip. EMR for lesions less the 25 mm in the rectum are usually suitable for en bloc resection [47].

Endoscopic submucosal dissection (ESD) is a relatively new technique that offers en bloc mucosal excision. This has the benefit of a high-quality pathological specimen to facilitate accurate assessment of deep and lateral margins and the depth of submucosal invasion. If R0 resection is obtained with no high risk features then recurrence rates are very low. However, ESD has a higher risk of perforation, but manageable non-surgically with endoclips. It is therefore reserved for higher risk lesions and requires a steep learning curve. It involves lifting the lesion, mucosal incision, making a 'groove' down to the muscle layer, submucosal dissection, elevation of a mucosal flap, and completing the resection en bloc [47].

3.3 The Conundrums: Minimising recurrence after organ-preserving treatment

In principle, locoregional treatment is appropriate for the least invasive tumours as they are less likely to have occult lymph node metastases (1–2% for Kikuchi SM1 invasion versus 2–8% for ≥SM2). The gamble with preservation surgery is that estimation of recurrence is only assessable at histopathology.

The best outcome that will not require further treatment is a well to moderately differentiated adenocarcinoma, ≤ SM1, and R0 margins only (see **Table 3**). Therefore, the main challenges for the MDT are non-assessable excision margins (typically from cautery damage), poor differentiation, >SM1 invasion, presence of vascular invasion or R1 margins. These factors are associated with 5–18% local recurrences. If any of these features are present, the MDT ought to consider more radical treatment, specifically adjuvant therapy (such as chemotherapy with EBR and/or brachytherapy) and/or TME excision. If TME surgery is decided, the patient must be aware that scarring from local excision may increase the risk of collateral damage to pelvic nerves, levator muscle, prostate or vagina, and increase the incidence of bleeding and low anterior resection syndrome (LARS).

One of the more challenging discussions is the possibility of residual locoregional disease after excision of a SM2 or SM3 cancer without other adverse risk factors. The patient must be aware of a 5–12% incidence of locoregional recurrence. Decisions are made to in effect halve that risk with either TME surgery or adjuvant brachytherapy +/− EBR +/− chemotherapy. The patients must be aware that TME surgery has significant morbidity of up to 10% and potentially functional concerns, such as LARS. From current literature, it is difficult to estimate the risk of recurrence by

brachytherapy+/− EBR, though suggested to be less than 5%. It remains an area in need of high quality RCTs.

For tumours staged T2, lymph-node negative and less 4 cm in diameter, local excision after neoadjuvant chemoradiotherapy has been shown in clinical trials to be a safe alternative to TME surgery [48, 49] with minimal adverse impact on anorectal function 1 year after surgery. Longer term data suggests some compromise to function [50]. This strategy is not routinely recommended outside of clinical trials, but may be explored at the MDT for elderly, frail patients with significant perioperative risks [51].

There is currently little evidence that healthy young patients with proven ERC should undergo organ preserving excision. TME surgery remains the 'gold standard' [52, 53]. Expert staging and treatment demand a thorough understanding of the anatomy of the rectum and the variability of characteristics in relation to gender and body habitus. Ultimately variations in presentation, patient features, and surgical factors, including the availability of therapeutic options prevents defining borders of ERC management to a viable and universal protocol. The MDT discussions must reflect that complexity and rely on up-to-date evidence of new treatments or consider enrolment into trials.

Differing treatment strategies may be appropriate depending on site of the ERC. Organ-preserving approaches are less relevant for a young patient with no comorbidities and a mid or upper ERC. However, the MDT should explore neoadjuvant therapy for a similar patient with a very low ERC, given the potential risks and impact on quality of life for a low anastomosis or abdominoperineal resection. Once the risks are discussed, an early, localised adenocarcinoma adjacent to the anal sphincter muscle may be appropriately treated with primary chemo-radiotherapy only and intense follow-up towards preserving anal sphincter function. The difference of just a few centimetres in location or millimetres in invasion can have an enormous impact on treatment options and decision-making. What remains unanswered is the longer-term impact of avoiding radical surgery.

If adverse pathology is diagnosed after local excision, proceeding to completion resection via TME surgery may be required. This may necessitate stomas, exenteration surgery for very advanced disease or adjuvant treatments. Nevertheless, those risks must be made clear to the patient before embarking on any treatment for ERC towards shared clinical decision-making and against potential litigation. Strategies to manage this particular question are quickly evolving, though likely to become a common problem with no simple answer, which mandates the MDT to be up to date with the options available.

3.4 Surveillance

To date there is much variation in surveillance protocols after definitive ERC treatment. Overall, follow-up, intense or otherwise, is unlikely to significantly reduce OS. Furthermore, they are costly and cause significant patient anxiety. However, they may improve DFS and therefore quality of life while living with recurrent cancer. The recognised variations in ERC treatment will support differing approaches by MDTs on follow-up regimes. The authors recommend regular review of protocol updates and changes to patient circumstances and health condition.

The authors support an intense regime for ERCs locally treated with surgery +/− chemoradiotherapy+/− brachytherapy, in line with the Brazilian protocol proposed by Habr-Gama et al. [46]. Those with recurrent disease after local excision and subsequently treated with curative intent will require modifications to their protocol, often based on MDT preferences.

Recommended 5-year surveillance, 'intense' protocol for ERC:

• Physical examination & serum CEA	Every 3 to 6 months for 5 years
• Rectosigmoidoscopy	Every 3 to 6 months for first 3 years
• Colonoscopy	First and third to fourth year
• MRI	3–6 months for first 3 years
• CT scan	Yearly for 5 years

If there are other high-risk polyps in the large bowel, colonoscopy may be required yearly until no further concerning polyps are identified followed by then standard bowel surveillance as per hospital guidance.

4. Conclusion

Organ-preservation strategies to treat ERC are effective and, when carefully considered, have acceptable outcomes comparable to TME surgery. Technological advances have improved accessibility of MIS and interest in non-operative treatment continues to grow. However, there are important gaps in the evidence on surgical versus non-surgical treatment. Also, there is a lack of understanding of how patients weigh and prioritise their perceptions of potential benefits over that of morbidity and the risk of local recurrence. Decisions on ERCs other than a 'good' T1 (that is an SM1, R0, no lympho-vascular invasion) treated by local excision remain a challenge, specifically when balancing the likelihood of over- versus under-treatment. It is therefore imperative on well-informed specialists of the MDT to offer the best estimates on outcomes towards shared decision-making with patients.

Overall, the prospects for ERC treatment are very promising. As the current trend to organ-preservation continues, along with current and future research, so too will our understanding of therapeutic strategies improve towards standardising management.

Acknowledgements

We acknowledge the contributions from Drs. Scott Sanders and Farah Sandhu of the Histopathology Department, South Warwickshire NHS Foundation Trust and University of Warwick, UK. This chapter was supported by the Departments of Gastrointestinal Surgery, Histopathology and Radiology of the National Health Service, South Warwickshire NHS Foundation Trust, UK. We also acknowledge support of the School of Medicine, University of Warwick, UK, and the Institute of Cancer and Genomics, University of Birmingham, UK. We would also like to thank Dr. N Pargass for her help in verifying the references in finalising this chapter.

Conflict of interest

The authors declare no conflict of interest.

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