

CHAPTER 8 DIAGNOSTIC TESTS AND PREOPERATIVE ASSESSMENT

A right-sided colon cancer usually presents with iron deficiency anaemia, or as a palpable abdominal mass. In contrast, left-sided and rectal cancer usually presents with rectal bleeding, and/or a change in bowel habit. The change in bowel habit may include an increased frequency, altered consistency, altered calibre, or worsening constipation. Unfortunately, by the time a Colorectal Cancer becomes symptomatic, a majority of these patients will have either nodal or distant metastases at diagnosis. The diagnosis of Colorectal Cancer based upon symptoms may be difficult because these typical clinical features are present in only 40% of patients¹ with cancer. Similar symptoms (especially bleeding and abdominal pain) may arise from other causes.

An attempt may be made to stratify how urgently patients with symptoms should proceed to evaluation. This stratification should include other risk factors for Colorectal Cancer such as increasing patient age, (esp. over 40 years) and a strong family history of colorectal and other cancers. Urgent referral should be considered in patients with:

- unexplained iron deficiency anaemia
- a palpable rectal mass
- persistent rectal bleeding
- persistent changes in bowel function.

Rectal bleeding is a particularly common symptom in the community. All such patients should be evaluated and investigated. All patients over 40 years of age should undergo a colonoscopy.² For younger patients with typical anal outlet bleeding a sigmoidoscopy is a reasonable first approach. However, if the bleeding recurs or persists despite treatment of an apparent anal cause of bleeding, then a colonoscopy is indicated.³

Who should be investigated?

Guideline — Preoperative assessment	Level of evidence	Practice recommendation	Refs
All people with suspicious large bowel symptoms or rectal bleeding should be investigated, especially if other risk factors (such as older age or family history) are present, or in any patient over 40 years of age. People under 40 years of age should be investigated if there is a positive family history, if there is not an identified cause of symptoms, or if symptoms are persistent.	III-3	Equivocal	4-7

8.1 Methods of investigation

8.1.1 Digital rectal examination

A digital rectal examination should be the first assessment in any patient with anorectal symptoms. It enables detection and assessment of the size and fixation of mid and low rectal tumours. While digital assessment of the extent of local disease is imprecise, it provides a rough estimate of the local staging of the rectal cancer⁸ and of the state and strength of anal sphincters. The adequacy of the anal sphincters may influence a surgical decision about whether to perform sphincter-preserving surgery.

8.1.2 Sigmoidoscopy: rigid versus flexible

Rigid sigmoidoscopy is usually performed in conjunction with the digital rectal examination. It facilitates the diagnosis of anal pathologies (fissure, haemorrhoids) and rectal neoplasm. In assessing neoplasm, it allows assessment of: (i) the distance from the lower edge of the neoplasm to the anal verge, and (ii) the location of the neoplasm.

Flexible sigmoidoscopy is superior to rigid sigmoidoscopy in that more of the large bowel up to the sigmoid colon is examined.⁹ It requires a basic preparation in the form of an enema, and is usually performed in a diagnostic unit without sedation. Sigmoidoscopy, whether rigid or flexible, is important in the diagnosis and assessment of rectal neoplasm.^{9,10}

Sensitivity and specificity for flexible sigmoidoscopy for lesions in the rectosigmoid region are similar to those for colonoscopy.¹¹ The procedure is safe¹⁰ and the perforation rate is less than 2 in 10,000 examinations.¹²

8.1.3 Colonoscopy

Colonoscopy is currently the most accurate investigation for assessing the colon and rectum.¹³ The sensitivity of colonoscopy for colon cancer is 95%.^{14,15,16} Colonoscopy allows biopsy and histologic confirmation of the diagnosis. It also allows identification and endoscopic removal of synchronous polyps. A study by the United States National Polyp Study found that colonoscopy was significantly more accurate than double contrast barium enema in diagnosing colorectal polyps.¹³

All patients with colorectal neoplasia should have a colonoscopy as part of their preoperative assessment unless there is perforation or significant large bowel obstruction. In 5–10% of patients, the presence of synchronous pathologies (esp. neoplasm) may alter the surgical approach. Patients with colorectal neoplasm who are undergoing emergency procedures should have a completion colonoscopy within three to six months of their surgery.

However, even meticulous colonoscopy has a significant miss rate for small adenomas. When evaluated by one or two colonoscopists by performing back-to-back (tandem) colonoscopies on the same day, there is a miss rate of 15% for polyps <1 cm and 6% for polyps ≥ 1 cm.^{17,18}

Improved effectiveness of colonoscopy is achieved with practice,^{19,20} sedation,²¹ and better preparation of the colon.¹⁹ Use of high-magnification colonoscopy with chromoscopy (i.e. with indigo carmine) demonstrates morphologic detail of diminutive polyps that can readily be used to separate adenomatous from nonadenomatous polyps²² and might permit early detection of early Colorectal Cancer, in the form of flat or depressed lesions.²³ Attempts at improving the accuracy of colonoscopy for colorectal neoplasia using high-magnification colonoscopy with chromoscopy (i.e. with indigo carmine or crystal violet) are currently under study.²⁴

Complications

Colonoscopy is performed as a day-case procedure and usually needs sedation. Diagnostic colonoscopy is associated with a complication rate of 0.14%, compared with a rate of 2% for therapeutic colonoscopy.²⁵ In a review of six prospective studies of colonoscopy, about one in 1000 patients suffer perforation, three in 1000 suffer major haemorrhage, and between one and three in 10,000 die as a result of the procedure.¹² A review of Australian data has a similar complication rate.⁵ There are other occasional, serious complications associated with bowel preparation or the use of sedation.

Quality issues

Guidelines on training and experience have been issued by the Gastroenterological Society of Australia.²⁶ Training or experience in colonoscopy has an important impact on the efficacy of colonoscopy. Trained endoscopists achieve a caecal intubation rate of over 90%.^{9,27} However, self-

trained colonoscopists have reported caecal intubation rates as low as 54%, which did not improve with continued performance of colonoscopy.²⁸

The sensitivity of colonoscopy is lowest in the splenic flexure and caecum.¹⁴ The colonoscopist must recognise that a total colonoscopy requires unequivocal identification of the caecum and terminal ileum. A barium enema or computerised tomography (CT) colonography will be required in some cases to ensure complete visualisation of the colon.

8.1.4 Barium enema

Barium enema is indicated if there are problems with local access to colonoscopy, or when the endoscopist is unable to complete a colonoscopy,

The sensitivity of double contrast barium enema for colon cancer is 90%, with a range of 65–95%.¹⁴⁻¹⁶ Barium enema is more likely to miss a Dukes A cancer (see Chapter 14) than colonoscopy.¹⁴ In a review,¹⁶ the best results of double contrast barium enema for detecting polyps smaller than 1 cm was 70–95%, compared with 90% for colonoscopy. The identification of such lesions necessitates a colonoscopy to remove them.

The rectum and rectosigmoid region are not well visualised on double contrast barium enema. These regions should be examined by sigmoidoscopy, or by colonoscopy.

Lesions are more commonly missed in the sigmoid colon because of underlying diverticular disease. They are also often missed in the caecum because of inadequate imaging.²⁹ If visualisation of the sigmoid colon is difficult because of severe diverticular disease, supplementary examination by flexible sigmoidoscopy or colonoscopy may be needed.³⁰ Colonic redundancy can also mask neoplastic lesions.

Reports of barium enema are often vague due to a technically inadequate examination. All barium enema reports should contain an indication as to the completeness, quality and limitations of the examination.

Complications

Barium enema is done as an outpatient procedure. Sedation is not used. Serious complications are rare and have been estimated at three per 10,000 tests, with a death rate of three in 100,000 tests.¹²

Quality issues

The accuracy of the double contrast barium enema is, in large part, dependent on quality issues. Five to 10% of barium enemas are judged unsatisfactory.^{6,31} The American College of Radiology has outlined the quality issues associated with double contrast barium enema.⁶ Good quality bowel preparation is necessary. Double contrast barium enema should be carried out under the supervision of a radiologist experienced in the technique and the results should be reported by two independent radiologists. This is known as ‘double reporting’.⁷ A suggested aim for quality control is that barium enema should detect more than 90% of Colorectal Cancers and more than 80% of polyps greater than 1 cm in size.

8.1.5 CT colonography (virtual colonoscopy)

CT colonography (virtual colonoscopy) is probably the best test for patients with an incomplete colonoscopy or for those patients who cannot undergo colonoscopy.³² It is inaccurate for lesions less than 1 cm in size. A good preparation is important for an adequate test. The sensitivity and specificity per patient of CT colonography for lesions 5 mm or greater is 67% and 75% respectively, and for lesions greater than 1 cm, is 90% and 82% respectively.

For radiological imaging of the large bowel, CT colonography caused significantly less discomfort than double-contrast barium enema and is rapidly replacing barium enema (refer to 5.1 and 5.2) as the method of choice for colonic imaging.³³

Magnetic resonance colonography

Magnetic resonance (MR) colonography is an experimental procedure that is currently being investigated and evaluated.

There is an application before Medical Services Advisory Committee (MSAC) to evaluate CT Colonography. A report can be expected in the near future.

What are the investigations for symptoms of Colorectal Cancer?

Guideline — Investigations	Level of evidence	Practice recommendation	Refs
Investigation should include a digital rectal examination, a rigid sigmoidoscopy and a colonoscopy. A double contrast barium enema plus sigmoidoscopy or CT colonography may replace the colonoscopy if there are difficulties with local availability, expertise or an incomplete colonoscopy.	III-3	Equivocal	6, 9, 10, 13-16

8.2 Preoperative staging

8.2.1 Locoregional staging of colon cancer

Locoregional extent of the tumour is best evaluated during laparotomy and by histologic examination of the specimen, but in selected cases, preoperative CT scan will help identify involved contiguous structures.

There is no evidence that routine preoperative CT scan is cost-effective or alters the treatment plan.³² A careful clinical assessment may be more valuable by identifying those patients with a bulky cancer who may benefit from CT imaging.³⁴ Magnetic resonance imaging (MRI) has no advantage over CT scan in locoregional staging of colon cancer.^{35,36}

Colonoscopic ultrasonography uses an ultrasound transducer incorporated in the tip of the colonoscope.³⁷ It is unlikely to be of practical use because surgery for colon cancer is not stage-dependent.

A CT scan should be considered if there are clinical indications of a locally advanced cancer or of systemic metastases that might alter operative or other management strategies.

8.2.2 Locoregional staging of rectal cancer

Preoperative locoregional staging of rectal cancer is essential, both to plan for surgery and to consider the possible need for preoperative adjuvant chemoradiotherapy (see Chapter 16).

Endorectal ultrasound

Accuracy rates for depth of cancer invasion through the rectal wall range from 85% to 95%. Comparative studies have shown endorectal ultrasound to be superior to CT scan.³⁸⁻³⁹ The overall accuracy for detecting lymph node metastases is about 80%.⁴⁰⁻⁴²

While endorectal ultrasound is the most accurate method to preoperatively stage the rectal cancer locally, it is not necessarily indicated for all rectal cancers. Its main role will be for:

- advanced (T3–4) rectal cancers where neoadjuvant therapy is being considered,⁴³ and
- early (T1) rectal cancers that are being considered for local surgery, either by trans-anal local excision or by transanal endoscopic microsurgery (TEMs), rather than by abdominoperineal excision.⁴¹

The accuracy of endorectal ultrasound is strongly dependent on the expertise of the operator, who should be appropriately trained. Such training and expertise is available in some colorectal units.⁴⁴ The learning curve requires more than 50 rectal cancers before optimal accuracy is attained.⁴⁵

Table 8.1 gives details of an endorectal ultrasound staging system.

Table 8.1 Endorectal ultrasound staging

uT0	Submucosa intact (benign lesion)
uT1	Tumours confined to the mucosa and submucosa
uT2	Tumours confined to the rectal wall and muscularis propria
uT3	Tumours penetrating into perirectal fat
uT4	Tumours penetrating into surrounding organs
uN0	No nodes involved on ultrasound
uN1	Nodes involved on ultrasound

CT scan

CT scan is rarely helpful in the early stages of primary rectal cancer.⁴⁶ It is not sensitive enough to accurately assess the depth of invasion within the bowel wall and to detect metastases in normal-sized lymph nodes.

However, for patients with a large, bulky rectal cancer, and especially a stenosing cancer that precludes an endorectal ultrasound, CT scan is useful in assessing the extent of pelvic disease. It may also give information about metastatic disease (see below).

Magnetic Resonance Imaging (MRI) for rectal cancers

MRI using a high-resolution phased array technique is the single most accurate tool to demonstrate preoperatively the involvement of mesorectal fascia and hence the likelihood of an involved circumferential resection margin.⁴⁷ The value of a preoperative phased array MRI in patient management is being evaluated in larger clinical trials.⁴⁸ It might serve as a promising tool to select preoperatively those rectal cancer patients with different risk of recurrence, so that they can be treated according to the risk.

MRI of rectal cancers is currently proposed as a technique for pre-operative staging of rectal cancers and as a technique for re-imaging cancers following pre-operative radiotherapy. Preoperative MRI scans appear most accurate in defining the circumferential margins of locally advanced tumors. This helps determine whether a clear resection margin can be attained. MRI scans are less accurate in defining T and N stages, especially for early tumours (ie. T1 and T2). MRI scans are less accurate in re-staging patients following radiotherapy as the technique can not clearly differentiate cancer from fibrosis.

A meta-analysis of available clinical trials comparing MRI with endoanal ultrasound (US) and CT scan found that US was most accurate in determining local invasion and perirectal tissue involvement. However, MRI and US were comparable in terms of adjacent organ invasion and lymph node involvement. Improving technology in both MRI, US and CT means that these conclusions may well change over the next five years.⁴⁹

8.2.3 Staging for distant metastases

The purpose of staging is three-fold: (i) to assist in treatment decision making, (ii) to provide information on prognosis, and (iii) to define disease groups for comparison of results.

The United Kingdom Colorectal Cancer Working Party has recommended a routine chest x-ray and liver scan by CT or ultrasound.⁵⁰ This may help determine prognosis,⁵¹ although there is no evidence that it alters oncologic outcome.

Preoperative identification of liver and/or lung metastases may be useful in:

- frail, elderly patients who may not need resection of a relatively asymptomatic Colorectal Cancer
- patients suspected to have extensive liver metastases (>50% of liver volume) since, in these people, resection of the primary Colorectal Cancer is associated with a high postoperative mortality and morbidity with little benefit⁵²
- identifying a few selected cases where synchronous liver resection may be performed with colorectal resection
- patients with high-risk rectal cancer (T3T4N1) where preoperative chemo-radiotherapy might be considered.

Chest x-ray

Chest x-ray has low sensitivity for pulmonary metastasis, which does not justify its routine use in preoperational staging.

Staging for intra-abdominal and liver metastases may involve one or more of a number of methods. These should be used selectively as they rarely alter the proposed management.

Transabdominal ultrasound

This is often capable of detecting liver metastases, but is not sufficiently sensitive (sensitivity 40–70%) to exclude them.^{53,54} However, it is widely available, relatively cheap and may be used as an initial screening investigation if a CT scan is not readily accessible.

CT scan

Dynamic sequential contrast-enhanced CT scan is 70–80% sensitive in diagnosing intra-abdominal and liver metastases.⁵⁵ Helical (spiral) CT is more sensitive, particularly for small lesions.⁵⁶ Recent guidelines published by the Association of Coloproctology of Great Britain and Ireland have proposed that the ideal preoperative work-up for patients with Colorectal Cancer includes the use of CT.⁵⁷

CT (or helical CT) during arterial portography (CTAP) is the most sensitive preoperative method of assessment, with a sensitivity rate of greater than 90%.⁵⁸ However, histological confirmation is not available in most studies.⁵⁹ CT is, however, hampered by a fairly high rate of false positives due to artefacts and lack of specificity. Usually, these may be clarified by correlation with other imaging or in combination with CT during hepatic arteriography.

Magnetic Resonance Imaging (MRI)

MRI is considerably more expensive, less readily available and no more sensitive than CT scan in a multicentre prospective study on staging for distant metastases.³⁵ There is also no advantage in using both MRI and CT scan in the same patient as far as distant metastases are concerned.³⁵ However, pelvic MRI (see Section 8.2.2) provides superior anatomic information of the pelvis as compared to CT scan.⁵⁶

Intraoperative ultrasound

When combined with surgical palpation of the liver, intraoperative ultrasound is the most sensitive examination for liver metastases. It changes the staging of the disease in 11% of the cases in which it is used. However, the surgical management is rarely altered.⁶⁰

Intraoperative ultrasound does not detect liver metastases less than 5 mm in size, and there is a false negative rate of 15% of patients who later develop overt liver metastases.^{60,61}

Thus even with the most sensitive test for liver metastases, a negative test does not fully exclude occult metastases.

8.2.4 Other investigations

Intravenous urography

Routine intravenous urography is not appropriate because of the low sensitivity.⁶² If clinical or CT scan suggests urinary tract involvement, an intravenous urography may be indicated for further evaluation and for determining function in the other kidney.

Cystoscopy

In rare cases, a large sigmoid cancer might involve the bladder. Urological symptoms such as haematuria, recurrent urinary tract infection, pneumaturia and faecaluria may be present. Cystoscopy and CT scan are complementary in this situation.

Carcinoembryonic antigen

While high preoperative carcinoembryonic antigen (CEA) levels may suggest the presence of occult systemic disease, the test is not sufficiently sensitive or specific to be used for routine staging or for the early diagnosis of Colorectal Cancer.⁶³ (Refer 17.1.2)

Anorectal physiological testing

In elderly patients where there are concerns of possible faecal incontinence following a low colorectal anastomosis, anorectal physiological testing might be a useful adjunctive test, although it has never been demonstrated to predict functional outcomes.

8.2.5 Preoperative medical assessment

The issue of performing routine preoperative screening tests has yet to be clearly resolved. The preoperative assessment aims to (i) identify patient factors that may increase the risk of surgery, (ii) quantify the risk so that decisions can be made regarding a patient's suitability for major surgery, and (iii) to minimise this risk through appropriate strategies. The first step in risk assessment is to obtain an appropriate history and perform a physical examination.

8.2.6 Preoperative stomal therapy consultation

In Australia, one of the aims of intervention by a stomal therapy nurse is that whenever possible, the nurse sees all patients who potentially require a stoma as soon as a decision is made and again prior to their surgery⁶⁴ to mark the site of the stoma.⁶⁵ This has not been subject to randomised controlled trials, but a retrospective qualitative study stated that outcomes of patients who had access to stomal therapy nursing were better than those who had not received this specialist care.⁶⁶ Stomal therapy nurses are a credible authority with the expert knowledge to help patients cope with and adapt to a stoma. They can do this by facilitating education, counselling and support, and by giving a sense of order to the whole process.⁶⁷

The feelings and fears of the patient and the family must be addressed in a suitable setting and with adequate time allowed. Repeat consultations may be necessary to convey information and allow questions.

A study carried out in the United Kingdom shows that 80% of patients who had stomal sites marked by the stomal therapy nurse, but had the site moved by the surgeon, had problems.⁶⁵ A retrospective study carried out in the United States showed that 43.5% of patients who were not sited for elective stomal surgery had problems, compared to 32.5% of patients who were sited preoperatively.⁶⁷ This indicates that preoperative siting by the stomal therapy nurse is beneficial for improved outcomes of patients with stomas.^{68,69} (See Chapter 10.)

All patients who may require a temporary or permanent stoma should be seen by a stomal therapy nurse before the operation where this facility is available.⁶¹⁻⁶⁶

Cancer information service and support groups provide invaluable resources for the patient and their family. Support is also available from each state and territory cancer information service through the Cancer Helpline 13 11 20.

8.3 Fluorodeoxyglucose-positron emission tomography (FDG-PET)

FDG-PET scan has an evolving role in the staging of Colorectal Cancer, especially in the follow up of patients after curative surgery. In patients with clinical suspicion or increased CEA, or if the CT scan is equivocal, FDG-PET assessment is the first choice of imaging. A meta-analysis showed that at equivalent specificity, FDG-PET is the most sensitive non-invasive imaging modality for the diagnosis of colorectal liver metastases compared with MRI, CT scan and ultrasound.⁷⁰ FDG-PET was also more accurate than CT scan and other conventional imaging in predicting resectability.⁷¹ While FDG-PET scan has altered the management of recurrent Colorectal Cancer, its role in primary Colorectal Cancer is currently unclear.⁷²

What role does FDG-PET scan have in assessing recurrent Colorectal Cancer?

Guideline — FGD-PET scan	Level of evidence	Practice recommendation	Refs
FDG-PET scan facilitates management of probable or proven recurrent Colorectal Cancer.	III-2	Recommend	10

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