Modern management of colorectal cancer

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Abstract

Colorectal cancer affects approximately 1:20 of the population and in South Africa is largely managed by general surgeons. Management of this disease has undergone very significant changes over the last two decades. Until very recently, only two academic general surgery departments included a specialist colorectal unit, and this remains so in the majority of our universities. This has resulted in a generation of surgical graduates who are unfamiliar with, and unskilled in current best management practices for this disease. Rectal cancer is particular challenging and attracts extremely high morbidity and mortality, with poor oncological outcomes. Repeatedly, outcome has been shown to be worse in the hands of generalists, rather than specialist colorectal surgeons, of whom there are very few in the country. This review presents the most important advances of the last 20 years and highlights current controversies and frontiers.

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Introduction

Colorectal cancer (CRC) is the second highest cause of death by cancer in the Western world, after bronchus and lung, and followed by breast, pancreas and prostate. Colorectal surgery or coloproctology separated from general surgery in the 1990s, later than many other subspecialties. Audit studies at this time showed that results improved under the management of specialist CRC surgeons, rather than generalists. Uncompromising conclusions were drawn from the study data. These demonstrated that "some general surgeons perform less-than-optimal CRC surgery and some are less competent technically than their colleagues".[1]

While the breadth and sophistication of techniques for benign disease began to increase, there was also a flurry of advances in the management of CRC, both from a surgical and an oncological perspective. When former USA president Ronald Reagan contracted colon cancer in 1985, colonoscopic screening gained importance in that country. The rest of the Western world gradually followed. Screening using colonoscopy, as well as stool testing, was widely accepted as a cost-efficient method with high sensitivity.

In the last 15 years, major advances in CRC management have included:

- Total mesorectal resection (TME).
- Magnetic resonance imaging (MRI), computed tomography (CT) and endorectal ultrasound (ERUS) in CRC staging.
- Preoperative (neoadjuvant) radiochemotherapy.
- Stenting of obstructed colons (still controversial).
- Laparoscopic resection.
- Local excision with transanal microscopic techniques (TEM/TEO).
- Multidisciplinary team assessment.
- Decline of indications for mechanical bowel preparation.

Total mesorectal excision

In the early 1980s, Bill Heald, an English surgeon, demonstrated that the use of TME reduced local recurrence of CRC from 15-30% to less than 5%.[2] This is a demanding procedure of 3-5 hours and requires skill, patience, exceptional assistants, considerable strength and stamina. It is also difficult to teach and learn. Heald showed that metastatic lymph nodes might lie in the mesorectum below the level of the cancer. Thus, the rectum needs to be excised with its mesorectal envelope which contains its regional lymphatics (Figure 1 a and b). This mandated the need for a perfect anatomical resection that would inevitably compromise blood supply to the residual rectal stump and increase the risk of anastomotic leak. Another challenge was to reduce the rate of permanent stoma formation by developing sphincter-saving techniques that require ultra-low resections and colo-anal anastomoses. These anastomoses are created on the pelvic floor, often out of view of the surgical team and utilise a variety of stapling devices that are challenging to use and which require familiarity and practice (Figures 2 a and b). In addition, TME needs to preserve flimsy, vulnerable structures, such as the pelvic nerves that control genito-urinary organs and pelvic floor function (Figure 3). The use

Figure 1a: Complete rectal excision with intact mesorectum

Figure 1b: The lower border of the cancer is seen 2 cm above the distal rectal resection margin, which is encased in its fatty mesorectum

of sharp dissection under vision, rather than blunt finger dissection, has led to the more frequent achievement of the three ideals of rectal cancer surgery: complete cancer resection, preservation of the nerves and a low anastomotic leak rate. The abdominoperineal resection rate, where the anus is sacrificed and the patient has a permanent stoma, has also declined. In a well-serviced patient population, TME requires experienced, properly trained colorectal resectionists.

Magnetic resonance imaging, computed tomography and endorectal ultrasound in colorectal cancer staging

MRI provides optimal images when organs are unaffected by movement or respiration. The rectum is one of these and contrasts well with the fatty tissue of the mesorectum (Figure 4). This facilitates good radiological assessment of tumour penetration and affected nodes. Patients should also undergo an abdominal and thoracic CT scan to assess distant spread. In South Africa, MRI remains considerably underutilised by surgeons in their assessment of CRC. The resultant images are of a far better quality than those that derive from a pelvic CT scan. Also, with practise, they are straightforward to analyse. Like orthopaedic surgeons, experienced rectal surgeons are able to interpret the images

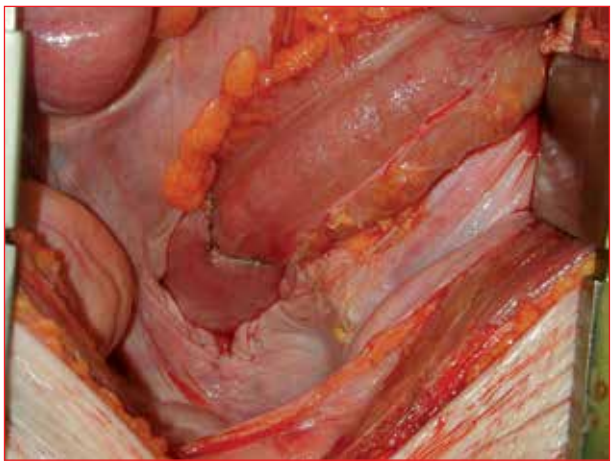

Figure 2a: Abdominal view of a mid-rectal staple line

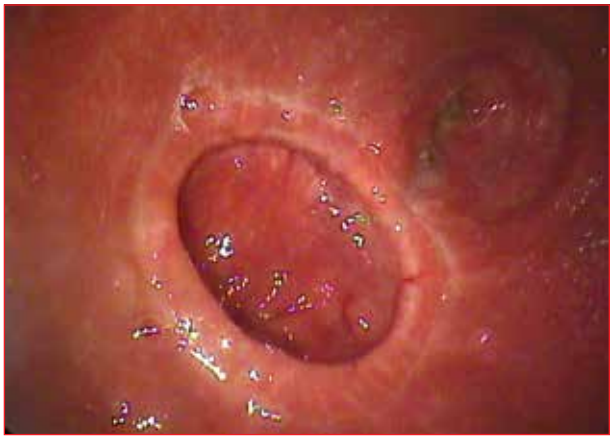

Figure 2b: Endoscopic view of healed stapled rectal anastomosis

Figure 3: Intact pelvic sympathetic nerves after rectal excision

with more clinicopathological insight than radiologists who have little understanding of these aspects of CRC. MRI allows the clinician to decide when preoperative downstaging radiotherapy is appropriate and has been shown to be more accurate than digital examination, even when carried out by experienced colorectal surgeons. Positron emission tomography (PET) scanning has not proved to be of much value in preoperative staging for this disease and is rarely used.

ERUS is difficult to learn and harder to master. But in competent hands, it provides the best images of the layers

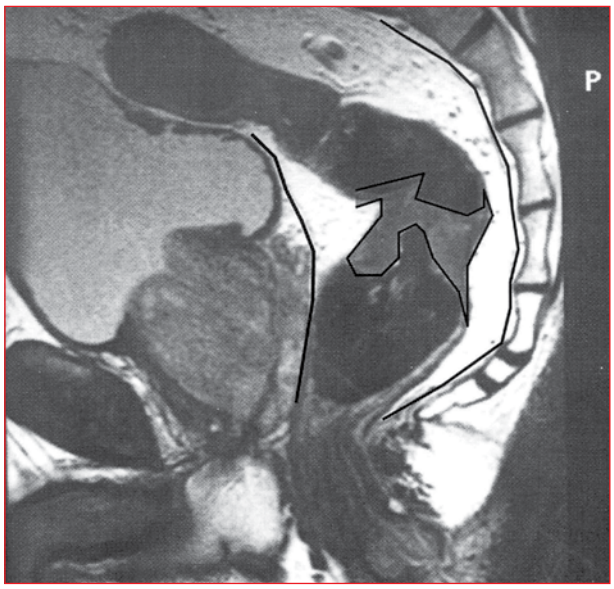

Figure 4: A magnetic resonance imaging sagittal view of low rectal cancer

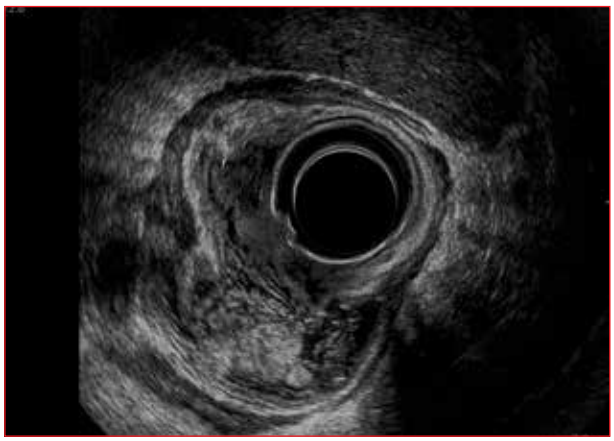

Figure 5: Image generated by endorectal ultrasound. It demonstrates a large noninvasive adenoma

of the rectal wall, thus allowing accurate staging of T0-T2 lesions (Figure 5). Some early lesions may be suitable for local excision. Thus, ERUS has its major application in this important patient subgroup whose cancers require difficult therapeutic decisions.

Local excision

The excision of early-stage rectal cancer via the anus is attractive, especially in patients with significant co-morbidity. Traditionally, this has been a very challenging procedure because of limited access through the anal canal and difficulty with bleeding and diathermy smoke. The tumour is removed piecemeal by using lighted retractors and a diathermy needlepoint (Figure 6). This is slow and tedious. A sucker is in constant use for both blood and smoke. No attempt is made to close the raw area. The patient is given a rectal catheter and is placed on antibiotics for five days.

These difficulties have been overcome by the introduction of transanal endoscopic microsurgery (TEM or TEO) (Figure 7).

Figure 6: A fractured, disorientated specimen after a difficult transanal local excision

Figure 7: Transanal endoscopic microsurgery proctoscope with a 5-mm lens that connects to the monitor

This uses a 4-cm diameter, sealed operating proctoscope through which a laparoscopic telescope and instruments can be passed, allowing controlled and accurate excision with excellent vision and almost no bleeding (Figure 8 and 9). Tumours as high up as 15 cm, and occupying three quarters of the rectal circumference, can be resected with little risk of morbidity. The obtained specimen will not have been traumatised and can be presented to the pathologist in one piece with minimal diathermy artifact, orientated and pinned on a corkboard. It has been introduced into South Africa recently. Our own initial series of 40 excisions has demonstrated these benefits.[3]

Preoperative radiotherapy

Preoperative radiotherapy entered mainstream rectal cancer management approximately 10 years ago for selected tumours. Regrettably, in South Africa it remains rarely used by general surgeons who tend to proceed straight to surgery

Figure 8: Surgeon's view of operating field seen on monitor

and then only refer patients to oncologists for adjuvant therapies on receipt of an unfavourable histology report.

Preoperative radiotherapy plays two roles. First it can be used to shrink a large cancer (T4) that is unlikely to be resectable with clear margins, or it can be used to downstage a T3 (the most common stage) lesion, when the nodal status is uncertain. This has been shown to reduce local recurrence, the most feared complication of rectal cancer because of the inability to excise it. This results in debilitating symptoms which are very difficult to palliate. Usually, T1 and T2 lesions do not require preoperative radiotherapy.

Patients receive between 40 and 50 Gy in two Gy doses, five days a week for 4-5 weeks, including radiosensitising chemotherapy during the first week. Surgery is planned at least eight weeks after completion of radiotherapy. It is becoming increasingly clear that there is an advantage in delaying even longer, probably up to 12 weeks.[4] Thus, the patient only undergoes surgery 4-5 months after starting therapy, a strategy that requires a significant shift away from traditional rectal cancer surgical management by non-specialists.

Radiotherapy can be given in 5 Gy fractions over five days (the so-called 5 x 5 protocol) to selected patients with T3 rectal cancer, but surgery must take place within five days of completion, before the acute phase response has begun.

The rationale in applying radiotherapy before surgery is based on the following:

- It should be applied to well vascularised and oxygenated tissue so that healthy pelvic tissue is better able to recover from its effects than it would do after surgical trauma.
- The implantation of viable cancer cells during surgery will be minimised.
- The small bowel is mobile and above the peritoneal reflection, and not fixed in the pelvis (as is the case after surgery), while its exposure to damaging irradiation will be minimised.

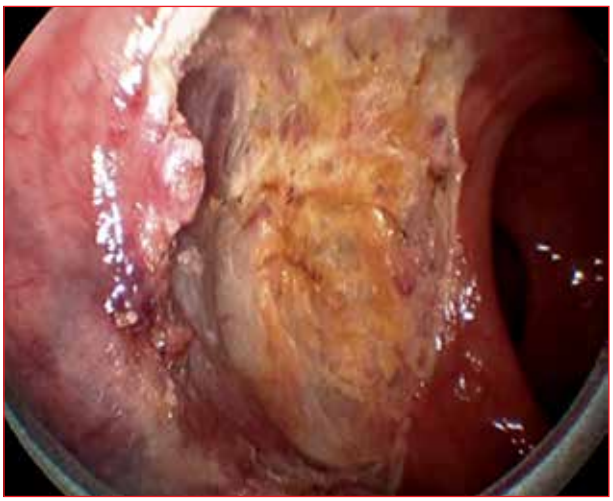

Figure 9: Rectal wall defect after tumour excision. It may be closed with endoscopic suturing

- The neo-rectum, which is derived from the descending colon, will not have been exposed to radiotherapy and will be healthy, pliant and free of any radiotherapy injury.
- Usually, the preoperative patient is well and able to tolerate the demands of radiotherapy treatment.

However, if surgical complications ensue because of an anastomotic leak, for example, patients will become ineligible for postoperative radiotherapy because of the long delay before they are able to tolerate the treatment.

A simple way to conceptualise the role of preoperative radiotherapy is that oncologically it sterilises the tissue at the resection margins, while downstaging the cancer itself. There is a complete oncological response to preoperative radiotherapy in approximately 15% of patients, resulting in a resection specimen with no residual tumour. Whether or not it is safe to simply observe patients whose tumours appear to be complete responders, as assessed by scans and biopsy, is the subject of current research.

In summary, irradiation is more dose-effective when given preoperatively, rather than postoperatively.

Stenting of obstructed colons

Colonic obstruction is a fatal condition potentially. It carries mortality rates 15-22% with emergency surgery. Patients are often in poor condition, elderly and dehydrated and a colostomy is the usual outcome; and is often permanent.

Endoscopic, self-expanding metal colonic stent placement, to relieve left-sided obstructing colon cancers, is used to avoid emergency surgery and may be carried out as definitive palliation or as a "bridge to surgery". In the latter setting, the stent decompresses the obstructed colon (Figure 10), allowing patient resuscitation and optimisation for surgery at a later stage (Figure 11). However, 80% of colonic obstruction aetiology is malignancy, so that many patients who have been decompressed are then found to have metastases or co-morbidity that contraindicates

Figure 10: Abdominal X-ray of a decompressed bowel after stent placement

Figure 11: Resected specimen containing a stent that was used as a "bridge to surgery"

surgery. In this setting, the stent assumes a palliative role, as the patient requires no further surgical intervention and colostomy is avoided.

The stent is deployed over a guide wire via the colonoscope, using fluorescence guidance. It requires training and skill, but a large series from Groote Schuur Hospital has illustrated its facility in a local setting.[5] The concern of tumour perforation by the stent remains a debate, but it is a valuable alternative if the expertise exists.

Laparoscopic colorectal cancer surgery

Laparoscopic colorectal cancer surgery has potential advantages, including less pain, a shorter hospital stay, a quicker return of gastrointestinal function, better cosmesis, less adhesions and fewer wound problems, such as an incisional hernia. However, these must be weighed against greatly increased theatre time and equipment costs. The use thereof also features a very long learning curve, even for surgeons who are experienced in other laparoscopic operations. An example is laparoscopic total colectomy which substitutes a full length abdominal incision for a short suprapubic one, but requires more time, cost and a long learning curve (Figures 12-14).

An advantage of laparoscopic surgery is that abdominal operations in high body mass index subjects are easier laparoscopically than via laparotomy, for example, cholecystectomy, fundoplication, appendicectomy and adrenalectomy. However, this does not apply in colorectal surgery, where laparoscopy is significantly more difficult than open surgery in overweight patients, and also has the difficulties of fragile mesenteric fat and vasculature, the challenge of retracting of the omentum and small bowel out of the operation field and a high variability in organ length and flexure anatomy. Also, the construction of intra-abdominal anastomoses requires expensive stapling devices.

Data from large centres show only modest short-term benefits, and stress the importance of expert laparoscopic colorectal cancer surgeons to achieve these results. Modest outcome data from large multicentre trials, for example conversion rates above 20%, are often criticised by laparoscopic enthusiasts. The participating surgeons are disparaged for not being sufficiently skilled, even when they are based in specialist colorectal units where the surgery and equipment is of a higher standard than that found among general surgeons in South Africa.

Laparoscopic colorectal cancer surgery must demonstrate real clinical benefits, such as improved negative radial margin rates, adequate lymph node yields and the sparing of pelvic nerves with improved sexual and pelvic floor function (Figure 3). It should not be implemented solely for the marginal benefits of a smaller incision, fewer hernias, magnified views of the pelvis or minimal tumour handling.

Surgeons in developing nations who wish to introduce laparoscopic colorectal cancer surgery must ensure that delivery of cancer surgery of good quality is the primary goal. The need for high-quality, properly resourced laparoscopic training facilities must be recognised. Instead of laparoscopy, the priority should be to ensure that patients with rectal cancer are managed by colorectal surgeons, rather than general surgeons who are untrained in TME and in the use of neoadjuvant therapies. Once achieved, logical progression to laparoscopic colorectal cancer surgery can take place. Existing laparoscopic colorectal cancer surgery, as practised by general surgeons, is only likely to discredit this type of surgery, increase costs and foster standards that encourage mediocrity, rather than excellence. Good open surgeons should continue with good open surgery.[6]

Bowel preparation

The need for bowel preparation in colorectal surgery has long been questioned. It causes dehydration and starves the patient in advance of major surgical trauma. Electrolyte

Figure 12: Specimen delivery through a suprapubic incision after laparoscopic total colectomy for megacolon

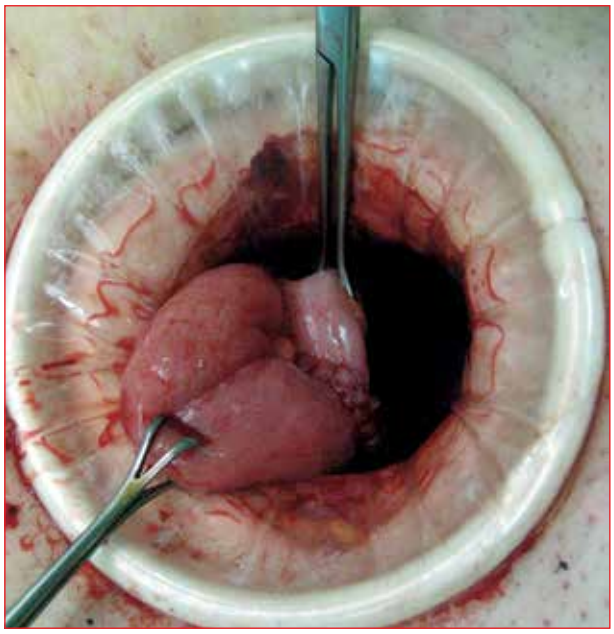

Figure 13: Handsewn ileorectal anastomosis and wound retractor

Figure 14: The postoperative abdomen

and fluid shifts have been proven to be effective. The colon is seldom completely clean and the liquid residual stool is left to challenge the new anastomosis. A large body of evidence has shown that avoidance of mechanical bowel preparation does not lead to an increase in complications, such as anastomotic leak and reduced bowel preparation-associated morbidity.[7] Patients prefer it too. The data are unequivocal for colon surgery. Some reservations remain with regard to low rectal anastomoses.

Multidisciplinary team assessment

This review has illustrated the need for numerous disciplines in CRC management. The multidisciplinary team approach recognises this and usually takes the form of a regular meeting at which patients are assessed by a colorectal surgeon, radiation oncologist, radiologist, pathologist, stomaltherapist or colorectal nurse specialist. The weekly CRC meetings at Groote Schuur Hospital are one of the oldest in the world, dating back to the 1970s. This is harder to achieve in private practice, but the surgeon needs to ensure that he has access to his own team of CRC-orientated specialists in order to provide consistent opinion, reliable communication and a team approach.

Conclusion

Colorectal cancer is the most common cancer killer after lung cancer. Its management has been significantly improved by recent advances, but many of these have still not been incorporated into South African surgical practice. There are less than 10 registered colorectal surgeons in the country. Currently, a CRC patient deserves consideration for MRI scanning, preoperative radiotherapy, TME, stenting when there is acute obstruction, laparoscopy, or local excision with TEO in selected situations, avoidance of bowel preparation and evaluation via a multidisciplinary team approach. There have been considerable improvements in stomal therapy and fistulous wound management as a result of the introduction of colorectal nurse specialists. These colleagues also provide an essential preoperative counselling service. Two other areas of real advance have been the growing acceptance of routine colonoscopic screening and the development of routine metasectomy surgery, particularly in the liver, and also in the lung. While only a small number of patients are suitable for this surgery, it has led to more structured follow-up programmes that have sought to identify resectable secondaries.

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