Advances in the treatment of malignant large-bowel obstruction

Most cases of large-bowel obstruction are due to colonic adenocarcinoma.

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Colonic adenocarcinoma accounts for the great majority of cases of large-bowel obstruction, and this potentially lethal condition presents a difficult management problem for the attending doctor.

Unrelieved colonic obstruction from any cause leads to a predictable series of sequelae. Large amounts of fluid and electrolytes (especially sodium and potassium) can accumulate within the bowel, leading to intravascular depletion and shock. As the bowel distends, increasing pressure may lead to mucosal ischaemia, which can cause the barrier function of the mucosa to fail, resulting in translocation of bacteria into the bloodstream and systemic sepsis. As congestion and impaired perfusion of the gut wall worsen, transmural ischaemia may develop, ultimately leading to perforation and faeculent peritonitis. Once perforation occurs, the prognosis worsens considerably, with mortality rates around 30 - 40% typically being quoted.

The immediate priorities in the treatment of colonic obstruction are therefore fluid resuscitation and relief of the obstruction, with resection of the tumour and restoration of intestinal continuity (if possible) being important but not urgent goals of treatment.

Left versus right-sided colonic obstruction

Obstructing lesions of the left (distal) side of the colon present the surgeon with a more complex problem than lesions of the right (proximal) side. The standard operation for an obstructing lesion of the ascending colon would be a right hemicolectomy and primary anastomosis. This is a relatively small and technically straightforward operation, and an anastomosis between normal terminal ileum and normal, collapsed colon downstream of the resected bowel can be performed, which carries a low risk of breakdown and leakage.

In contrast, resections of left-sided colonic lesions are more difficult, and one is faced with the decision of whether to do an anastomosis

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using abnormal, dilated colon containing large amount of faeces in a patient who may be in a poor general condition. Concerns about the possibility of anastomotic leakage in this setting, and attempts to diminish this risk, have led to a number of surgical strategies for this problem. Until recently, the available options all involved operations, described as one-, two- or three-stage surgery.[1]

Three-stage surgery

Until the 1970s there was broad agreement that this was the only safe approach to left-sided colonic obstruction. At the initial operation, a loop colostomy is fashioned proximal to the obstructing tumour (which is left *in situ*) in order to decompress the bowel. This is a small, quick operation that in extremely ill patients may even be performed under local anaesthetic, and deals with the immediately life-threatening problem. Some time later, once the patient's general condition has been optimised, a second operation is performed to resect the tumour, and an anastomosis is done. The previously fashioned colostomy serves to divert the faecal stream proximal to the anastomosis. The final-stage operation, undertaken a few months later, is to close the stoma. The disadvantages of this approach were that the patients required repeated surgery, all had stomas and a significant proportion (about 25%) never had their stoma closed.

Two-stage surgery

Later it became increasingly common for surgeons to perform a resection of the tumour, oversewing the rectal stump, and fashioning an end colostomy (Hartmann's procedure) as the initial operation. The patient could then be brought back to theatre at a later date to close the stoma. This led to shorter hospital stays than the three-stage procedure, but possibly even more patients (up to 60% in some series) never had their stoma closed.

One-stage surgery

It recently began to be widely accepted that resection of the tumour and primary anastomosis could safely be performed on obstructed bowel. The obvious advantages of this approach are that the patient is spared a stoma, and needs to undergo only one operation. There are two commonly employed strategies for this approach: either segmental resection of the bowel containing the tumour followed by on-table lavage of the upstream bowel prior to anastomosis; or else a subtotal colectomy is performed (in other words the tumour and all colon proximal to it is resected), and the terminal ileum is anastomosed to the colon or rectum downstream of the tumour. One randomised trial has compared these two approaches,[2] and found them to be equivalently safe, but that long-term bowel function was worse in the subtotal colectomy group. There are circumstances where a subtotal colectomy may be preferred, such as in more proximal tumours, and in patients where there is a higher chance of synchronous or metachronous tumours (such as young patients or those with a strong family history). More recently, the necessity of on-table lavage (a time-consuming procedure which, if done incorrectly, can lead to disastrous peritoneal soiling with faeces) has been questioned, with simple decompression of the bowel prior to anastomosis being advocated. There is probably little to choose between these options, but it is important to understand that all are technically extremely demanding even for experienced colorectal surgeons, and are major operations to embark upon in a haemodynamically unstable, sick patient.

Stenting of left-sided colonic lesions

Perhaps the most significant recent advance in emergency colorectal surgery has been the advent of self-expanding metal stents, which allow non-operative decompression of obstructing lesions. These are similar in design to biliary, vascular and other types of stent. They are essentially wire mesh tubes, constructed in such a way that they can be deployed through a narrow lumen, and then slowly expand. They are used in two settings – to provide palliation in incurable patients, and as a 'bridge to surgery' in those with potentially resectable disease.

Palliative stenting

About 25% of patients with obstructing colonic malignancies will have incurable metastatic disease at the time of presentation.[3] In this group of patients, the goal of therapy is to relieve their obstruction in order to palliate this extremely painful symptom, ideally in as non-invasive a way as possible. Colonic stenting offers palliation that is effective in about 90% of cases, and durable, with the majority of patients remaining unobstructed until death from metastatic disease.[4,5] The advantages of this approach are that the patient avoids an operation, which in this setting carries significant morbidity and mortality, and can avoid a stoma.

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'Bridge to surgery'

Patients with curable malignant obstruction may also benefit from stenting. In this setting, emergency stenting allows the patient to have his bowel decompressed quickly, after which an elective colonic resection with primary anastomosis may be more easily and safely done once the patient's fluid and nutritional status have been improved, and the operation can be done on undilated bowel. It is also worth bearing in mind that often we do not know for sure if metastases are present at the initial emergency presentation, and stenting allows time for accurate staging to be done. A number of these patients are then found to have incurable disease, and the stent becomes the definitive palliative procedure.

Safety

The very best single institution mortality rate for emergency surgery for colonic obstruction is 3%,[6] but this is not typical of most surgeons' experience worldwide, with mortality rates around 10 - 25%[7,8] reported in various series.

Put into this perspective, colonic stenting has been found to be remarkably safe. In a large systematic review of 29 case series[4] there were a total of 3 deaths out of 598 patients undergoing stenting (< 1%). Two of these patients died after perforation of the bowel during stent insertion, which is the most dangerous complication of this procedure. Among the large published series of colonic stenting, the mean rate of bowel perforation is 4%, with a range of 0 - 16%.[4] The other rarer reported complications include tenesmus and anal pain in patients with rectal stents. A meta-analysis of studies (most non- randomised) comparing stenting with surgery for malignant large-bowel obstruction[9] found a significantly lower mortality rate, fewer complications, and shorter hospital stay in the stented group, even though in many cases the sicker patients were probably the ones selected for stenting.

Technique

Once malignant large-bowel obstruction is suspected clinically and on plain X-rays (Fig.1), the diagnosis should be confirmed, and the level of obstruction identified, using a single contrast enema (Fig. 2), contrasted CT scan or flexible endoscopy. Where contrast is used, if one is considering stenting as therapy, it is important to use a water-soluble contrast rather than barium, as the latter is not easily cleaned out of the bowel, and can significantly impair endoscopic visualisation of the lesion.

Fig. 1. The typical X-ray appearance of large-bowel obstruction.

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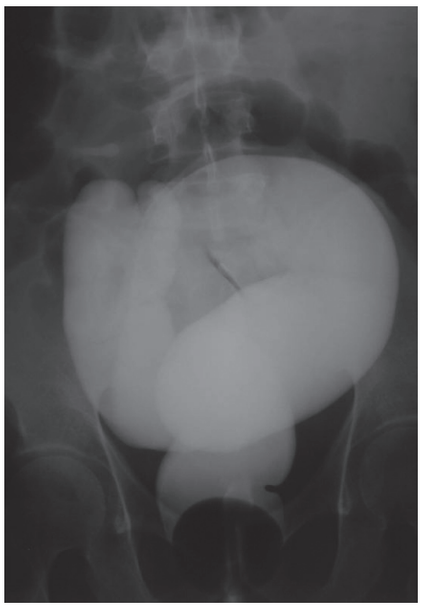

Fig. 2. The gastrografin enema of the same patient, showing obstruction at the level of the proximal sigmoid colon.

A colonoscope is introduced into the bowel via the anus, and the obstructing tumour visualised by the endoscopist. A guidewire (Fig. 3) is passed down the scope and through the narrowed lumen of the bowel, and a catheter passed over the wire. Contrast is then injected through the catheter in order to confirm its position within the lumen of the bowel, and to identify the upper limit of the tumour. The stent is then railroaded over the guidewire across the lesion (Fig. 4) and deployed using a specialised delivery system. This is all done under radiological screening.

Once *in situ*, it slowly expands, creating a 1-2 cm lumen. If successful, decompression is usually rapid and dramatic, with almost immediate relief of symptoms (Fig. 5).

Which procedure is most appropriate?

There seems to be little doubt that stenting is the treatment of choice in the palliative setting, as it offers the patient minimally invasive and durable palliation without a stoma, with as little time as possible spent in hospital and recovering from surgery. It is also a cost-effective form of treatment – although the stents themselves are expensive (several thousand rands), this is considerably less than the cost of an operation.

In the 'bridge to surgery' group of patients, the advantages of stenting are less clear, as the patient will ultimately require surgery. A multicentre randomised trial is currently attempting to clarify this issue, but on current evidence, stenting appears to be the best way of allowing later one-stage surgery to be done safely.

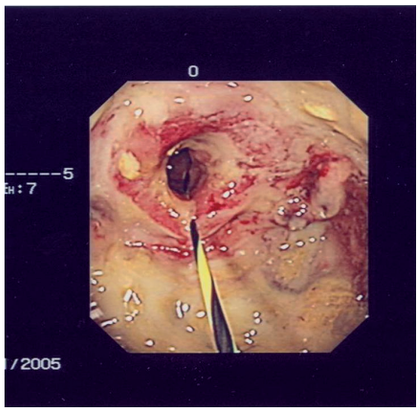

Fig. 3. A guidewire being introduced through an obstructing lesion (the lumen is about 2 mm in diameter).

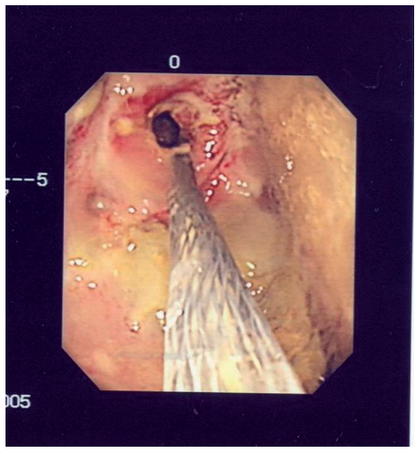

Fig. 4. The stent is placed through the lesion, railroaded over the guidewire.

Fig. 5. The stent has been deployed. Note the hourglass shape of the stent, with the neck across the lesion, and the colon has markedly decompressed.

Indeed, we would argue that colonic stenting should be the first-line treatment of left-sided malignant colonic obstruction, with surgery reserved for those patients where there is clinical suspicion of bowel infarction or perforation (evidenced by peritonitis, acidosis or signs of sepsis) or where stent placement is unsuccessful. This has become the standard approach at our institution.

While colonic stenting and single-stage surgery without stoma formation may be regarded as the ideal standard of care in malignant colonic obstruction, one must take into consideration the available surgical expertise when recommending an appropriate treatment strategy for these patients. Stenting is not widely available in South Africa, requiring radiological and endoscopic equipment, and specialised skills to perform the procedure, and few centres see these patients in sufficient numbers to allow these skills to be readily acquired.

Similarly, single-stage emergency surgery for colonic obstruction is not always appropriate. In South Africa, a large amount of emergency surgery is, by necessity, performed by medical officers without advanced surgical training. In this situation we believe it would be unwise to advocate the single-stage operations, which are technically demanding, time-consuming, and carry the risk of anastomotic leaks. It is probably safest, if one has limited colorectal surgical experience or the patient is haemodynamically unwell, simply to bring out a diverting colostomy and refer the patient to a specialised centre for definitive surgery. Although the treatment of malignant colonic obstruction has advanced over the years, the logic of the old three-stage procedure still stands. It should also be stressed that decompression of obstructed bowel by whatever means, and not resection of the tumour, is the urgent and life-saving surgical priority.

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In a nutshell

- Malignant colonic obstruction carries a high mortality rate.
- The priorities of treatment are fluid resuscitation and decompression of the upstream bowel.
- Right-sided obstructing lesions are usually treated by a right hemicolectomy and primary anastomosis.
- Colonic stenting offers a safe, minimally invasive approach to decompressing the obstructed colon.
- Colonic stenting may be done as definitive palliation, or as a 'bridge to surgery'.
- Several operative strategies exist for left-sided colonic obstruction, and the choice of procedure depends on the general condition of the patient, and the surgeon's experience.
- In an unstable patient, or when the surgeon is inexperienced in major colonic surgery, a defunctioning colostomy is a safe option for emergency decompression of the bowel.