Leading article

Towards safer colonoscopy

Although colonoscopy was slow to become an established procedure, increasing experience in the United Kingdom and elsewhere has helped dispel widely held views that colonoscopy is an especially difficult technical procedure. Successful and safe colonoscopy requires basic endoscopic expertise, anatomical knowledge, and sound clinical judgement. Manipulative skill, patience, and the ability to cope with any complication are a prerequisite. In experienced hands and in a well organised unit colonoscopy now seldom takes more than 15-20 minutes, radiographic screening is rarely necessary, although perhaps helpful to have available, and stiffening devices are a thing of the past. With the benefits of light sedation and analgesia, and lying comfortably in one position, most patients, especially the elderly, express a preference for colonoscopy to a double contrast barium enema.

The report in this issue by Macrea and colleagues on complications encountered in 5000 colonoscopies is the first to be published from a single unit and represents substantially the work of one endoscopist. The period covered from January 1971 to January 1980 includes the 'learning phase' of both intubation and polypectomy procedures using the early colonoscopes. It is not surprising therefore that the authors emphasise (although they do not show us the data) a decline in the complication rate over the later part of the series, which they attribute to their earlier experiences and improvements in instrumentation. A similar correlation between the complication rate and experience of the examining endoscopist has been well documented in both the American Society for Gastrointestinal Endoscopy¹ and German² series. Four major reviews of the complications of colonoscopy have been published in recent years¹⁻⁴ from which broad lessons may be learned and recommendations made.

The hazards of preparation include fluid and electrolyte imbalance. Although fluid overload may occur, dehydration and hypovolemia are more common especially with hypertonic solutions. Mannitol provides excellent bowel preparation but because of its potential to cause gas explosion⁵ should never be used when electrosurgery is contemplated unless carbon dioxide is used for bowel insufflation. Recently metronidazole and tetracycline given orally for 48 hours before mannitol has been shown to reduce viable bacterial counts with a concomitant reduction of both hydrogen and methane to very low levels.⁶ An inert osmotic electrolyte solution containing polyethylene glycol has recently been described^{7,8} which may prove a more suitable alternative to mannitol.

The most widely used medications include intravenous diazepam which may be associated with apnoea especially in the elderly and when administered too rapidly. Thrombophlebitis and rarely pulmonary embolism may occur although these risks may be reduced by the use of

diazepam emulsion (Diazemuls®). Combination with pethidine may be associated with respiratory depression, hypotension, nausea, and vomiting. Light sedation and analgesia is preferable as patient cooperation is improved and pain more readily felt, thus providing a warning to the endoscopist. General anaesthesia is unnecessary and should be avoided except in rare cases in children or uncooperative patients.^{2 3}

Colonoscopic procedures may result in transient bacteremia⁴ but bacterial endocarditis has not been reported. Antibiotic prophylaxis is probably wise, as Macrea and colleagues suggest, for patients with a prosthetic heart valve and those with depressed immunity or chronic liver disease, although there is little hard data to support this approach. Careful technique avoids force, uses minimal air insufflation, maintains a 'straight' colonoscope and continuous luminal visualisation. If pain is felt air should be aspirated and the instrument withdrawn a few centimetres before further intubation is attempted. Abdominal compression by the assistant's hand will often help to reduce a sigmoid or transverse colon loop and aid advance of the instrument tip within the lumen.¹¹

Haemorrhage is a rare complication of diagnostic colonoscopy occurring in 0.04%.⁴ Bleeding is usually unseen and intra-abdominal, resulting from excessive force during manipulation. The source may be a seromuscular tear,¹² rupture of the liver,¹³ spleen,¹⁴ or mesentery.³ It is especially important, therefore, to ascertain a previous history of bleeding diathesis or anticoagulant therapy before proceeding with colonoscopy.

Perforation during diagnostic procedures occurs in 0.21%⁴ and may result from direct force by the colonoscope tip or shaft, instrumentation with accessories, pneumatic pressure, or any combination of these.¹ Perforation is more likely in patients with adhesions, severe diverticular disease or a strictured segment of bowel. Overt perforation by the colonoscope may be immediately apparent but rupture into the retroperitoneal space or gas within the bowel wall may be less readily recognised. While frank perforation may be managed with minimal morbidity and mortality by prompt surgical intervention,¹⁵ benign pneumoperitoneum¹ and intramural gas¹⁶ may be successfully managed conservatively.

More commonly encountered problems include a vasovagal reflex, such as Macrea and colleagues describe, and also the postcolonoscopy distension syndrome^{1 3} which may be most distressing to the patient. Both may be associated with excessive air insufflation especially if sigmoid diverticular disease or a stricture is present when the introduction of air should be kept to a minimum. Carbon dioxide gas is readily absorbed and is a valuable alternative in this situation.⁴ Various ECG changes have been reported to occur during colonoscopy¹ and patients with known cardiac disease should be carefully assessed before and monitored during this procedure. Patients with a demand pacemaker should be monitored during electrosurgery, when the return plate should be placed well down the thigh and the pacemaker converted to the fixed rate mode.⁴

The majority of complications occur as a result of polypectomy procedures. It is wise to obtain consent for polypectomy before any colonoscopy procedure is started in case an unexpected polyp is encountered. The endoscopist should have a thorough knowledge of his equipment which should be carefully checked before intubation. Backup

accessories including additional snares should always be available. Skill and ability to cope with possible problems are especially important in this setting. It does well to remember that the poor risk patient, in whom one is perhaps endeavouring to avoid major surgery, will always do worse after laparotomy, if that becomes necessary.

When a lesion is identified the colonoscope should be manipulated to obtain the best possible view, and any fluid bowel contents aspirated to 'dry the field'. Snare function should be ensured within the lumen before the polyp is snared just below the head of the lesion, to leave a residual pedicle. The power setting in relation to the size of the stalk is important¹⁸ and coagulation and transection should be performed under direct visualisation. It is important to avoid rapid 'cheeseparing' of the stalk which may result in haemorrhage because transection occurs before adequate coagulation. This is more likely with a fine wire snare. With large polyps, which may be in contact with the opposite wall of the bowel, the polyp head should be moved forwards and backwards during coagulation to avoid a contralateral burn.

A difficult complication, especially with large polyps, is incomplete polypectomy because of an incarcerated snare wire. This may occur with braided wire snares, when the current density is too low or the coagulation to cutting power ratio too high. The situation may require removal of the snare handle and withdrawal of the colonoscope, reintubation and the passage of a second snare and an attempt at repeat polypectomy. Alternatively, piecemeal polypectomy has been recommended initially for such large lesions^{19 20} or surgery may be contemplated.

Haemorrhage after polypectomy occurs in 1.7 to 2.4%⁴ and may be primary or delayed in a ratio of three to one. It is usually a consequence of inadequate coagulation resulting from either too little or too much power and is most common with a large polyp and thick stalk. A coagulation defect is occasionally contributory. Although most cases of bleeding can be managed expectantly with transfusions it is wise always to visualise the polypectomy site after transection before retrieving the polyp. In the event of immediate haemorrhage the bleeding site should be resnared (hence the advice to leave a pedicle whenever possible) and held tightly for 10 minutes without further coagulation. If current is applied the snare may become embedded in the pedicle. With less bleeding 1/10 000 adrenaline, 5 ml in 50 ml of iced water may be flushed over the bleeding site.¹⁸ Selective angiography with vasoconstrictor infusion has also been described¹⁹ although no series reported. If the transfusion requirement exceeds four units of blood surgery should always be considered.

The incidence of perforation is higher after polypectomy or coagulation than diagnostic procedures, and occurs in 0.29 to 0.42%.⁴ It may be immediate or delayed and is usually because of too high a power setting. The risk is increased during removal of a sessile polyp when a false pedicle is created and excessive traction may increase this risk. Pain during polypectomy suggests a transmural burn and delayed perforation may follow.²⁰ Silent perforation may also occur.²¹ Laparotomy and repair of perforation should follow established diagnosis.¹⁵ Conservative management is reasonable when the patient is asymptomatic or experiences the postpolypectomy coagulation syndrome of abdominal pain, fever, and leucocytosis without evidence of perforation.^{1 20} This

occurs when non-perforating transmural coagulation extends to the serosal coat.

Two recent series have suggested that mucosal angiodysplasia may be successfully managed by colonoscopy, when coagulation biopsy can both confirm the diagnosis and provide effective therapy.^{22 23} The complication rate is low and much less than the morbidity and mortality of surgery for vascular abnormalities in the age group affected.²⁴ It is in the management of colonic polyps, however, that the most significant benefit for colonoscopy is shown. Transabdominal colotomy and polypectomy carries a morbidity of up to 20% and mortality of 1.3%²⁵ compared with colonoscopic polypectomy which has a morbidity of 2.01% and mortality of 0.05%.¹³

Macrea and colleagues emphasise that risks should not be undertaken with possible malignant lesions. The colonoscopist cannot determine if a polypoid lesion harbours malignancy until it has been retrieved for histological appraisal. The management of malignant polyps is based on the policy of local excision described by Morson, Bussey, and Samoorian.²⁶ The criteria for colonoscopic removal include: a lesion with sufficient pedicle, no lymphatic invasion by malignancy, no malignant invasion at the line of excision, that the malignancy is well differentiated, and the patient a poor surgical risk. It has been our policy to re-examine patients from whom a malignant polyp has been removed at six weeks, six months, and one year initially, to exclude incomplete removal or local recurrence. The patients are examined annually thereafter.²⁷

The reviews of complications published to date have all been retrospective and it is unlikely that all clinically relevant complications have been reported. A prospective study of colonoscopic complications undertaken by the American Society of Gastrointestinal Endoscopy will report on approximately 7000 colonoscopies in May of 1983 and their results will be awaited with interest.

Complications of gastrointestinal endoscopy have been remarkably few considering how many endoscopists have had little or no formal training. The era of self-teaching by 'trial and error' is, however, no longer acceptable with excellent endoscopic teaching opportunities now available. Colonoscopic procedures are relatively simple and safe and can be readily learned under the guidance of an experienced tutor. After performing some 50 colonoscopies under supervision the novice can expect his potential complication rate to fall^{2 28} but a continuing regular colonoscopy list with at least six patients a week is probably important to maintain and improve expertise.

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