MEDICAL PRACTICE

Hospital Topics

Examination of the Whole Colon with the Fibreoptic Colonoscope

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Summary

During examination of the intact colon with the Olympus CF LB 185-cm colonoscope it has proved possible to reach the caecum or terminal ileum in 47 out of 50 cases (94%). Careful bowel preparation, moderately heavy sedation, and some x-ray screening are necessary for the procedure, but it was well tolerated by all patients and there was no morbidity. The average time taken to the caecum was 40 minutes and the average time to completion of examination 90 minutes. The long colonoscope was as convenient to use as the fibresigmoidoscope in examinations confined to the sigmoid colon or in patients with a colostomy, ileostomy, or ileorectal anastomosis. Of the two, the long colonoscope is the instrument of choice for clinical use.

Because of the expense, time, and equipment involved colonoscopy appears to be best offered as a specialist service after x-ray studies. There is also a limited place for colonoscopy during abdominal surgery, when it is technically an easier procedure. In this series 10 patients were saved exploratory laparotomy by examination with the colonoscope, and we also diagnosed four resectable carcinomas not seen on double-contrast barium-enema studies. The colonoscope provides an effective new means of diagnosis of lesions throughout the colon.

Introduction

Since the introduction to Britain in 1969 of the fibreoptic colonoscope there have been reports by Dean and Shearman¹ and Salmon *et al.*² on the use of the 70-cm fibresigmoidoscope and by Fox³ on the 110-cm colonoscope. The use of these instruments is usually confined to the left side of the colon. We report here our experience using a longer instrument, the Olympus CF LB 185-cm colonoscope, to examine the whole colon in 50 consecutive patients.

Present Study

DESIGN OF INSTRUMENT

The design of the 185-cm colonoscope is essentially similar to that of the 70-cm fibresigmoidoscope (Olympus CF SB) described previously. Proximal four-way control of the tip allows flexion to 120° in any direction, an essential facility since rotation of the whole instrument becomes impracticable after passage of a number of bends in the colon. There is finger-tip control of air or water insufflation and suction. Flexible biopsy forceps 220-cm long are provided, and we have used a stiffening wire (20-gauge piano wire) 190-cm long. The equipment was mounted on a modified trolley including a suction pump (Edwards 1SP 30C). A side viewing attachment (Olympus S.L.E.) is invaluable for co-ordination between the assistant inserting the colonoscope and the operator, and also for teaching.

PREPARATION OF PATIENT

One-third of the present patients were examined as outpatients. Preparation was the same for both inpatients and outpatients and gave excellent results in 90% of cases. For

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other examinations confined to the left side of the colon we used two enemas administered four hours and one hour before colonoscopy, but for examination of the whole colon more vigorous preparation is needed. All patients were asked to follow a strict low-residue diet without vegetables or meat for two days. On the afternoon of the second day any patient without inflammatory bowel disease was given a single 30-ml dose of castor oil, and after this only liquids were allowed. A Veripaque (oxyphenisatone) enema (1 g/l., 1,500-2,500 ml volume) was administered about two hours before examination on the third day. In patients with inactive inflammatory bowel disease magnesium sulphate was given until the stools became liquid and a saline enema (up to 1,800 ml) was administered two hours before examination. For patients with active inflammatory bowel disease and fluid diarrhoea one day on a liquid diet and a saline enema was usually adequate preparation.

MEDICATION

Our early experience without using sedation showed that in most patients the combination of air distension of the colon and distortion of bowel loops caused moderate to severe discomfort at some stage of the examination. We therefore routinely used moderately heavy sedation. Diazepam (10-20 mg) was given by slow intravenous injection until the patient appeared drowsy, then the same dose of diazepam and 50 mg pethidine were given intramuscularly. Patients given this combination of drugs were usually asleep during the early stages of examination but were able to wake and co-operate fully when necessary and remained sensitive to pain. They were invariably fully conscious by the end of the examination and could be escorted home within two hours of its completion. No patient was distressed or unwilling to undergo re-examination if necessary. Antispasmodics were not used in this series.

TECHNIQUE

Colonoscopy was performed on an x-ray table with image intensification facilities. X-ray screening was used for a few seconds at a time to determine the position of the instrument but was not used to control its onward movement.

The colonoscope was inserted with the patient in the left lateral position, and the position was thereafter varied as necessary. Often passage through the sigmoid colon was assisted by change to the prone position. Palpation of the abdomen or the "alpha manoeuvre" of the looped sigmoid colon described by Tajima⁴ was not found helpful.

Two operators are essential for the examination. One controls the colonoscope and the other views through the side-arm and advances or withdraws the instrument as instructed. Where possible the tip is steered down the lumen of the bowel under direct vision. At times it is necessary to advance the instrument blindly. Such advance is safe so long as the mucosa is seen to be moving past the tip of the instrument and retains its normal colour without blanching or until the patient complains of discomfort. During blind passage of the instrument side-to-side movements of the tip may ease its passage. When advance becomes impossible under direct vision it is helpful to check the position of the instrument by x-ray screening. If a loop has formed Dehyle and Demling's⁵ technique of hooking the tip to anchor it and withdrawal of the instrument will normally straighten the bowel and allow further progress. It is sometimes necessary to repeat this manoeuvre several times. After straightening the bowel insertion of the stiffening wire down the biopsy channel prevents reformation of a redundant loop. Because of this loop formation the length of colonoscope inserted is no guide to the anatomical position of the tip, which must when necessary be determined with x-ray screening (see Illustrations). Furthermore, in some cases insertion of up to 165 cm of colonoscope may be necessary to reach the caecum but 75 cm can then be withdrawn, the tip remaining stationary.

Once in the caecum, if it is difficult to identify the ileocaecal valve efflux of the contents of the distal ileum can be encouraged by a hot drink and by giving metoclopramide 10 mg intravenously. If difficulty is experienced in passing the instrument through the ileocaecal valve the biopsy forceps can be inserted ahead of the tip to act as a guide. The biopsy forceps require lubrication with silicone fluid for easy passage down the instrument but because of their length each biopsy may take several minutes. The opened forceps can be used as a measuring guide.

A full view of the colon is not usually obtained during insertion of the instrument, and scanning of the bowel is best performed during withdrawal. Despite air insufflation and rotation of the tip about 5 to 10% of the mucosa may not be seen where haustration is severe or at acute flexures.

Different courses taken by the 185-cm colonoscope in reaching the caecum.

OPERATIVE COLONOSCOPY

The colon must be fully prepared as above. A large abdominal incision is necessary before the surgeon can assist passage of the instrument by manipulating it round flexures. The use of muscle relaxants and the loss of normal intra-abdominal pressure renders the bowel unusually distensible and difficult to examine fully. Thus even though the caecum is quickly reached (10 minutes in this series) appreciable time is required for thorough examination of the colon. In our experience colonoscopy is best performed in the preoperative period, although local areas of bowel can easily be examined at operation.

SELECTION OF PATIENTS

Patients were selected for examination because diagnostic doubt remained after double-contrast barium-enema investigation. The indications for examination were most commonly unexplained rectal bleeding, the presence of possible polyps or other lesions on x-ray pictures, and the investigation of certain cases of inflammatory bowel disease where it was judged clinically desirable to visualize the right colon. A further 60 cases preselected for limited examination were not included in this series.

Results

It was possible to examine the whole colon in 47 (94%) of the 50 patients investigated. The average time taken to reach the caecum was 40 minutes (range 5-120 minutes) and the average time for full examination 90 minutes. Even with experience the speed of the examination was not greatly reduced and depended largely on the character of the individual colon. Passage through the short, thickened colon of a patient with chronic colitis is achieved in a few minutes, while the combination of a lax transverse colon with acute splenic and hepatic flexures in other patients can require over an hour of manipulation under heavy sedation before the ascending colon is reached. Once the caecum has been reached about 20 minutes is required for inspection of the colon during withdrawal. In occasional patients full colonic examination and the removal of multiple biopsy specimens may take up to three hours. The ileocaecal valve is often surprisingly difficult to locate in the caecum and we saw the valve in only 10 patients. In five of these patients, where there was a clinical indication to do so, the instrument was passed into the ileum.

Fifteen patients were examined because of rectal bleeding not explained by double-contrast barium-enema examination and a lesion was found in five (carcinoma 2, polyps 2, colitis 1). Out of 28 patients with an uncertain finding on radiography 12 proved to have a normal colon, in 9 the presence of a polyp was confirmed, and in 7 an additional lesion was found. The result of colonoscopy made laparotomy unnecessary in 10 patients, and in four an unsuspected carcinoma was diagnosed.

Three illustrative cases show the usefulness of the long colonoscope.

Case 1.—A 23-year-old man with right-sided colitis was diagnosed as having Crohn's disease because of persistent narrowing of the terminal ileum confirmed on two x-ray studies. Colonoscopic examination of the terminal ileum showed it to be normal in appearance and distensible. Ileal biopsy showed no evidence of disease, whereas the caecal and transverse colon biopsies were diagnostic of ulcerative colitis.

Case 2.—A 62-year-old man had had previous resection of a sigmoid colon carcinoma covered by temporary transverse colostomy. Follow-up barium-enema studies showed a constant

narrowed segment with an apparent polyp near the previous colostomy site. Repeat enema examination confirmed this appearance, and the possibility of a metachronous carcinoma was raised. On colonoscopy the appearance was found to be due to spasm alone and no polyp was seen.

Case 3.—An 85-year-old man with recurrent abdominal pain had a suspected constricting carcinoma of the caecum shown on barium-enema examination. Before laparotomy was undertaken the colonoscope was passed; he was seen to have an irritable colon but the caecum was normal and laparotomy was avoided.

COMPLICATIONS

No haemorrhage occurred during or after over 400 biopsies using the flexible biopsy forceps. One patient experienced a short-lived hypotensive episode during colonoscopy without change in cardiac rhythm or electrocardiographic abnormality. There was no other complication from colonoscopy in any patient.

So far no complications have been reported in the literature, but we have been informed of several unpublished cases of bowel perforation during colonoscopy both in Europe and in Japan. The possibility of perforation means that care is particularly necessary during "blind" passage of the instrument and that excessive sedation or general anaesthesia might be dangerous.

Discussion

During the development of the Olympus colonoscope in Japan Matsunaga and Tajima⁶ visualized the caecum in 15% of 69 initial cases and then 42% of 50 recent cases, while Watanabe,⁷ using the Machida FCS colonoscope, reached the caecum in 90% of 40 cases. Deyhle and Demling⁸ with both of these instruments reached the caecum in 81% of 59 patients and gave valuable advice on colonoscopic technique. Passage through the ileocaecal valve to the ileum has been achieved in a much smaller percentage of cases, the highest being 30% of Watanabe's 40 cases.

We have confirmed that successful examination of the whole colon is possible in a high proportion of cases. X-ray facilities, thorough bowel preparation, and adequate sedation and analgesia are essential prerequisites for this technique. Some technical experience and great patience are equally important.

A good quality double-contrast barium-enema film should be taken before colonoscopy is considered. A barium-enema examination is less uncomfortable for the patient, less time-consuming, and will normally yield sufficient information for a clinical decision about management to be made. Colonoscopy may yield invaluable information where symptoms persist despite a normal x-ray picture or where there is doubt about the presence or nature of a lesion on radiography. In patients with unexplained rectal bleeding or unexplained colonic pain even a negative colonoscopy is reassuring, and it is preferable to have seen the whole colon rather than the sigmoid colon alone in such cases. Probably colonoscopy will in future lessen the need for diagnostic laparotomy in patients with suspected colonic disease.

It has been suggested that since most large-bowel disease is found in the rectum and sigmoid colon the shorter colonoscopes are adequate for routine use. We have used both 70-cm and 185-cm colonoscopes, and in our experience the longer instrument has been equally convenient for examination of the distal colon and of patients with ileostomy, colostomy, or ileorectal anastomosis. The versatility of the 185-cm colonoscope suggests that it is the instrument of choice for most centres even if it is used mainly for examination of the left colon.

LIMITATIONS

Colonoscopy subjects the patient to inconvenience and some discomfort. It is time-consuming for the operators and occupies x-ray facilities for long periods, though we estimate that even in the most difficult cases we have used under 45 seconds of screening time. The instrument is costly, requires careful maintenance, and is subject to wear and tear which may lead to damage of the fibre bundle or of the mechanical parts. For these reasons it seems likely that colonoscopy will be a specialist service provided in a few centres. Examination of the whole colon is not to be recommended as an occasional procedure for those with a limited interest in endoscopy.

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Haematoma of Rectus Abdominis Associated with Dialysis

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Haematoma of the rectus abdominis muscle has been mistaken for a variety of abdominal lesions and only about one in five cases is correctly diagnosed. They usually occur at the site of anastomosis of the superior and inferior epigastric arteries. The main symptom is severe abdominal pain of sudden or gradual onset. Nausea, vomiting, fever, and prostration may be present, and a tender, fixed mass can usually be felt in the abdominal wall, which is guarded or rigid. Discolouration of the skin over the lesion is a rare and late sign.

Factors commonly causing or predisposing to haematoma of the rectus abdominis muscle are listed in the Appendix. We report here four cases in which the condition was seen in patients undergoing either peritoneal dialysis or haemodialysis, and we believe this is the first time such an association has been recorded.

Case 1

The patient was a 45-year-old woman who had been undergoing haemodialysis for 15 months. She had persisting ascites due to constrictive uraemic pericarditis which had developed before she started dialysis. Owing to a septicaemia from infection of her shunt with *Pseudomonas aeruginosa* a Cimmino-Brescia arteriovenous fistula had been made one month previously.

Before cannulating the fistula preparatory to haemodialysis the patient's blood pressure, pulse, respiration, and temperature were found to be normal. The abdomen was moderately distended owing to ascites, and the spleen was palpable two finger-breadths below the left costal margin. Haemodialysis was started with R.S.P. Travenol equipment. Heparin 5,000 U was given as a priming dose followed by 600 U hourly. After five hours she complained of sudden, left-sided abdominal pain, especially under the costal margin. On examination the abdominal wall felt turgid and there was tenderness and guarding. A mass occupied the left upper quadrant, and splenic thrombosis was suspected. Dialysis was discontinued and protamine given to counteract the effect of heparin.

At laparotomy several litres of ascitic fluid was drained and a large haematoma was found extending through all the muscles of the left side of the abdomen. The enlarged spleen contained a number of necrotic areas and splenectomy was performed. The liver was normal. Postoperatively she did well.

Comment.—The cause of the haematoma in this patient was the anticoagulant therapy, the aetiological factor most often reported in recent years.¹⁻³ As is often the case the condition was diagnosed only at operation. Extension of the haematoma throughout the abdominal musculature is rare.

Case 2

A 45-year-old woman on regular haemodialysis treatment complained during routine predialysis examination of right-sided, low abdominal pain which had been present for three days. Four days previously she had undergone a seven-hour haemodialysis using R.S.P. Travenol equipment. No heparin was given in the last 90 minutes. At the end of the dialysis the patient vomited several times. During the first night after dialysis she was woken by sudden, severe pain in the abdomen. It seemed, in her words, "as if something had snapped." At the same time she noticed a mass the size of an orange in the abdominal wall. When seen she had a tender mass the size of a tangerine orange in the right lower quadrant, and the skin over it was warm and discoloured. A diagnosis of resolving haematoma was made and conservative treatment decided on. After two months the mass had completely absorbed without aspiration.

Comment.—The haematoma in this case must be classified as spontaneous or idiopathic. The time relationships of the heparin given during dialysis and the vomiting immediately after dialysis to the onset of symptoms were too distant for them to be regarded as causative factors. The onset of sudden, severe pain together with the appearance of a mass in the right lower quadrant of the abdomen was typical. In half the reported cases the haematoma was in this position. Ecchymosis and a raised skin temperature are uncommon findings.

Case 3

The patient, a 35-year-old man with uraemia who had been on haemodialysis for two months, developed cerebral oedema while being dialysed. Peritoneal dialysis was started and hypertonic glucose and cortisone were given. During the next five days his condition improved, but then there were again signs of cerebral oedema. Further peritoneal dialysis was begun, and after the first two litres of dialysate had been collected the patient com-

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