Colonoscopy
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Begun in the early 1960s, the art of colonoscopy—direct visual inspection of the large bowel—has developed rapidly in the last five years. Now available for widespread clinical use the procedure has revolutionized the diagnosis and management of colon diseases. In fact, it is the most significant advance in the diagnosis of colon and rectal cancer in the last decade. In 1974, 48,000 of the estimated 100,000 new cases of colon cancer will die within five years; colonoscopy may be the key to preventing many of these deaths.

The Colonoscope

The instrument consists of a flexible four mm. glass bundle containing some 250,000 glass fibers with a lens at either end to focus and magnify the image. Light from an external source is transmitted by a fiberoptic bundle to the tip of the colonoscope. The light intensity is adequate for both visualization and photography. Images are transmitted by the fiberoptic viewing bundle. The absence of an interim lens system allows the transmission of an image regardless of how looped the instrument becomes. Accessory channels are provided for: suction of mucous, fluid and blood; insufflation of air or water; biopsy and polypectomy by a snare and probes. Deflection of the instrument tip is accomplished by twisting the shaft of the colonoscope or by manipulating the wires running its length.

Two types of colonoscopes are available. One, approximately 105 cm. in length, is used for the left side of the colon; the other varies from 165 to 186 cm. and can visualize the entire colon. A colonoscope with two open channels has recently become available for polypectomy, but it is also an excellent diagnostic instrument. American Cystoscope Makers, Inc., Olympus and Machida are the primary manufacturers of these instruments.

Indications and Contraindications

Indications remain broadly defined. For diagnostic colonoscopy they include: (1) any unexplained colonic sign or symptom; (2) lower gastrointestinal bleeding; (3) assessment of inflammatory bowel disease; (4) any abnormality on barium enema examination or sigmoidoscopy; as well as (5) postoperative evaluation of the colon. Operative colonoscopy is indicated for: polypectomy and extraction of foreign bodies.

Assuming the patient is not critically ill, the only contraindications are severe fulminant ulcerative or granulomatous colitis and acute diverticulitis.

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Preparation of the Patient

For 48 hours prior to the procedure, a clear liquid diet is prescribed. The preceding evening 10 ounces of citrate of magnesia are given; three hours before colonoscopy, tap water or saline enemas are administered until clean, allowing time for the colon to empty itself. Premedication with Demerol (25-100 mg. IV) and Valium (5-30 mg. IV) produces moderate sedation making colonoscopy more tolerable for both patient and endoscopist. It is emphasized that, although sedated, patients can complain of pain, an important warning to the endoscopist.

Technique

In experienced hands, colonoscopy is a simple procedure. It should be performed only in institutions where fluoroscopy is available, since it is often necessary. However, some skilled colonoscopists require minimal, if any, fluoroscopic observation providing the colon is relatively straight.

The patient is placed in the left lateral decubitus position; rotation to the back may facilitate insertion particularly in difficult cases. The colonoscope is introduced and passed through the rectum under direct visualization. Normal colonic mucosa has a definite vascular pattern similar to that seen at sigmoidoscopy. Valvulae, normally thin semilunar projections into the lumen, are prominent throughout the colon, particularly in the sigmoid. At the apex of the rectosigmoid area, a red “blur-out” is often apparent as the tip of the colonoscope touches the sigmoid colon wall.

Steady insertion, rotation of the instrument body and flexion of its distal end will often “slide” the tip along the greater curvature of any loops in the sigmoid colon. If the sigmoid is markedly looped, however, problems may arise. If the mucosa does not “slide by” but rather begins to blanch or whiten, perforation of the bowel may be imminent, and the scope should be withdrawn to allow identification of the lumen before further insertion is attempted. Sigmoid straightening (Fig. 1) may be necessary when the deflected tip is impacted in the angulated sigmoid-descending colon juncture. Simple withdrawal of the scope while deflecting the tip will often straighten the colon.

But, when “slide-by” and sigmoid straightening are ineffective, the alpha maneuver (Fig. 2) may be helpful.
Under fluoroscopic monitoring, the instrument is withdrawn to about 20-30 cm., creating a partially inverted U-shape, and then rotated 180 degrees counterclockwise. "Slide-by" is then attempted so that the tip of the colonoscope approaches the sigmoid-descending colon juncture at a less acute angle. After further insertion, a long segment of easily negotiated tubular colon signals that the instrument is in the descending colon (Fig. 3), and beyond that, in the splenic flexure, appearing as a blind wall. Here, cardiac pulsation can occasionally be seen as well as fine blood vessels which form a discrete vascular pattern.

Upon reaching the splenic flexure, the instrument tip is again deflected, and the scope withdrawn by using a clockwise rotation to straighten the sigmoid "alpha-loop." Hooking-lifting-telescop ing (Fig. 4) is helpful for passing the transverse colon with its triangular valvulae pattern (Fig. 5), as well as the hepatic flexure, which may transmit the
Fig. 3. Normal mucosa in the descending colon.

Fig. 4. HOOKING, LIFTING, TELESCOPING

HOOK TIP
WITHDRAW

TIP DEFLECTION
SUPINE OR RIGHT LATERAL DECUBITUS POSITION
bluish color of the liver. By hooking the instrument tip in the transverse colon or the hepatic flexure and withdrawing the colonoscope, the colon is lifted and "telescoped" along the straightened length of the instrument. Next, the ascending colon is seen with its flatter valvulae extending approximately 40 percent around the luminal circumference in an irregular pattern. By placing the patient on his back or in the right lateral decubitus position and maneuvering the instrument, the cecum can be reached. (Fig. 6.) It may be identified by the ileocecal valve and the transverse cecal fold. Experienced colonoscopists can reach the cecum generally in 15 to 45 minutes in approximately 75 to 85 percent of cases, and the splenic flexure in 90 percent. Inspection is accomplished during insertion and withdrawal of the instrument. It is important to emphasize that lesions in areas with acute bends such as flexures or an extremely deformed sigmoid colon may be difficult to see during withdrawal, and extreme care should be taken.

**Benign Diseases of the Colon**

Colonoscopy can provide immediate visual evidence of the site and extent of colon disease and confirm the diagnosis by biopsy. In the patient with longstanding symptoms of an irritable bowel, spasm or strong contractions may be seen, as well as thickened and muscular valvulae. Cases of shorter duration show less marked findings. In severe cases, the colon may appear "prediverticular."

**Diverticulosis**

Colonoscopy may be difficult in patients with diverticulosis, due to the deformity, sharp angulations and occasional bound-down rigidity found in severe cases. Diverticula may occur throughout the colon, although they are typically concentrated in the descending to mid-sigmoid colon and are found between prominent thickened muscular valves. (Fig. 7.) Very prominent valves may partially block the lumen making inspection difficult. In addition, the mouth of the diverticula may be so large as to be confused with the actual bowel lumen.

**Granulomatous Colitis**

Colonoscopy adds significant information on the exact nature of many in-
Ulcerative colitis

Colonoscopy is contraindicated in severe fulminant cases, but in less active cases, direct visualization and biopsy can more accurately determine the extent of disease than radiologic studies. Endoscopically, ulcerative colitis shows diffuse, continuous mucosal involvement, usually beginning in the rectum, characterized by loss of vascular pattern and valves, granularity, friability and haustra resulting in a tubular colon. Occasionally, thick mucopurulent exudate with small ulcerations, mucosal bridging and pseudopolyps (Fig. 9) may be seen. One of the primary roles of colon-
Colon Polyps and Cancer

Some investigators feel that most, if not all, colon and rectal cancers originate in polyps. Generally, the larger the polyp, the more likely it is to be malignant. The incidence of cancer is also higher in villous adenomas (Fig. 10), although the more common pedunculated variety can also undergo malignant change. As Gilbertson pointed out, removal of benign rectal polyps and adenomatous lesions sharply reduced the incidence of rectal cancer. Theoretically, the same is true of colon cancer, as evidenced by the fact that three to 10 percent of polyps removed through the colonoscope show carcinoma in situ or minimal carcinomatous invasion beyond the muscularis mucosa. Follow-up, including laparotomy, has demonstrated the effectiveness of colonoscopic polypectomy. Furthermore, since most polyps cause no clinical symptoms and many smaller than one cm. are not recognized on roentgenograms, colonoscopy is an excellent technique for early detection.

Pioneered by Shinya, the removal of polyps in the large bowel may be accomplished with flexible snares and electro-surgical current. A snare is looped around the stalk of the polyp and gently tightened. A rotatable snare recently introduced by American Cystoscope Makers, Inc. greatly facilitates this procedure. Although controversial, inflation of nonexplosive gas (CO₂) seems advisable during the procedure. A blended electrical current of cutting and coagulating frequencies is discharged on the insulated snare, dividing the stalk without causing bleeding. (Figs. 11 and 12.) The polyp must not touch the adjacent or opposite mucosa, as high density current and heat may perforate the colonic wall. The transected polyp can then be withdrawn from the colon by suction or nontraumatic grasping forceps. It is extremely important that endoscopists be familiar with the principles of electrosurgery before performing colonoscopic polypectomy to prevent complications including patient and physician burns. The tremendous advantages of colonoscopic polypectomy include dramatic reductions in expense, morbidity and mortality.

The relatively high incidence of cancer in patients with ulcerative colitis of 10 or more years duration is well known. Colonoscopy aids in the early
Fig. 13. Detection of carcinoma of the cecum by colonoscopy.

recognition of carcinoma (Fig. 13) in this disease by visual observation, biopsy and cytology. A similar role is possible in patients with diverticulosis and multiple polypoid lesions such as multiple polyposis or Gardner’s syndrome. Colonoscopy is also helpful in the assessment of a proven or questionable colon cancer. Not only can the diagnosis be proven, but a second primary or additional lesion such as a polyp may be found. Occasionally, colonoscopy may rule out cancer in a radiologic abnormality without needless surgery.

Summary

Unquestionably, colonoscopy is a significant advance in the diagnosis and management of colon and rectum disease. Despite its proven effectiveness, facilities for training colonoscopists are grossly inadequate. Hopefully, funding will become available for establishing colonoscopy training centers throughout the United States. Once adequate numbers of colonoscopists become available, improvement in the survival rate of patients with cancer and other diseases of the colon will certainly occur.

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