Applications and pitfalls of endoscopy in inflammatory bowel disease

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ABSTRACT: The role of upper gastrointestinal and hepatobiliary endoscopy and colonoscopy in the diagnosis and management of patients with inflammatory bowel disease (IBD) is reviewed. The differentiation of IBD from other forms of colitis, mass lesions in the colon, strictures and polyps, and the management of the patient with dysplasia including clinical strategies for early detection are discussed. The role and value of endoscopic surveillance programs have yet to be defined. **Can J Gastroenterol 1990;4(7):324-330**

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Applications et pièges de l'endoscopie dans les maladies inflammatoires de l'intestin

RESUME: Le présent article examine le rôle de l'endoscopie des voies gastrointestinales et hépatobiliaires, et la côlonoscopie dans le diagnostic et le traitement des maladies inflammatoires de l'intestin (MII). Il traite du diagnostic différentiel des MII et des autres formes de colites, des lésions tumorales du côlon, des sténoses et des polypes, du traitement du patient atteint de dysplasie et des stratégies cliniques visant une détection précoce. Le rôle et la valeur des programmes de surveillance endoscopique restent encore à définir.

ENDOSCOPY WITH MULTIPLE mucosal biopsies and the potential for therapeutic intervention is becoming increasingly employed in the diagnosis and assessment of patients with inflammatory bowel disease (IBD). Traditionally, endoscopy has been confined to sigmoidoscopy and colonoscopy, but it is also important to consider upper gastrointestinal endoscopy, especially in patients with Crohn's disease, and to perform endoscopic retrograde cholangiopancreatography in patients suspected of having hepatobiliary complications of either ulcerative colitis or Crohn's disease. This paper will review some of the common issues and pitfalls in the endoscopic diagnosis and management of IBD.

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UPPER GASTROINTESTINAL ENDOSCOPY IN IBD

Upper gastrointestinal endoscopy and mucosal biopsy may be valuable for the diagnosis of IBD. Crohn's disease may involve multiple sites throughout the gastrointestinal tract. Involvement of the esophagus, stomach or duodenum tends to occur with well documented small or large bowel disease. Rarely, Crohn's disease may arise solely at a site in the upper gastrointestinal tract.

Endoscopically, the mucosal surface is granular or nodular with friability, erosions and aphthous ulcers. Occasionally, linear ulceration is seen in severe disease, with lack of distensibility, inflammation and later duodenal obstruction. Rarely, a duodenocolic fistula may be encountered, although these are usually missed endoscopically and may only be demonstrated on barium enema. Less common still may be an enterocutaneous fistula from the duodenum.

The incidence and prevalence of upper gastrointestinal Crohn's disease are difficult to determine because most cases are poorly documented; series do not represent the population at large, and were reported before diagnostic criteria were well standardized or endoscopy widely available. Three retrospective studies suggest a prevalence of between 0.4 and 3% (1-3). However, more recent endoscopic reports based on histological criteria suggest that the figures are probably higher.

In an endoscopic study of 45 consecutively hospitalized patients with Crohn's disease and a nondiagnostic barium meal, Korelitz et al (4) found 42% of patients to have abnormal histology. Twenty-four per cent had biopsies diagnostic and 18% suggestive of Crohn's disease, with granulomas in 7%. The antrum and duodenum were most frequently positive, with the esophagus least often involved; histology was abnormal in 24% of endoscopically normal sites. This study is difficult to evaluate, since hospitalized patients were selected as having no radiological abnormality; furthermore, controls were taken from a different geographic population, with endoscopy and histology interpreted by several different clinicians.

In a prospective study, Schmitz-Moorman et al (5) evaluated 225 patients with Crohn's disease of the small or large bowel by upper gastrointestinal endoscopy and histology. They had 30 control subjects, 11 of whom had ulcerative colitis. Endoscopic lesions were found in the gastric antrum in 49% and in the duodenum in 34%, and histology was more sensitive for detecting abnormalities, although the site of biopsies was not predetermined and may have been influenced by the endoscopist. Granulomas were observed in less than one-third of patients but were more common in younger patients with a shorter duration of disease.

Jouin et al (6) performed endoscopy on 129 patients from a cohort of 195 patients with Crohn's disease, more commonly finding small superficial aphthous ulcers or patchy erythematous areas commonly in the antrum and proximal duodenum. Lesions were found in 28% of patients, and granulomas in 16%, with granulomas as frequent in the upper as in the lower gastrointestinal tract.

Malchow et al (7) prospectively evaluated 1414 unselected biopsies obtained during 509 gastroscopies for concordance between endoscopic and histological diagnosis. Agreement was best for histological changes in the duodenum with a kappa of 90 falling to 0.12 for biopsies from the gastric body and to 0.10 for biopsies from the antrum. Thus, clinically significant disease is overlooked when endoscopy alone is used, and Crohn's disease may be missed altogether. A recent study has compared upper gastrointestinal endoscopic and histological findings in Crohn's patients and control groups of ulcerative colitis and dyspepsia patients (8). There was complete or partial agreement between endoscopy and histology in 85% of all patients, with some overlap in ulcerative colitis and Crohn's disease possibly due in part to drug treatment. There was evidence of Crohn's disease of the upper gastrointestinal tract in 60% of patients with known Crohn's disease.

HEPATOBILIARY DISORDERS IN IBD

Sclerosing cholangitis is a progressive, ultimately fatal, chronic hepatobiliary disease most commonly occurring in young men, presenting with a chronic cholestatic syndrome and usually associated with chronic IBD (9-13). Most patients present with jaundice, abdominal pain and pruritus, although patients may be asymptomatic with only a disturbance of liver function tests.

Endoscopic retrograde cholangiography may be the most sensitive and specific diagnostic test in establishing a diagnosis of sclerosing cholangitis. The association of sclerosing cholangitis with IBD varies from 47% in one pediatric series (13) to 100% in an adult series from Scandinavia, which reported 45 cases of sclerosing cholangitis, 37 patients having ulcerative colitis, six Crohn's disease, and two unspecified colitis (12).

In one study, 50% of patients had pruritus, 66% right upper quadrant pain, 33% fever, jaundice, hepatomegaly and weight loss, and 16% splenomegaly (13). Alkaline phosphatase and gammaglutamyl transferase were elevated in all patients, with some increase in both aspartate aminotransferase and alanine aminotransferase, but only half the patients had an elevation of bilirubin. All patients had abnormal extra- and/or intrahepatic bile ducts on cholangiography.

Of 681 patients with ulcerative colitis in Oxford, 21 (3%) had persistently abnormal liver function tests, and 17 of these were found by cholangiography to have sclerosing cholangitis (9). Liver biopsy showed histological changes in only half the patients, making endoscopic retrograde cholangiography necessary to confirm the diagnosis.

Changes in the intrahepatic bile ducts include thin-walled tubular and saccular cholangiectases and annular fibrous crests with or without abscess; and fibrous cholangitis with or without ductal dilation and replacement of bile ducts by fibrous cords (14). The 'pruned tree' appearance on cholangiography represents the transition from patent to cholangiectatic ducts. Radiographic findings at cholangiography include changes in both the extra- and intrahepatic ducts, although different series report different proportions involved. The most important features included diminished arborization, ectasia and stenosis (15,16). Strictures may be multifocal involving either the extra- or intrahepatic ducts, and in advanced disease, confluent stricturing with long connected segments may be found (16).

Pancreatic abnormalities: The association of IBD and sclerosing cholangitis with pancreatic abnormalities is controversial. A Scandinavian study of 151 patients with ulcerative colitis found seven with sclerosing cholangitis and four with an abnormal pancreatogram. The changes were attributed to either a common immune mechanism or a mechanical effect (17). MacCarty et al (16) observed various degrees of pancreatic duct stricture in 8% of patients, while in a further Scandinavian study endoscopic retrograde pancreatography was normal in all 38 patients with sclerosing cholangitis (18).

Carcinoma of the bile ducts: Longstanding biliary inflammation is associated with carcinoma of the bile duct (usually affecting the extrahepatic bile ducts) (19). Tumours may be glandular, cystic or papillary, and localized or infiltrating. In a series from the Cleveland Clinic, six bile duct cancers were found in 1207 cases of ulcerative

colitis for a prevalence of 0.5% and a relative risk of 31.3 (20). Patients had a mean age of 38.5 years at the time of diagnosis, and a mean duration of ulcerative colitis of 23.2 years. Colectomy had been undertaken between five and 16 years before, thus suggesting no protection from progression of the sclerosing cholangitis and development of malignancy.

There is a variable temporal relationship in the presentation of IBD and hepatobiliary disease, with either occurring after the onset of the index disease. In patients with hepatobiliary disease of obscure origin, it is important to question the presence of antecedent bowel symptoms, to undertake sigmoidoscopy and obtain biopsies, and to consider endoscopic retrograde cholangiopancreatography (21). Furthermore, sclerosing cholangitis may be asymptomatic (22). In the study reported by Aadland et al (12), 24 patients were followed over a 10 year period, and cholangiographic changes progressed from mild to moderate in only three, while in the remaining 21 patients there was no change. However, it is important to appreciate that cholangiographic changes may worsen without any change in symptoms, laboratory parameters or liver biopsy (22).

Endoscopic retrograde cholangiography has made the diagnosis of sclerosing cholangitis easier and more specific, and it should be considered in any patient with persistently abnormal liver function tests.

COLONOSCOPY IN IBD

The diagnosis of IBD of the colon is established in the majority of patients on the basis of clinical findings, sigmoidoscopy, rectal biopsy and double contrast barium enema. By no means do all patients require colonoscopy. In most instances colonoscopy is the last step in a succession of diagnostic examinations performed during evaluation of a problem in patients with colitis.

While double contrast barium enema has remained the mainstay of diagnosis for IBD, few comparative studies have been undertaken. In a survey of 149 patients with IBD, 23 (15%) were considered to have total colitis on barium enema; 51 (34%) had visual appearances consistent with total colitis at colonoscopy; and 92 (62%) had the same on histology. Furthermore, radiological assessment of skip lesions was unreliable, but it was not clear whether the differences were clinically relevant (23).

Most studies indicate that between 18 and 20% of patients with Crohn's disease have normal radiographic findings but endoscopically detectable disease, which is similar to studies determining the extent of disease in ulcerative colitis (24). Most false negatives are associated with mild disease at proctosigmoidoscopy. Although radiographic studies appear less sensitive than endoscopy for diagnosis, their abilities to discriminate between Crohn's disease and ulcerative colitis are comparable, with accuracies between 95 and 98% (24).

INDICATIONS FOR COLONOSCOPY IN IBD

Colonoscopy is usually reserved to evaluate the extent of disease, since that information is rarely essential in determining the therapeutic approach to the patient. Moreover, colonoscopy during acute disease is contraindicated due to the increased risk of perforation. When difficulty arises in the interpretation of a barium enema, colonoscopy is valuable especially for evaluation of strictures or mass lesions. In patients with a diagnosis of nonspecific colitis, colonoscopy and biopsy can be crucial to distinguish between ulcerative colitis, Crohn's disease and a wide range of other inflammatory conditions. The colonic epithelium responds to inflammation in a limited number of ways, and intraluminal appearances are rarely definitive. The correct diagnosis is usually obtained from the histopathological assessment of multiple biopsies obtained during colonoscopic examination, combined with clinical and endoscopic observations. Colonoscopy may be especially useful in the pre- and postoperative evaluation of Crohn's disease of the large bowel, since radiology cannot provide accurate information after surgical intervention. Furthermore, most surgeons are unwilling to make an anastomosis through bowel affected by active disease and request an accurate preoperative delineation of the disease before planning surgery. Postoperatively an ileostomy stoma can usually be intubated with a standard colonoscope or a pediatric instrument and examination of a continent ileostomy (Kock pouch) can similarly be inspected in patients with pouch dysfunction or suspected pouchitis. Lastly, colonoscopic surveillance is undertaken by most gastroenterologists on a regular annual or biannual basis in patients with total ulcerative colitis of eight or more years' duration to search for dysplasia and prevent the development of cancer.

DIFFERENTIAL DIAGNOSIS OF CROHN'S DISEASE VERSUS ULCERATIVE COLITIS

On occasion it may be extremely difficult to distinguish between ulcerative colitis and Crohn's disease, and colonoscopic examination of the entire colon with intubation of the terminal ileum may be necessary, together with multiple biopsies taken every 10 cm throughout the colon.

The normal mucosa of the rectum and colon is smooth, pale, glistening and transparent, varying from grey through pink in the colon with a blue tone at the splenic and hepatic flexures where the spleen or liver impress on the colon wall. The vascular pattern shows a branching network of superficial vessels which are most prominent in the rectum and increase in diameter distally. No bleeding or pus is seen under normal circumstances, and mucus is rarely present even after bowel preparation, when mild erythema or edema may be seen. Friability is not normally present even after bowel preparation.

Multiple biopsies provide the pathologist with an adequate number of samples to differentiate microscopically discontinuous mucosal involvement from a pattern of increasing severity distally, which is seen in ulcerative colitis. The finding of granulomas on colonoscopic biopsies is clearly helpful, but they occur relative-

ly infrequently, in about 5% of cases (25-27).

Endoscopic patterns of colonic inflammation are well described. Despite the different endoscopic appearances between Crohn's disease and ulcerative colitis, differentiation can be difficult. Endoscopic biopsy may assist with the correct diagnosis. Crohn's disease involves the mucosa and submucosa while ulcerative colitis primarily affects the mucosal layer. Early in the course of Crohn's disease, the surface vascular pattern tends to remain intact with the earliest lesion being a small aphthous ulcer, usually 3 to 4 mm in diameter and often surrounded by a narrow red border of erythematous mucosa. Cobblestoning is characteristic of submucosal involvement in Crohn's disease. This is the uniform nodularity caused by submucosal edema. Cobblestoning must be distinguished from multiple pseudopolyps in IBD. The length of pseudopolyps is characteristically greater than the width of their base with adjacent mucosa usually being flat. The low nodules of cobblestoning are distinctly contiguous.

The earliest manifestation of ulcerative colitis is an increase in mucosal bloodflow that appears as a diffuse erythema with micro-aneurysmal changes endoscopically. The vascular architecture is often lost due to edema. Other features include granularity and friability due to mucosal engorgement. As inflammation progresses, minute surface ulcerations occur. Spontaneous bleeding is characteristic of ulcerative colitis.

Several endoscopic features differentiate ulcerative colitis from Crohn's disease (28). Ulcers never occur in ulcerative colitis in an area of otherwise normal mucosa. Ulcers may occur in diffusely abnormal mucosa in both forms of colitis, but if the surrounding mucosa is normal, the diagnosis is never ulcerative colitis. Aphthous ulcers are pathognomonic of Crohn's colitis. Cobblestoning is pathognomonic of Crohn's colitis. Granularity and friability are common early in ulcerative colitis, but may be late findings in Crohn's colitis.

Pera et al (29) evaluated 606 colonoscopies in 357 patients with ulcerative colitis, Crohn's disease or indeterminate colitis. Patients were followed for 22 months to obtain endoscopy-independent diagnoses by histology, surgery or autopsy, and an endoscopic score and likelihood ratios were calculated. Colonoscopy had an accuracy of 89% with 4% errors and 7% indeterminate, which occurred predominantly in the presence of severe inflammation. Discontinuous disease, anal lesions and cobblestoning were predictive of Crohn's disease, while erosions, micro-ulceration and granularity were most predictive for ulcerative colitis.

OTHER FORMS OF COLITIS

Other forms of acute and chronic colitis may mimic chronic idiopathic IBD but can often be identified with a careful history, colonoscopic examination and biopsy (30).

Studies of patients with mucoid, bloody diarrhea suspected of having idiopathic IBD show that between 22 and 38% have some form of infectious colitis or another inflammatory colonic disorder (31-34). An increased awareness and selective culture media will improve diagnosis. Examination of the ileum is valuable in one-third of patients (35) and should include microbiological examination of biopsies, which may be the only way to confirm yersinia, campylobacter or chlamydial infection (33). Multiple biopsies taken in the terminal ileum and every 10 cm throughout the colon are needed to confirm microscopic colitis (36,37) or collagenous colitis (36,38).

Perioperative colonoscopy: Colonoscopy either before or after surgery is most useful in patients with Crohn's disease, which may affect any part of the gastrointestinal tract. It is important to determine the extent of the disease prior to undertaking segmental resection. In the presence of an ileocolic fistula, it may be possible to determine whether the colon is primarily involved or has been affected secondary to the close proximity of diseased ileum. Usually adjacent segments of colon are normal, and such information may modify the surgical plan (39). Postoperative indications for colonoscopy, with possible examination of an ileostomy stoma or continent ileostomy pouch, include recurrence of diarrhea.

Direct inspection of the colon following ileocolonic resection and anastomosis is best undertaken by colonoscopy, since high quality barium studies are difficult to obtain in the postoperative bowel due to changes in anatomy, spasm of the affected segment (which prevents good air contrast) and rapid transit of barium. Small aphthous ulcers typical of Crohn's recurrence may be readily seen and biopsied.

The stoma of an ileostomy may be intubated endoscopically to determine whether ileostomy dysfunction is due to adhesions, stricture with partial or intermittent obstruction, or recurrent disease. A further important indication for endoscopic evaluation through an ileostomy includes the patient with anemia or frank bleeding, when recurrent disease may be identified more proximally. The Kock pouch of a continent ileostomy may become inflamed with pouchitis (40) and can be similarly examined to confirm inflammation or the cause of incontinence or difficulty with intubation (32). Incontinence of the pouch may result from fistula formation or loss of the nipple, which can readily be seen at endoscopy, as may any recurrence of Crohn's disease. A pediatric gastroscope with its shorter bending section and acute angulation or the oblique-viewing endoscope is especially useful for obtaining full visualization of the pouch.

MASS LESIONS

Inflammatory polyps: Mass lesions seen on barium enema may represent an adenomatous polyp, a non-neoplastic pseudopolyp or carcinoma, and require evaluation by colonoscopy. To the endoscopist, pseudopolyps are most frequently small and multiple, occurring throughout the colon, and are found in both ulcerative colitis and Crohn's disease. They appear to be covered by glistening, essentially normal mucosa similar to that surrounding them. Inflammatory polyps represent regenerative islands of epithelium not involved

in the surrounding destructive ulceration, although they are sometimes composed of granulation tissue (41). Occasionally they may be large, almost occluding the lumen; they rarely cause intussusception (42). Although pseudopolyps have no malignant potential, when large and solitary, they may be confused with carcinoma (43,44). If the lesion is solitary or appears different from the surrounding mucosa or other inflammatory polyps, it should be removed for histological appraisal. At polypectomy, care should be taken to ensure effective coagulation, since healing of the polypectomy site may be delayed in the presence of inflammatory disease. Biopsies should be taken from pseudopolyps that are larger than 1 cm in diameter, have an irregular surface configuration or are a different colour from surrounding lesions. Polypectomy should be considered only for lesions which may be confused with carcinoma or if a large inflammatory polyp is considered to be responsible for symptoms of obstruction or hemorrhage (28).

Adenomatous polyps: Adenomatous polyps occur uncommonly in patients who have ulcerative colitis, and usually resemble pseudopolyps rather than typical adenomas. In a series of 150 colitics examined by colonoscopy, four (3%) were found to have adenomatous polyps, of which three were solitary (45). If a diagnosis of adenoma is made on simple biopsy, the lesion should be removed by snare polypectomy as in a noncolitic colon.

Strictures: Strictures in ulcerative colitis are seen with a frequency approximately equal to that seen in patients with Crohn's disease (38). Although a stricture encountered in ulcerative colitis should suggest the possibility of malignancy, most result from fibrosis, muscular hypertrophy or spasm, and colonoscopy provides the best means to evaluate strictures, since a direct inspection of the segment may be undertaken and multiple biopsies and cytological samples obtained (46). At colonoscopy the instrument may be passed up to and often through the stricture to determine its precise nature, and strictures previously seen on barium enema may be easily intubated by the adult colonoscope, since air insufflation will distend the narrow lumen when narrowing is due to muscular hypertrophy or spasm (47). Inflammatory strictures are characterized by mucosal erythema, friability and ulceration, while fibrotic strictures appear thin, short and weblike. If a stricture is unyielding and rigid to the colonoscope, has an abrupt or shelf-like margin and cannot be intubated by the colonoscope, malignancy should be suspected (48). A visual diagnosis alone is not sufficient; it must be supported by multiple biopsies at the edge of and within the strictured segment. Brush cytology may also be useful if the lesion cannot be clearly intubated. Since carcinoma in colitis can extend submucosally, giving negative superficial biopsies (49), lesions which appear endoscopically malignant should always be referred for resection. If a stricture cannot be intubated with the adult colonoscope, a pediatric colonoscope or slim upper gastrointestinal endoscope may be used.

DYSPLASIA AND CANCER IN COLITIS

The recognition of dysplasia as a marker of high risk of cancer has made a screening program possible in patients with longstanding ulcerative colitis (50). However, the frequency of examination is not clear, and there is as yet no evidence that such a program has significantly altered the course and outcome of the disease.

Currently the pathological staging of patients with carcinoma is purely a matter of chance; some cancers are detected relatively early and fortunately cured, while a similar patient may have disseminated disease and die early. The hope is implicit that early detection of invasive carcinoma will result in an increased cure rate and not just increased survival time, which could be the result of lead time bias. To date no trial has shown the benefit of detecting dysplasia or presymptomatic carcinoma in a surveillance program to prevent deaths from carcinoma; however, such studies may never be carried out because of the potential difficulties in randomizing patients with any form of 'premalignancy' to the appropriate control arm of a randomized clinical trial.

Clinical strategies for early detection of dysplasia and carcinoma are limited, but it is important to distinguish whether the search is primarily for a premalignant – as opposed to an early invasive – lesion. If the endpoint of clinical surveillance studies is to detect lesions endoscopically, for example, many will prove to be invasive carcinoma and will be associated with a definite mortality from disseminated carcinoma. This unexpected advanced carcinoma is less likely when one is searching for premalignant lesions, since invasive and advanced tumours will be found less frequently.

Macroscopic appearance of dysplasia: At endoscopy, areas of dysplasia may be seen raised above adjacent mucosa as plaques or irregular areas of nodularity which are often poorly circumscribed, in contrast to the well circumscribed adenoma.

These differences in appearance have three distinct clinical implications. First, when surveillance is being undertaken to detect dysplasia, the possible gross appearances of the lesion being sought must be borne in mind and sought deliberately, since their subtle nature may be readily overlooked.

Second, dysplasia has the potential to be, or actually is, the superficial part of an invasive carcinoma. Unless or until the lesion is removed, it remains uncertain whether this change has actually occurred.

Third, the question of whether adenomas can exist or coexist with dysplasia needs to be considered. In ulcerative colitis, lesions indistinguishable from adenomas by all criteria appear to be relatively common, and endoscopic resection of these lesions as if they were simple adenomas appears safe and unassociated with an excess of carcinoma in the lesion or the remainder of the colon.

The last major difference between the diagnosis of dysplasia and adenoma is in the effect that it has on the clinician. There may be a relative ignorance on the part of both the clinician and the pathologist. Given an

endoscopic biopsy showing features of dysplasia, the pathologist has the option of calling the lesion an adenoma or dysplasia. If there is little or no clinical information, or if the pathologist is unfamiliar with the concept of the dysplasia-associated lesion or mass (DALM) (51), the lesion will be reported as an adenoma; if the clinician is unfamiliar with the DALM concept, the lesion may be treated as an adenoma. If the pathologist makes a diagnosis of dysplasia, the clinician must immediately consider whether colectomy is the appropriate management, since biopsies of dysplasia and adenoma share a common feature – namely that an associated invasive lesion cannot be excluded unless the lesion is removed.

Implications for patient management: If the policy is to follow low grade dysplasia, it should be recognized that one is deliberately following a lesion which can give rise directly to invasive carcinoma and may therefore already have realized that potential. Further, these carcinomas may not be readily recognized clinically in patients with IBD.

There is a distinction between a first 'diagnostic' and subsequent 'surveillance' endoscopy if dysplasia is found. It is likely to be much more serious when dysplasia is discovered on a first rather than a subsequent endoscopy because in the former the length of time that dysplasia has been present is unknown and is probably more likely to be accompanied by an underlying invasive component (52).

Endoscopy and diagnosis of dysplasia: Proctosigmoidoscopy provides a limited view localized to the rectum and the opportunity to obtain rectal biopsies. Rectal biopsies have been widely advocated for following patients with chronic ulcerative colitis, but more recent studies have suggested that as many as 75% of patients with colonic dysplasia do not have rectal involvement (53,54). Colonoscopy provides the best opportunity to take multiple biopsies and obtain more representative sampling from the whole colon to seek for dysplasia. All suspicious areas should be biopsied, especially areas of mucosal irregularity where the surface appears 'velvety' in appearance or any mass lesion is present. Dysplasia associated with such a lesion increases the probability of carcinoma significantly (51,55). Inflammatory polyps and strictures have their own rules.

Clinical strategies for early detection: Follow-up strategies or options fall into one of four categories: do nothing; regular follow-up and biopsy; follow-up and biopsy at short intervals; and excision of the diseased organ.

The biopsy classification determined by an international working party can be used to guide patient management (56). When the biopsy classification is negative or indefinite, it is probably negative, and the patient should continue with regular 12 monthly follow-up; when the interpretation is unclear but probably positive, a short interval follow-up of three to six months should be recommended, and when low grade dysplasia is confirmed, three monthly follow-up must be undertaken and colectomy considered if a DALM is present. When high grade dysplasia is reported, colectomy should be undertaken, although some would advocate confirmation of high grade dysplasia before advocating surgery.

Doing nothing can be advocated in patients in whom further surgery would not be contemplated even if anything was found, and regular follow-up is carried out in patients without evidence of dysplasia.

The role and value of endoscopic surveillance programs has yet to be defined. Advances in endoscopy and the development of new techniques such as high magnification endoscopy and laser spectroscopy may provide further sensitivity and cost effectiveness in cancer detection in the future.

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