Angiography for diagnosis and treatment of colorectal cancer

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INTRODUCTION
Colorectal cancer is one of the three leading causes of worldwide cancer mortality[1]. It is the second leading cause of cancer-related deaths in the Western world[2]. Because of changes in life style and nutritional habits, the incidence of colorectal cancer is increasing in China. From 1972-1989, the incidence of colorectal cancer increased 85 % in men and 79 % in women. The average rate of increase in incidence was 4.2 % per year since 1970’s. Of all cancers in China, colorectal cancer ranks the fifth in incidence. Although 80 % of patients initially can have the primary tumor completely resected, the cancer invades the serosa or involves the regional lymph nodes in almost half of patients, predisposing them to a high risk of recurrence[3]. Recurrent cancer of the large intestine is second in cancer-related deaths only to lung cancer[4,5].

Colorectal cancers are detected mainly by endoscopic and radiological examination. However, endoscopy is unsuccessful in some patients who have a low tolerance for the procedure and in patients, especially elderly ones, who are physically unable to undergo a barium enema. In the United Kingdom a complete colonoscopic examination to the caecum is achieved in only 70 % of cases[6].

Angiography has been used to define sites of gastrointestinal bleeding when endoscopy has been unsuccessful[7]. To our knowledge, there have been no reports describing the significance of angiography to help diagnosis in colorectal cancer. Our present study assessed the clinical value of the angiography for colorectal cancer.

MATERIALS AND METHODS
Materials
Between Jan.1997 and Jan 1999, we enrolled in this study 47 consecutive patients (25 men, 22 women, age range, 37-81) with histologically or clinically proven colorectal cancer. All patients had normal cardiopulmonary, renal, and hepatic function. In addition, no patient had evidence of coagulopathy or had been previously treated with chemotherapy or any other anti-cancer treatment. Carcinoma was located in the rectum in 26 patients, in the sigmoid colon in 10, in the ascending colon in 7, in the descending colon in 1 and in the transverse colon in 3. Of the 47 tumors, 6 were classified on histologic study as mucinous adenocarcinoma and 41 were adenocarcinoma, of which 3 were poorly differentiated, 31 moderately to well differentiated, and 7 well differentiated. No case was defined as Dukes’s stage A; 3 were stage B1, 26 were stage B2, 13 were stage B3, and 5 were stage D. Acute obstruction of the colon was seen in 6 patients, and 7 cases were postoperative recurrent tumor. In this group, 3 cases were colorectal cancer with hepatic metastases.

Methods
The groin was sterilized and prepared with local anesthesia. The abdominal aorta was catheterized through the femoral artery by Seldinger’s method[8]. In each patient, we selectively advanced the catheter into the vessel that supplied the tumor: the ileocolic artery for cancer of the ileoceum, right colic artery for cancer of the ascending colon, left colic artery for cancer of descending colon, sigmoid artery for cancer of the sigmoid colon, superior rectal artery and bilateral iliac arteries for cancers of the anus and most distal rectum[9].

When these arteries could not be located, we placed the catheter into the superior mesenteric artery for the right half of the colon and the inferior mesenteric artery for the left half of the colon. Digital subtraction angiography (PHILIP INTEGRIS V 3 000, PHILIPS LTD, Holland) and the use of contrast dye of Ultravist 370 yielded a “Tumor flush” caused by the abnormal capillary mass of the tumor, which gave the exact location of the tumor. Then we infused chemotherapeutic agents into the tumor through the same artery; each patient received 5-fluorouracil (5-Fu 1 000 mg), mitomycin C (MMC,
20 mg), and cisplatinum (CDDP, 80 mg).

Both the hepatic and superior rectal arteries were cannulated in one patient who had rectal cancer with multiple liver metastases.

RESULTS

We performed a digital subtraction angiography procedure (DSA) in 47 patients with colorectal cancer. We were able to locate the exact tumor site in 42 of 47 (89.4 %) angiographic studies, including six patients with acute obstruction of the colon (Figures 1-3). The location of the primary tumor was difficult to identify in 5 cases because the patients had a recurrence of cancer and liver metastases that were found at the same time of the DSA during angiography. Regional chemotherapy for primary colorectal cancer was successfully completed in 47 patients, and 3 patients received chemotherapy for metastatic tumors in the liver at the same time (Figure 4).

DISCUSSION

In patients with symptoms of colorectal cancer, flexible colonoscopy or barium enema are usually performed, for definitive diagnosis. Cathartics are usually necessary to prepare for the barium enema. However, if plain radiographs of the abdomen show a dilated colon and acute colonic obstruction is suspected, a barium enema (or water-soluble contrast study) may be obtained without preparation to define the location and nature of the obstructing lesion. Some patients, especially older patients, are not able to finish rolling on the table during the examination. Although flexible colonoscopy is the most accurate and complete examination for the large bowel, some patients cannot tolerate the procedure. In addition, technical limitations, such as the inability to evaluate the splenic or hepatic flexures or the cecum, compromise the diagnostic usefulness of colonoscopy. Furthermore, colonoscopy is contraindicated in patients with suspected perforation or obstruction of the large bowel[10,11]. Angiography is a safe and accurate technique for localizing acute gastrointestinal hemorrhage[12]. Since 1996, we have used angiography to diagnose colorectal cancer and to deliver regional chemotherapy[13,14]. Our rate of locating tumors with is 89.4 %, and we have simultaneously detected cases of colorectal cancer with metastatic liver tumors using angiography. During this procedure, patients have been able to lie comfortably on the table, even those in pain with an acute bowel obstruction induced by colorectal cancer. We had difficulty to find the site of the tumor of recurrent colorectal cancer by angiography because the vessels supplied the tumor had been ligated during the last operation. Regional chemotherapy has been widely used to treat solid tumors[15,16]. The rationale for arterial chemotherapy is that arterial administration allows for high local levels of the drug without corresponding systemic toxicity[17-20]. After intraarterial infusion of 5-Fu, drug levels at the tumor site has been reported to be 9-to 69-fold higher than those obtained during intravenous administration[21]. Few studies have been published on intraarterial chemotherapy in primary colorectal cancer. In our study, chemotherapeutic agents were infused after angiography into vessels supplying the colorectal cancer. As we were reporting short-term results (less than 3 years), we did not see a statistical survival benefit in this study.

Distant metastases develop in 10-15 % of patients despite complete resection of the primary colorectal tumor[22]. Colorectal cancer commonly metastasizes through lymphatic pathways and portal venous vessels to the liver[23-25]. Thus, hepatic arterial chemotherapy is an attractive treatment option for bilobar non-resectable liver metastases in patients in whom the liver is the sole site of distant disease and recurrence[26-31]. Furthermore, angiography and intra-hepatic artery infusion chemotherapy may be used simultaneously we make it possible.
to be finished at the same period.

Local recurrence and distant metastasis are the most common reasons for treatment failure after surgical resection for colorectal cancer. Local recurrence of rectal cancer, with extension through the wall and with regional lymph node involvement, occurs in 50 % of patients. In patients with unresectable lesions, pain and organ obstruction are distressing and potentially devastating symptoms[32]. It was reported that intraarterial infusion of 5-Fu and MMC by percutaneous placement of an infusion catheter in the bilateral internal iliac arteries relieved the pain in 50 % of patients with unresectable, recurrent rectal cancer[33]. In our study, one patient with recurrent cancer having severe pelvic pain underwent angiography for diagnosis and then received intraarterial chemotherapy in the bilateral internal iliac arteries. After treatment, the pain was relieved, and the bowels were more easily evacuated. We are not sure of the mechanism underlying these treatment effects.

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