Locoregional recurrence is the major cause of morbidity and mortality for patients suffering with colorectal cancer. Therefore, patients with colorectal cancer are routinely followed up with CT to detect the presence of locoregional recurrence and distant metastases. A central goal of postoperative surveillance for colorectal cancer is to improve survival through the earlier identification of tumor recurrence. Locoregional recurrence refers to tumor occurring at or adjacent to the surgical site and at the regional lymph nodes. It has been reported that metastatic spread based on the site of the primary tumor shows a relatively predictable pattern. Given the prevalence of colorectal cancer and the role of CT for postoperative surveillance, radiologists should be familiar with the CT findings of locoregional recurrence after curative resection for colorectal cancer.

Index words: Colon, CT
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Locoregional recurrence is defined as tumor occurring at or adjacent to the surgical site [3]. It includes soft tissue or nodal failure in the operation field, as well as tumor occurring at the anastomosis site. Regional spread of disease in the lymph nodes has a predictable pattern based on the lymphatic drainage patterns [4, 5]. Having a firm understanding of the distribution of nodal metastasis according to the primary tumor site will help physicians define a systematic approach to analyze the patterns of recurrent disease and to detect early recurrent nodal disease, particularly with the associated increased levels of carcinoembryon-
ic antigen.

In this pictorial essay, we illustrate 1) the various CT findings of locoregional recurrence of colorectal cancer with emphasis on distinguishing those patients with colon cancer from those with rectal cancer and 2) the pitfalls in diagnosing recurrent colorectal cancer.

**CT Technique**

Helical CT was routinely performed in all patients with two consecutive 15- to 20-sec breath-holds, from the dome of the diaphragm to the pelvic floor, with using a slice collimation of 5 mm and a table pitch of 1:2. To help differentiate nonopacified bowel from locoregional recurrence, we administered 750 mL oral contrast material 45- 60 minutes before scanning. Scanning was initiated 70 seconds after the IV injection of 100-120 mL of nonionic contrast agent at a rate of 3 mL/sec.

**CT Findings of Locoregional Recurrence**

The CT findings indicative of locoregional recurrence include thickening of the bowel wall at the suture line > 1 cm in thickness, a soft tissue mass invading the surrounding structures (muscle, bone, bladder), or enlarged regional lymph nodes (6, 7). The criteria for abnormal nodes are usually nodes that are greater than 1 cm on the short-axis diameter or a group of three or more small clustered nodes (8). Although these criteria are helpful findings for differentiating metastatic nodes from non-

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**Fig. 1.** Locoregional recurrence in a 51-year-old man who had undergone right hemicolectomy for ascending colon cancer. The CT scan shows lobulated wall thickening with luminal narrowing involving the anastomotic site (arrows).

**Fig. 2.** Diagram shows arteries with the accompanying lymphatics in the ileocolic mesentery, in the ascending-, transverse-, descending- and sigmoid mesocolon, and the upper mesorectum.

**Fig. 3.** Locoregional recurrence in a 62-year-old woman who had undergone right hemicolectomy for ascending colon cancer. The CT scan shows a mass with invasion to the right kidney in the right ascending mesocolon (arrows). D = descending portion of the duodenum.
metastatic and hyperplastic nodes, there is no specificity with this system. That is, even a normal or small node may have microscopic metastases whereas an enlarged node may be benign or inflammatory. Thus, comparison with postoperative baseline studies is often required. A new or increasing mass around a blood vessel or at the mesentery associated with a surgical site suggests regional nodal recurrence.

**Locoregional Recurrence of Colon Cancer**

Approximately 10% to 20% of the recurrent disease after curative resection for colon cancer occurs as isolated locoregional failures that may be amenable to further surgical resection (9). Locoregional recurrence of colon cancer includes tumor occurring in the operative resection site of the bowel and mesentery (Fig. 1). Regional nodal metastasis could be an isolated intra-abdominal site of recurrence, and this could be attributed to inadequate mesenteric resection (10). Right-sided colonic tumors tend to spread to the paracolic nodes, the interme-

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**Fig. 4.** Locoregional recurrence in a 64-year-old man who had undergone right hemicolectomy for colon cancer at the hepatic flexure. The CT scan shows a mass in the middle colic nodal group (arrows). P = head of the pancreas, Arrowhead = middle colic vein.

**Fig. 5.** Locoregional recurrence in a 72-year-old man who had undergone left hemicolectomy for colon cancer at the splenic flexure. The CT scan shows an enlarged lymph node in the left side of the transverse mesocolon (arrow). Arrowhead = middle colic vein.

**Fig. 6.** Locoregional recurrence in a 74-year-old man who had undergone left hemicolectomy for sigmoid colon cancer. The CT scan shows an enlarged lymph node lateral to the abdominal aorta at the position of the IMA node (arrow).

**Fig. 7.** Locoregional recurrence in a 63-year-old man who had undergone low anterior resection for rectal cancer. The CT scan shows a heterogeneous nodular mass adjacent to the anastomosis (arrow).
mediate nodal group along the ascending mesocolon and the lymph nodes at the root of the superior mesenteric artery (SMA) [Fig. 2] (4). Therefore, recurrent nodal disease in patients with tumor in the ascending colon can be observed in the ascending mesocolon, which is located lateral to the second portion of the duodenum and anterior to the right kidney [Fig. 3]. Tumors of the hepatic flexure and the right side of the transverse colon initially spread to the paracolic nodal group and the nodal group at the gastrocolic trunk anterior to the head of the pancreas [Fig. 2] (4). Therefore, recurrent nodal disease in patients with tumor in the hepatic flexure and the right side of the transverse colon can be found in the nodal group anterior to the head of the pancreas [Fig. 4]. Tumors at the left side of the transverse colon and splenic flexure can spread to nodes in the transverse mesocolon along the left middle colic vessels [Fig. 2] (4). Therefore, recurrent nodal disease in patients with tumor in the left side of the transverse colon and splenic flexure can be found at the base of the transverse mesocolon [Fig. 5]. Left-sided colonic tumors tend to spread to nodes in the paracolic, intermediate mesocolic and inferior mesenteric artery (IMA) nodal group [Fig. 2] (5). Therefore, recurrent nodal disease in the patients with tumor at the left sided colon can be found in the IMA nodal group [Fig. 6].

**Locoregional Recurrence of Rectal Cancer**

The reported range of locoregional recurrence, after curative resection for rectal cancer, has varied from 4% to 50%, with surgical resection being the main curative...
therapy in these patients (11). Even with radiation therapy and total mesorectal excision, the risk of recurrence for patients with rectal cancer remains around 10% (12). Incomplete removal of the lateral spread of the tumor is now accepted as the cause of the majority of locoregional recurrences (13). Recurrent tumor usually appears as a soft-tissue mass in or near the surgical site (Figs. 7-9).

Tumors in the rectum can spread by two main lymphatics routes: either following the superior rectal route toward the mesorectum and mesocolon or following the lateral route along the middle and inferior rectal vessels toward the hypogastric (internal iliac) nodal group (Fig. 10) (5). Among the hypogastric nodal group, the specific nodal chains that can be identified are the anterior nodes, located anterior to the hypogastric vessels, and the lateral sacral nodes, located along the lateral sacral arteries anterior to the sacral foramina. When performing standard total mesorectal excision, the perirectal nodes are removed with the primary tumor, but the internal iliac nodes are left in situ. Thus, for lower rectal cancer, there is a risk that the involved internal iliac nodes will be left behind with the chance for local recur-
rence [Figs. 11-13].

Although downward spread along the inferior rectal vessels to the groin is unusual, after radical resection for rectal cancer with interruption of the normal pathway of lymphatic drainage, recurrent disease may find an alternative route to the superficial and deep inguinal nodes and then it can occasionally ascend along the external iliac and common iliac groups [Fig. 14] [5].

**Pitfalls**

Difficulties have been described in distinguishing locoregional recurrent rectal cancer from postoperative change (hematoma, abscess, fibrosis and changes of the normal pelvic structures), and particularly in the pelvis. Most patients undergoing abdominoperineal resection develop a fibrotic mass in the presacral operative bed [Fig. 15] [15]. Although early studies suggested that MR imaging would be superior for differentiating recurrent tumor from scarring in the operative bed, a more recent study has dispelled this theory [14]. PET/CT was recently reported to be effectively used to differentiate between recurrent tumor and scarring [15]. The inflammatory changes related to asymptomatic anastomotic

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**Fig. 14.** Isolated nodal recurrence in a 50-year-old woman who had undergone low anterior resection for rectal cancer. The CT scan shows nodal metastasis in the lateral chain of the external iliac nodes [arrow].

**Fig. 15.** Fibrotic mass in a 64-year-old man who had undergone abdominoperineal resection for rectal cancer. The CT scan shows a fibrotic mass in the presacral operative bed [arrows]. The findings at biopsy of the mass were negative for malignant cells.

**Fig. 16.** Inflammatory change related to anastomotic leakage in a 57-year-old woman who had undergone low anterior resection for rectal cancer. The CT scans show a presacral fluid collection with an air-fluid level [arrows in A] that communicates with the rectum [arrowheads in B].
leaks after low anterior resection should be also recognized (Fig. 16).

Detecting masses is also dependent on making comparison with the normal anatomy, which could be markedly altered by surgery and/or radiation. Normal pelvic structures such as ovary, seminal vesicle, prostate gland and non-opacified bowel can mimic tumor recurrence (Figs. 17-19).

**Conclusion**

The CT findings of locoregional recurrence after curative resection for colorectal cancer vary according to the primary tumor site. Regional spread in the lymph nodes follows a relatively predictable pattern based on the established lymphatic drainage patterns. It is important that radiologists understand the recurrence patterns according to the primary tumor site and that they are familiar with the various CT findings of locoregional recurrent colorectal cancer. With this knowledge, they can detect early recurrence during surveillance of patients after they have undergone curative resection for colorectal cancer.

**References**


