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Cancer Specific Long-term Survival After Surgery for Carcinoma of the Splenic Flexure

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Purpose: **Carcinoma of the splenic flexure is uncommon and it is associated with a high risk of obstruction. However, survival after resection of this tumor is controversial. The aim of this study was to evaluate cancer specific long-term survival after surgery for splenic flexure cancers compared to survival for the colon cancer at other sites.**

Patients and Methods: **Of 500 patients undergoing surgery for colon cancer, 16 (3.2%) had cancers of the splenic flexure. Clinicopathological features and cancer specific long-term survival after curative resection were evaluated.**

Results: **Splenic flexure carcinomas were found to be associated with a high risk of obstruction (4 out of 16; 25.0%) and a high risk of penetration/perforation (1 out of 16; 6.2%) compared with colon cancers at other sites ($P<0.0001$ and $P=0.0128$, respectively). Operative mortality rate for patients with carcinomas of splenic flexure was significantly higher than that of other sites (6.3% versus 0.8%; $P=0.0319$). However, resection for splenic flexure tumors was usually possible, and there was no difference in cancer specific long-term survival after surgery between the patients with splenic flexure cancers and the other site colon cancers ($P=0.3505$).**

Conclusions: **Carcinoma of the splenic flexure has a similar prognosis to colon cancer at other sites.**

Key words: splenic flexure, colon cancers, cancer specific long-term survival

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Introduction

The clinical features of carcinoma of the splenic flexure have been elucidated: it is uncommon,[1,2,3)] and symptoms are often vague and misleading, which may be responsible for a delay in diagnosis.[2)] The incidence of obstruction in splenic flexure cancers is approximately twice that of colon cancers at other sites.[1,3)] However, survival after resection of splenic flexure cancers is controversial. Some authors reported that the survival rate of splenic flexure cancers was worse than that of other colon cancers[3,4)] whereas other studies have not made any reference to this.[1,2,5)] The aim of this study was to review our experience with this disease and to evaluate the cancer specific longterm survival after surgery for splenic flexure cancers compared to that of colon cancers at other sites.

Methods

Between January 1982 and December 1997, 500 patients with a single primary adenocarcinoma of the colon underwent surgery at Nagasaki University Hospital. Patients with more than one carcinoma of the colon (synchronous or metachronous) were not included in the study. The splenic flexure is defined as the junction of the distal third of the transverse colon with the first part of the descending colon.[2,3)] In this paper, carcinoma of the rectosigmoid junction was considered with carcinoma of the rectum and patients with these cancers were excluded from the study.[2)] Colon obstruction was defined in the following situations: symptoms of increasing constipation, pain and vomiting; radiographic signs of abdominal distension and abnormal gaseous distension of the gut laparotomy findings of proximal bowel distension and edema; and urgent surgery performed within 48 hours of admis-

sion. Curative resection was defined as the removal of the primary tumor, with or without an anastomosis, which was histologically complete, with no metastasis to liver, peritoneum or other distant organs. Local recurrence was defined as convincing evidence of recurrence of cancer at the anastomosis, in the abdominal wound, in the drain site or peritoneum, but not hepatic or peritoneal secondaries. Tumor staging was classified by Dukes staging, i.e. cancers limited to the bowel wall were classified as Dukes' A, those extending through the wall with negative lymph nodes were classified as Dukes' B, cancers with positive lymph nodes were defined as Dukes' C, and those with distant metastasis were classified as Dukes' D.[1,6]

Categorical data were analyzed by chi-square or Fisher's exact probability test, and continuous data were analyzed with a Student's *t*-test. Analysis of survival was performed using the method of Kaplan and Meier,[7] and differences between the curves were determined using the log rank test.[8] By this method cases were classified as either "Fails" (uncensored data) or "Non-fails" (censored data). Fails were defined as patients who died due to recurrence of colonic cancer, non-fails being surviving patients, or patients who died of causes other than cancer of the colon.[5] Patients who died within one month of the operation were not included in the survival analysis. All tests were two-tailed and a p value of less than 0.05 was considered significant.

Results

500 patients, 16 (3.2%) had carcinomas of the splenic flexure. They included 7 males and 9 females with a mean age of 60.7 years (S.D. ±11.0 years). Table 1 compares clinical features of splenic flexure cancers and colon cancers at other sites. More splenic flexure cancers were obstructing than were those occurring at other sites ($P<0.0001$). The splenic flexure cancers had perforation and/or penetration induced by the colon carcinoma more than the other site colon cancer ($P=0.0128$). However, there were no significant differences in age, sex, peritoneal dissemination, hepatic metastasis and extra-abdominal metastasis between the two groups (Table 1).

Table 2 compares histopathological features of splenic flexure cancers and colon cancers at other sites. There were no significant differences in tumor size, histologic type, depth of invasion, lymph node metastasis, lymphatic and venous involvement between the splenic flexure cancer and the other site colon cancer.

Table 1. Comparison between clinical features in splenic flexure cancers and colon cancers at other sites.

Variable	No. of Carcinoma (%)		*P* value
	Splenic flexure (n=16)	Other sites (n=484)	
Age (years)*	60.7±11.0*	65.4±11.9*	0.1231
Sex			0.2545
Male	7(43.7)	281(58.1)	
Female	9(26.3)	203(41.9)	
Obstruction			<0.0001
Absent	12(75.0)	468(96.7)	
Present	4(25.0)	16(3.3)	
Penetration/perforation			0.0128
Absent	15(93.8)	481(99.4)	
Present	1(6.2)	3(0.6)	
Peritoneal dissemination			0.4522
Absent	15(93.8)	461(92.6)	
Present	1(6.2)	23(7.4)	
Hepatic metastasis			0.1392
Absent	14(87.5)	448(89.2)	
Present	2(12.5)	36(10.8)	
Extra-abdominal metastasis			0.2616
Absent	15(93.8)	474(97.9)	
Present	1(6.2)	10(2.1)	
Site of extra-abdominal metastasis			
Supra-clavicular lymph node	0	3	
Lung	1	4	
Bone	0	1	
Brain	0	0	
Stomach	0	1	
Skin	0	1	

*Mean ± standard deviation.

Table 2. Comparison between histopathological features of splenic flexure cancer and colon cancers at other sites.

Variable	No. of Carcinoma (%)		*P* value
	Splenic flexure (n=16)	Other sites (n=484)	
Tumor size (cm)*	4.11±2.01*	4.92±2.37*	0.1775
Histologic type			0.1370
Well differentiated	3(18.8)	148(30.6)	
Moderately differentiated	13(81.2)	280(58.0)	
Poorly differentiated/Mucinous	0(0)	55(11.4)	
Depth of invasion			0.5052
Mucosa/Submucosa/Muscle layer	3(18.8)	111(23.0)	
Subserosa	7(43.7)	253(52.4)	
Serosa exposed/Invasion to adjacent organ	6(37.5)	119(24.6)	
Lymph node metastasis			0.5728
Absent	11(68.8)	296(61.8)	
Present	5(31.2)	183(38.2)	
Lymphatic invasion			0.4515
Absent	6(37.5)	138(28.8)	
Present	10(62.5)	596(71.2)	
Venous invasion			0.3719
Absent	10(62.5)	348(72.7)	
Present	6(37.5)	131(27.3)	

*Mean ± standard deviation.

Curative resection was performed in 12 of the 16 patients with splenic flexure cancers. Non-curative resection was performed in 4 patients (Table 3). Curative resection included left hemicolectomy with lymph node dissection. There was no difference in a proportion of curative resection between the two groups. There was also no significant difference in Dukes' stage between the two groups (Table 4).

Median follow-up was 546 days (range, 112-3775 days). At the end of the follow-up period (April, 1998), 393 (78.6%) of the colon cancer patients were alive, 84 (16.8%) had died from colon cancer, 5 (1.0%) had died from operative complications and 18 (3.6%) had died of causes other than cancer. Operative mortality rates for patients with carcinomas of splenic flexure and other sites were 6.3% (1 out of 16 patients) and in 0.8% (4 out of 484 patients), respectively, which indicated significant difference (P=0.0319).

There was no significant difference in cancer specific long-term survival after surgery between the patients with splenic flexure cancers and those with cancers at other sites (P=0.3505) (Fig. 1). There was also no significant difference in survival after curative resection between the patients with splenic flexure cancers and those with cancers at other sites (P=0.6076) (Fig. 2).

Table 3. Comparison between type of operation in splenic flexure cancers and colon cancers at other sites.

	Splenic flexure (n=16)	Other sites (n=484)	P value
Operation			0.4820
Curative	12(75.0)	414(85.5)	
Non-curative	4(25.0)	69(12.3)	
Irresectable	0(0)	1(0.2)	

Table 4. Comparison of Dukes stage between splenic flexure cancers and colon cancers at other sites.

	No. of Carcinoma (%)		P value
	Splenic flexure (n=16)	Other sites (n=484)	
Dukes stage			0.5242
A	3(18.8)	98(20.3)	
B	6(37.5)	189(39.1)	
C	3(18.8)	135(27.9)	
D	4(25.0)	62(12.8)	

Table 5. Comparison of patterns of initial recurrence after curative surgery between splenic flexure cancers and colon cancers at other sites.

	Splenic flexure(%) (n=11)	Other sites(%) (n=412)	P value
Recurrence			0.5467
No	9(81.8)	362(87.9)	
Yes	2(18.2)	50(12.1)	
Site of initial recurrence			
Hematogenous	2(18.2)	28(6.8)	
Liver	1	23	
Lung	0	5	
Spleen	1	0	
Brain	0	1	
Peritoneum	0	9(2.2)	
Lymph node	1(9.1)	7(1.7)	
Local	0	5(1.2)	
Unknown	0	4(1.0)	

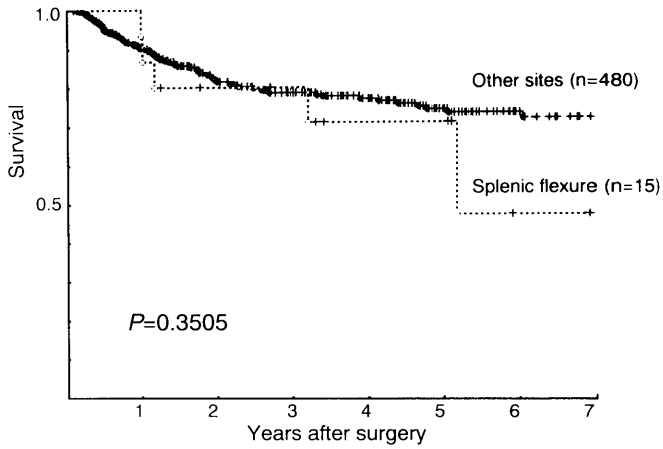

Fig. 1. Cancer specific survival in relation to tumor sites in patients who underwent surgery. Survival curves indicate carcinoma of the splenic flexure (open circles) and other sites (closed circles).

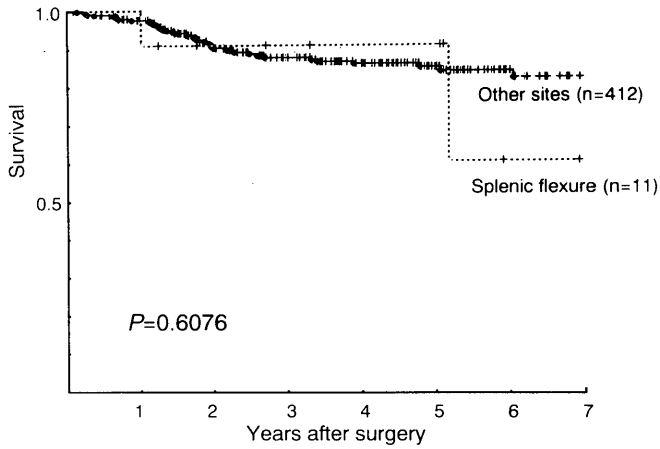

Fig. 2. Cancer specific survival in relation to tumor sites in patients who underwent curative resection. Survival curves indicate carcinoma of the splenic flexure (open circles) and other sites (closed circles).

Discussion

In our series 3.2% patients presented colon cancers located at the splenic flexure, which is consistent with the 2-5% described in other series.[2,4] Carcinoma at the splenic flexure is associated with the highest risk of obstruction.[1-3,9] In our series, the incidence of obstruction in splenic flexure cancers was approximately eight times that of colon cancers at other sites, which is 2-fold higher than that described in other reports.[1-3,9] In this series, there was no significant difference in Dukes' stage between splenic flexure cancers and colon cancers at other sites. Most authors[1-3] reported that there was no significant difference in Dukes staging between the two groups. Aldridge *et al*[3] reported that the rate of curative resection did not vary with tumor site as this was constant at approximately 70% at all colon sites. Carcinoma of the splenic flexure is often manifested as left upper quadrant or epigastric pain, with no abnormal physical findings. Barium enema studies in such cases may reveal a tumor of the splenic flexure, but special techniques are often necessary for its visualization.[4] Total colonoscopy is essential for early diagnosis of splenic flexure cancers, because of their location above the reach of the sigmoidoscope.

Survival among patients with splenic flexure cancers has been found to be worse than in those with colon cancers at other sites[3,4] and Aldrige et al[3] reported that this was the case even in splenic flexure cancers without obstruction. However, other studies[1,2,5] revealed that when the tumor site was the splenic flexure survival was not affected in spite of the high incidence of obstruction. It is widely accepted that obstruction in large-bowel cancer has some independent effect on survival.[1,2,10] In this series, there was no significant difference in survival between splenic flexure cancers and colon cancers at other sites.

Extended resection, such as subtotal colectomy or extended right hemicolectomy with ileodescending colostomy, might logically be expected to improve survival of patients with colon cancer at the splenic flexure[1] because the lymph nodes along the course of both the superior and inferior mesenteric vessels would be removed.[1,3] In our series, prognosis of splenic flexure cancers was not worse than in other colon cancers, although none of the splenic flexure cancer patients underwent the extended resection. In addition, we did not observe local recurrence at this site. We thus think that dual lymphatic drainage is not disadvantageous in terms of survival and that extended resection is unnecessary.[1]

With reference to the report by Aldridge et al,[3] one can pose the question of whether the carcinoma at the splenic flexure is biologically different from that at other sites within the large bowel? We feel that splenic flexure carcinoma in terms of tumor biology may not differ from colon cancers at other sites, because there were no differences in modes of metastasis at operation and recurrence between splenic flexure and other sites cancers in this series. However, one problem remains and that is the fact that splenic flexure carcinomas carry a high risk of obstruction. The acute angle at the splenic flexure may contribute towards this risk.[3,11] The term 'silent growth' has been applied to the splenic flexure carcinoma in the past[12] as it is frequently refractory to diagnosis, often presenting only once obstruction has occurred.[3] Certainly, the present study has failed to identify a clinicopathological reason for increased obstruction at this site. Further advances in study of the biology of tumors occurring at the splenic flexure might help answer this question of the high risk of obstruction.

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