JBUON 2015; 20(2): 406-412
ISSN: 1107-0625, online ISSN: 2241-6293 • www.jbuon.com
E-mail: editorial_office@jbuon.com

ORIGINAL ARTICLE

Emergency surgery for obstructing colorectal malignancy: prognostic and risk factors

Georgios Papadimitriou, Dimitrios Manganas, Christos Phedias Georgiades, Vasileios Vougas, Konstantinos Vardas, Spiros Drakopoulos

First Department of Surgery and Transplant Unit, Evangelismos General Hospital, Athens, Greece

Summary

Purpose: *Emergency surgery for colorectal malignant obstruction is thought to correlate with poor outcome. The main aim of our study was to identify possible factors that could predict obstruction, and risk factors of poor postoperative outcome. The second aim was to determine any differences between primary anastomosis and stoma creation in the obstruction population, especially in left-sided tumors.*

Methods: *A retrospective review of 212 patients who underwent surgery for colorectal malignancy between January 2008 and January 2013 was performed. Fifty-five patients (26%) underwent emergency surgery for completely obstructing colorectal carcinoma, and 157 (74%) underwent elective surgery.*

Results: *The groups were comparable for age, gender, ASA score, tumor location, tumor stage, lymph node metastasis and mortality. Advanced tumor stage was recorded as the only prognostic factor of obstruction (p=0.001). Postoperative mortality rate was 9.1% in the obstruction group and 6.4% in the elective group (p=0.498). Analysis didn't reveal any risk factors for poor early outcome in the obstruction group. All patients with right-sided obstructive cancer were treated with resection and primary anastomosis, while the same procedure was performed in almost 61% of operations for left-sided tumors with no anastomotic failure.*

Conclusions: *Obstructive colorectal malignancy presents at a more advanced stage compared with non-obstructive cancer, with, interestingly, no statistically significant differences in postoperative mortality. Risk factors of poor early outcome couldn't be identified. Resection and primary restitution of continuity is the surgical approach of choice for right-sided obstructive cancers, but it can be, also, safely performed in left-sided cancers.*

Key words: *colorectal carcinoma, emergency surgery, obstructive colon cancer, prognostic factors*

Introduction

The incidence rates of colorectal carcinoma increased in recent years almost all over the world. In the United States it is the second most frequent cause of cancer death [1]. 1.23 million colorectal cancers have been diagnosed worldwide, placing colorectal cancer the third most commonly diagnosed cancer, and accounting for 8% of all cancer deaths [2]. The reported incidence of obstructive colorectal cancer varies between series, and is as high as 30% [3-5]. Emergency surgery for complicated colorectal malignancy has been associated with high postoperative mortality rates [6,7], as well as poor 5-year survival [8,9].

Surgical management of obstructing colorectal tumors varies widely and depends on factors such as patient's hemodynamic status, American Society of Anesthesiologists (ASA) score, age, perioperative findings and tumor location. For both cancers of the right and left colon, some surgeons prefer resection and primary anastomosis (RPS), and some others resection and stoma creation (RS), with or without on-table lavage [10-12]. In re-

Correspondence to: Georgios Papadimitriou, MD. 12 Tsakiroglou Street, 17122, Nea Smirni, Athens, Greece. Tel: +30 6977464807, Fax: +30 210 7233421, E-mail: gkpapadimitriou@hotmail.com
Received: 14/09/2014; Accepted: 19/10/2014

cent years colon stenting has gained a place in the management of obstructive tumors as a bridge to surgery: following release of the obstruction with a stent the patient is properly staged and offered multidisciplinary treatment and eventually elective surgery [13,14]. Unfortunately, no prospective randomized trials exist.

The primary aim of our retrospective study was to identify possible factors that could predict obstruction, and risk factors of poor postoperative outcome. A second aim was to review the treatment of emergency obstructive colorectal malignancy, especially the use of the Hartmann's procedure for left-sided tumors.

Methods

Patients and inclusion criteria

We retrospectively studied the data of patients who underwent emergency and elective surgery for colorectal carcinoma between January 2008 and January 2013, focusing on data concerning patients with obstructive cancer. The study has been conducted according to the principles established in Helsinki. Data were collected from the clinic and operation records. All patients were followed-up for at least 3 months.

Patients with missing data (N=3), patients operated for cancer recurrence (N=6) and those subjected to palliative stoma (N=4) were excluded from further analysis. Furthermore, cases of familial adenomatous polyposis (N=3) and benign conditions (diverticulitis, colon ischemia, volvulus; N=31) were also excluded.

Preoperative and postoperative procedures

Three pathologists with at least 5-year clinical experience performed all histopathological analyses, while 4 surgeons with 10-year experience in colorectal surgery performed all operations.

Diagnosis of obstructive colorectal cancer was established postoperatively based on histopathological reports, while diagnosis for the elective operations was made preoperatively with colonoscopy and histopathological analysis of biopsy specimens.

Ileus was determined based on the clinical assessment (nausea, vomiting, tenesmus, abdominal pain, fecal content in the nasogastric tube), plain abdominal radiographs (air-fluid levels) and, in a few cases, computed tomography (CT) scan of the abdomen with oral contrast. Preoperative evaluation included, also, blood/serum tests, chest radiograph and electrocardiogram. All patients with acute obstruction of the colon and rectum were admitted to the operation room within 48 hrs of admission, after medical resuscitation with intravenous fluids, monitoring of renal function and parenteral antibiotic prophylaxis against both aerobic and anaerobic bacteria (metronidazole and second-generation cephalosporins).

Variables assessed

Initial variables included age, gender, ASA score, tumor location, type of surgery, obstruction status, length of hospitalization, tumor classification, total number of excised lymph nodes and mortality. Tumors were classified according to tumor node metastasis (TNM) system of the American Joint Committee of Cancer (AJCC). All stage IV tumors had metastasized to the liver. Mortality was defined as that occurring within 90 days postoperatively, but there were no further data confirming the cause of death.

Lesions proximal to splenic flexure were recorded as right-sided cancers and those distal to splenic flexure as left-sided cancers. All tumor resections were performed either as one-stage procedure (RPA) or as two-stage procedure (RS). A standard high ligation of the vascular pedicle was performed. Neither preoperative bowel preparation nor on-table lavage was performed in patients with obstructive cancer. Right or extended right colectomy was performed for right-sided cancers, while left or extended left colectomy, anterior resection, low anterior resection (with or without loop-ileostomy) and Hartmann's procedure was performed for left-sided cancers.

Statistics

Statistical comparative analysis for categorical variables was performed using Chi-square test. Normality distribution of quantitative variables was assessed with Kolmogorov-Smirnov test and with histograms. Comparative analysis of the quantitative variables was performed using Student's *t-test* or nonparametric Mann-Whitney *U test* for non-normally distributed variables. Multivariate analysis was performed using the binary logistic regression model. Survival curves were generated using Kaplan-Meier method and differences between the curves were analyzed by log-rank test. All statistical analyses were performed using the Statistical Package for Social Sciences (version 21.0; SPSS Inc., IL, Chicago, USA), and p value <0.05 was considered statistically significant.

Results

Patient characteristics

During the study period 212 patients (134 males, 78 females) underwent surgery for colorectal carcinoma. Of this population, 55 patients (25.9%) presented with acute obstruction and 157 (74.1%) were admitted for elective surgery. The patient median age was 72 years (range 30-94). Of the patients 54.7% were over 70 years. Overall 90-day mortality rate was 7.1% (Table 1).

Table 1. Patient and disease characteristics

Characteristics	*Results*
Total No. of patients	212
Age (y)	
Mean (SD)	69.25 (12.28)
Median (range)	72 (30-94)
Age >70, N (%)	116 (54.7)
Sex	
Male / Female, N (%)	134/78 (63.2/36.8)
ASA score	
Mean (SD)	2.1 (0.72)
Median (range)	2.0 (1-4)
Grade >3, N (%)	55 (25.9)
Tumor site	
Right / Left, N (%)	69/143 (32.5/67.5)
Tumor location, N(%)	
Cecum	31 (14.6)
Ascending	28 (13.2)
Transverse	10 (4.7)
Descending	11 (5.2)
Sigmoid	58 (27.4)
Rectum	74 (34.9)
Length of hospitilalization (d)	
Mean (SD)	13.39 (5.96)
Mortality, N (%)	15 (7.1)

y: years, d: days, SD: standard deviation

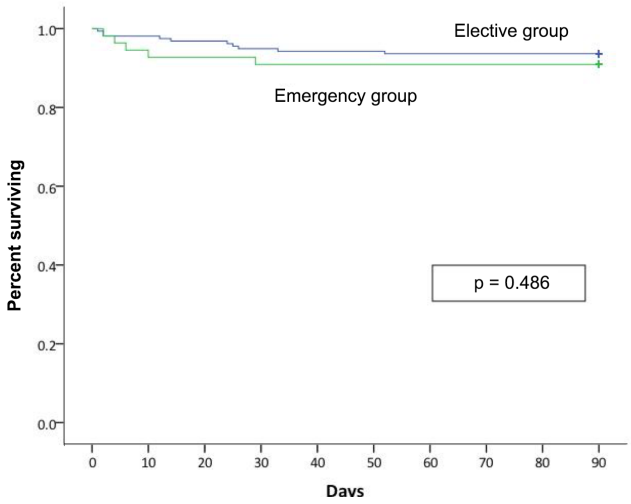

Figure 1. Kaplan-Meier 90-day survival curves for the emergency and elective group.

Prognostic factors of obstruction

Age, gender, ASA score, tumor location, TNM stage, number of lymph nodes resected in specimens, number of lymph node metastases, length of hospitalization and mortality of both groups of patients after radical surgery are summarized in Table 2.

Nineteen (34.5%) of the obstructive tumors and 50 (31.8%) of the non-obstructive were right-sided, while 36 (65.5%) and 107 (68.2%), respectively, were respective data for left-sided (p=0.713). The majority of the patients in both first group (N=42,76.4%) and second group (N=115,73.2%) had ASA score <III (p=0.65). Interestingly, all of the patients in the emergency group with an ASA score of III or IV (N=13) were alive at 3-month follow-up.

Univariate analysis showed statistically significant difference between the two groups in relation to tumor stage (p=0.008). In the first group 65.5% of the tumors were stage III and IV, in contrast with only 47.1% in the second group. Significant correlation was also found with tumor location (p=0.001), with the majority of obstructive tumors located in the sigmoid (47.3%) and of non-obstructive tumors in the rectum (40.1%). However, after analysis with binary logistic regression model, only tumor stage remained the most important predicting factor that was related to obstruction (Table 2).

Risk factors of poor early outcome

The postoperative 90-day mortality rate was 9.1% (5 patients) in the obstruction group and 6.4% (10 patients) in the elective group with no statistically significant difference (p=0.486), as shown in Figure 1. Especially in the obstruction group, no risk factors of poorly early outcome were identified, as no significant correlation was found between postoperative mortality and ASA score (p=0.3), TNM stage (p=0.419), age (p=0.269), gender (p=0.859) and type of operation (RPA vs RS, p=0.085). Even age >70 years was not statistically significant despite the fact that all of the patients who died were over 70 years.

RPA vs RS in the obstructive cancers

Mean age of the patients was 72.23 years in the RPA group and 69.6 years in the RS group (p=0.468). Even gender (p=0.360), length stay (p=0.930) and mortality rate (as mentioned above) were not significantly different. However, there was significant difference with location of the

Table 2. Results of univariate and multivariate analyses of all factors associated with obstructing colorectal cancer

Total No. of patients: 212	*Emergency group (N=55)*	*Elective group (N=157)*	*Univariate*	*Multivariate*	
Factors			*p value*	*HR (95% CI)*	*p value*
Age (y), mean (range)	71.58 (37-94)	68.43 (30-89)	0.102[1]		
Age >70, N (%)	36 (65.5)	83 (52.9)	0.192[3]		
Sex (male/female), N (%)	35 (63.6) / 20 (36.4)	99 (63.1) / 58 (36.9)	0.939[3]		
ASA score, N(%)					
ASA I-II	42 (76.4)	115 (73.2)	0.65[3]		
ASA II-IV	13 (26.6)	42 (26.8)			
Tumor site (right/left)	19 (34.5) / 36 (65.5)	50 (31.8) / 107 (68.2)	0.713[3]		
Tumor location, N (%)					
Cecum	7 (12.7)	24 (15.3)			
Ascending	7 (12.7)	21 (13.4)			
Transverse	5 (9.1)	5 (3.2)	0.001[3]	0.90 (0.76-1.06)	0.219
Descending	5 (9.1)	6 (9.1)			
Sigmoid	23 (41.8)	35 (22.3)			
Rectum	8 (14.5)	66 (42)			
Tumor stage (TNM), N (%)					
0	0 (0)	15 (9.6)			
I	3 (5.5)	23 (14.6)	0.008[3]	1.87 (1.31-2.68)	0.001
II	16 (29.1)	45 (28.7)			
III	26 (47.3)	63 (40.1)			
IV	10 (18.2)	11 (7.0)			
Lymph nodes resected, N (range)	23.13 (6-83)	23.26 (3-68)	0.594[2]		
Lymph-node metastasis, N (range)	2.49 (0-24)	2.08 (0-40)	0.149[2]		
RPA/RS, N (%)	41 (74.5) / 14 (25.5)	99 (63.1) / 58 (36.9)	0.122[3]		
Mean hospital stay (d), N (range)	12.4 (3-31)	13.73 (3-35)	0.154[2]		
Mortality, N (%)	5 (9.1)	10 (6.4)	0.498[3]		

[1]t-test, [2]Mann-Whitney U test, [3]Chi-square test, RPA: resection-primary anastomosis, RS: resection-stoma, HR: hazard ratio, y: years, d: days

obstruction (p=0.001), as all of the patients with right-sided obstructive cancer were treated with one-stage procedure (Table 3).

Left-sided malignancy

All patients treated with RS had rectosigmoid tumors. Univariate analysis of the obstructive left-sided tumors treated with stoma construction (Hartmann, N=12; loop-ileostomy, N=3) is shown in Table 4. Difference between reconstruction of the stoma and age over 70 years was statistically significant (p=0.01), as none of the patients over 70 years was operated twice. On the other hand, there were no differences as far as gender or ASA score were concerned (p=0.68 and p=1.0, respectively). Interestingly, the postoperative 90-day mortality rate in the RS group was 20% (3/15 patients died) and only 4.8% in the RSA group (only 1 of the 21 patients died), with no statistically significant difference (p=0.171), as shown in Figure 2. The cause of death in the RPA patient group was low respiratory tract infection (LRTI) and not anastomotic failure.

Discussion

In our study 26% (55/212) of all colorectal cancer patients admitted to our hospital had signs of obstruction, and were ungently operated. These data are in accordance with the incidence reported in previous series [3-5].

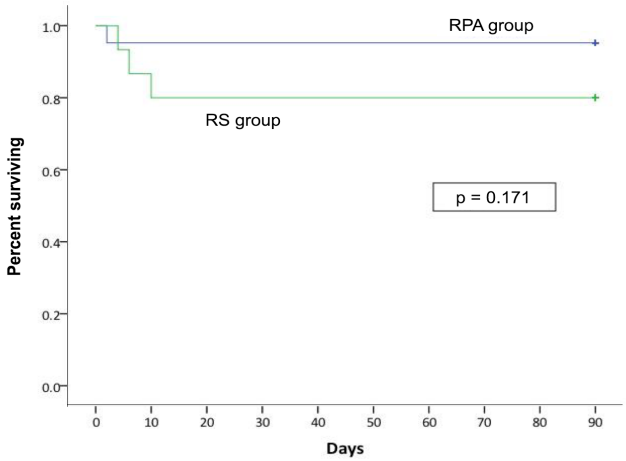

Figure 2. Kaplan-Meier 90-day survival curves of RPA vs RS surgery for left-sided obstructing cancers.

The first aim of this study was to identify possible factors that could predict obstruction, and also to identify risk factors of poor postoperative outcome. Univariate analysis of emergency and elective patient data revealed no association with age, age over 70 years, gender, ASA score, lymph node metastasis and operation type (RPA/RS), but there was statistically significant correlation with tumor stage (p=0.008), even after multivariate analysis (p=0.01). These findings are quite consistent with the Biondo et al. study [15], but, conversely, there are many studies in the literature which revealed correlation even with ASA score, operation type or age [6,16,17]. There were no differences in the number of lymph nodes resected between obstructive and elective group, a fact which confirms that optimal oncologic surgery was performed even to emergency cases.

Mortality rate in our obstruction group was 9.1%, which is quite lower to this reported by other investigators [15,18-20]. In many studies, early postoperative survival has been associated with age, ASA score and tumor stage [5,18,20], but our analysis didn't identify any predictive factors of postoperative mortality. Even age over 70 years was not statistically significant in relation to mortality.

The second objective of our study was to determine any differences between RPA and RS group in the obstruction group of patients. One-stage resection and anastomosis is now a general practice for right-sided obstructive lesions, but it is still controversial for left-sided cancers

Table 3. Univariate analysis of variables stratified by stoma creation in the obstruction group

Total: 55 patients	*RPA (N=41)*	*RS (N=14)*	*p value*
Age, mean (range) (y)	72.76 (37-94)	68.14 (48-90)	0.211[1]
Age >70, N (%)	28 (68.3)	6 (42.9)	0.091[2]
Sex (male/female), N (%)	24 (58.5) / 17 (41.5)	11 (78.6) / 3 (21.4)	0.178[2]
Location of obstruction (right/left), N (%)	19 (46.3) / 22 (53.7)	0 (0) / 14 (100)	0.002[2]
Length of hospitalization, days (range)	12.24 (3-31)	12.86 (4-28)	0.739[1]
Mortality (%), N (%)	3 (7.3)	2 (14.3)	0.434[2]

[1]t-test, [2]chi-square test, y: years. For other abbreviations see footnote of Table 2

Table 4. Univariate analysis of variables stratified by reconstruction of the stoma in the left-sided obstructing cancers

Total: 16 patients	*Reconstruction of the stoma (N=4)*	*Permanent stoma (N=10)*	*p value*
Age >70, N (%)	0 (0)	6 (60)	0.040[1]
Sex (male/female), N	4/0	7/3	0.217[1]
ASA score, N (%)			
I-II	3 (75)	9 (90)	0.469[1]
II-IV	1 (25)	1 (10)	

[1]chi-square test

[11,12,21,22]. We treated all of our patients with right-sided obstructive cancer with RPA, while almost 39% of operations performed for left-sided tumors were RS (Hartmann's procedure 30%). Interestingly, the mortality rate in our study after RPA for right-sided obstructive cancer was lower than the mortality after RPA for left-sided obstructive cancer (5.3 vs 9.1%), in contrast to recent large studies [12,20]. Furthermore, there were no statistically significant differences in mortality between RS and RPA group as far as left-sided obstructive cancers are concerned, while no anastomotic failures were observed in the RPA group (only one patient died because of LRTI). Only 18% of the patients treated with Hartmann's procedure had ASA score >II, and only half of these patients were over 70 years. Our results even showed no statistically significant difference in surgical outcomes, such as mortality and length of hospitalization between the two groups, in accordance with the results of previous studies [23,24]. Many investigators consider colonic stenting followed by interval elective surgery as the best and safer treatment option [13,14], while subtotal colectomy is preferred only when there are synchronous neoplasms in the right colon or caecal perforation [25,26]. Only 2 of our patients were treated with subtotal colectomy and ileorectal anastomosis (5% of all left-sided obstructions), due to caecal destruction. Our institution does not favor endoscopic stenting or stage resection surgery (diverting colostomy).

In the literature, stoma reversal rate after Hartmann's procedure is only 20% in those patients with colon cancer [27]. The respective rate in our study was 36.36%, as 4 patients were re-operated successfully within 3-8 months. Patient age over 70 years emerged as the only important factor influencing reversibility, as none of the patients over 70 was re-operated. The postoperative mortality after Hartmann's operation for left-sided obstructive cancer was 18.18%, which is similar to mortality reported by other authors [28].

The present study has some limitations, such as the relatively small patient number with obstructing cancer, and the fact that it is a retrospective study from a single institution with, unfortunately, missing data concerning the cause of postoperative deaths. Despite these significant limitations, this study managed to emphasize various factors as possible risk factors for obstructing colorectal malignancy, and analyze the surgical approaches of patients with such pathology.

Conclusions

Analyses of the present study have documented that obstructing colorectal malignancy presents at a more advanced stage compared with non-obstructive cancer, with, interestingly, no statistically significant differences in postoperative mortality. Correlates of poor early postoperative outcome as risk factors couldn't be identified.

On the other hand, resection and primary restitution of continuity is the surgical approach of choice for right-sided obstructive cancers, but it can be, also, safely performed in left-sided cancers. Indisputable, Hartmann's procedure is still of value in elective patients and when perioperative findings cannot guarantee a safe anastomosis.

References

1. Siegel R, Naishadham D, Jemal A. Cancer statistics, 2012. CA Cancer J Clin 2012;62:10-29.
2. Ferlay J, Shin HR, Bray F et al. Estimates of worldwide burden of cancer in 2008: GLOBOCAN 2008. Int J Cancer 2010;127:2893-2917.
3. Ansaloni L, Andersson RE, Bazzoli F et al. Guidelenines in the management of obstructing cancer of the left colon: consensus conference of the world society of emergency surgery (WSES) and peritoneum and surgery (PnS) society. World J Emerg Surg 2010; 5: 29. doi: 10.1186/1749-7922-5-29.
4. Stower MJ, Hardcastle JD. The results of 1115 patients with colorectal cancer treated over an 8-year period in a single hospital. Eur J Surg Oncol 1985;11:119-123.
5. Alvarez JA, Baldonedo RF, Bear IG et al. Presentation, treatment, and multivariate analysis of risk factors for obstructive and perforative colorectal carcinoma. Am J Surg 2005;190:376-382.
6. Tentes AA, Mirelis CG, Kakoliris S et al. Results of surgery for colorectal carcinoma with obstruction. Langenbecks Arch Surg 2009;394:49-53.
7. Morris EJ, Taylor EF, Thomas JD et al. Thirty-day postoperative mortality after colorectal cancer surgery in England. Gut 2011;60:806-813.
8. Ohman U. Prognosis in patients with obstructing colorectal carcinoma. Am J Surg 1982;143:742-747.
9. Fitchett CW, Hoffman GC. Obstructing malignant lesions of the colon. Surg Clin North Am 1986;66:807-

820.

10. Yang HY, Wu CC, Jao SW et al. Two-stage resection for malignant colonic obstructions: the time for early resection and possible predictive factors. World J Gastroenterol 2012;18:3267-3271.
11. De Salvo GL, Gava C, Pucciarelli S et al. Curative surgery for obstruction from primary left colorectal carcinoma: primary or staged resection? Cochrane Database Syst Rev 2004;2:CD002101.
12. Hsu TC. Comparison of one-stage resection and anastomosis of acute complete obstruction of left and right colon. Am J Surg 2005;189:384-387.
13. Lee GJ, Kim HJ, Baek JH et al. Comparison of short-term outcomes after elective surgery following endoscopic stent insertion and emergency surgery for obstructive colorectal cancer. Int J Surg 2013;11:442-446.
14. Zhang Y, Shi J, Shi B et al. Self-expanding metallic stent as a bridge to surgery versus emergency surgery for obstructive colorectal cancer: a meta-analysis. Surg Endosc 2012;26:110-119.
15. Biondo S, Martí-Ragué J, Kreisler E et al. A prospective study of outcomes of emergency and elective surgeries for complicated colonic cancer. Am J Surg 2005;189:377-383.
16. Sjo OH, Larsen S, Lunde OC et al. Short term outcome after emergency and elective surgery for colon cancer. Colorectal Dis 2009;11:733-739.
17. Cheynel N, Cortet M, Lepage C et al. Trends in frequency and management of obstructing colorectal cancers in a well-defined population. Dis Colon Rectum 2007;50:1568-1575.
18. Tekkis PP, Kinsman R, Thompson MR et al; Association of Coloproctology of Great Britain, Ireland. The Association of Coloproctology of Great Britain and Ireland study of large bowel obstruction caused by colorectal cancer. Ann Surg 2004;240:76-81.
19. Tan KK, Sim R. Surgery for obstructed colorectal malignancy in an Asian population: predictors of morbidity and comparison between left- and right-sided cancers. J Gastrointest Surg. 2010;14:295-302.
20. Biondo S, Parés D, Frago R et al. Large bowel obstruction: predictive factors for postoperative mortality. Dis Colon Rectum 2004;47:1889-1897.
21. Jiang JK, Lan YT, Lin TC et al. Primary vs. delayed resection for obstructive left-sided colorectal cancer: impact of surgery on patient outcome. Dis Colon Rectum 2008;51:306-311.
22. Goyal A, Schein M. Current practices in left-sided colonic emergencies: a survey of US gastrointestinal surgeons. Dig Surg 2001;18:399-402.
23. Aslar AK, Ozdemir S, Mahmoudi H et al. Analysis of 230 cases of emergent surgery for obstructing colon cancer-lessons learned. J Gastrointest Surg 2011;15:110-119.
24. Kube R, Granowski D, Stübs P et al; Study group Qualitätssicherung Kolon/Rektum-Karzinome (Primärtumor) (Quality assurance in primary colorectal carcinoma). Surgical practices for malignant left colonic obstruction in Germany. Eur J Surg Oncol 2010;36:65-71.
25. The SCOTIA Study Group. Single-stage treatment for malignant left-sided colonic obstruction: a prospective randomized clinical trial comparing subtotal colectomy with segmental resection following intraoperative irrigation. Br J Surg 1995;82:1622-1627.
26. Lee YM, Law WL, Chu KW et al. Emergency surgery for obstructing colorectal cancers: a comparison between right-sided and left-sided lesions. J Am Coll Surg 2001;192:719-725.
27. Zorcolo L, Covotta L, Carlomagno N et al. Safety of primary anastomosis in emergency colo-rectal surgery. Colorectal Dis 2003;5:262-269.
28. Leong QM, Koh DC, Ho CK. Emergency Hartmann's procedure: morbidity, mortality and reversal rates among Asians. Tech Coloproctol 2008;12:21-25.