

MULTIVISCERAL 'EN-BLOC' RESECTIONS OF COLORECTAL TUMOURS - MILESTONES IN THE SURGICAL TECHNIQUES

K. Draganov, V. Marinov, A. Petreska, D. Rusenov, Y. Kolev, B. Borisov, N. Katev,
D. Penchev, G. Chengalova, S. Lavchev, D. Stoyanova, S. Tonev, R. Gaydarski

Clinic of Liver, Biliary, Pancreatic and General Surgery, Tokuda Hospital of Sofia

ABSTRACT

PURPOSE: Colorectal tumours (CRT) consisting mainly of colorectal cancer (CRC) are diagnosed sometimes at an advanced T4 stage, i. e. local involvement of neighbouring organ/organs and anatomical structure/structures. Aggressive surgical approach preceded and/or followed by neo-adjuvant/adjuvant therapy is advocated because of proven benefit for the patient. The aim of this study was to carry out a literature survey, on the one hand, and to analyze the cases from the authors' institutional experience, on the other hand, in an attempt to submit for consideration the milestones of the multivisceral en-bloc resections in cases of locally advanced CRTs, i.e. to describe the specific surgical approaches depending on different tumour location and peritumoural involvement of adjacent structures and organs.

MATERIAL AND METHODS: A retrospective analysis of 154 cases of CRT was performed, all of them operated in the Clinic of Liver, Biliary, Pancreatic and General Surgery, Tokuda Hospital of Sofia, from January 1, 2007 to March 31, 2013. All the patients were diagnosed in an advanced T4-stage and received multivisceral en-bloc resections. Three main groups of methods that had been used were analyzed: 1) preoperative diagnosis, giving a hint of multivisceral en-bloc resection; 2) intraoperative assessment - gross tumour appearance, frozen sections (?), final histological examinations, and 3) surgical methods.

RESULTS: Early morbidity and mortality rates were 22,6% and 5,8%, respectively, without any significant difference when compared with 'simple' colon and rectum resections and with literature data available.

CONCLUSION: Multivisceral en-bloc resection for CRCs has been performed in more than 10% of the cases. It benefits the long-term prognosis. Tumour location and number of resected organs are essential characteristics of these procedures and they are independently associated with the quantity of intraoperative blood loss, higher early morbidity rates and more frequent local recurrence.

Key words: *colorectal cancer, T4 colorectal cancer, multivisceral 'en-bloc' resection, surgical methods, case reports*

INTRODUCTION

In 1946, Everett Sugarbaker wrote that 'During recent years a rising operability has been reported in

carcinoma of the colon and rectum. There is little, if any, indication that this is the result of earlier diagnosis. Rather, it appears to be due to augmented attempts at the removal of growths which previously were considered inoperable' (21). According to literature data, T4 colorectal adenocarcinoma is seen in 5-22% of all cases (6,12). That's why the above mentioned augmented attempts continue during the next several decades. Thus a clarified and well-substantiated aggressive approach to locally advanced T4-Colorectal tumours

Address for correspondence:

K. Draganov, MD, PhD
Clinic of Liver, Biliary, Pancreatic and General Surgery
Tokuda Hospital of Sofia
51B Nikola Y. Vaptsarov Blvd, 1407 Sofia
e-mail: kiril_draganov2000@hotmail.com

(CRT) consisting mainly of colorectal cancer (CRC) as well as large intestine neuroendocrine tumours (NET) and GIST (although the latter are rare) is advocated. It is mainly based on the biological behaviour of these tumours which is sufficiently although not definitively investigated yet. Nowadays CRTs are considered favourable for an aggressive surgical approach preceded and/or followed by neo-adjuvant/adjuvant therapy with quite satisfactory long-term results (13,21).

Terminology and definitions

A multivisceral en-bloc resection is defined as en-bloc removal of any organ/organs or structure/structures to which the primary tumour is adjacent (13). The indications for such procedures are primary as well as recurrent CRTs. Emergency treatment is the one when a colorectal resection is done within 24 hours of patient's admission. Removal of unattached organs such as liver resection for hepatic metastases, cholecystectomy for symptomatic gallbladder disease, splenic resection for iatrogenic injury, or resection of synchronous tumours should not be considered as a multivisceral resection for the purpose of this paper.

The aim of this study was to carry out a literature survey, on the one hand, and to analyze the cases from the authors' institutional experience, on the other hand, in an attempt to submit for consideration the milestones of the multivisceral en-bloc resections in cases of locally advanced CRTs, i.e. to describe the specific surgical approaches depending on different tumour location and peritumoural involvement of adjacent structures and organs.

MATERIAL AND METHODS

A retrospective analysis of 154 cases of CRT was performed, all of them operated in the Clinic of Liver, Biliary, Pancreatic and General Surgery, Tokuda Hospital of Sofia, from January 1, 2007 to March 31, 2013. All the patients were diagnosed in an advanced T4-stage and received multivisceral en-bloc resections. The patients with palliative procedures were excluded from the analysis. However, the aim of this paper was not to study our early and late postoperative results because that was the objective of another paper of ours. This particular paper was focused on giving a light to problematic 'technical' steps in making decisions during surgery and fulfilling them.

Three main groups of methods that had been used were analyzed: 1) preoperative diagnosis, giving

a hint of multivisceral en-bloc resection; 2) intraoperative assessment - gross tumour appearance, frozen sections (?), final histological examinations, and 3) surgical methods.

Location of T4 CRT

The location of an advanced CRT is specific for invading adjacent structures thus it is essential for the preoperative assessment and intraoperative choice of the volume of en-bloc resections. Thirty-six patients (23,37%) had tumours in the supramesocolic part of the colon (hepatic flexure, transverse colon and left flexure) and the rest 118 ones (76,63%) had tumours affecting the inframesocolic parts (ascending, descending and sigmoid colon and rectum). Approximately similar site incidence was found by other authors (13) in their series of 201 cases (Fig. 1).

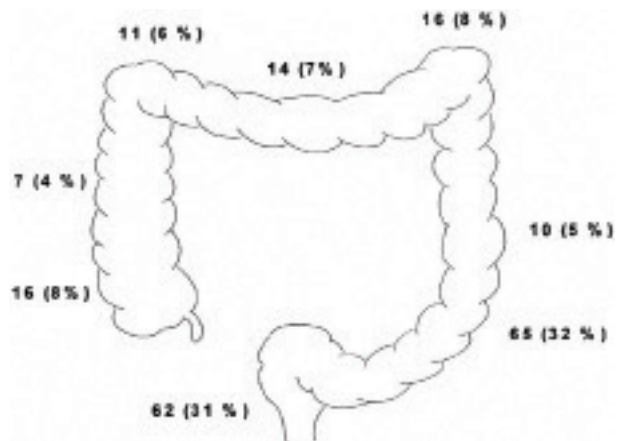


Fig. 1. CRC location in multivisceral resection (13)

Preoperative assessment

Imaging studies such as CT-scan and MRI are essential in order to determine local tumour infiltration. They should be routinely performed for CRC and are as much informative for T4 CRC as lower endoscopy added by endosonography (13).

Intraoperative assessment

At laparotomy, the final decision for multivisceral en-bloc resection has to be made (13). That's why the accuracy of intraoperative assessment of potential curative procedure is of great importance. In most patients the intraoperative assessment is confirmed by postoperative pathohistologic evaluation and staging.

Several studies demonstrate histologically carcinomatous peritumoural infiltration in 40- 72,5% of patients who have undergone multivisceral resections (3,6,13,16,18). In a German series, the pathohistologic examination detected tumour infiltration in 116 out of 341 resected organs (34%) (13). In the same study, clear margins were found in 17% of cases in which the surgeon had considered incomplete tumour resection. The explanation of these data was the so-called 'peritumoural inflammatory changes and inflammatory adhesions to adjacent organs'. So the 'large intestine dissection approach' from adherent organs was created as an alternative to the more traumatic and risky en-bloc resection (15). However, this procedure was not justified by practice because of its relatively high recurrence rate and unsatisfactory 5-year survival rate of 26 and 30%, respectively (15). Twenty-five years ago, local recurrence rates were shown to be significantly higher when adherent organs were separated from the tumour than cases of en-bloc removals (69 versus 18%) (10). An inadvertent dissection or any rupture of the tumour influenced the 5-year survival rate - just the poor 17%, compared with 49% after complete en bloc resection (3,5). This was confirmed in a subsequent study by the German Colorectal Cancer Study Group, when intraoperative tumour cell dissemination resulted in a 5-year survival rate of 19% and 21% for colon and rectal cancer, respectively, even if the tumour could be completely resected, in contrast to a 5-year survival rate of 49% to 53%, respectively, if spillage was avoided by en bloc resection (8). Frozen section to identify local infiltration was not helpful in this situation (10). In the same sense, many authors cast aside intraoperative frozen section to determine the extent of resection in order to avoid tumour contamination (13). All these facts rather confirmed than denied the aggressive surgical approach. The intraoperative assessment should rarely be used to exclude a patient from multivisceral resection with curative intent and every effort should be made to resect macroscopically invasive tumours completely.

Surgical methods and differentiated approach to T4 CRT

The organs and structures most frequently involved by a T4 CRT are the front abdominal wall (in 31%), the small intestine (in 29%) (Fig. 2) and the urinary bladder (in 24% of the patients) (13). Less of-

ten, a supramesocolic cancer (i.e. cancer of the right flexure, the transverse colon and the left flexure) infiltrates the liver, the gallbladder, the duodenum, the pancreas, the major gastric curvature and the spleen while ascending and descending colon cancer might invade the ureters and/or the kidneys. Five percent of low rectal masses advance with adherence to the vagina, uterus and prostate gland (3).

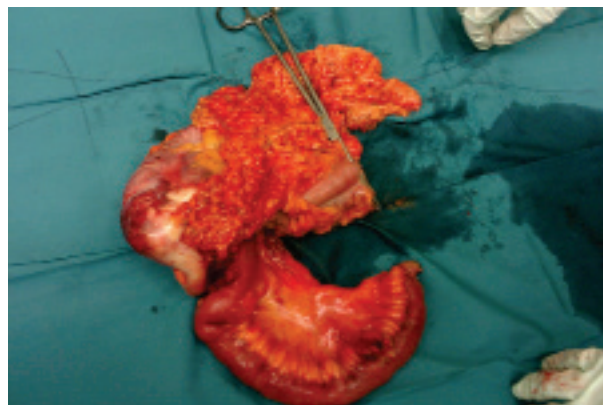


Fig. 2. A specimen of ascending colon cancer infiltrating the terminal ileum approximately 30 cm proximally to the ileocecal valve

Case reports

A case of a 51-year old woman with a T4 transverse colon cancer was demonstrated on Fig. 3. She had a 14-month history of extreme body weight loss, pain in the upper abdomen, diarrhea, oral smell, episodes of nausea and vomiting. Fibrocolonoscopy revealed a mass of the transverse colon and a gastrocolic fistula confirmed by the intraoperative assessment. The superior mesenteric vein (SMV) was also infiltrated on 2 cm stretch by conglomerated lymph node metastases (a supplementary intraoperative finding without preoperative evidences). The procedure included multivisceral en-bloc resection, i. e. extended right hemicolectomy + distal gastrectomy + resection of the SMV and lymph node dissection. No complications were registered in the postoperative period and during the 16-month follow-up. Until now, the patient is free of disease.

A case of a 76-year old man was demonstrated on Fig. 4. A malignant growth of the hepatic colonic flexure had caused infiltration of the visceral surface of segment VI of the liver, the gallbladder and the descending duodenum. The diagnosis was established



Fig. 3. A case of transverse colon cancer infiltrating the major gastric curvature (a) and forming a gastro-colic fistula (b); infiltration of the SMV by lymph node metastases (c)

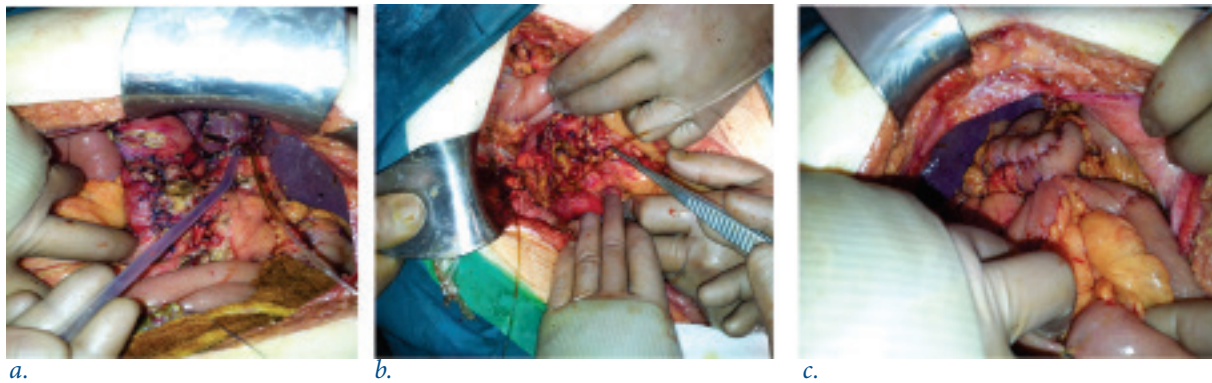


Fig. 4. A case of hepatic flexure colon cancer infiltrating segment VI of the liver (a), the duodenum (b) where inserted transcystic drainage is seen; gastric stump and gastro-jejunal anastomosis (c)

by fibrogastroscopy, fibrocolonoscopy and CT-scan. The en-bloc resection included no-touch technique extended right hemicolectomy (followed by side-to-side ileotransversostomy), atypical resection of segment VI, cholecystectomy, distal gastric resection (followed by gastrojejunal anastomosis), resection of superior and descending duodenum and the anterior surface of the head of the pancreas. Vater's papilla was preserved by insertion of transcystic drainage as a guiding point during the duodenal resection.

The left half of the transverse colon and the left flexure tend to infiltrate the major gastric curvature, the body and the tail of the pancreas, the spleen and, sometimes, the left diaphragm. Fig. 5 and 6 demonstrated such cases of ours.

Early postoperative results

Morbidity rates vary significantly in different series and the figures mainly depend on two factors - primary tumour location, i.e. the characteristics of the removal of adjacent organs and the time of surgery (elective versus emergency procedures) (1,13,16). According to literature data, the patients

with en-bloc multivisceral resections for colon cancer present less frequently with postoperative complications (28%) than those with en-bloc removals of rectal cancer (45%) (13). The postoperative complication rate was also greater after emergency operations (59%) compared with elective multivisceral resections (29%) (13). However, the postoperative complication rates of potentially curative and palliative operations were not significantly different (32% versus 34%). No significant differences in the morbidity rates after en-bloc resections compared with 'simple' colon or rectal resections were reported in studies dated in the 1990's (11,15,19) while later papers demonstrated significantly higher complication rates after multivisceral resections (between 33% and 50%) than plain colon or rectal resections (1,13,16).

The early mortality rate after multivisceral en-bloc resections ranges widely - from 0,0% to 12,0% (4,7,13,14,16). The most common specific (surgical) death causes include septic complications, bleeding and anastomotic leakage. Concomitant diseases such as cardiac, vascular, pulmonary and cerebral disorders cause fatal outcome in approximately half of the

cases. The death rate among colon cancer patients is higher than that among rectal cancer ones (9,4% versus 3,2%). Emergency surgery is explicitly followed by higher mortality rate compared with elective surgery (22,0% versus 5,2%) (4,7,13,14,16).

In our series, the early morbidity and mortality rates are 22,6% and 5,8%, respectively, without any significant difference compared with 'simple' colon and rectum resections and with literature data.



Fig. 5. A case of left flexure CRC invading the tail of the pancreas, major gastric curvature, spleen and the left diaphragm; resection margin on the gastric body is seen (linear stapler is used)

RESULTS

They were 113 males (45,2%) and 137 females (54,8%). Mean patients' age was 64 years and 6 months. Those aged 51-80 years were most commonly affected with a peak in the group of 1-70 years. Symptoms were determined by the location of the process and the type of the developed complication of the disease. The distribution according to the type of complication of colonic

diverticulosis in patients who underwent surgery was shown in Fig. 1.

Colonic diverticular disease complicated with perforation was observed in 31 patients (three with feculent peritonitis, 23 with total purulent peritonitis and five with local purulent peritonitis). In 28 cases, perforated diverticulitis was located in the left colon. Fistulizing disease was found out in five patients, i.e. colovesical fistula in three and colocutaneous fistula in two patients. Bleeding from colonic diverticula was detected in 21 patients. The conservative therapy was unsuccessful and surgery was required in one case only. Bowel obstruction requiring surgical intervention occurred in two patients with colonic diverticular disease. The mechanical stop of the passage was a result from strictures formed by the expansion of fibrous tissue due to frequent acute attacks of the disease and persistent inflammation in the area.

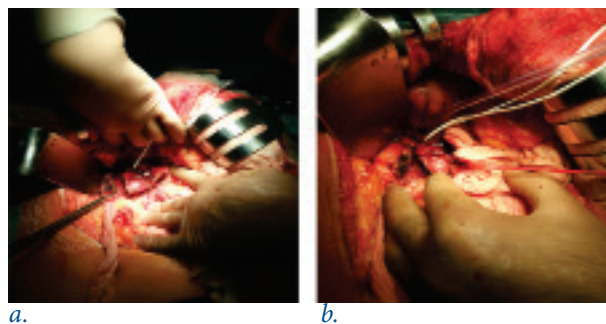


Fig. 6. A case of left-half transverse colon cancer invading the body of the pancreas (a), the posterior gastric wall and the spleen hilum. The common hepatic artery (b) is dissected, lifted on a vascular holder and preserved the en-bloc resection

The types of performed surgical procedures were presented in Table 1. Data about the procedures performed in uncomplicated diverticular disease helped comparing the elective and emergency surgical strategy.

In cases with diverticular perforation limited resection in perforation area with subsequent suture and proximal stoma was applied in three patients only. As the involved bowel segment was not removed the technique was used only to reduce operative trauma in highly risky patients, usually with feculent peritonitis. Hartmann's resection was performed in 12 patients - in one patient with feculent peritonitis, in 10 patients

with total purulent peritonitis and in one patient with local peritonitis. Hartmann's resection was rarely used in stage II by Hinchey, however, sometimes clinical picture and even macroscopic intraoperative findings mimicked neoplastic process due to the severe inflammatory changes. Colon resection with primary anastomosis was applied in eight patients. The possibility to resect the left colon with subsequent extraperitoneal transversorectostomy after the relevant extraperitoneal drainages was the main indication of its performance. Resection of a colon with primary anastomosis and proximal protective stoma was performed in nine patients presenting with purulent peritonitis based on diverticular perforation (stage III by Hinchey). In two cases, a loop transversostomy was performed. In the remaining seven cases, Vitzel's ileostomy was carried out. The advantage of using it was the achievement of adequate protection of the anastomosis without necessity of subsequent reversal. The ileostomy was usually removed after the 12th day after the operation.

Seven of the 14 patients with performed colostomy (protective or part of Hartmann's procedure) for diverticular perforation were re-hospitalized for reversal. Six patients were after Hartmann's resection of the colon and in one case, a loop protective transversostomy was carried out. The time between the urgent operation and reversal in these series ranged between two and eight months.

Because of the bleeding diverticula of the cecum a right hemicolectomy was performed in one patient. The patients with colovesical fistula underwent an excision of the fistula and suture of the urinary bladder. The treatment strategy related to the colon was Hartmann's procedure in two patients and resection of the sigmoid colon with primary anastomosis in one patient. The reversal in the first two patients was performed three and four months after the first operation.

Two patients were hospitalized because of bowel obstruction based on colonic diverticular disease. One patient underwent right hemicolectomy and resection of the sigmoid colon while proximal protective Vitzel's ileostomy was carried out in the second case.

Early postoperative surgical and nonsurgical complications were observed in 11 operated patients (in 28,2% of the cases) with complicated

diverticular disease of the colon: in seven patients with perforation, in one with fistula, in one with bleeding and in two - after the reversal. There was no insufficiency of anastomosis in any patient who underwent resection with primary anastomosis. As a result from the appearance of complications, three relaparotomies were carried out due to the establishment of intestinal abscesses, wound dehiscence or anastomosis (after the restitution of the passage). In two cases, primary surgery was due to the presence of diverticular perforation, while in one case, the reason was diverticular bleeding. In the early postoperative period, fatal outcome occurred in five patients presenting with diffuse peritonitis based on diverticular perforation.

To identify the factors influencing the results in the early postoperative period, several factors were analyzed. The presence of leukocytosis ($p=0,039$), significant comorbidities such as arterial hypertension, diabetes mellitus, and cerebrovascular disease ($p=0,014$), diverticular perforation ($p=0,04$), performance of perioperative blood transfusions ($p=0,027$) and hypoproteinemia ($p=0,001$) were statistically significant. The patients with diverticular perforation were further divided into groups according to the type of established peritonitis - local, total purulent or feculent. The analysis demonstrated that the risk of development of postoperative complications significantly increased with dissemination of the process ($p=0,009$). In order to select the most appropriate surgical strategy in terms of emergency concerning to diverticular perforation, different procedures were compared in relation to the occurrence of postoperative complications and early mortality rate (Fig. 2). The result was statistically significant ($p=0,041$). The lowest complication rate was observed in patients who underwent resection with primary anastomosis and proximal protective stoma. The analysis of the early postoperative mortality rate showed similar results ($p=0,007$).

The surgical tactic in 23 patients with acute diverticulitis in stage III by Hinchey was interesting. Postoperative complications were observed in 25% of the patients operated with resection and primary anastomosis, in 11,1% of those operated with primary anastomosis and applied protective stoma and in

40% of those treated with Hartmann's operation. The number of patients with primary passage reconstruction without proximal protection was too small, and that was why the statistical analysis could not be accurate. So the main comparison was made between the cases with Hartmann's resection and those with primary anastomosis and proximal stoma (Fig. 3). The study of these two groups in regard to postoperative morbidity rates demonstrated a statistically significant difference between them ($p=0,05$). Besides the complication rate was lower after the ileostomy compared to that after the loop transversostomy ($p=0,047$).

DISCUSSION

Multivisceral en-bloc resection for CRCs is performed in more than 10% of cases. It benefits the long-term prognosis (13,16-18,22). The tendency at amelioration of early and late results has led to exploring the prognostic value of numerous factors.

In general, surgery for CRC including multivisceral en-bloc resection must be performed using the 'no-touch and isolation technique', i.e. with primary ligation of the draining lymphovascular bundle. This warrants significantly lower recurrence rates (13).

Tumour-positive resection margins exert a negative impact on survival rates - less than 12 months (2).

Surgical expertise has also been analyzed. Surgeons' experience can be classified as low or high depending on whether a particular surgeon has performed 15 or more multivisceral resections (9). There were no significant differences between 'experienced' and other surgeons regarding the proportion of curative operations, intraoperative blood loss, postoperative complications, and long-term survival (13). Mean intraoperative blood loss varied from 400 to 1,000 mL for colon cancer (mean of 600 mL) and from 700 to 2,300 mL (mean of 1500 mL) for rectal cancer (13). Approximately two out of three patients (67,0%) required blood transfusion. Procedures including resection of two or more organs were associated with a significantly increased blood loss (mean of 1,200 mL) than those with a resection of a single organ.

Separation of adherent organs from the primary tumour and/or rupture of the tumour are proved

as risk factors for higher recurrence and poorer 5-year survival rates (11,20).

CONCLUSION

Multivisceral en-bloc resection for CRCs has been performed in more than 10% of the cases. It benefits the long-term prognosis. Tumour location and number of resected organs are essential characteristics of these procedures and they are independently associated with the quantity of intraoperative blood loss, higher early morbidity rates and more frequent local recurrence. However, multivisceral en-bloc resections are quite routinely used nowadays and warrant five-year survival rates of more than 50%.

REFERENCES

1. Amshel, C., S. Avital, A. Miller, L. Sands, F. Marchetti, M. Hellinger. T4 rectal cancer: analysis of patient outcome after surgical excision.- *Am. Surg.*, **71**, 2005, No 11, 901-903, discussion 904.
2. Curley, S. A., G. W. Carlson, C. R. Shumate, K. I. Wishnow, F. C. Ames. Extended resection for locally advanced colorectal carcinoma.- *Am. J. Surg.*, **163**, 1992, No 6, 553-559.
3. Devine, R. M., R. R. Dozois. Surgical management of locally advanced adenocarcinoma of the rectum.- *World J. Surg.*, **16**, 1992, No 3, 486-489.
4. Eisenberg, S. B., W. G. Kraybill, M. J. Lopez. Long-term results of surgical resection of locally advanced colorectal carcinoma.- *Surgery*, **108**, 1990, No 4, 779-785, discussion 785-786.
5. Gall, F. P., J. Tonak, A. Altendorf. Multivisceral resections in colorectal cancer.- *Dis. Colon Rectum*, **30**, 1987, No 5, 337-341.
6. Gebhardt, C., W. Meyer, S. Ruckriegel, U. Meier. Multivisceral resection of advanced colorectal carcinoma.- *Langenbeck's Arch. Surg.*, **384**, 1999, No 2, 194-199.
7. Gezen, C., M. Kement, Y. E. Altuntas, N. Okkabaz, M. Seker, S. Vural, et al. Results after multivisceral resections of locally advanced colorectal cancers: an analysis on clinical and pathological T4 tumors.- *World J. Surg. Oncol.*, **10**, 2012 Feb 15, 39. doi: 10.1186/1477-7819-10-39.
8. Hermanek, P. Multiviscerale Resektion beim kolorektalen Karzinom - Erfahrungen der

- SGKRR-Studie.- *Langenbeck's Arch. Chir. Suppl. Kongressband*, **377**, 1992, 95-100.
9. Hermanek, P., U. Mansmann, D. Staimmer, S. Riedl, P. Hermanek. The German experience: the surgeon as a prognostic factor in colon and rectal surgery.- *Surg. Clin. North Am.*, **9**, 2000, No 1, 33-49, vi.
 10. Hunter, J. A., J. A. Ryan, Jr., P. Schultz. En bloc resection of colon cancer adherent to other organs.- *Am. J. Surg.*, **145**, 1987, No 1, 67-71.
 11. Izbicki, J. R., S. B. Hosch, W. T. Knoefel, B. Passlick, C. Bloechle, C. E. Broelsch. Extended resections are beneficial for patients with locally advanced colorectal cancer.- *Dis. Colon Rectum*, **38**, 1995, No 12, 1251-1256.
 12. Kapoor, S., B. Das, S. Pal, P. Sahni, T. K. Chattopadhyay. En bloc resection of right-sided colonic adenocarcinoma with adjacent organ invasion.- *Int. J. Colorectal Dis.*, **21**, 2006, No 3, 265-268.
 13. Lehnert, T., M. Methner, A. Pollok, A. Schaible, U. Hinz, C. Herfarth. Multivisceral resection for locally advanced primary colon and rectal cancer. An analysis of prognostic factors in 201 patients.- *Ann. Surg.*, **235**, 2002, No 2, 217-225.
 14. Luna-Perez, P., S. E. Rodriguez-Ramirez, M. G. De la Barrera, M. Zeferino, S. Labastida. Multivisceral resection for colon cancer.- *J. Surg. Oncol.*, **80**, 2002, No 2, 100-104.
 15. Montesani, C., G. Ribotta, R. De Milito, A. Pronio, A. D'Amato, P. Narilli, et al. Extended resection in the treatment of colorectal cancer.- *Int. J. Colorectal Dis.*, **6**, 1991, No 3, 161-164.
 16. Nakafusa, Y., T. Tanaka, M. Tanaka, Y. Kitajima, S. Sato, K. Miyazaki. Comparison of multivisceral resection and standard operation for locally advanced colorectal cancer: analysis of prognostic factors for short-term and long-term outcome.- *Dis. Colon Rectum*, **47**, 2004, No 12, 2055-2063.
 17. Nelson, H., N. Petrelli, A. Carlin, J. Couture, J. Fleshman, J. Guillem, et al.; National Cancer Institute Expert Panel. Guidelines 2000 for colon and rectal surgery.- *J. Natl Cancer Inst.*, **93**, 2001, No 8, 583-596.
 18. Otchy, D., N. H. Hyman, C. Simmang, T. Anthony, W. D. Buie, P. Cataldo, et al.; Standards Practice Task Force; American Society of Colon and Rectal Surgeons. Practice parameters for colon cancer.- *Dis. Colon Rectum*, **47**, 2004, No 8, 1269-1284.
 19. Poeze, M., J. G. Houbiers, C. J. van de Velde, T. Wobbes, M. F. von Meyenfeldt. Radical resection of locally advanced colorectal cancer.- *Br. J. Surg.*, **82**, 1995, No 10, 1386-1390.
 20. Staib, L., K. H. Link, A. Blatz, H. G. Berger. Surgery of colorectal cancer: surgical morbidity and five- and ten-year results in 2400 patients - monoinstitutional experience.- *World J. Surg.*, **26**, 2002, No 1, 59-66.
 21. Sugarbaker, E. D. Coincident removal of additional structures in resections for carcinoma of the colon and rectum.- *Ann. Surg.*, **123**, 1946, No 6, 1036-1046.
 22. Tjandra, J. J., J. W. Kikenny, W. D. Buie, N. Hyman, C. Simmang, T. Anthony, et al.; Standards Practice Task Force; American Society of Colon and Rectal Surgeons. Practice parameters for the management of rectal cancer.- *Dis. Colon Rectum*, **48**, 2005, No 3, 411-423.