

Multiorgan Resections for Advanced Colorectal Cancer

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Abstract. *Background:* A retrospective review is presented of a single institution's experience with multivisceral resections for locally-advanced colorectal cancer. *Materials and Methods:* Twenty-eight patients, who had undergone R0 multiorgan resection, were identified from the database of a total of 1150 patients operated on for colorectal carcinoma in the years 1995-2005 at a single center. There were twelve total pelvic exenterations and 16 patients had undergone en bloc primary tumor resection with adherent organs, such as the spleen, diaphragm, pancreas, stomach, kidney, etc. The patients were followed-up according to a standard protocol. *Results:* The post-operative mortality was 7%, the average follow-up 21.6 months and the 5-year survival 45%. *Conclusion:* Our results confirmed that, in the case of invasion of colorectal cancer to the adjacent intra-abdominal organs or structures, multiorgan resection offers the only chance of potentially-curative treatment.

Colorectal carcinoma is the most common intra-abdominal malignancy in developed countries. The Czech Republic showed the highest incidence in the world in 2002 (94.8/100,000 men and 62.2/100,000 women) (1). Adherence to adjacent intra-abdominal organs or structures was encountered in 15% of patients with colorectal cancer (2) (Figure 1). This type of tumor is characterized by aggressive local behavior in the form of invasion to the adjacent organs or structures and a low propensity to metastasize. Infiltration of the surrounding organs may still be considered inoperable by some surgeons. Rectal carcinoma most often

involves the uterus, adnexa, vagina, prostate, seminal vesicles or urinary bladder. Many of these patients are deemed unresectable and receive palliative therapy without evaluation for a potentially-curative radical surgical approach. This study offers a retrospective review of a single institution's experience with multivisceral resections for locally-advanced colorectal cancer. *En bloc* multivisceral resection is the ideal surgical method to manage locally-advanced, adherent colorectal tumors (3). With advanced pelvic cancer, pelvic exenteration with *en bloc* resection of the involved organs and structures, including portions of the bony pelvis, is indicated. This type of resection achieved survival rates similar to those of patients with non-invasive tumors (4). However, surgery which violated the tumor margins achieved <15% survival (5).

Materials and Methods

From the total of 1150 operations for colorectal cancer performed between 1995 and 2005 at the Surgical Department of Thomayer's Teaching Hospital, Prague, Czech Republic, 28 R0 multiorgan resections were performed for locally-advanced colorectal carcinoma. Simultaneous colorectal and hepatic resections (34 patients) were not included, nor were 14 patients who had undergone multivisceral resections, but histology had proved an R1 resection. In the group of 28 R0, both acute and elective, multivisceral resections there were 20 male and eight female patients, aged from 43 to 78 years, with a median age of 68 years. In scheduled procedures, pre-operative staging had been performed according to our protocol, which included total colonoscopy, CEA, CA19-9, transabdominal ultrasound, CT of the abdomen and pelvis and chest X-ray, replaced during the last 2 years by PET/CT of the trunk. In case of T3-T4 rectal cancer, neoadjuvant radiotherapy was used. The surgical procedures performed are detailed in Table I. Multivisceral resection is defined as removal of the primary colorectal tumor *en bloc* with adherent structures. Intra-operative ultrasound of the liver was obligatory and lymphadenectomy up to the apical nodes was standard. In the case of total pelvic exenteration, *en bloc* removal of the rectum and anus, urinary bladder, internal genitalia with

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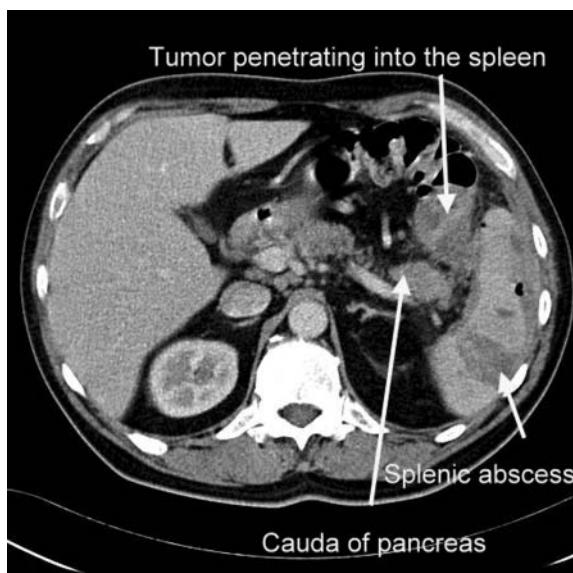


Figure 1. CT scan of advanced colon cancer invading the spleen, diaphragm and pancreas.

pelvic lymph nodes, with or without sphincter preservation, was performed. Total or posterior pelvic exenteration involves ligation of the inferior mesenteric artery at its origin, usually with para-aortic lymphadenectomy of the juxta-regional nodes up to the duodenum, lateral pelvic node dissection, lymphadenectomy along the external iliac vessels, resection of the internal iliac vessels and, in the case of infiltration of the sacrum, resection of the bony pelvis as the last step to prevent bleeding.

All the patients were followed-up in the surgical out-patient clinic, according to our standard colorectal cancer surveillance protocol. A transabdominal ultrasound was performed and tumor markers checked every 6 months, abdominal CT scan and colonoscopy were performed once a year and a chest X-ray every 2 years. The PET or PET/CT scan was indicated in the event of a diagnostic query or before re-operation for relapse. Adjuvant chemotherapy was administered to patients in pTNM stages II b, III and IV. The overall survival rates were calculated according to the Kaplan-Meier method.

Results

For the group of 28 patients, hospital mortality was 7%, median follow-up 21.6 months and the 5-year survival 45% (Figure 2). Tumor invasion into the resected organs was histologically confirmed in 85% of the patients. The average blood loss was 700 ml, the mean hospital stay 17 days and morbidity 30%. The most severe post-operative complications had included urinary fistula after pelvic exenteration, which in two patients had led to several re-operations and, ultimately, to death. Another complication had developed in a patient who had undergone left colectomy with pancreatic tail resection. Abscess and

Table I. Surgical procedures.

| Operation | no. | % |
|---|-----|-----|
| Total pelvic exenteration: in 1 case with ileocecal resection, in 1 case with total proctocolectomy, in 2 cases with coloanal anastomosis and in 2 cases with resection of solitary metastasis | 12 | 44 |
| Left colectomy, splenectomy, resection of diaphragm, caudal pancreatectomy, proximal gastrectomy and abdominal wall resection | 2 | 7 |
| Colon resection with nephrectomy | 2 | 7 |
| Colon resection with hysterectomy and/or adnexectomy, or resection of vagina in 1 case with small bowel resection | 4 | 14 |
| Colon resection with caudal pancreatectomy | 2 | 7 |
| Colon resection with small bowel resection, in 1 case with gastrectomy, splenectomy and abdominal wall resection | 4 | 14 |
| Colon resection with partial resection of urinary bladder | 2 | 7 |
| Total | 28 | 100 |

external pancreatitis fistula had presented and were treated by ultrasound-guided drainage without re-laparotomy. One patient, with a history of severe rectal bleeding from rectal cancer invading the urinary bladder, had been deemed inoperable in another institution and both the internal iliac arteries had been radiologically embolized. The patient had refused radiotherapy due to deep bed sores. Total pelvic exenteration was performed together with right adrenalectomy for solitary metastasis. This patient has survived for 2 years after the total pelvic exenteration without relapse. Another patient had been indicated for urgent operation for rectal obstruction, and a tumor invading the urinary bladder had been found. Intra-operative ultrasound of the liver had detected solitary metastasis. During this urgent operation, derivation sigmoidostomy and non-anatomic liver resection had been performed. Chemoradiotherapy had followed and pelvic exenteration with coloanal anastomosis had been performed. This patient has also survived for 2 years after the pelvic exenteration.

Discussion

Surgical resection remains the primary and the only potentially-curative treatment for colorectal cancer. *En bloc* resection of locally-advanced, adherent colorectal

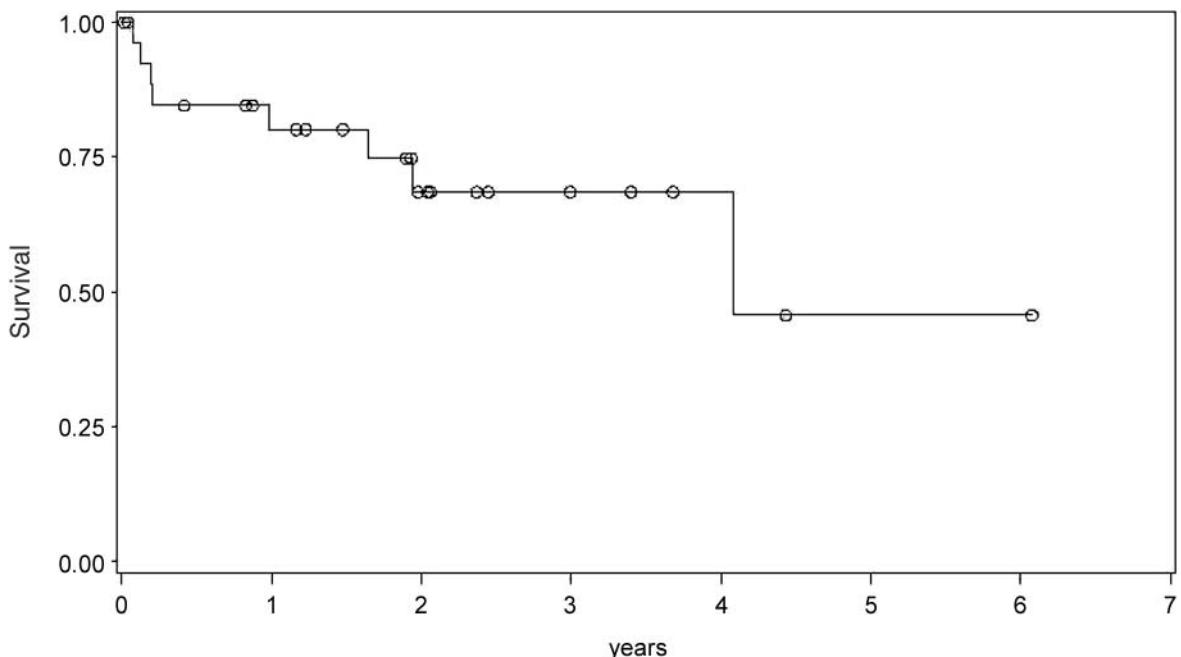


Figure 2. Kaplan-Meier survival curve.

tumor is the ideal surgical method and is the basis of R0 resection. Adherence of the tumor to adjacent structures demonstrated histological tumor invasion in approximately 50% of cases (6). The intent of the operating surgeon should be to achieve complete tumor removal with adequate margins of the involved structures (7). The concept of *en bloc* resection has significantly reduced the local recurrence rate and improved the 5-year overall survival (Table II).

The only way to achieve a surgical cure in patients with locally-advanced primary or recurrent rectal cancer is an extended resection (such as pelvic exenteration), eventually followed by sacral resection (8). After multivisceral resection, our patient group had achieved a overall 5-year survival rate of 45%. We consider multivisceral resections the only curative treatment for locally-advanced colorectal cancer, since surgery which violates the tumor margins offered a survival of approximately 15%. Patients with incompletely-resected locally-advanced or recurrent colorectal cancer have a dismal prognosis, with a mean survival ranging from 8-12 months (9).

Conclusion

Locally-advanced colorectal cancer, which has invaded the adjacent organs and structures, especially of the pelvis, is still considered by some surgeons to be inoperable, although currently the only treatment option for this aggressive

Table II. Results of multi-organ resections from the literature.

| Author (Ref.) | Multi-visceral resections | Mortality | Five-year survival | Infiltration of resected organs |
|------------------------|---------------------------|-----------|--------------------|---------------------------------|
| Reiner (et al) (10) | 158 | 12% | 38% | 70% |
| Heslov and Frost (11) | 58 | 5% | 38% | 56% |
| Montesani (et al) (12) | 33 | – | 30% | – |
| Hermanek (et al) (13) | 197 | 3% | 52% | – |
| Gebhardt (et al) (14) | 173 | 4% | 51% | 55% |
| Lehnert (et al) (15) | 201 | 7.5% | 51% | 50% |
| Nakafusa (et al) (16) | 53 | 0% | 76.6% | – |
| Visokai (et al) | 28 | 7% | 45% | 85% |

disease is aggressive surgery. Our results confirmed that R0 resection can offer the patient a chance of long-term cure.

References

- Ajmova J: Zhoubny novotvar kolorekta. Aktualni informace 2005 UZIS CR, Praha 2005.
- Sugerbaker PH and Corlew S: Influence of surgical techniques on survival in patients with colorectal cancer. Dis Colon Rectum 25: 545-547, 1982.
- Nelson H, Petrelli N, Carlin A, Couture J, Fleshman J, Guillem J, Miedema B, Ota D and Sargent D: Guidelines 2000 for colon and rectal cancer surgery. JNCI 8: 583-596, 2001.

- 4 Izbicki JR, Hosch SB, Knoefel WT, Passlick B, Bloechle C and Broelsch CE: Extended resections are beneficial for patients with locally advanced colorectal cancer. *Dis Colon Rectum* 38(12): 1251-1256, 1995.
- 5 Hunter JA, Ryan JA Jr and Schultz P: *En bloc* resection of colon cancer adherent to other organs. *Am J Surg* 154(1): 67-71, 1987.
- 6 Lopez MJ and Monafo WW: Role of extended resection in the initial treatment of locally advanced colorectal carcinoma. *Surgery* 113(4): 365-372, 1993.
- 7 Harish K, Narayanaswamy Y and Nirmala S: Treatment outcomes in locally advanced colorectal carcinoma. *Int Semin Surg Oncol* 1(1): 8, 2004.
- 8 Moria Y, Akasu T, Fujita S and Yamamoto S: Total pelvic exenteration with distal sacrectomy for fixed recurrent rectal cancer. *Surg Oncol Clin N Am* 14: 225-238, 2005.
- 9 Taylor WE, Donohue JH, Gunderson LL, Nelson H, Nagorney DM, Devine RM, Haddock MG, Larson DR, Rubin J and O'Connell MJ: The Mayo Clinic experience with multimodality treatment of locally advanced or recurrent colon cancer. *Ann Surg Oncol* 1: 177-185, 2002.
- 10 Reiner G, Teleky B, Wunderlich M and Schiessel R: Extended organ resection of colorectal cancer *Langenbecks Arch Chir* 371(4): 281-290, 1987.
- 11 Heslov SF and Frost DB: Extended resection for primary colorectal carcinoma involving adjacent organs or structures. *Cancer* 62(8): 1637-1640, 1988.
- 12 Montesani C, Ribotta G, De Milito R, Pronio A, D'Amato A, Narilli P and Jaus M: Extended resection in the treatment of colorectal cancer. *Int J Colorectal Dis* 6(3): 161-164, 1991.
- 13 Hermanek P: Multivisceral resection of colorectal cancer – experiences of the Colorectal Cancer Study Group. *Langenbecks Arch Chir Suppl Kongressbd* pp. 95-100, 1992.
- 14 Gebhardt C, Meyer W, Ruckriegel S and Meier U: Multivisceral resection of advanced colorectal carcinoma. *Langenbecks Arch Surg* 384(2): 194-199, 1999.
- 15 Lehnert T, Methner M, Pollok A, Schaible A, Hinz U and Herfarth C: Multivisceral resection for locally advanced primary colon and rectal cancer: an analysis of prognostic factors in 201 patients. *Ann Surg* 235(2): 217-225, 2002.
- 16 Nakafusa Y, Tanaka T, Tanaka M, Kitajima Y, Sato S and Miyazaki K: 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(12): 2055-2063, 2004.

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