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## Multivisceral resection of advanced colorectal carcinoma

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Received: 4 August 1998  
Accepted: 18 December 1998

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The results of that paper were partially presented at the Meeting of the German Society of Surgery, Berlin, 29 April 1998

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**Abstract** *Background and aims:* In about 10% of patients with carcinoma of the colorectum, the tumour has already invaded contiguous organs or else inflammatory tumorous adhesions involving neighbouring structures are found. In such a situation, the question arises whether one should perform a multivisceral resection, the usefulness of which in terms of surgical risk and late oncological results have been investigated in the present study. *Patients and methods:* A total of 173 patients with colorectal carcinoma who underwent a multivisceral resection during the period between 1984 and 1995 are reported. Excluded from the study were patients with recurrent tumour or distant metastases. *Results:* In the majority of cases (63%), the primary tumour originated in the sigmoid colon or rectum. In 102 patients, only a single neighbouring organ was additionally involved, while the remaining patients had involvement of two or more contiguous organs. In 140 patients, the resection was curative, while in the remaining patients an R1/2 situation presented. In the curative group, tumour infiltration was confirmed histologically in 55% of the cases, while in the remaining patients a peritumorous adhesion had

mimicked tumour invasion. Postoperative surgical complications occurred in only 1.4% of the interventions, a figure identical to the incidence of complications seen with conventional limited operations. The same applied to the postoperative 30-day mortality rate of 3.6%. The 5-year survival rate of the overall group of patients undergoing multivisceral resection was 42%, that of the subgroup undergoing curative surgery was 51%, and that of the subgroup receiving only palliative resection was 0%. Calculation of the stage-related 5-year survival rates for *Union Internationale Contra la Cancrum* stage-II and stage-III tumours revealed figures of 58% and 43%, respectively. After non-extended resection, the respective survival rates were identical (60% and 41%). *Conclusion:* An identical surgical risk and survival rates for curative resection, equally as good as those seen with conventional, non-extended procedures, justify the liberal use of multivisceral resection in the surgical treatment of colorectal carcinomas directly invading neighbouring organs.

**Key words** Colorectal carcinoma · Multivisceral extended resection

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**Table 1** Multivisceral resections performed between 1984 and 1995 and the tumour sites

Tumour site	Overall <i>n</i> = 173	Curative resection <i>n</i> = 140	Palliative resection <i>n</i> = 33
Rectum	51 = 29.5%	45 = 32.1%	6 = 18.2%
Sigmoid	58 = 33.5%	47 = 33.6%	11 = 33.3%
Remaining colon	64 = 37.0%	48 = 34.3%	16 = 48.5%

**Table 2** Number of organs per patient removed during multivisceral resection

Patients	Overall <i>n</i> = 173	Curative resection <i>n</i> = 140	Palliative resection <i>n</i> = 33
No. of organs			
1	102	84	18
2	51	39	12
3	13	11	2
≥4	7	6	1

## Introduction

In about 10% of all colorectal carcinomas, the tumour is found to be infiltrating contiguous organs, or at least there is peritumorous inflammatory adhesion which, without a histological work-up, cannot be differentiated from true tumour invasion. In such cases, the surgeon has to decide whether the tumour can be safely separated from the neighbouring structures or whether an en bloc resection is indicated.

Since a very high percentage of even very large T4 tumours have not yet metastasised to the regional lymph nodes, a multivisceral resection offers the chance to radically remove the local disease and effect a cure. However, the question arises as to whether the morbidity and mortality rates associated with such extended procedures are acceptable, and whether the survival rates thereby achieved also justify the use of such a procedure. The aim of the present study was, therefore, to find an answer to the above questions on the basis of an analysis of the results obtained from our own clinical material.

## Materials and methods

Between October 1984 and December 1995, 173 (7%) of a total of 2462 patients undergoing resection for colorectal carcinoma underwent a multivisceral extended resection. Not included in this study were patients in whom distant metastases were already present, or in whom the lesion was a recurrent tumour.

**Table 3** Organs removed during multivisceral resection (average 1.6 per patient)

Organ	Number
Bladder	41
Prostate	5
Seminal vesicle	5
Spermatic duct	6
Ureter	5
Adnexa	39
Uterus	25
Vagina	13
Ileum/jejunum	55
Duodenum	6
Colon/appendix	6
Stomach	10
Spleen	3
Liver	2
Kidney	6
Tail of pancreas	1
Pelvic wall	3
Abdominal wall	37
Diaphragm	3

**Table 4** Multivisceral resections performed between 1984 and 1995 and the surgical procedures used

Extended resections	Curative ( <i>n</i> = 140)		Palliative ( <i>n</i> = 33)	
	( <i>n</i> )	(%)	( <i>n</i> )	(%)
Colonic resection	92	65.7	27	81.8
Rectal resection	26	18.6	4	12.1
Rectal extirpation	22	15.7	2	6.1

There were somewhat more female than male patients (102/71; 59%/41%). The mean patient age was 71 years and ranged between 32 years and 94 years. Of all patients undergoing surgery, 39% were in the eighth decade of life. The most frequent site of origin of the carcinoma (63%) was the sigmoid colon or rectum (Table 1).

One-hundred and two operations involved a single contiguous organ, the remaining 71 interventions involved two or more adjacent organs (Table 2). A list of the 271 instances of contiguous organ invasion is shown in Table 3. Topping this list are the internal female genital organs, with the small bowel and bladder in second place.

Table 4 shows the number of different surgical procedures performed; it is worth noting that, in this group of patients, abdomino-perineal rectal extirpation (24 cases) was almost as common as anterior rectal resection (30 cases). The operation was curative in a total of 140 patients and only palliative in 33.

The histopathological work-up of the surgical specimens revealed true tumour invasion of one or more contiguous organs in 95 (55%) of the patients (Table 5), while

**Table 5** Actual tumour invasion of contiguous organs relative to operated patients (A) and to en bloc resection of contiguous organs (B)

	Overall		Curative		Palliative	
	(n)	(%)	(n)	(%)	(n)	(%)
<b>A</b>	173		140		33	
Tumor-free	78	45.1	68	48.6	10	30.3
Tumour invasion	95	54.9	72	51.4	23	69.7
<b>B</b>	257		209		48	
Tumor-free	151	58.8	127	60.8	24	50.0
Tumour invasion	106	41.2	82	39.2	24	50.0

**Table 6** pT-, pN- and *Union Internationale Contra la Cancrum* (UICC) stages in curative multivisceral resections (excluding stage 4) (TNM classification of malignant tumours 1992)

Stage	Resections (n = 140)	
	(n)	(%)
pT1	0	
pT2	2	1.4
pT3	55	39.3
pT4	83	59.3
pN0	88	62.9
pN1	35	25.0
pN2	7	5.0
pN3	10	7.1
UICC I	2	1.4
UICC II	86	61.4
UICC III	52	37.1

peritumorous adhesions had mimicked direct tumour infiltration in 45% of these.

The stages of the curatively resected tumours can be seen in Table 6. Most cases with no involvement of neighbouring organs had stage pT3 (two cases with pT2) tumours. However, even among pT4 tumours, nine showed no contiguous organ infiltration even though the serosa had been perforated. Worthy of note is the fact that in 88 (53%) of the 140 curative extended resections, no lymph-node metastases (pN0) were present, and no differences were found between pT3 (64% pN0) and pT4 (61% pN0) stages.

Postoperative surgical complications were observed in 16 of the patients undergoing curative surgery (Table 7). These complications included anastomotic leakage in 3.9% of the overall number of patients treated, and local infection or wound healing disturbances in 6.2%. The 30-day mortality rate was 3.6%.

The analysis of the data was carried out using the SPSS statistical program (Statistical Package for Social Science, version 5.01). The information relating to the death of those patients who died was obtained from the relevant registry

**Table 7** Postoperative complication and mortality rates following curative colorectal resections. A: non-multivisceral, n = 828, 1984–1990; B: multivisceral, n = 140, 1984–1995

	A (%)	B (%)
Postoperative surgical complications	11.5	11.4
Bleeding (intraabdominal)	1.8	1.3
Anastomotic leakage	3.7	3.9
Wound infections	6.2	6.2
30-day mortality	3.4	3.6

offices. Survival rates (as of 31 December 1997) were calculated using the Kaplan-Meier analysis. The postoperative mortality rate was included and no correction for age was made; follow-up was 99.5% complete. Differences between survival curves were established using the log-rank test. For the computation of differences, a *P* value of less than 0.05 was considered significant, and values less than 0.001 highly significant.

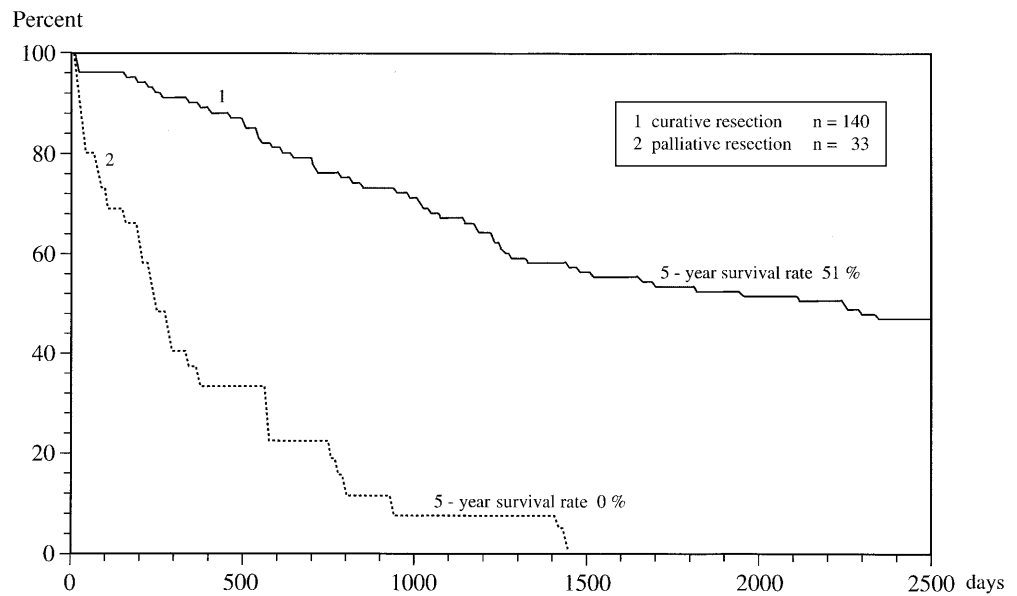
### Survival rates

The 5-year survival rate of the overall group of patients undergoing multivisceral resection was 42%; the corresponding figure for those patients undergoing curative resection was 51%, compared with 0% for the patient subgroup receiving only palliative surgery (Fig. 1). For the latter group, the 1-year survival rate was 32%. With regard to tumour location, the figures for the rectum and colon of patients undergoing curative surgery were virtually identical, namely 48% and 52%, respectively. For this reason, the overall number of patients undergoing curative resection has been used as a basis for the subsequent analyses, with no differentiation being made between rectum and colon, thus avoiding the problem of creating subgroups too small for appropriate statistical analysis.

An analysis of stage-related survivals revealed a 5-year survival rate of 58% for *Union Internationale Contra la Cancrum* (UICC) stage II, and 43% for stage III tumours. No noteworthy difference was found for the same stages in patients not undergoing multivisceral extended resection (Table 8), the corresponding figures in this group being 60% and 41%, respectively [12].

The pT stages proved to be of importance for the prognosis (Table 9). It was found that pT3 tumours, that is tumours with no direct spread to contiguous organs, had clearly better survival rates than pT4 tumours (64% compared with 44%), but the difference was not significant. This difference was also found when the nine patients with serosal penetration but no histological infiltration of contiguous organs were excluded from the pT4 group (5-year survival rate 43%). For the pT4 tumours undergoing mul-

**Fig. 1** Survival after curative and palliative multivisceral resection of colorectal carcinoma



**Table 8** Stage-dependent 5-year survival in patients undergoing multivisceral and non-multivisceral resection. UICC, Union Internationale Contra la Cancrum

UICC stage	5-year survival rate (%)	
	Multivisceral n = 140	Non-multivisceral n = 828
II	58	60
III	43	41

**Table 9** Five-year survival rate after curative multivisceral resection of colorectal carcinoma

	5-year survival rate		P value
	(n)	(%)	
pT3	55	64	n.s.
pT4	83	44	
pT3N0	35	80	P < 0.05
pT3N+	20	37	
pT4N0	51	42	n.s.
pT4N+	32	47	
One organ invaded	—	44	—
Two organs invaded	—	49	—
Three organs or more invaded	—	35	—

tivisceral resection, the 5-year survival rate was a comparable 38%.

A further subgroup analysis revealed that in the case of the pT3 tumours, lymph-node metastasis was of great prognostic importance (80% 5-year survival rate for pT3N0 tumours compared with 37% for pT3N+ lesions,  $P < 0.05$ ).

A correspondingly significant difference was not established in the case of pT4 tumours (Table 9). The number of additionally resected contiguous organs had no influence on the survival rate (Table 9).

In 11 of the patients undergoing curative resection, tearing of the tumour and, thus, tumour cell dissemination occurred during the operation. In this small group, the observed 5-year survival rate was 27%. Despite their poorer prognosis, these patients were not eliminated from the overall group of patients undergoing curative multivisceral resection for the analysis.

## Discussion

Some 10% of all patients with colorectal carcinoma have locally advanced tumours that can be radically removed only with an extended multivisceral resection. The relevant figures quoted in the literature vary between 5% and 22% [1–14]; in our own patient material the incidence was 7%.

Over the years, it has been established that a high percentage of even large tumours have not metastasised to regional lymph nodes and, in such cases, good results may be expected from radical en bloc resection. In a prospective study involving 1000 resected colorectal carcinomas, Spratt and Spjut [15] reported that two-thirds of the largest tumours had not metastasised to the lymph nodes. Among our own curative multivisceral resections, we found a pN0 situation in 63% of the cases. While in the case of curative non-extended resections, the gender distribution was almost identical (52.5% male and 47.5% female in our own patient material [12]), in the case of multi-

organ resections female gender predominated, which is explainable by the preferential involvement of the female internal genital organs. Lopez and Monafo [16] even report a ratio of 2:1, and suggest the ease of surgical access to the internal female genital organs as an additional explanation for this increased female preponderance.

With regard to the surgical approach to adherent carcinomatous masses, en bloc resection is an absolute must, since any attempt to separate the carcinoma from neighbouring organs results in tearing or transection of the tumour with the attendant risk of intraoperative dissemination of tumour cells. This, in turn, results in a significant worsening of the prognosis of the individual patient [4, 8, 17–20]. Hermanek Jr. [7], on the basis of the results reported by the SGCRC (Study Group of Colorectal Carcinomas), identified a worsening in the prognosis of rectal carcinoma from 59% to 21% ( $P < 0.001$ ). The corresponding figures published by Hagmüller et al. [22] are even worse (65% compared with 16% for rectal carcinoma, and 57% versus 11% for carcinomas of the colon).

In the individual case, the macroscopic situation met with during surgery makes it impossible to distinguish between true contiguous organ invasion by the tumour and peritumorous inflammatory adhesions. In such cases, the worsening of the prognosis associated with the dissemination of tumour cells makes it imperative to perform an en bloc resection, even when the subsequent histopathological work-up reveals that merely inflammatory adherent organs or portions of organs have been sacrificed. Such a situation has been reported in 30–70% of patients who have undergone multivisceral resection [1–3, 6–8, 11, 13, 14, 18–21]. In our own curatively operated patients, tumour invasion was actually present in 55% of the cases. It must be noted, however, that an extended resection is justifiable only when the associated individual surgical risk is not increased, since elevation of operative mortality would then cancel out the good late results of the curative resection.

Among our own patients, we recorded a postoperative surgical complication rate of 11.4% and a mortality rate of 3.6% (Table 7). These figures are identical with the 11.5% and 3.4%, respectively, found with curative non-extended resections. In the German SGCRC Multicentre Study, multivisceral resection of contiguous organ-invading tumours was also associated with a mortality rate of 3% compared with the 3.5% seen with limited resection [7]. In the group of patients reported by Hagmüller et al. [22], multivisceral resection was associated with a higher complication rate, but the postoperative mortality rate of 4.8% was only a little higher than the 2.9% found with conventional non-extended procedures.

These figures show that despite longer operating times and, in some cases, very extensive, in part interdisciplinary (urology/gynaecology), surgery, multivisceral resections in experienced hands are not associated with increased surgical risk.

The effectiveness of multivisceral resection is also reflected in the survival rates. Thus, in our own patients, for example, the stage-related 5-year survival rate was comparable with that seen with conventional non-extended colorectal resection (58% versus 60% in UICC stage II, and 43% versus 41% in UICC stage-III tumours. Comparable data are also provided by the SGCRC study [7] and by Hagmüller et al. [22].

As expected, a clear difference in the prognosis was found between pT3 and pT4 tumours (64% versus 44% 5-year survival rate), figures that are similar to those reported in the literature [1, 4, 11, 23]. However, the comparable figure of 38% for conventionally operated pT4 tumours even indicated a tendency towards a somewhat poorer survival rate. These figures show that multivisceral resection is capable of elevating the stage-related late results to the same level as that associated with tumours with no direct invasion of contiguous organs. This also applies to very extensive en bloc resections during the course of which more than one neighbouring organ has to be removed; the sometimes quite advanced age of such patients is also no reason not to carry out appropriate resections. In an analysis of our patient material, Kästel et al. [24] found that in 70-year-old patients, postoperative morbidity and mortality rates were no higher than those observed for younger patients, and the 5-year survival rates were even better than those of the younger patients.

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## Conclusions

1. Multivisceral resection can be carried out with complication and mortality rates identical to those seen in limited resections.
2. Since the surgical risk is not increased, carcinomatous adhesions should always be resected en bloc, even in aged patients, since otherwise intra-operative dissemination of tumour cells significantly diminish the prognosis. Such a surgical approach must be adopted although histological work-up shows that carcinomatous invasion of contiguous organs is present only in about 50% of the cases.
3. Curative multivisceral resections are associated with stage-related survival rates that are identical to those seen with limited resection.

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