



Original article

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RISK OF ELECTIVE SURGERY OF COLORECTAL CARCINOMA IN ELDERLY

SUMMARY

In a retrospective study 403 patients with colorectal carcinoma and elective gut resection were investigated with respect to postoperative complications and mortality depending on the age and accompanying risk factors (pulmonary diseases, cardiac diseases, diabetes mellitus, renal failure, arterial circulatory disturbances). Postoperative mortality was 1.35% in younger patients (<65 years), 5.8% in older patients (65-76 years) and 8.2% in old patients (>75 years). In the presence of one risk factor, none of the younger but 10% of the older and old patients died postoperatively. In the presence of two or more risk factors mortality was 0%, 12.5% and 15%, respectively. In a detailed analysis age alone showed no statistically significant influence on the lethal outcome. The important fact for the higher mortality, not only in the old but already in the older patients, was the presence of the risk factors.

As an aid in this decision making we investigated the risk of elective colon resections in patients with colorectal carcinoma depending on the age and accompanying diseases.

Key words: colorectal carcinoma, surgery of colorectal carcinoma and complications, age and colorectal carcinoma

INTRODUCTION

In the Federal Republic of Germany as well as in other western countries colorectal carcinoma is nowadays the second most frequent malignancy (1). Due to its high incidence in elderly patients (2, 3) and the changing age structure (by the year 2000 25% of our population will have been above 65 years of age) there will be an increasing number of very old patients with colorectal carcinoma in the near future (4). In many of these old patients the surgeon has to decide whether the patient might endure gut resection as the best therapy or whether in cases with too high a risk other less straining therapies might be chosen.

PATIENTS AND METHODS

In the retrospective study we analyzed data of 403 patients (191 men, 212 women) with colorectal carcinomas, in which an elective gut resection with primary anastomosis was performed from January 1980 to December 1988.

According to the criteria of the WHO, we divided the patients into three age groups: younger patients under 65 years of age, older patients between 65 and 75 years and old patients over 75 years (5). The diseases, which we looked upon as risk factors for postoperative complications and mortality, are shown in table 1.

Table 1. Accompanying diseases (risk factors) in patients with colorectal carcinoma and elective gut resection

Diseases	Definition
Pulmonary	severe lung emphysema or obstructive lung disease with necessity for preoperative treatment
Cardiac	coronary arteriosclerosis, cardiac arrhythmia and heart failure with necessity for preoperative treatment
Renal	creatinine > 2mg/dl
Diabetes mellitus	necessity for preoperative drug treatment
Arterial circulatory disturbances	occlusion of arterial vessels of the limb or cerebral ischemia in patient's history

Pulmonary diseases were defined as severe lung emphysema or obstructive lung disease with the necessity for preoperative treatment.

Cardiac diseases included heart infarction in patients' history, coronary atherosclerosis, cardiac arrhythmia and heart failure, all making preoperative drug treatment necessary.

Renal failure was defined as creatinine >2mg/dl. Diabetes mellitus was considered only when there was a necessity for preoperative drug treatment. The risk factor of arterial circulatory disturbances included occlusion of arterial vessels of the limb or cerebral ischemia in history. Liver cirrhosis was looked upon as a risk factor in our study. Only a few patients in our study suffered from severe liver cirrhosis. They were all under 65 years of age and none of them died.

In the postoperative course anastomotic leakage, other local complications such as ileus, bleeding and wound healing impairment, cardiopulmonary complications, other systemic complications (renal failure, venous thrombosis, cerebral disturbances) and mortality defined as postoperative death in hospital were recorded. Results were described in total numbers and/or frequency percent. Statistical significance of mortality in different groups

of the patients was calculated with χ^2 test and defined as $p < 0.05$. The influence of age and number of risk factors on postoperative mortality and possible interactions between these parameters were investigated by stepwise logistic regression (BMDP LR).

RESULTS

The study included 403 patients with colorectal carcinoma. Two hundreds and ninety four of the patients were operated in the Surgical Clinic of the Philips University Marburg from January 1980 to December 1985 and 109 patients in the Department for General and Trauma Surgery of the Heinrich Heine University Düsseldorf from April 1986 to December 1988. There were 193 men and 212 women. Median age was 68 years; the youngest patient was 29 years of age, the oldest patient was 91. Distribution of age according to the criteria of WHO (5) and sex is shown in Table 2.

Forty one percentage of the patients were under 65 years of age, 35% between 65 and 75 years of age and 24% above 75 years of age. In the younger and older patients sex ratio was balanced, whereas in the old patients women predominated with 65% due to their higher expectation of life in our country.

Table 2. Distribution of age according to the criteria of WHO and sex

Age, years	Men	Women	Total
<65	83 (50)	83 (50)	166 (41)
65-75	74 (53)	65 (47)	139 (35)
>75	34 (35)	64 (65)	98 (24)
Total	191 (47)	212 (53)	403 (100)

The figures indicate the number with the percentage in parentheses.

The rate of postoperative complications and mortality was obviously higher in the aged (table 3).

Anastomotic leakage increased continuously from 4.2% in younger patients to 6.5% in older patients and up to 8.2% in young patients. Other local complications also increased from 4.2% to 9.4% and 12.2%, respectively. Severe cardiopulmonary complications were rare in young patients (1.8%). In older patients they mounted to 10.8%. In old patients the rate of cardiopulmonary complications was a bit lower, but with the higher effect on mortality. Other systemic complications showed no difference between younger and older patients, but an increase of about 25% in the old patients. There was no difference in the rate of early postoperative laparotomy between different age groups.

Table 4 shows the number of patients with risk factors in different age groups.

83.3% of the younger patients had no risk factor, 10.85% had just one and 5.4% two or more risk factors. In the older group, only 54% showed no risk factors, 28.8% one and 17.2% two or more risk factors. The percentage was 49, 30.6 and 20.4 in the group of old patients, respectively. Severe cardiac diseases and diabetes mellitus were the most frequent factors (21 and 17%). Pulmonary diseases as well as arterial circulatory disturbances were comparatively rare (5.9% each). Renal failure (creatinine > 2mg/dl) was found only in 1.5% of the patients.

According to Boyd et al. (7) we evaluated our data not only depending on the age, but also on the number of accompanying diseases (table 5).

Table 3. Mortality and complication after elective colon and rectum resection in patients with colorectal carcinoma depending on the age of patients

Age	Patients		Anastomotic leakage	Other local complications	Cardiopulmonary complications	Mortality
	number	%				
<65	166	41	4.2	4.2	1.8	1.2
65-75	139	35	6.5	9.4	10.8	5.8*
>75	98	24	8.2	12.2	8.2	8.2*
Total	403	100	5.9	7.9	6.7	4.5

*p< 0.05 (χ^2 test), compared with age < 65 years

Table 4. Number of patients and risk factors depending on age

Number of risk factors	Age <65	Age 65-75	Age \geq 75
0	139 (83.8)	75 (54.0)	48 (49.0)
1	18 (10.8)	40 (28.8)	30 (30.6)
\geq 2	9 (5.4)	24 (17.2)	20 (20.4)

The figures indicate the number with the percentage in parentheses.

Table 5. Mortality and complications after colon and rectum resections in patients with colorectal carcinoma depending on the age of the patients and the number of accompanying diseases

Age Years	Number of risk factors	Patient number	Anastomotic leakage, %	Other local complications, %	Cardiopulmonary complications, %	Mortality %
> 65	0	139	4.3	3.6	2.2	1.4
	1	18	5.5	11.0	0.0	0.0
	\geq 2	9	0.0	0.0	0.0	0.0

Anastomotic leakage and other local complications showed no differences in the same age group. Cardiopulmonary complications increase especially not only in older patients but also in old patients in the presence of accompanying diseases. In the group of patients without risk factors mortality was 1.4% of the younger, 1.3% of the older and 4.2% of the old patients. In the presence of one risk factor none of the younger patients, but 10% of the older and old patients died. Furthermore, none of the younger patients with two or more risk factors died. In the older patients, mortality increased up to 12.5% and in the old up to 15% in the presence of two or more risk factors.

In the multivariate analysis only the factor 'number of risk factors' showed a statistically significant ($p < 0.001$) influence on postoperative mortality. There was neither further influence of age and nor any interaction between age and number of the risk factors. This means that the old age alone was not a risk factor for lethal outcome after elective colon and rectum resection in patients with colorectal carcinoma in our study. The presence of the accompanying diseases more important was not only in the old but already in the older patients.

Postoperative death was caused in the group of the younger patients in all cases by anastomotic leakage and other local complications (ileus, wound rupture), but in only 25% of the older and old patients. On the other hand, none of the deaths of the younger patients but 62.5% of the deaths of the older and old patients were caused by systemic (mainly cardiopulmonary) complications.

The influence of different risk factors on postoperative mortality is shown in table 6.

None of the younger patients with risk factors died. In the presence of pulmonary diseases, cardiac diseases or diabetes mellitus mortality ranged between 10% and 15% both in the older as well as in

the old patients. Only arterial circulatory disturbances showed a higher mortality of 27.3% in the older patients, but the number of patients with this risk factor was very small. In all age groups only very few patients suffered from renal failure without any influence on mortality.

DISCUSSION

A few years ago extensive surgical procedures in the patients above 70 years of age seemed to be contraindicated. But, meanwhile, the improved diagnostic procedures, intensive preoperative and postoperative care as well as more differentiated and better anesthesia and surgical possibilities made it possible to extend this age limit. At the University of Innsbruck, the reported percentage of surgical patients above 70 years of age was 2% in 1930, 7% in 1950 and 12% in 1970 (8). Kraas et al. (9) reported on 15% of surgical patients above 70 years of age in 1983. This development is especially seen in the patients with carcinomas typical of the old age, i.e. colorectal carcinoma. In the study by Greenburg et al. (10) of elective colorectal surgery, 35% of the patients were over 70 years of age. In a similar study by Payne et al. (11) the percentage of patients above 75 years of age was 30.4%. These two studies also demonstrate a specific problem, when compared with the publications about surgery in the old. Many authors set the age limit at 70 years of age (12, 13), few at 65 (14), others at 75 years (11, 15, 16) and some at 80 years of age (17,18). We decided to use WHO age classification which differentiated between younger patients under the age of 65, older patients between 65 and 75 years of age and old patients above the age of 75 (5). This age classification reflects the age structure of industrialized nations with a higher percentage of the old, but still very vi-

Table 6. Risk of postoperative death of an accompanying disease depending on the age

Risk factor	Age < 65	Age 65-75	Age > 75
Pulmonary disease	0/3 (0)	1/8 (12)	2/13 (15)
Cardiac diseases	0/13 (0)	5/4 (11)	4/29 (13)
Renal failure	0/1 (0)	0/2 (0)	0/3 (0)
Diabetes mellitus	0/13 (0)	3/29 (10)	3/25 (12)
Arterial circulatory disturbances	0/6 (6)	2/11 (27)	1/7 (14)
The exact definition of risk factors is in the Patients and Methods. The figures represent deaths/patients with the percentage in parentheses.sss			

tal patients. On the other hand, after the age of 75, an increase in age-related organic dysfunction can be observed (16, 19-21). In addition, the incidence of drug side effects due to pharmacokinetic changes increases in the very old (22).

In our study, the mean age was 68 years. We included only patients with elective gut resection and anastomosis in colorectal carcinomas. Patients with only local tumor excision or anus praeter naturalis were excluded. Almost 25% of our patients were above 75 years of age. Whereas sex distribution was equal in the groups of younger and older patients, 65% of patients in the group of the old were females. This phenomenon reflects sex distribution of the population in our country, where the percentage of old women is much higher than that of old men. A 2-3-fold increase of mortality in colon resection in the very old is recorded in the literature (7, 11, 16, 18, 23, 24). According to this, the mortality rate in the younger patients was one third and in the older patients was two thirds of the mortality rate of the old patients in our study. The higher number of severe accompanying diseases in the old age seems to be more important reason than the patient age alone. Especially Boyd et al. (7) come to the conclusion that age alone is not the factor influencing mortality rates in elective colorectal surgery. Analyzing our data, according to the criteria of this study, there was a distinct difference in old patients with two or more risk factors. In our study only 20.4% of the old patients (>75 years) had two or more risk factors. In the study of Boyd et al. (7), the percentage of patients with two or more risk factors was 45% in the age group from 70 to 79. The percentage of younger and older patients with two or more risk factors was also smaller in our study. The reason is certainly a wider definition of risk factors in the study of Boyd et al. For example, in our study, we defined diabetes mellitus, cardiac arrhythmia as well as myocardial insufficiency and pulmonary diseases only as risk factors, if there was a need for therapeutic intervention preoperatively. Low total protein (albumin was not routinely measured) or preoperative weight loss were not regarded as risk factors, because such patients received high caloric parenteral nutrition preoperatively (2,000 kcal including 1 g amino acid/kg body weight). Liver diseases were not risk factors in our study, because none of the old patients had decompensated hepatic failure with abnormal coagulation and ascites. In the younger and older patients, this risk factor was also rarely seen. As indication for surgical intervention was quite strict, possible existing disturbances were balanced preoperatively. No influence on mortality rate was seen in these patients. 23% of the younger patients, 28% of the older patients, and only 8% of the old patients

had liver metastasis. A smaller number of patients with liver metastasis in the group of old patients was recorded only in a few cases due to a decision of our doctors to restrict the treatment of these patients to palliative procedures such as laser therapy or cryotherapy. We think that most of the old patients with an advanced tumor disease will not be sent to a hospital by their general practitioners. Lethality of the patients with liver metastasis was 0% in the younger patients, 18% in the older patients and 20% in the old patients. Liver metastases increased the mortality in the older and old patients. But, as liver metastases are an expression of the advanced tumor disease and not an independent disease, we did not consider it in our risk analysis.

Our strict definition of risk factors certainly does not comply with other authors' attitude. Heberer (25) found risk factors in 80% of patients older than the age of 70 who needed surgical intervention for abdominal diseases. This study, however, included emergency surgery. Del Guercion and Cohn (26) studied patients older than the age of 65 with invasive cardiopulmonary methods before these patients underwent bigger surgical procedures. In only 13.5% they found a normal organic and physiological function. The rest of the patients showed more or less distinct changes. It should be asked whether physiological changes due to age are risk factors by themselves or this should be defined as risk of age by itself. Nevertheless, there is a need to take care of these age-related organic changes with intensive perioperative treatment and surveillance. An indication for us to be right with our definition of risk factors is the fact that none of the younger and older patients without risk factors died as a consequence of primary systemic complications.

In our study, the analysis of mortality of different risk factors in the old patients showed a similar mortality of about 10-15% for all diseases except renal failure. In older patients (between 65 and 75 years of age) with contrast arterial circulatory disturbances, there was a higher mortality of 27.3%, but the number of patients with this risk factor was very small. Renal failure (creatinine >2 mg/dl) had no influence on mortality in either group. It has to be mentioned that the total number of patients with this risk factor was very low in our study. Analyzing our data according to the number of preexisting risk factors as in the study of Boyd et al. (7), we did not register any influence of risk factors on mortality rate in younger patients. Mortality rate significantly increased in the older and old patients, if risk factors were present. Especially in the group of older patients, mortality increased from 1.3% if no risk factor existed up to 12.5% in the presence of two or more risk factors. Mortality rate was 2.9 times

higher in old patients in comparison with older and young patient, if no risk factor existed. However, according to Boyd et al., age alone had no statistically significant influence on the mortality rate in the multivariate analysis. This is in part certainly due to the fact that patients without risk factors showed a low mortality rate in all groups.

The study by Dienstl (27) demonstrated that death in colon and gastric surgery in old patients is caused by surgical complications in only one third, but two thirds are due to age-related complications. These results are confirmed by our data. Whereas death in the younger patients was caused in 100% by localized surgical complications, the cause of death in the older and the group of patients was related to systemic complications in two thirds.

Due to accompanying diseases, mortality rate of elective colorectal surgery in old patients with colorectal carcinoma is significantly higher. But

overall mortality of 8.2% in this group justifies the surgical intervention even in old patients, because chances of cure are as good as in young patients (16, 17). Furthermore, one should remember that emergency intervention for complications of the tumor such as ileus, perforation or bleeding significantly increases morbidity and mortality rate especially in the old (12).

However, high mortality rate not only in the old but already in the older patients with two or more risk factors should provide a reason for careful evaluation of risk benefit ratio of the operation and intensive perioperative care in individual patients. This is even more necessary in expansive tumor growth or severely limited life expectancy due to accompanying diseases. In these patients less straining therapies, e.g. cryosurgery or laser therapy in rectal cancer, should be considered.

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RIZICI IZBORNE HIRURŠKE TEHNIKE U OPERACIJI KOLOREKTALNOG KARCINOMA KOD STARIJIH OSOBA

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SAŽETAK

U retrospektivnoj studiji ispitana su 403 pacijenta sa kolorektalnim karcinomom kojima je urađena izborna (odgovarajuća) hirurška tehnika. Ispitivanje se odnosilo na postoperativne komplikacije i mortalitet u zavisnosti od starosnog doba i pratećih faktora rizika (plućna i srčana oboljenja, diabetes mellitus, bubrežna insuficijencija, poremećaji arterijske cirkulacije). Postoperativni mortalitet je iznosio 1.35% kod mlađih pacijenata (< 65 godina), 5.8% kod starijih pacijenata (65-76 godina) i 8.2% kod najstarijih pacijenata (>75 godina). U prisustvu jednog faktora rizika nijedan od mlađih pacijenata nije umro u postoperativnom periodu, ali je umrlo 10% starijih i najstarijih pacijenata. U prisustvu dva ili više faktora rizika mortalitet je iznosio 0%, 12.5% i 15% u pogledu ove tri grupe. U detaljnoj analizi samo starosno doba nije pokazalo statistički značajan uticaj na smrtni ishod. Važan uzrok povećanog mortaliteta, ne samo kod najstarijih već i starijih pacijenata, bilo je prisustvo faktora rizika.

U smislu pomoći u donošenju ovakvih odluka, ispitivali smo rizik izborne (odgovarajuće) resekcije kolona kod pacijenata sa kolorektalnim karcinomom u zavisnosti od starosnog doba i pratećih bolesti.

Ključne reči: kolorektalni karcinom, hirurgija kolorektalnog karcinoma i komplikacije, starosna dob i kolorektalni karcinom