

Anastomosis site – a risk factor for anastomotic leakage after elective anterior resection of rectal cancer

Andrzej Rutkowski, Marek P. Nowacki, Janusz Olędzki, Krzysztof Bujko

Background. The primary aim of the study was to assess the dependence of the risk of leakage on the anastomosis site in patients with rectal cancer. The secondary aim was to assess the possibility of sphincter-preserving surgery with regard to tumor localization.

Methods. This is a retrospective study of 301 consecutive patients with rectal cancer following elective anterior resection. Patients with acute surgical indication, in poor general condition, with anemia and with over 10-year insulin-independent diabetes were not included in the study. The risk of clinical anastomotic leakage was studied. The definition of clinical anastomotic leakage in the present study was: gas or pus from the drain, pelvic abscess and peritonitis. Clinical suspicion was based on physical or radiological examination and confirmed intra-operatively. In statistical analysis the χ^2 -test was used. Statistical significance was accepted at $p < 0.05$.

Results. The rate of postoperative complications was 31.2% (94 of 301). Two patients died following surgery (mortality rate – 0.7%). Clinical anastomotic leakage was observed in 13.6% of cases. The highest risk of leakage (26.5%) was related to a low anastomotic level, when the tumor was located within a distance of 5 cm from the anal verge. In these cases the rate of sphincter-preservation was 33.1%. The risk of anastomotic leakage after resection of tumor with lower margin situated within a distance of 5 to 7-8 cm from anal verge (middle part of the rectum, but below peritoneal reflection), was 17.3%. Overall risk of leakage in anastomoses situated within a distance below 6 cm from the anal verge was 19%. The sphincter-preserving operations of middle and upper rectum tumors (above 7-8 cm from anal verge) were performed in 91% of cases and anastomotic leakage occurred in 7.7%; $p = 0.01$.

Conclusion. The low colorectal anastomoses (up to 6 cm from anal verge) are associated with a high risk of leakage (19%). Therefore in these cases a defunctioning stoma should be performed.

Wysokość zespolenia jako czynnik ryzyka niebezpieczeństwa u chorych po elektywnej resekcji przedniej z powodu raka odbytnicy

Celem pracy było ustalenie zależności pomiędzy wysokością zespolenia okrężniczo-odbytniczego, a ryzykiem niebezpieczeństwa i reoperacji. Badano również zależność pomiędzy odległością guza od brzoju odbytu, a szansą na wykonanie operacji oszczędzającej zwieracze.

Metoda. Oceniono retrospektywnie 301 chorych, u których wykonano elektywną resekcję przednią z powodu raka odbytnicy. Z badania wyłączono pacjentów, u których występowały nagłe wskazania do operacji oraz będących w złym stanie ogólnym, z niedokrwistością lub cukrzycą insulinozależną, o ponad 10-letnim przebiegu. Oceniono ryzyko występowania objawowej niebezpieczeństwa. Niebezpieczeństwo zespolenia podejrzewano w przypadku objawów rozlanego zapalenia otrzewnej, ropnia w miednicy, obecności gazu lub ropy w drenie. Podejrzenie to weryfikowano badaniem per rectum, endoskopowo, badaniami obrazowymi oraz oceniano śródoperacyjnie, jeżeli stan chorego wymagał reoperacji. Analizy statystycznej dokonano przy pomocy testu chi-kwadrat przy założonym progu znamienności $p < 0,05$.

Wyniki. Wczesne powikłania pooperacyjne (do 30 dni od zabiegu) wystąpiły u 94 chorych (31,2%). Zmarło 2 pacjentów (0,7%). Odsetek niebezpieczeństwa zespolenia wyniósł 13,6%. Największe ryzyko niebezpieczeństwa stwierdzono wówczas gdy dolna granica guza znajdowała się w odległości do 5 cm (26,5%). Przy takim umiejscowieniu, odsetek operacji oszczędzających zwieracze był mały (33,1%). Gdy dolna granica guza znajdowała się w środkowej części odbytnicy, ale poniżej załamka otrzewnej (powyżej 5 cm do 7-8 cm od brzoju odbytu), ryzyko niebezpieczeństwa zespolenia wynosiło 17,3%. Zespolenie poniżej załamka otrzewnej w odległości do 6 cm od brzoju odbytu wiązało się z ryzykiem niebezpieczeństwa wynoszącym 19%. W przypadku gu-

zów górnej i środkowej części odbytnicy, położonych powyżej załamka otrzewnej (powyżej 7 cm od brzegu odbytu), operacje oszczędzające zwieracze wykonano w 91%. Odsetek nieszczelności wyniósł w tym przypadku 7,7%; $p = 0.01$.

Wniosek. Zespolenie okrężniczo-odbytnicze poniżej załamka otrzewnej obarczone jest wysokim ryzykiem objawowej nieuszczelności (19%), dlatego zawsze w takich przypadkach należy rozważyć wykonanie zabezpieczającej stomii.

Key words: rectal cancer, anastomosis leakage, defunctioning stoma

Słowa kluczowe: rak odbytnicy, nieuszczelność zespolenia, zabezpieczająca stomia

Low anterior resection for rectal cancer is associated with a high risk of clinical anastomotic leakage [1-7]. The leak is a risk factor of sepsis, and it is one of the most common causes of postoperative mortality [6, 8]. Anastomotic leakage has impact on risk of local recurrence [9, 10]. The factors associated with the increased rate of anastomotic dehiscence are: atherosclerosis, anemia, low anastomosis site, diabetes, advanced age, bowel perforation or obstruction and total mesorectal excision [6, 11, 12]. The outcomes of randomized trials have shown that preoperative radiotherapy was not related to a higher risk of anastomotic leakage [13-15]. The use of protective stoma in colorectal anastomoses seems not to decrease the leakage rate, but it does reduce the risk of serious postoperative complications and reoperations [16]. However, in this case, the second operation (decolostomy) is necessary and it is also associated with postoperative complications. Our study assessed the correlation between tumor localization, anastomosis site and risk of anastomosis dehiscence.

The primary aim of this study was to assess the dependence of anastomosis site on the risk of leakage in patients with rectal cancer. The secondary aim was to assess the possibility of sphincter-preserving operations in dependence on tumor localization.

Material and methods

Between January 1996 and December 2000, 362 patients underwent anterior resection for rectal cancer. This is a retrospective study of 301 (83%) consecutive patients following elective anterior resection. We studied 134 women and 167 men; mean age: 61 years. 61 patients (17%) with acute surgical indication, in poor general condition (WHO >2), with anemia (HB <10 g/l) and with insulin-independent diabetes of over 10-years standing were excluded from the study. In the study group the following co-morbidities were noted: hypertension (34.6%), coronary disease (24.9%) and diabetes (10.3%). The diagnosis of clinical stage of disease and the assessment of the distance between the anal verge and the tumor were based on the results of physical examination, pelvic CT, transrectal ultrasonography, or MRI. When the tumor was located less than 12 cm from the anal verge and the disease was only locally advanced, two schedules of preoperative radiotherapy were administered: short radiotherapy with 5x5 Gy with immediate surgery for resectable cancer and long conventional radio(chemo)therapy with a total dose of 50 – 50.4 Gy, 2-1.8 Gy per fraction and a 5-6 weeks interval between the end of irradiation and surgery for primarily unresectable cancer. The long-term radiotherapy was used alone or in combination with chemotherapy (5-fluorouracil and leucovorin). If the tumour was located within 6 cm from the anal verge, total mesorectal excision was performed. If the tumour was located in the upper rectum, subtotal mesorectal excision was performed – the mesorectum was transected 2-5 cm below tumour border. Two stapled technique and end to end anastomo-

sis were used. In the study group, the protective stoma and/or pouch colonic were not performed. Peritoneal cavity lavage, prophylactic antibiotic therapy and anticoagulant therapy were routinely used. All complications within 30 days after operation were recorded. The risk of leakage depending on the anastomosis site was assessed. The definition of clinical anastomotic leakage in the present study was: gas or pus from the drain, pelvic abscess and peritonitis. Clinical suspicion was based on physical and/or radiological examination and confirmed intra-operatively. In statistical analysis the χ^2 -test was used. Statistical significance was accepted at $p < 0.05$.

Results

Between January 1996 and December 2000, 430 patients with rectal cancer underwent planned resections. 301 patients (70%) underwent anterior resection. The rate of postoperative complications was 31.2% (94/301). Two patients (0.7%) died within 30 days after surgery. Clinical anastomotic leak was observed in 13.6%. Table I shows the risk of postoperative complications in relation to the type of operation and distance between the anal verge and the lower border of tumour. All complications within 30 days after operation were recorded (Table II). The highest risk of leakage (26.5%) occurred in patients with tumours the lower border of which was located within 5 cm from the anal verge. In this subgroup of patients the rate of sphincter-preservation was 33.1%. The rate of anastomotic leak after resection of tumour with lower border located between 5 and 7-8 cm from the anal verge (middle part of the rectum but below the peritoneal reflection) was 17.3%, and the rate of sphincter-preservation was 86.2%. Sphincter-preserving operations of middle and upper rectal tumors (higher than 7-8 cm from the anal verge) were performed in 91% of patients. In this subgroup the anastomotic leak occurred in 8.2% of cases. The difference between the rates of anastomotic leak in relation to tumor location (above or below peritoneal reflection) was statistically significant (14/171 vs 27/130; $p = 0.0063$). Table 3 shows the risk of anastomotic leak in relation to the level of anastomosis. In 158 patients the anastomosis was located at and below 6 cm from the anal verge. In these patients the anastomotic leak occurred in 30 cases (19%). All patients were re-operated. In 143 patients the anastomosis was located above 6 cm from the anal verge; anastomotic leakage occurred in 11 (7.7%) of those patients and 10 (7%) of them were reoperated. The differences between these two subgroups are statistically significant (leak: 30/158 vs 11/143; $p = 0.01$; reoperation 30/158 vs 10/143; $p = 0.0072$). The duration of the surgical procedure did not differ statistically between those two subgroups (mean 168 minutes for anastomosis at

Table I. Tumor location, operation and risk of postoperative complications

Tumor location (distance from anal verge in cm) n – numbers of operations	AR (%)	APR (%)	HRTM (%)	Postoperative complications (%)	Anastomotic leak (%)
Lower part of rectum (0 – 5 cm) n = 148	49 (33.1)	97 (65.5)	2 (1.4)	55 (37.2)	13 (26.5)
Middle part of rectum (>5 – 9 cm) n = 161	143 (88.9)	8 (5.0)	10 (6.2)	54 (33.5)	19 (13.3)
– Below peritoneal reflection	(86.2)	(6.4)	(7.4)	(39.3)	(17.3)
– Above peritoneal reflection	(92.5)	(3.0)	(4.5)	(25.4)	(8.1)
Upper part of rectum (>9 – 15) n = 121	109 (90.1)	(0.8) 1	11 (9.0)	38 (31.4)	8 (7.3)

AR – anterior resection; APR – abdominoperineal resection;
HRTM – Hartmann procedure

Table II. Type and number of postoperative complications

Type of postoperative complication	Number of complications
Anastomotic leakage	41 (13.6)
Peritonitis	12 (4.0)
Pelvic abscess	19 (6.3)
Wound infection	18 (6.0)
Urinary tract infection	31 (10.3)
Respiratory tract infection	17 (5.6)
Bowel obstruction	8 (2.7)
Eventration	5 (1.7)
Other	35 (11.6)

Table III. The risk of anastomosis leak associated with the distance between the anastomosis and the anal verge

Distance between anastomosis and anal verge (cm)	Number of operations	Postoperative complications (%)	Anastomotic leakage (%)	Reoperation (%)
2	6	4 (67)	2 (33)	2 (33)
3	24	13 (54)	9 (37.5)	10 (42)
4	33	16 (48)	9 (27)	7 (21)
5	42	12 (28.5)	4 (9.5)	6 (14)
6	53	15 (28)	6 (11)	5 (9)
7	36	14 (39)	3 (8)	4 (11)
8	42	8 (19)	4 (9.5)	1 (2)
9	4	0 (-)	0 (-)	0 (-)
10	37	8 (22)	2 (5)	3 (8)
11	7	2 (28.5)	1 (14)	1 (14)
12	17	6 (35.3)	1 (5.9)	1 (5.9)
2 – 6 cm	158	60 (38)	30 (19)	30 (19)
7 – 12 cm	143	38 (26.6)	11 (7.8)	10 (7)

and above 6 cm. vs 185 minutes for anastomosis below 6 cm). The overall rate of postoperative complications was 38% and 26.6% respectively. Anterior resection was performed in 137 patients treated with preoperative radiotherapy; 96 patients received short-term radiotherapy (25 Gy with 5 Gy per fraction over a period of 5 to 7 days) and 41 patients received conventional irradiation with overall treatment time 5 – 5.5 weeks, with the total dose of 50 -50.4 Gy given with 1.8-2 Gy dose per fraction. In 38

patients, conventional radiotherapy with two concomitant courses of 5-fluorouracil + leucovorin chemotherapy was used. Anastomotic leak after preoperative radiotherapy occurred in 24 (17.5%) of patients, while for the 164 patients operated without preoperative radiotherapy – in 17 (10.4%) cases. This difference was statistically insignificant.

Table IV. The role of defunctioning stoma – references

Author	Method of the study	No. of patients		Anastomotic leakage	
		Stoma (+)	Stoma (-)	Stoma (+) (%)	Stoma (-) (%)
Pakkastie TE (23)	Randomized	19	19	3 (16)	6 (32)
Graffner H (24)	Randomized	25	25	1 (4)	3 (12)
Rullier E (21)	Not randomized	86	45	16 (19)	9 (20)
Dehni N (22)	Not randomized	30	106	2 (7)	18 (17)

Discussion

For patients in whom the lower pole of the tumor was located within 5 cm from the anal verge, the abdomino-sacral resection (ABK) was performed in a majority of cases (65.5%), and the anterior resection in 33% of cases. The rate of sphincter-preserving operations (anterior resection) for tumors located below peritoneal reflection (7-8 cm from anal verge) was 53.5%. For well and moderately differentiated tumors, a 2 cm distal bowel margin is sufficient [17, 18]. The relatively high rate of clinical anastomotic leaks in this series (13.3%) is related to the high rate of low anterior resections (52.5%). The rate of anastomotic leak for low tumors of the rectum (below peritoneal reflection) was 20.8%. The low anterior resection is associated with a high rate of anastomotic leaks [1, 6, 7, 19, 20]. A defunctioning stoma decreases the rate of clinical anastomotic leaks and reduces both the need for reoperation and postoperative mortality [6, 21-23]. We have found a number of reports in literature concerning randomized studies directly comparing the role of the defunctioning stoma in patients with low anterior resection. The differences in the rates of clinical anastomotic leaks for patients with defunctioning stoma, as compared to patients treated without defunctioning stoma, were not statistically significant [23, 24] – Table IV. The outcomes of one of the randomized studies suggests that the defunctioning stoma decreased the rate of serious postoperative complications related to the anastomotic leak [23]. In another randomized study [24] we came across an opposite conclusion – the authors recorded a higher rate of anastomotic stenoses after anterior resection in the colostomy group, as compared to the non-colostomy group (36% vs 8%). We conclude that the role of a defunctioning stoma is not defined. However, the outcomes of numerous studies have shown that a defunctioning stoma decreased the rate of clinical anastomotic leaks and other serious complications in case of tumors located below the peritoneal reflection.

Conclusions

1. Low anterior resection was associated with a high ratio of anastomotic leaks (19%).
2. Preoperative radiotherapy was not associated with a higher ratio of anastomotic dehiscence.
3. Protective stoma should be performed in all patients with anastomosis below the peritoneal reflection.

Andrzej Rutkowski M.D., Ph.D.

Department of Colorectal Disease
The Maria Skłodowska-Curie Memorial Cancer Center
and Institute of Oncology
02-781 Warszawa
ul. W.K. Roentgena 5

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