Surgeon-related aspects of the treatment and outcome after radical resection for rectal cancer

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Abstract

Aim : **To summarise the magnitude and mechanisms of surgeon-related variability in the outcome after radical resection for rectal cancer and to present a solution and targets.**

Methods : **A review of the literature, consultation of the "Guidelines for the management of colorectal cancer" published by the Association of Coloproctology of Great-Britain and Ireland, and analysis of data from the database of the Belgian Ministry of Health, RIZIV-INAMI, on radical resection for rectal cancer in Belgium during the years 1995-1997.**

Results : **The proportion of abdominoperineal excision of the rectum (APER) varies between 23-58% in specialised centres and 43-57% general practice. In Belgium the APER rate for rectal cancer located between 4 and 16 cm above the anal verge is 50% with an overall in-hospital mortality of 3.5% ; both APER rate and postoperative mortality are lower in university than in community hospitals. Most studies observe an effect of specialisation, reducing mortality with a factor of 2.5 – 3. The magnitude of surgeon-related variability in the oncological outcome has been well documented indicating that the impact of the surgeon-factor is considerably larger than that of adjuvant therapy. When comparing subspecialised with general surgeons, relative risk factors of 0.3-0.8 are reported for local recurrence rate, and 0.7-0.8 for disease free survival.**

Conclusion : **Inter-surgeon variability is to be related with surgical skill and adequate implementation of recent diagnostic and therapeutic methods. Guidelines and centralisation are appropriate concepts, but do not guarantee improved quality of care. The targets are an APER rate of < 40% with an operative risk of < 2%, a local recurrence rate of < 10% and a disease free survival of > 70%. External audit is essential, but subspecialty training is a prerequisite and the surgeon is not the only factor to be audited.** (Acta gastroenterol. belg., **2001**, 64, **258-262**).

Key words : rectum, rectal neoplasms, colorectal surgery, rectal surgery specialty, neoplasm recurrence, local, survival.

Introduction

We are living in an era of tighter scrutiny where quality as well as productivity and use of resources are appreciated. Also the public has a growing interest in rating the performance of individual hospitals and surgeons. The Bristol case (1) illustrated that the medical profession has a duty to audit its performance and to inform patients about risks. However, comparisons are misleading (e.g. Le Guide des Hôpitaux) if no risk-adjusted analysis is performed, allowing for differences in case mix and patient fitness (2).

Variables of proven or probable prognostic significance in the treatment of colorectal cancer have been enumerated in the International Documentation System (3). The factor 'surgeon' is listed as one of them. Indeed, local recurrence and survival after curative resection for colorectal cancer was documented to vary from one surgeon to another despite similar case mix (4-6).

The aim of this review is to illustrate, analyse and discuss the surgeon-factor and its relation to the outcome after rectal cancer surgery. Proposals are formulated with the hope that they will improve the quality of rectal cancer surgery in Belgium.

Material and methods

A Medline search was performed in the medical literature published in English since 1990. Also, extensive cross-checking was performed in the reference lists. However, not all reviewed reports are enumerated in the reference list or mentioned in the text.

The "Guidelines for the management of colorectal cancer" published in June 1996 were consulted (7). These guidelines can be obtained at : Association of Coloproctology of Great-Britain and Ireland, RCSE, 35/43 Lincoln's Inn Fields, London WC2A 3PN or via e-mail admin@asgbi.org.uk.

The database of the Belgian Ministry of Health, RIZIV-INAMI, was consulted for the years 1995-1997 with the permission of Dekeyszer Th, MD, and with the help of Pincé Hilde, MD. To be retained for further analysis, a patient record had to have a combination of ICD9-CM code 1541, standing for rectal cancer between 4 and 16 cm above the anal verge, with at least one code for an operative procedure. Only records with the following operation codes for radical rectum resection were used for this report : abdominoperineal excision of the rectum (APER) : 485 and 4869 without a code for a rectal anastomosis or with the code for a (definitive) stoma ; sphincter saving operations (SSO) : 484 and 486 and their four digit subcodes, 485 with a code for a rectal anastomosis (4592, 4595). The database also provided information on age, sex, postoperative mortality during the hospitalisation for radical resection, type of hospital (university or community hospital). The database does not inform on tumour related factors, nor on

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Table I. — **Cancer in the lower two thirds of the rectum : type of surgery and outcome (according to Havenga *et al.*, 1999)**

Centre, region or country	Period	Treatment	APER rate	LRR (5 yr cum.)	DFS (5 yr cum.)
Specialised centres					
NHH, Basingstoke	1978-1994	TME, 11% RCT	5%	4%	80%
MSKCC, New York	1980-1993	TME, 62% RCT	32%	9%	75%
NCC, Tokyo	1985-1993	TME, no RCT	39%	9%	78%
General practice					
Norway	1986-1988	conv., 9% RCT	57%	42%	52%
CCCW Leiden region (NL)	1988-1993	conv., 57% RCT	43%	39%	53%

APER rate : N of abdominoperineal excision of the rectum / total number of radical rectum resections.
TME : total mesorectal excision ; conv. : conventional surgery without strict TME.
RCT : radio(chemo)therapy administered in x% of patients.

survival. The Fisher's exact test or the Chi-square statistic was performed to estimate the difference between 2 proportions.

Results

Magnitude of the surgeon-factor

The curative resection rate for rectal cancer was found to vary between surgeons from 40% to 76% (6), while it should be more than 60% (7). Also, the proportion of sphincter saving operations performed at radical resection for rectal cancer highly varies between institutions and surgeons. As can be expected the APER rate tends to be lower in specialised centres, 23-58% (e.g. 8-11), than in general practice, 43-57% (e.g. 12-15). The effect of sub-specialisation becomes more pronounced when rectal cancer in the lower 2/3, i.e. till 12 cm above the anal verge, is considered (16 ; Table I). The APER rate for rectal cancer located between 4 and 16 cm above the anal verge was found to be 50% in Belgium in the period 1995-1997. This rate is comparable with that observed in other nations or regions (12-15). In Belgium, 85% of radical resections for rectal cancer were performed in community hospitals and 15% in university hospitals. This compares well with the proportional distribution of hospital beds between university and non-university institutions, confirming that there is no centralisation for the treatment of rectal cancer in our country. The APER rate was observed to be significantly lower in university hospitals (38%) than in community hospitals (53% ; $p < 0.0001$). This difference remained very significant after adjustment for age and sex ; adjustment for tumour localisation and stage was impossible because these date were not available. A trend towards a decreasing APER rate during the observation period was not observed. It has repeatedly been demonstrated that rectal cancer is suitable for sphincter saving resection if a distal clearance of 1 cm can be achieved. Sphincter saving operations are the standard, and APER should no more be considered a procedure of choice for low or even for very low rectum cancer (reviewed in 17). The APER rate should be less than 40% (7). In order to reach this target sub-specialisation and more extensive colorectal surgical experience may be required. The 'Guidelines for the management of colorectal cancer' therefore state : "if a surgeon has any doubts regarding the choice between these two operations (APER and sphincter saving procedure), an experienced second opinion should be sought" (7).

Operative risk, i.e. postoperative morbidity and mortality, was demonstrated to vary widely between surgeons, e.g. from 0 to 20% postoperative mortality (6). Most studies observe an effect of specialisation, reducing mortality with a factor of 2.5-3, also after adjustment for risk factors (e.g. 18). A similar difference was found in Belgium between university hospitals, reasonably expected to be more specialised, and community hospitals. While the difference in the postoperative (in-hospital) mortality for patients up to 74 years did not reach a statistically significant level, it was significant for the elderly patients : 4.3% versus 9.9% (Table II). The Trent/Wales audit could not confirm an effect of specialisation or case load on postoperative mortality, but the overall mortality after colorectal cancer surgery was high at 7-8% (12).

The magnitude of surgeon-related variability in the oncological outcome after rectal cancer surgery has been well documented in multiple publications. In a prospective audit of 13 general surgeons operating in one clinic, the relative hazard ratio among surgeons was 0.56 – 2.03 for 10 years survival, after adjustment for other risk factors (6). These ciphers mean a 400% (or factor 4) difference between best and worst results. When comparing sub-specialised with general surgeons, relative risk factors of 0.3-0.8 were reported for differences in local recurrence rate, and 0.7-0.8 for disease free survival after rectal cancer surgery (19-21). However, a similarly wide variability of outcome is also documented in the German multicenter study that includes the results of five university clinics (22-24). All these data indicate that the impact of the surgeon-factor is considerably larger than the impact of adjuvant therapy, and that the surgeon, much more than the institution or hospital, should be considered as a factor for patient stratification in multicenter randomised clinical trials on the treatment of rectal cancer.

Table II. — **Type of radical resection and postoperative mortality after rectal cancer surgery in Belgium (1995-1997)**

	Nation	University hosp.	Community hosp.	
N of radical resections	3734	552	3182	
APER rate	50%	38%	53%	$p < 0.0001$
Postop. Mortality	3.5%	1.4%	3.9%	$p < 0.01$
< 55 yrs.		0%	0%	NS
55-64 yrs.		1.3%	1%	NS
65-74 yrs.		0.6%	2.5%	NS
≥ 75 yrs.		4.3%	9.9%	$p < 0.05$

Table III. — **A comparison of outcome variability after rectal cancer surgery performed by independent consultants versus by a team applying a 'standardized' technique (data deduced from ref. 6 and 25)**

	Independent consultants	Team with 'standard' technique
Number of surgeons	13	4 + 'others'
Local recurrence rate variation	0-21%	14-52%
Survival variation	20-63%	38-58%

Mechanism and nature of the surgeon-factor

The variability in type of operation, postoperative morbidity and mortality, and oncological outcome after rectal cancer surgery is to be related to surgical skill and proper implementation of recent diagnostic and therapeutic methods, including surgical techniques. The application of total mesorectal excision (TME, syn. total anatomical dissection) for rectal cancer located in the lower 2/3 of the rectum certainly contributes to the better local recurrence rate and cancer specific survival rate reported by specialised centres (Table I). Recommendations related to surgical technique have been formulated in the 'Guidelines for the management of colorectal cancer' (7). Guidelines, however, do not guarantee an improved standard and quality of surgical technique with reduced ranges of variability in outcome. Indeed, a comparable degree of variation in local recurrence and survival has been reported in a team of surgeons that agreed to apply strictly standardised techniques (25) and a group of independently performing consultants in one hospital (6), as summarised in Table III.

Case load and particularly surgical experience (more than 10 years) has been related to quality of surgery (18-20), but the impact of caseload was not confirmed by others.

Sub-specialisation and training were found to be of paramount importance. This does not exclude that some 'general' surgeons could obtain results comparable with those published by the 'champions' of TME also reporting very low recurrence rates. Indeed, the recurrence rate after curative surgery was ≤ 6% for 6 out of 13 'general' surgeons (6). From this report, two other relevant observations can be deduced : a high correlation (correlation factor R = 0.67) between postoperative mortality and the adjusted hazard ratio for survival after curative resections of rectal cancer, and, a very worth mentioning inverse relationship (R = – 0.4) between adjusted survival and the number of procedures assisted to trainees (Fig. 1). Others also observed no difference in mortality or outcome after colorectal cancer surgery when a high proportion of the operations were performed by trainee surgeons (26). This means that the specialist-tutor does not have to 'do it all by him/her self' in order to keep the standard high, and that outcome results may well be useful as one of the criteria to assess the quality of training in training-centres.

It is somewhat troublesome that so called surgeon-related variability also depends on non-surgical factors. For example, better preoperative imaging techniques will result in clinical T or N upstaging and eventually in the administration of neo-adjuvant therapy, which will affect late outcome. A pathology report on rectal cancer should report on penetration, grade, distal margin, circumferential margin, number of nodes, apical node state. Dedicated pathologists will sample more and better and eventually use more advanced methods for tumour cell detection. A pTN upstage eventually leads to the administration of adjuvant therapy in patients that would not have been treated otherwise. Also, demonstration of lateral section involvement (R1) will exclude such cases from the group of patients with curative resection. Variability in pathology reports on rectal cancer and the effect of case load have been illustrated (27). All six important criteria were reported by only 17% pathologists. Finally, late outcome after rectal cancer surgery will also be influenced by the adequacy, quality and performance of (neo)adjuvant therapy.

The solution for the surgeon-factor

Based on the data published in the literature, it seems that the solution for the surgery-related influence on the outcome of rectal cancer should be based on specialisation, centralisation and audit.

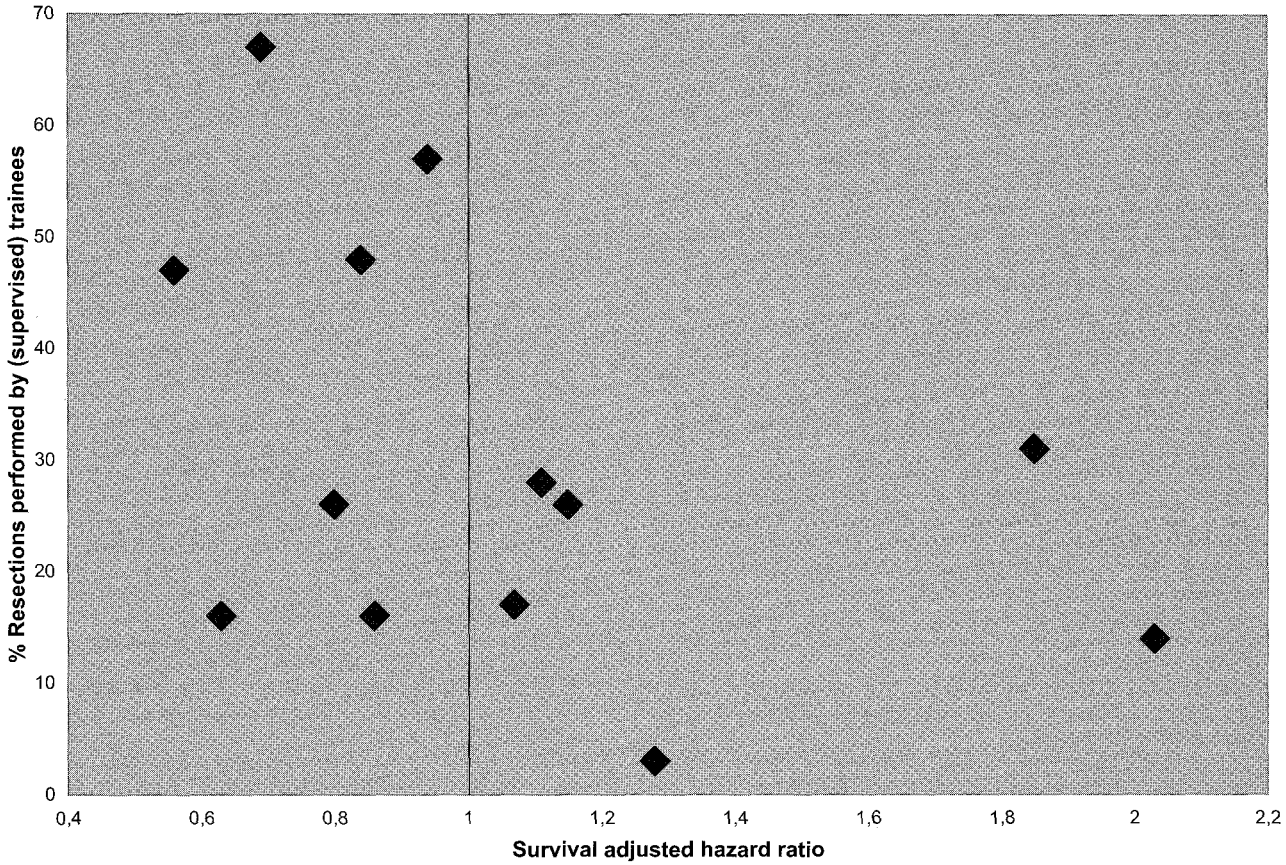

Fig. 1. — Correlation between quality of outcome and quality of providing training (deduced from data reported by McArdle and Hole in ref. 6). Low values of survival adjusted hazard ratio indicate better outcome. The correlation factor R = – 0.4.

The advantage of centralisation of the treatment of rectal cancer in multidisciplinary teams is evident : these centres most likely have updated technology, adequate case load, sub-specialists trained in all domains concerned with the treatment of rectal cancer. In this environment new diagnostic and therapeutic modalities will be adapted more rapidly and implemented more adequately. These centres do not all need to be university centres. Indeed, some community hospitals have been found to perform as good as university hospitals (19). Centralisation with sub-specialisation would also improve surgical training : higher case load, higher proportion of procedures assisted to trainees.

Centralisation and sub-specialisation, however, do not guarantee improved quality of treatment per se. Therefore, all centres, also the multidisciplinary 'centres of excellence' need to be audited. Internal audits are informative, but external audit of the quality of care largely has to be preferred because it would apply the same methodology of quality control to all centres and teams.

Conclusions and targets

Major advances have been made in the treatment of rectal cancer, but equally major variability in type of surgery, operative risk and outcome has been documented. The standards set by expert centres are an APER rate of < 40% with an operative risk of < 2%, a local recurrence rate of < 10% and a disease free survival of > 70%.

In order to achieve these targets, patients with rectal cancer should be treated by surgeons with an interest and subspecialty training in colorectal surgery, operating in a multidisciplinary team of sub-specialists. Because guidelines and centralisation of specialised care do not suffice in order to guarantee quality of care, auditing is essential. An external audit of the results of all centres, with risk-adjusted analysis, is the only objective and honest method to inform surgeons, the medical community and patients about real risks. It is evident that the surgeon is not the only factor to be audited.

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