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Influence of hospital volume on the frequency of abdominoperineal resections and long-term oncological outcomes in low rectal cancer

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Abstract

Aim: Studies analysing the outcome after resection of low rectal cancer that has not infiltrated the anal sphincter reveal poorer long-term outcomes after abdominoperineal resections (APR) in comparison with low anterior resections (LAR). Further, a relationship between the frequency of APR and LAR for low rectal cancer and hospital volume is known. Our aim was to investigate the independent impact of hospital volume and type of resection on oncological outcomes after resection of low rectal cancer.
Method: In a prospective multi-centre observational study of 1557 patients with low rectal cancer undergoing LAR or APR, the long-term oncological outcomes were analysed for their dependence on hospital volume and type of procedure.
Results: Univariate analysis revealed that patients undergoing APR had a higher local recurrence rate ($p = 0.022$) and shorter disease-free survival ($p < 0.001$) than patients undergoing LAR, while hospital volume showed merely a tendency to impact the local recurrence rate ($p = 0.060$). With regard to disease-free survival, no dependence on hospital volume was to be found ($p = 0.201$). The rate of APR was significantly associated with hospital volume ($p < 0.001$). Multivariate analysis revealed an independent impact of hospital volume on local recurrence rate, while disease-free survival was influenced by the type of surgical procedure performed.
Conclusion: In the surgical treatment of low rectal cancer the hospital volume has a major impact on outcome. The type of procedure does not affect the local recurrence rate but the disease free survival.

Keywords: Low rectal cancer; Sphincter-preserving anterior resection; Abdominoperineal resection; Hospital volume; Survival

Introduction

A better understanding of the local spread of rectal cancer has resulted in improved surgical techniques and the introduction of total mesorectal excision by Heald[1,2] and high transection of the mesenteric artery, enabling complete resection of the local draining lymphatics. This, together with simultaneous, successive reduction of the oncologically required distance from the distal resection line,[3,4] now enables surgeons to resect ever lower rectal carcinomas while preserving the sphincter and still achieving an oncologically acceptable result. Additionally, the availability of staplers makes possible a colorectal or coloanal anastomosis at almost any distance from the anal verge. The result has been that the past decades have seen a reduction in the rates of abdominoperineal resections for rectal cancer regardless of level, from 80% to approximately 20–30%,[5] A number of authors even report appreciably fewer rates of abdominoperineal resections among their patients, the actual rate depending largely upon tumour level, and thus on patient selection. Single-centre analyses also show that ultra-low, inter-sphincteric resection of rectal cancer is also possible with good functional results and no negative impact on long-term oncological outcome.[6,7] However, in approximately 40% of patients with low rectal

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cancer located less than 6 cm from the anal verge, an oncological acceptable result mandates an abdominoperineal rectal resection (APR).[8]

Data reported in the literature show that long-term oncological outcomes of APR in low rectal cancer are poorer than those achieved with low anterior resection (LAR), although the data are not uniformly consistent.[8–10] An unequivocal preference for one or the other surgical procedure cannot be discerned from the figures, in particular in view of the fact that prospective studies of the quality of life following APR vs. LAR fail to show a superiority of LAR.[11] Problems with a postoperatively high defecation rate and partial sphincteric incontinence after ultra-low anterior resection may have a negative impact on quality of life.

Over and beyond this, oncological outcome following APR and LAR shows a relationship with hospital volume and surgeon caseload. Thus, for example, the literature data show that the APR rate is significantly lower in high-volume hospitals and in the hands of an experienced surgeon.[12–15] Equally, long-term oncological outcomes are dependent upon both the hospital volume and the surgeon caseload.[14,16,17] The independent influence on long-term oncological outcomes of the individual parameters APR rate, hospital volume and surgeon's caseload is difficult to determine on account of their interactions. In addition, a direct comparison of the two surgical techniques is also made more difficult by the fact that the rate of positive circumferential resection margins, but also intra-operative tumour perforation, increases with decreasing distance of the tumour from the anal verge,[18,19] while the rate of APRs increases.

On account of the unavoidable, indication-related selection bias, single-centre, non-randomised analyses are poorly suitable for comparing the oncological outcome achieved with APR and LAR. Since prospective randomized studies comparing APR with LAR are ethically inadmissible, we prospectively employed data from a multi-centre observational study to investigate the long-term oncological outcomes of sphincter-preserving low anterior resection (LAR) and abdominoperineal resection (APR) as a function of hospital volume.

Patients and methods

Study

Within the framework of the prospective multi-centre observational study "Kolon/Rektum-Karzinom (Primärtumor)" conducted in the period between 1 January 2000 and 31 December 2004, epidemiological and treatment-related data were collected from patients with colorectal carcinoma. The baseline data for the present analysis were provided by all those patients with a low rectal carcinoma treated in the years 2000 and 2001. A detailed description of the study design and monitoring, as well as the method of data evaluation, has been published elsewhere.[20] At 6-monthly intervals, follow-up data providing information on the last patient interview, life/death status, where applicable cause of death (cancer-related, independent from cancer), local tumour recurrence, detection of distant metastases, where applicable time and method of detection of the malignant recurrence were collected. Participation in the study was on a voluntary basis both for hospitals and patients. Written consent to have their data collected was provided by every patient. Since the study was designed as an observational study and the collection of data had no influence on the therapeutic regimen, approval by an ethics committee was not required.

Patients

Between 1 January 2000 and 31 December 2001, a total of 6886 patients with a rectal carcinoma were entered into the study. In this period, all patients with a UICC stage I–III low rectal carcinoma who underwent an abdominoperineal resection of the rectum (APR) or a low anterior resection (LAR) in curative intent, each with total mesorectal excision, were selected. Patients undergoing a limited tumour resection, laparoscopic resection or a Hartmann procedure, as well as those in whom grossly visible residual tumour remained after surgery (R2 resection), were excluded from the analysis. A further exclusion criterion was the absence of written consent to have follow-up data recorded.

Analysis

The APR and LAR patients were first compared for demographic data (age, gender, body mass index [BMI], tumour stage, tumour site, ASA-score), treatment-associated (neoadjuvant therapy, intra-operative complications, postoperative morbidity, hospital mortality, frequency of microscopically positive circumferential resection margins, frequency of adjuvant therapy) and long-term oncological results (5-year local recurrence rate, disease-free survival). There then followed a comparison of the patients grouped by hospital volume in terms of the distribution of surgical procedures and long-term oncological outcomes, and finally a multivariate analysis of the long-term oncological results.

Definitions

For data collection, the tumours were put into four groups on the basis of the distance of the distal tumour margin from the anal verge (AV), as measured with the rigid rectoscope (I: <4 cm, II: 4–7.9 cm, III: 8–11.9 cm and IV: 12–16 cm). Tumours located less than 8 cm from the AV were defined as low rectal cancer, and form the basis for the present analysis.

On the basis of the procedure volume (annual number of patients operated on for low rectal cancer in the period