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Determining the quality of colorectal cancer surgery

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Key words: Colorectal Neoplasms; Colorectal Surgery; Treatment Outcome; Digestive System Surgical Procedures; Quality Indicators, Health Care

Surgery is the cornerstone of curative treatment for patients with colon and rectal cancer. Surgical quality assurance is a central issue in the treatment of rectal cancer mainly because of widely varying local recurrence rates from 2.4% to 40%. Quality assurance in rectal cancer surgery has lead to substantial improvements in sphincter preservation, local control, and overall survival. The outcome after treatment of rectal cancer is influenced by the surgeon in the selection of a treatment approach and in the actual performance of the surgical procedure. Well-performed rectal cancer surgery is a prognostic variable both in the short- and long-term prognosis. It often influences outcome more than current adjuvant chemoradiation therapies. There is extensive evidence from large observational studies and multicenter clinical trials, which show that the quality of rectal-cancer surgery affects local disease recurrence and therefore patient's survival. High-quality rectal-cancer surgery involves the surgeon dissecting in the mesorectal plane located immediately outside the layer of mesorectal fascia, which surrounds the mesorectum. This should result in removal of the entire mesorectum, which contains all potential routes of metastatic tumour spread. Neither postoperative radiotherapy nor postoperative chemoradiotherapy can compensate margin involvement. The introduction of the TME concept resulted in a significant reduction in abdominoperineal resection from 60% to 27%. The refinement of stapling devices is one reason for this improvement, but it is also related to the TME technique itself, because dissection under direct vision down to the pelvic floor facilitates low-stapled anastomoses.

However, the embryological planes are not limited to the mesorectal layers only but continue to the sigmoid and descending colon on the left side, running finally posteriorly behind the pancreas and around the spleen, also to include the duodenum with the head of the pancreas, the caecum with the ascending colon and the mesenteric root on the right side. As with the rectum, in colonic cancer – except for very advanced cases – the lymphatic spread primarily follows the lymph drainage along the supplying arteries. Within these compartments, the visceral fascia from both sides, like envelopes, covers the mesocolon. This led to the concept of complete mesocolic excision (CME) as a surgical technique with sharp dissection of the visceral plane from the retroperitoneal one, aiming finally to avoid any breaching of the visceral fascia layer, which potentially may lead to tumour spread within the peritoneal cavity. With this procedure, the origin of the colonic arteries can be well exposed and tied centrally at their origin to ensure maximal harvest of the regional lymph nodes. The latter is associated with improved survival. Therefore, as seen for rectal cancer, the quality of surgery seems to be a very important factor for the prognosis of patients with colon cancer.

Different hospitals and surgeons have widely varying results in colorectal cancer patients with similar stage disease. Many questions remain regarding the reasons that govern these different outcomes. What is the best method to measure quality? Number of harvested lymph nodes, quality of TME involvement of the circumferential margin, local recurrence rate, anastomotic leakage rate or something else? Is volume or experience the sole driver of quality and outcome? Is volume merely a surrogate of quality and the better measure of quality related to training? Finally, can other measures of surgical quality be developed? Numerous studies have suggested a relationship between increasing volume and improved outcomes in rectal cancer surgery - the 'practice makes perfect theory'. But practice without proper education hardly can make good colorectal surgeon and therefore it is necessary to educate surgeons through colorectal training programs, workshops, operative demonstrations, histopathologic sessions, and seminars. Moreover, high number of colorectal cancer patients does not allow a rational centralization of these patients into specialist units so it is important to set up programs so that every department can reach a high standard of efficiency in colorectal cancer surgery.

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Radiotherapy in resectable rectal cancers

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Key words: Rectal Neoplasms; Adenocarcinoma; Radiotherapy Adjuvant; Radiotherapy; Postoperative Period; Preoperative Period; Antineoplastic Combined Chemotherapy Protocols; Digestive System Surgical Procedures; Treatment Outcome; Survival Rate

Radiotherapy

Rectal adenocarcinomas are as radiosensitive as adenocarcinomas of the breast. But a larger volume and nodal extension located near organs at risk poorly tolerant to RT, as the small intestine, had contained RT in a palliative state until the large trials of the 80's. Now, indications have changed: RT became conformal and technical progress had a significant impact on both the technique by itself and its association with surgery and chemotherapy *(Robertson, ijrobp, 2008*).

Pre or post opérative radiotherapy?

In the decades 80-90, two schools have solved this problem. Indeed, each of the alternatives had advantages; for preoperative RT, downstaging of tumours giving hope of sphincter preservation for extraperitoneal T3 rectal cancer. *(Gentile, Ann Ital Chir, 2003)* and surgery in best condition with faster healing. On the other side, postoperative radiotherapy left intact the possibilities of early healing and histological factors which could show the possible indications of chemotherapy.

The «Stockholm 1» trial included 849 patients between preoperative short-term radiation therapy, 25 Gy over 5 to 7 days versus surgery alone. Among all randomized patients, time to local recurrence or distal metastasis was significantly prolonged in the preoperatively irradiated group (p. less than 0.01).The postoperative mortality was 8% in the radiation therapy group compared to 2% in the surgery alone group (p less than 0.01) *(Cancer, 1990).*

On the contrary, the NSABP protocol R-01 randomized 555 patients between no further treatment after surgery versus chemotherapy or radiotherapy alone. No significant benefit in overall disease-free survival (p=0, 4) or survival (p=0, 7) from the use of radiation has been demonstrated *(Fisher, J Natl Cancer Inst, 1988).*

The trial of Pahlmann and Glimelius *(Ann Surg, 1990)* definitively responded this question: 471patients were randomized with the same RT as in the Stockholm 1 trial vs. 60 Gy in a total 8 weeks postoperative irradiation for only Astler-Coller B2, C1 and C2 rectal lesions.

The local recurrence rate was statistically significantly lower after preoperative than after postoperative (12% versus 20%; p=0, 02).

Short or conventional preoperative radiotherapy of rectal cancer?

The study of Kenova *(J Buon, 2007)* included 84 patients receiving a total dose of 25 Gy in 5 fractions each for 5-7 consecutive days, (as in the Stockholm 1 trial) or 50Gy in 25 fractions of 2 Gy each in 5 weeks, followed by surgery after 4-5 weeks. The use of short preoperative scheme was accompanied with higher rates of local recurrence: 11% vs. 0%.

Partial tumour regression with 50 Gy was achieved in 79 % of the cases. Such regression was not possible to access for the short-RT group since surgery was performed 3-5 days after RT. In fact, consensus was achieved with the time of chemo radiotherapy. All oncologists from all cancer centers *(Scott, Colorectal. Dis., 2009)* recommend long-course chemo radiotherapy before rectal resection. This consensus is maintained for cases of lower T (3a) N (0) cancers. Thereafter, the majority of patients with T(2) N(0) rectal cancers are still offered adjuvant short-course RT, if no indication of adjuvant chemotherapy is retained in these early tumours and/or for tumours situated in the upper third of the rectum.

Preoperative radiotherapy alone or combined with total mesorectal excision (TME)?

Preoperative RT and total mesorectal excision have each been shown to improve local control of disease in patients with resectable rectal cancer. The Dutch Colorectal Cancer Group conducted a randomized trial to determine whether the addition of preoperative RT increases the benefit of TME. 1861 patients were randomly assigned to receive a short-term RT followed by TME or TME alone. The rate of local control at two years was 2, 4 % in the RT-TME group vs. 8, 2 % in the surgery-alone group (p<0,001).

The conclusion *(Kapiteijn, N Eng J Med, 2001)* is that both of these techniques add their effects and must be used all together and should not be used in competition.

Preoperative RT plus TME: action on overall survival or simply relapse-free survival?

Preoperative RT plus TME reduce by approximatively 10% the risk of local recurrence *(Wolmark, JNCI, 2000),* but does it influence survival? Gains in overall survival were observed in old studies where the relapse rate was prohibitive *(O'Connel, N Engl J Med, 1997)* and none of the trials conducted in recent years showed any benefit in overall survival *(Sauer, N Engl J Med, 2004; Bujko, Radiother Oncol 2004; Bosset, Eur J Cancer…)* but an increase in disease-free survival (trials of preoperative RT: *Kapitejn, N Enl J Med, 2004* and méta-analysis *(Ceelen, Cochrane Database Syst Rev, 2009).*

Radiotherapy or chemo radiotherapy?

The meta-analysis of the Cochrane database *(Ceelen, 2009)* based on four published trials with sufficient follow-up compared preoperative RT with preoperative chemo radiation (CRT), which have shown promising

activity in stage II and III rectal cancer. Compared to preoperative RT alone, preoperative CRT significantly increased the rate of complete response although this did not translate into a higher sphincter preservation rate. The incidence of local recurrence was significantly lower in the CRT group compared to RT alone (p<0,001), but no statistically significant differences were observed in disease-free survival (p=0, 27) or overall survival (p=0, 58) at five years.

Techniques

Preoperative RT currently recommended is 45 Gy in five weeks and surgery eight weeks later. It must be carried with the following standards: energy photons> or= 6MV, with 3 or 4 beams. Conformal RT after imaging by CT scan and/or MRI is recommended, with adequate protection of critical organs (bowel, bladder...). Concomitant chemotherapy is also recommended (most of the time 5 fluorouracil associated with oxaliplatin)

Conclusion

Although a significant progresses has been made in almost thirty years, we are always waiting for new trials from which precise and definite results, particularly in survival, may be obtained.