

Influence of nutritional treatment on the postoperative course in patients with gastric cancer

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Abstract

Purpose: Malnutrition occurs in ca. 60% of all patients with gastric cancer. The obligatory standard for a curative radical oncological procedure is gastrectomy inclusive of regional lymph nodes. Nutritional treatment is expected to decrease possibilities of postoperative complications in patients subjected to curative surgery. The study is aimed at comparing treatment results in patients with gastric cancer subjected to radical surgery, nutritional and non-nutritional treatment respectively.

Material and methods: The study included 176 patients qualified for curative surgery of a total or subtotal gastrectomy. Analysed were 2 groups of patients: group I – not subjected to nutritional treatment, group II – subjected to nutritional treatment, both in the circumoperative period. The groups were compared in respect to: 1) age, 2) sex, 3) nutritional condition, 4) degree of clinical cancer development, 5) histopathological cancer type, 6) kind of surgical procedure performed, 7) antibiotic and antithrombotic prevention. All complications observed in the patients were divided into four kinds: surgical of a high or low risk and general of a high or low risk.

Results: Given the above-mentioned estimation parameters, no statistically significant differences between both groups were recorded. Of 176 patients, 27% showed surgical complications and 40% had general complications. No difference ($p=0.60$) in the incidence of a high and low risk surgical complications between groups I and II in the circumoperative period was observed, a significant difference ($p=0.03$) was recorded in the incidence of general complications. Low risk general complications (respiratory infections) were shown to

occur significantly more often ($p=0.005$) in patients receiving either parenteral or enteral nutrition after surgery.

Conclusions: A significant part of the patients with a medium degree and a medium to heavy degree of malnutrition subjected to a curative gastrectomy can pass through the postoperative period without using either parenteral or enteral nutrition and with no violations of all the other principles of the postoperative procedure as well as without provoking any significant increase of surgical complications. In case surgical complications should occur and delay resuming natural feeding, it is necessary that parenteral and/or enteral nutritional treatment be undertaken according to clinical circumstances and condition of the patient concerned; such proceedings increase chances of cure.

Key words: gastric cancer, gastrectomy, nutritional treatment, complications.

Introduction

Malnutrition in patients with malignant alimentary tumours develops in 30-80% cases subject to which organ is affected. It occurs in ca. 60% cases of all gastric cancer patients [1,2]. The obligatory standard for a curative radical oncological procedure is a surgical treatment, i.e. gastrectomy inclusive of regional lymph nodes [3-6]. Nutritional condition of the patients having to be subjected to an extensive surgical procedure due to gastric cancer, seems very significant for the effective surgical treatment [7-9]. Parenteral and/or enteral nutritional treatment contributes to eliminating or decreasing nutritional deficiencies and helps recover a normal protein, carbohydrate and fat as well as hydroelectrolytic balance respectively prior to the surgical treatment, while in the postoperative period both or one may cause a quick shift from the phase of catabolism to anabolism. [10-15]. Hence the introduction of nutritional treatment in curative gastric tumour patients with a surgical record should

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decrease the likelihood of postoperative complications in the patients concerned.

Circumoperative patient nutrition has been widely discussed for many years. The authorities on the issue are unanimous that malnutrition deteriorates treatment results, extends in-hospital stays and increases treatment costs. Nutritional treatment is recommended in severely malnourished patients. The majority of European societies, inclusive of the Polish Parenteral and Enteral Nutrition Society, accept the opinion that circumoperative nutritional treatment is not advisable in patients showing either a proper nutritional condition or mild malnutrition who within a week following surgery are expected to resume normal feeding fulfilling 60% of nutritional demand [16]. Total or subtotal gastrectomy hinders efficient oral feeding that fulfils 60% of nutritional demand within 7 days following surgery. However, orally fed and non-orally fed patients show a similar number of septic complications following gastric cancer surgery. Given the above-mentioned, tests are conducted to replace parenteral nutrition with a manufactured diet by enteral administration or intravenous crystal liquids, electrolytes and 5% glucose solutions [17,18]. The patients scheduled for enteral treatment due to surgery in the upper digestive segment are recommended to receive a thin probe through the nose down to the small intestine, 10-15 cm below the lowest anastomosis [16]. Actually, gastric cancer patients after surgery are, in most cases, given a combined parenteral/enteral nutrition, decreasing the intravenous supply in parallel with an increasing tolerance to enteral feeding.

Of importance in selecting a proper method of postoperative procedure may be assessment of the number and kind of postoperative complications in patients with a similar level of malnutrition, subjected to curative surgery due to gastric cancer contingent on the way of postoperative course.

The study is aimed at comparing early treatment results in patients with gastric cancer subjected to curative radical surgery who were and were not nutritionally treated.

Material and methods

The study included 176 patients (58 female and 118 male) qualified for the curative surgery of a total or subtotal gastrectomy; the patients were selected from 311 of those treated due to gastric cancer in the years 1988-2003.

Detailed analysis was performed in two groups of patients:

- group I – non-nutritionally treated in the circumoperative period,
- group II – nutritionally treated in the circumoperative period.

Group I included 51 patients (15 female and 36 male) in whom nutritional treatment was impossible in the circumoperative period due to lack of patient consent, a poor tolerance to nutritional treatment trials, lack of qualification for nutritional treatment within the first years of the period concerned. The patients, who had not been nutritionally treated, received an oral diet in the preoperative period, and were postoperatively given adequate rations of liquids and electrolytes inclusive of ca 300 kcal per day in the form of 1.5 litre of 5% glucose. In Group

II (125 patients – 43 female, 82 male) was introduced nutritional treatment in the form of parenteral nutrition (PN), enteral nutrition (EN) or combined parenteral/enteral nutrition. Oral supply of liquids was introduced in the 5th day following surgery, control of the anastomosis tightness was performed on the 7th day by means of uropoline. If the anastomosis proved tight, oral feeding was decided and hospital diet given.

An average age of non-nourished patients was 62.3, and nourished ones 62 years.

For the sake of comparison the following criteria were analysed in both groups: 1) age, 2) sex, 3) nutritional condition, 4) clinical staging of cancer according to the TNM UICC classification of 1997 [4,6], 5) histopathological cancer type according to the Lauren classification [4,6], 6) kind of surgical procedure performed, 7) antibiotic and antithrombotic prevention introduced.

Nutritional condition of the patients was assessed on admission to hospital with respect to:

- subjective, global assessment of nutritional condition – SGA (Subjective Global Assessment) [2],
- anthropometric examinations – percentage of body mass loss in the most recent 3 months prior to treatment commence, BMI [2],
- laboratory examinations – concentration of albumin in the blood serum, total lymphocyte count, concentration of total protein in the blood serum.

The patients subjected to thorough SGA-based assessment of nutritional condition were qualified to the following groups representing: 1) proper nutritional condition, 2) mild malnutrition, 3) medium malnutrition, 4) severe malnutrition. Chosen anthropometric examinations based on the height and body mass of the patient helped to determine a body mass index (Body Mass Index – BMI), and to define the disease-related loss of body mass within the period of 3 months prior to treatment commence [2]. Results of laboratory examinations were assessed before surgery, i.e. on admission to hospital. The minimum level of albumin concentration, total lymphocyte count (TLC) and concentration of total protein were agreed at the following amounts respectively: 35g/l, 1500 in mm³, 63 g/l. BMI values between 18 kg/m² and 20 kg/m² as well as body mass loss above 5% within the period of 3 months prior to admission to hospital were found to prove the risk of malnutrition and qualifying for nutritional treatment. Severe malnutrition was indicated by the BMI below 18 kg/m², body mass loss above 10% within the period of 3 months prior to treatment commence, TLC < 800 in mm³.

To assess the degree of gastric cancer development, the following were performed in 176 patients:

- clinical examination,
- endoscopy with taking specimens for histopathological examination,
- radiological examination of the chest,
- ultrasound and CT of the abdominal cavity,
- exploration of the abdominal cavity organs by the operator,
- macroscopic and microscopic examination of the operative preparation [4,6].

In the premedication period (30-45 minutes before surgi-

cal procedure) the patients were administered an intravenous antibiotic prevention (Cephalosporine I + metronidazol) and a subcutaneous antithrombotic prevention (low-molecular-weight heparin). A kind of surgical procedure was chosen based on surgical treatment standard guidelines in an early and advanced gastric cancer. Performing a subtotal excision of gastric cancer, 4/5 part of the stomach was resected, a margin was left from the edge of the tumour with Lauren I – 5 cm and Lauren II – 7 cm towards the incision line [4,6]. The digestive tract continuity reconstruction was performed by means of the following techniques: Billroth I, Billroth II, “omega” with the Braun anastomosis and Roux – en – Y in accordance with to the standards obligatory in these techniques.

All complications observed in patients were divided into 4 categories:

- surgical of a high risk – dehiscence of esophagointestinal anastomosis, dehiscence of gastrointestinal anastomosis, dehiscence of duodenal stump, bleeding from the upper segment of the digestive tract;
- surgical of a low risk – surgical wound suppuration, peritoneal fluid collection, suppuration in the canal after removing the drainage tube, an IV cannula reaction;
- general of a high risk – cardiac infarct, brain stroke, respiratory insufficiency, pancreatitis, circulatory insufficiency, kidney insufficiency;
- general of a low risk – fevers without no observable cause, pneumonia and bronchitis, pleural effusion, diarrhoea, urinary infections.

Statistical analysis was performed to find a dependence between monitored parameters and the incidence of surgical/general complications in both groups of patients. In order to verify hypotheses concerning lack of dependence between “quality” features discussed and complications, the χ^2 independence test was used. In order to verify hypotheses concerning lack of crucial differences between median values of “quantity” features in the groups of patients with a diverse degree of post-operative complication risk, the single-factor variance analysis based on the F test was used. A p values <0.05 were considered statistically significant.

Results

Examined were 176 patients with curative gastric cancer treated by means of resection surgery. Group I included 51 (29%) patients in whom nutritional treatment was not introduced, whereas group II consisting of 125 (71%) patients were nutritionally treated. A comparative analysis was made in both groups of the patients.

On closer analysis of age distribution in the groups in respect to sex, no statistically significant difference in the number of women and men either in group I ($p=0.08$) or in group II ($p=0.13$) was found.

Thorough SGA-based assessment of nutritional condition showed that on admission to hospital the patients were medium or severely malnourished in most cases: in group I – 94%; in group II – 95%. The BMI analysis showed that 24% of both non-nourished and nourished patients proved

qualified for nutritional intervention ($BMI < 20 \text{ kg/m}^2$). No statistically significant difference ($p=0.39$) of BMI values between group I and II was recorded. Loss of body mass indicating medium malnutrition occurred in 18% of the patients from group I and 38% of the ones from group II. Severe malnutrition was observed in 70% and 56% of the patients respectively. Albumin concentration in the blood serum below the norm was found in 41% of non-nourished patients and 39% of nourished ones. Total lymphocyte count below $1500/\text{mm}^3$ was found in 66% of the patients from group I and 41% from group II. Total protein concentration below the accepted norm was observed in 42% of non-nourished patients and in 36% of nourished ones. No statistically significant difference was found between both of the groups with respect to body mass loss ($p=0.37$), albumin concentration ($p=0.10$), total lymphocyte count ($p=0.40$), total protein concentration ($p=0.65$). Both of the analysed groups showed that the patients had an advanced cancer in a majority of cases, mostly tumours T3: 70% in group I; 54% in group II. Nodal metastases were observed in 55% of the patients in group I and 66% in group II; distant metastases 8% and 10% respectively. Group I included most of the patients having an intestinal cancer (49%), while group II a spread type of cancer (50%). No statistically significant difference in the size of the tumour ($p=0.11$) was recorded as regards lymph metastasis incidence ($p=0.55$) and distant ones ($p=0.65$), histopathological cancer type ($p=0.18$) observed between non-nourished patients and nourished ones in the circumoperative period. Group II included in a statistically significant way ($p=0.01$) more frequent cases of a total gastrectomy than a subtotal gastrectomy.

Of 176 patients operated due to gastric cancer, complications affected 91 patients (52%). Circumoperative mortality amounted to 5.1%. Surgical complications occurred in 47 (27%) patients, general complications in 70 (40%).

Low risk surgical complications included 5 (9.8%) patients in the non-nutritionally treated group whereas in the nutritionally treated group 18 (14.4%) patients. High risk surgical complications are respectively as follows: group I 6 (11.8%), group II 18 (14.4%). No statistically significant difference ($p=0.60$) in low and high risk surgical complication incidence between the non-nourished and nourished patients in the circumoperative period was noted.

Low risk general complications were recorded as follows: in group I in 8 (15.7%), in group II in 45 (36%); high risk general complications in I – 6 (11.8%), in II – 11(8.8%). Statistically significant difference ($p=0.03$) was recorded in general complication incidence between non-nourished patients and nourished ones in the circumoperative period. Low risk general complications occurred above two times more frequently in the nutritionally treated patients, the highest number of them included respiratory-related infectious complications. High risk general complications occurred with the same frequency in both of the analysed groups.

Postoperative parenteral nutrition was introduced in 119 patients with 57 ones excluded. Low risk general complications occurred in 8 (14% – 8/57) non-PN-treated patients following surgery and in 45 (37.8% – 45/119) PN-treated patients following surgery. 53 patients were enterally nourished, 49 of them also received parenteral nutrition, of 176 examined patients,

123 were not enterally nourished. Low risk general complications occurred in 28 (22.8% – 28/123) non-EN patients and in 25 (47.2% – 25/53) patients after EN. Low risk general complications occurred significantly more frequently ($p=0.005$) in the patients receiving the postsurgical PN and EN. No differences in surgical and general complication incidence was observed either in the circumoperatively non-nutritionally treated patients or nutritionally treated patients after a total and a subtotal gastrectomy.

Suppurative complications (surgical wound suppuration, peritoneal fluid collection, suppuration in the canal after removing the drainage tube) that were included in low risk surgical complications, occurred in 16 cases of 125 (12.8%) nourished patients and 5 cases of 51 (9.8%) non-nourished patients. Moreover, in the nutritionally treated patients was observed 6/125 (4.8%) post-IV cannula reactions which were not recorded in the group of non-nutritionally treated patients at all. Tube-related reactions should be the reason of a higher number of low risk surgical complications in nourished patients in the circumoperative period as compared with the patients malnourished. Anastomosis dehiscence is the most serious high risk surgical complication. The very complication occurred as the only high risk surgical complication in 6 malnourished patients – 6/51 (11.8%). In the nutritionally treated group of the patients in the circumoperative period, anastomosis dehiscence occurred in 16 patients – 16/125 (12.8%) as well as there were 2 cases of bleeding from the upper segment of the digestive tract. The anastomosis dehiscence occurred with a comparable frequency both in the group of non-nutritionally treated patients and nutritionally treated patients in the circumoperative period.

Among low risk general complications in nutritionally treated patients, a majority included respiratory infections. Pneumonia and bronchitis, pleural effusion occurred in 29 cases of all 125 (23.2%) nutritionally treated patients in the circumoperative period. Fever with no evident cause occurred in 26 cases of all 125 (20.8%) patients in that group. In the group of malnourished patients, the following were recorded respectively: 3/51 (5.9%) pulmonary infections and 5/51 (9.8%) fever showing a four-times reduction in pulmonary infections and a two-times reduction in the fever incidence. High risk general complications in both of the analysed groups were mainly circulatory-related disturbances. Circulatory insufficiency, cardiac infarct and brain stroke occurred in 6 cases of 51 non-nutritionally treated patients (11.8%) as well as in 5 cases of 125 nutritionally treated patients (4%). Respiratory insufficiency was not observed in group I patients, whereas 4 such cases of 125 (3.2%) patients were recorded in group II.

Discussion

Decrease in the number of surgical complications, particularly those of a high risk is envisaged by applying the circumoperative nutritional treatment in malnourished patients. In the study presented, the number of surgical complications in nutritionally treated patients is not lower than in non-nutritionally treated ones. Explanation was sought through a detailed analysis of which of the complications had occurred in the patients.

The presented study includes 176 gastric cancer patients divided into group I, i.e. non-nutritionally treated and group II i.e. nutritionally treated in the circumoperative period. No significant difference in the nutritional condition between both groups prior to surgery was found. Despite lack of nutritional intervention, group I patients did not show a complication incidence higher than in group II patients. Lack of nutritional treatment in the patients did not contribute to any increase in the incidence of high risk surgical and general complications. Non-surgical infectious complications, i.e. low risk general complications occurred in nutritionally treated patients more frequently than in non-nutritionally treated ones. It serves to confirm the assumption raised by the authors of some publications that nutritional treatment following surgical procedures increases the number of infectious complications in the patients subjected to this kind of therapy with no explainable cause. Bellantone et al. [19] found a two-times increase in the incidence of infectious complications in parenterally nourished patients, if they were not found to be severely malnourished in the preoperative period. The performed examinations have shown that it is possible to pass a gastric cancer patient safely through the circumoperative period without nutritional treatment, but still with keeping to all the other rules of surgical procedure.

Komorowski et al. [18] have stated that a routine use of parenteral nutrition in the postoperative period is not justified in patients showing no serious nutritional deficiencies. Nutritional treatment is recommended in severely malnourished patients in whom it may decrease surgical complication risk. The studies by Veterans Affairs [20] and Bozetti et al. [17] have shown that in severely malnourished patients subjected to surgical procedures due to digestive cancer, parenteral nutrition reduces the incidence of non-infectious complications resulting in the incidence of non-surgical infectious complications – particularly during use of parenteral nutrition. Braga [21,22], Pawłowski [23], Papapietro [24], Sand [25], Graham [26], Hoyer [27] and Wells [28] have shown in their studies that enteral nutrition is well tolerated and should be the treatment of choice in the patients subjected to gastrectomy due to cancer. Therefore, from the moment a gastric cancer is suspected, the nutritional procedure should include a natural diet supplemented with manufactured diets, and a combined parenteral/enteral nutrition should be introduced after surgery, with decreasing the intravenous supply in parallel with an increasing tolerance to enteral feeding.

Conclusions

A significant part of the patients subjected to a curative gastrectomy with a medium degree of malnutrition and a medium to heavy degree of malnutrition may pass through the postoperative period without using either parenteral or enteral nutrition, and still keeping to all the other rules of the postoperative procedure and without provoking any significant increase of surgical complications.

In case surgical complications should occur and delay resuming natural feeding, it is necessary that parenteral and/or enteral nutritional treatment be undertaken according to clini-

cal circumstances and condition of the patient concerned; such proceedings increase chances of cure.

In gastric cancer patients with a medium degree of malnutrition and a medium to heavy degree of malnutrition, who were non-nutritionally and nutritionally treated after curative resection procedures, the incidence of surgical and general complications is similar.

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