



Nutritional Support for Patients with Diseases of Hepatopancreatoduodenal Zone in the Early After the Operational Period

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Abstract

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AIM: Analysis of the effectiveness of nutritive nutrition in cancer patients in the early post-operative period.

MATERIALS AND METHODS: The examination included 80 patients with an average age of more than 20 years (men – 35, and women – 45). All patients for analysis were divided into two groups: The first, the main-receiving strictly enteral and/or probe nutrition (n = 41), the second, control-isolated parenteral nutrition (n = 39). The dynamics of laboratory examination results was assessed – the level of total blood protein, including albumin, the number of lymphocytes, the values of alanine aminotransferase, aspartate aminotransferase, total blood bilirubin, and serum ferritin. In addition, the duration of the use of enteral and parenteral nutrition, the number of patient days in the intensive care unit, the nutritional status of patients on the subjective global assessment (SGA), and nutritional risk index (NRI) scales were evaluated.

RESULTS: Most patients in the control group (n = 31) on the 10–12th days of the post-operative period, according to the SGA and NRI estimates, were in a state of normal nutritional status (n = 8) – in a state of moderate malnutrition. Since the introduction of parenteral nutrition with enteral nutrition (13–15 days), patients with signs of malnutrition have not been identified in this group. The assessment of the dynamics of total blood protein values in patients showed a significant difference between the average values of indicators in the clinical groups throughout the study period (p < 0.05). In the main group, the average content of total blood protein was 62.5 ± 10.0 g/l, in the control group – 57.5 ± 10.1 g/l by 8 days of the post-operative period. The dynamics of specific indicators of the biochemical composition of blood is determined by the methods of surgical intervention, the volume, duration, and nature of the operation.

CONCLUSIONS: When carrying out nutritional support in cancer patients operated on for tumors, hepatopancreatoduodenal region, in the early post-operative period, the enteral route to the action of nutrient mixtures may be preferable, provided there is a pronounced intestinal paresis and congestive discharge from the stomach.

Introduction

The timely treatment of malignant tumors of the hepatopancreatoduodenal zone remains one of the most pressing problems of clinical oncology. Tumors of the hepatopancreatoduodenal zone are most severe, as they are accompanied by a clinic of obstructive jaundice, pancreatitis, and liver failure. Choosing the right surgical or conservative therapy is a matter of principle, which determines the life expectancy of the patient. Patients treated in the intensive care unit (ICU) or surgical department have signs of protein-energy malnutrition. In most cases, patients continue to enter specialized hospitals only with the development of various complications of cancer of the organs of the hepatopancreatoduodenal zone. Violation of nutritional status has a significant impact on the outcome and prognosis of the disease,

increases the duration of treatment and the cost of treatment, and also increases mortality and the number of complications [1], [2], [3], [4].

The aim of this work was a comparative analysis of the effectiveness of enteral and parenteral nutrition in patients in the early post-operative period, operated on for the oncopathology of the hepatopancreatoduodenal zone.

The research objectives included: (1) A comparative assessment of the clinical condition of patients using the subjective global assessment (SGA) and nutritional risk index (NRI) algorithms in the early post-operative period after surgical interventions in the hepatopancreatoduodenal region; and (2) analysis of the dynamics of the results of the main metabolism in the early post-operative period and the dynamics of the results of the biochemical composition of blood in patients of this profile during enteral and parenteral nutrition [5], [6], [7], [8], [9].

Materials and Methods

The study was approved by the Ethics Committee of Karaganda Medical University.

An assessment of the clinical effectiveness of the use of methods of enteric support - enteral and parenteral nutrition in a complex of therapeutic measures in patients after operations in the hepatopancreatoduodenal zone - was carried out.

The examination included 80 patients. All patients for analysis were divided into two groups: The first, the main-receiving strictly enteral and/or probe nutrition ($n = 41$), and the second, control-isolated parenteral nutrition ($n = 39$). With the average age of the patients of the first group was 56.9 ± 12.1 years (from 21 to 75 years). There were 26 men and 15 women. In the second group, the average age was 54.2 ± 12.0 years (from 21 to 75 years): Men – 18, women – 21. The age distribution in the groups did not differ, patients from 53 to 75 years prevailed, which amounted to more than 50% of the main patient population.

The distribution of patients into groups was made by simple random sampling (simple randomized selection) based on the known number of the general population ($n = 80$) of patients who underwent examination for a specific period of time.

For the frequency of the study, as well as taking into account the comparison in the work of mainly quantitative indicators in two groups, the volume of each sample was additionally confirmed by the formula:

$$N = (Z_a - Z_b)^2 - S_1^2 + S_2^2 / \Delta^2,$$

where S_1^2 and S_2^2 are the standard deviations of signs in both groups, Z_a and Z_b , respectively, the critical value of the normal standard distribution, Δ^2 is the minimum critically significant value of the differences.

The criteria used for the comparative effectiveness of the proposed methods of nutritional support are reflected in the SGA and NRI protocols, which confirm their high level of evidence when analyzing the dynamics of the nutritional status of patients.

In this regard, the power of the study, taking into account the sample size and calculation data of the Statistical Package for the Social Sciences (SPSS) program, the "Power Analysis" module was 65% ($B = 0.32$). The confidence interval, reflecting the static significance of the differences between the mean values of the results of the biochemical, general blood test, according to the calculated between the SPSS program, was in most positions (78%) – 95%. In a smaller number (22%) of the compared clinical and laboratory values, the differences in the results obtained were small and included "zero," which made it possible to conclude that there was no clinical

significance of the revealed differences in these studies.

The influence of the compared approaches to maintain the body's energy needs during the post-operative period was evaluated by the dynamics of laboratory examination results – the level of total protein, including albumin, the number of lymphocytes, the values of alanine aminotransferase (ALAT), aspartate aminotransferase (ASAT), and total blood bilirubin.

The estimate of the use of enteral and parenteral nutrition, the number of patient days in the ICU with the need for a specific method of nutritional support was estimated.

The evaluation of the effectiveness of the above nutritional methods was supplemented by fixing the time of appearance of intestinal motility after surgery, the resumption of independent stool, and a return to a normal (pre-operative) diet. The main condition for enteral nutrition was the absence of a congestive gastric discharge through the nasogastric tube, despite the persisting signs of post-operative intestinal paresis.

Inclusion criteria for nutritional support in the early post-operative period were patients who did not have contraindications for one or another type of administration of nutrient mixtures.

The qualitative composition of nutritive mixtures is determined in the following sequence: The body's need for proteins is revealed, as well as the required number of non-protein calories (carbohydrates and fats) for its absorption by the body and subsequent vitamins and minerals.

The energy requirement of the patient's body was determined by the accessible and widespread Harris-Benedict equation of calculation based on the anthropometric data of the patient (gender, age, weight, and height). The measurement of the weight of patients in the early post-operative period was based on the difference in the weight of the patient with the bed and the weight of the bed itself (taking into account the weight of the mattress, linen, pillow, and drainage). Obtaining the result of the patient's weight with the bed consisted of installing floor weights under each leg of the bed and further summarizing the numerical data given the weight of the empty bed. Enteral nutrition was used from the 2nd day after the operation at the rate of 25–30 ml/h, gradually increasing the volume of the mixture with an average daily gain of 20–25% of the total calculated caloric needs of the patient, provided the patient assimilated the mixture.

Parenteral nutrition was started from the 1st day after surgery at the rate of 50% of the daily calorie requirement. By the 2nd day, patients received parenteral nutrition in full from the needs of the body. Enteral and

parenteral nutrition continued until the patient returned to a normal diet.

Statistical analysis

The data were statistically analyzed using the computer program “Statistical Package for the Social Sciences (SPSS),” version “20” for Windows. The T-criterion for independent samples was used to compare the average values of the analyzed parameters. Data were presented as Mean ± SD. Values were considered reliable at $p \leq 0.05$.

Results

Patients who were distributed according to the nosology of diseases for which hepatopancreatoduodenal zone operations were performed were as follows:

- Malignant lesions of the pancreas (n = 28);
- Benign pancreatic lesions (n = 10);
- Malignant lesions of the biliary tract and common bile duct (n = 13);
- Benign lesions of the biliary tract and common bile duct (n = 4);
- Malignant liver damage (n = 23);
- Benign liver damage (n = 2).

In 28 (30%) patients, the disease was complicated by obstructive jaundice, which required preliminary decompression of the biliary tract or decompression of the biliary tract. The duration of jaundice, on average, was 20.5 ± 3.3 days. In the case of maintaining high bilirubin numbers in the department, various decompression interventions were performed.

The nutritional status of patients of both groups before surgery and during the 10–12 days of the post-operative period according to the methods for assessing the nutritional status of NRI and SGA was regarded as a low, medium and high risk of malnutrition. Figures 1 and 2 show the dynamics of the nutritional status of patients in both groups relative to the NRI and SGA rating scales.

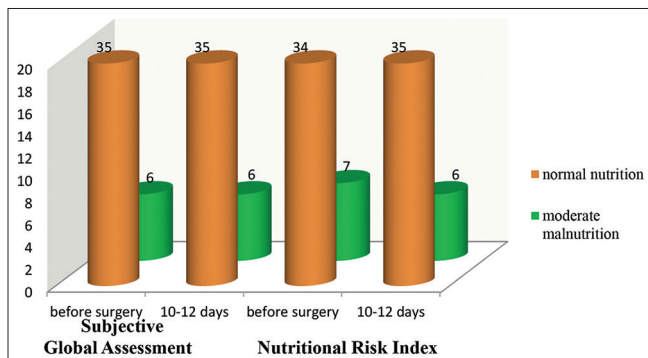


Figure 1: Status of nutritional status in the perioperative period in patients of the main (1) group

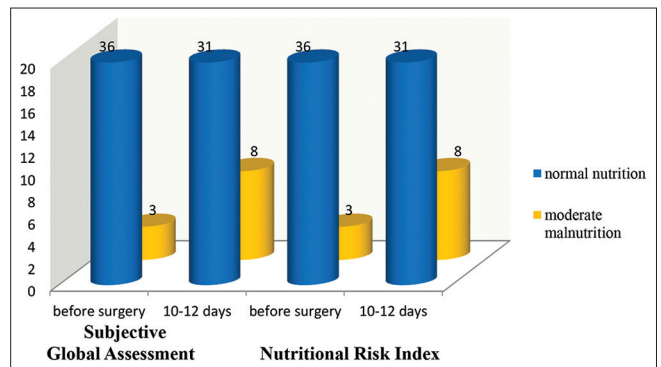


Figure 2: Status of nutritional status in the perioperative period in patients of the control (2) group

As shown in Figure 1 in the pre-operative period, according to SGA estimates, 35 patients of the main group had normal nutrition, six patients had moderate malnutrition. In the control group, the results of assessing the nutritional status by SGA reflected normal status in 36 patients, and moderate nutritional status in three patients. In the control group, the results of assessing the nutritional status by SGA reflected normal status in 36 patients and moderate nutritional status in three patients.

Consequently, in 71 patients in both groups, the NRI index was regarded as truly negative (normal nutritional status), in nine – truly positive (moderate malnutrition).

On the 10–12th days of the post-operative period in patients of the main group, the results of the SGA assessment reflected the data of the initial indicators – normal nutrition (n = 35) and moderate malnutrition (n = 6). The data of the NRI method in this time period completely coincided with the SGA ($p = 0.005$ or <0.005). Most patients in the control group (n = 31) on the 10–12th days according to SGA and NRI estimates were in a state of normal nutritional status, eight – in a state of moderate malnutrition. With the addition of parenteral enteral nutrition (on days 13–15), there were no patients with signs of malnutrition in this group ($p = 0.003$ or <0.003) (Figure 3).

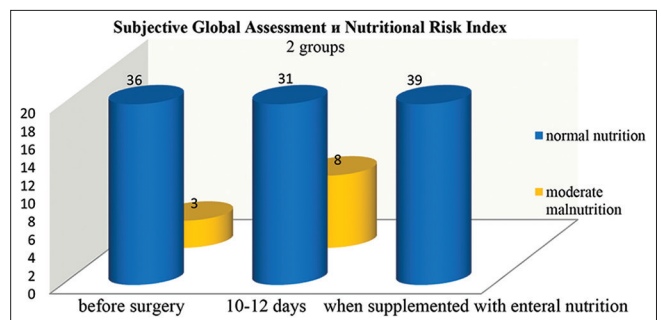


Figure 3: State of nutritional status of the control group with the addition of enteral nutrition

According to the calculation, the average values of metabolic needs, namely, the energy demand, in both groups on the 2nd day of the post-operative period, on average, amounted to 35.2 ± 3.5 kcal/kg or 2000–2500 kcal/day (Figure 4).

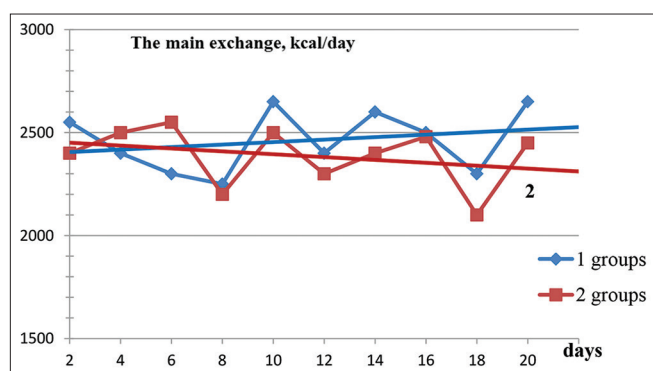


Figure 4: A comparative analysis of the dynamics of the level of basic metabolism in patients of both groups in the early post-operative period

Hence, according to the presented graph, on days 8–10, the values of this indicator in patients of the main group were 2200.0 ± 293.3 kcal/day, on day 15 – 2500.1 ± 353.4 kcal/day, while in the control group, the average value of the main metabolism was 2150.5 ± 272.0 and 2050.0 ± 313.3 kcal/day, respectively, the specified time period. By the 15th day of the post-operative period, in addition to parenteral, enteral nutrition (from 13 days), patients in the control group showed a relative increase in the level of basal metabolism – up to 2480.2 ± 119.3 kcal/day ($p = 0.003$ or <0.03).

By the 15th day of the post-operative period with an additional introduction to parenteral nutrition, enteral nutrition (from 13 days) in patients of the control group there was a relative increase in the level of basal metabolism – up to 2480.2 ± 119.3 kcal/day ($p = 0.003$ or <0.03). This fact, obviously, was associated with the preservation/restoration of parietal digestion in the gastrointestinal tract in the early post-operative period, despite postoperative intestinal paresis of varying degrees, and the involvement of nutrient ingredients in anabolic processes with the observed relative preservation of the weight of patients of the main and control groups relative to the original (on days 2–3, 10, and 15) post-operative period, which is reflected in Table 1.

Hence, the average weight of patients underwent statistically insignificant comparative changes between groups by 8 and 15 days of the post-operative period. The dynamics of body weight indicators reflected its relative preservation in the main group.

The assessment of the dynamics of the total blood protein values in the subjects showed a statistically significant difference between the average

values of its indicators in the clinical groups throughout the entire period of the examination.

In both groups, a gradual decrease in the total blood protein was observed relative to the course of the post-operative period. With a statistically significant decrease in its level in groups, in the main one, a slower and gradual decrease is noted. In patients of the control group, there is a certain kind of jump in its reduction, despite the use of parenteral nutrition nutrient mixtures containing a protein ingredient (a mixture of amino acids). Perhaps, as mentioned above, the preservation of parietal digestion can cause this difference in the dynamics of the level of total blood protein.

On the part of the change in the number of lymphocytes, it should be noted that before the operation, the absolute value of lymphocytes in the main and control groups was within the normal range ($29.9 \pm 3.7\%$), but, taking into account the methods and volumes of the operation, there were certain differences in the dynamics of the results in the post-operative period.

The assessment of the level of blood lymphocytes in the perioperative period, in the totality of clinical and laboratory changes, reflects the degree of tension of the immune system and the degree of involvement of the cellular component of immunity in the metabolism processes.

Gradually developing observed lymphopenia is more pronounced in the control group. Patients of the main group with lymphopenia do not have a statistically significant progressive decrease in their level in the post-operative period, which may reflect more stable preservation of the cellular immunity link.

The dynamics of the level of serum transaminases and their ratio (ASAT/ALAT), namely, the de Ritis coefficient, directly indicates in both groups certain changes in the hepatic parenchyma. The given gradual decrease in the coefficient directly correlated in the post-operative period with the predominance of the level of ALAT over ASAT.

Hence, the average ALAT values in the 1st group were 368.6 ± 13.9 ed/l, ASAT – 90.4 ± 3.6 ed/l, in the 2nd group – 404.8 ± 11.4 ed/l and 75.7 ± 5.9 ed/l, respectively. A constantly elevated ALAT level was apparently associated with the underlying disease, which caused a long period of cholestasis, confirmed by an increase in bilirubin levels in the preoperative and, to a lesser extent, in the intraoperative period.

Table 1: Dynamics of anthropometric data (body weight) of patients and laboratory examination results in the post-operative period

Days	1 main groups				2 control groups			
	Weight, kg	Total blood protein, g/l	ASAT/ALAT, ed/l	Blood lymphocytes, %	Weight, kg	Total blood protein, g/l	ASAT/ALAT, e d / l	Blood lymphocytes, %
2–3	76.2 ± 4.11	65.7 ± 5.6	1.0 ± 0.31	22.5 ± 3.2	82.8 ± 3.1	68.0 ± 4.3	1.2 ± 0.19	29.7 ± 4.0
6–7	78.5 ± 3.0	60.3 ± 4.9	0.7 ± 0.21	21.9 ± 3.6	79.0 ± 1.9	63.3 ± 7.1	0.9 ± 0.27	22.8 ± 5.6
8–10	80.9 ± 2.2	61.8 ± 6.0	0.9 ± 0.14	24.0 ± 2.9	81.9 ± 0.9	60.8 ± 6.6	0.9 ± 0.18	18.4 ± 6.9
15	81.4 ± 2.8	58.3 ± 4.4	1.1 ± 0.23	20.8 ± 5.1	79.7 ± 2.3	56.9 ± 5.8	0.8 ± 0.24	19.6 ± 6.3
p-level	0.432	0.037	0.049	0.289	0.516	0.042	0.141	0.019

ALAT: Alanine aminotransferase, ASAT: Aspartate aminotransferase.

When assessing the dynamics of the results of total bilirubin in both groups on days 5–7, the range of its values was observed, on average, 17.6 ± 8.3 mmol/l. In patients with obstructive jaundice (14% and 13%, respectively, of the groups), the values of direct blood bilirubin before surgery and on the 1st day of the post-operative period exceeded the norm by more than 10 times. On the 5–7th days, there was a tendency to a 5–6-fold decrease in its level, which persisted until discharge from the hospital ($p = 0.005$ or < 0.08).

Discussion

An analysis of the dynamics of the indicators of clinical efficacy of treatment showed that the duration of the postoperative hospital day in the hospital in the main group was 13.0 ± 5.0 days, which was significantly less than in the control group – 17.5 ± 10.8 days ($p = 0.09$ or < 0.09). The results presented within the framework of numerical values sufficiently reflect more detailed information and have confirmation in a small number of the literature [10], [11], [12], [13]. The average time spent by patients in the ICU for the main and control groups differed due to the volume of surgical intervention and amounted to 2.9 ± 2.7 and 4.3 ± 2.1 days, respectively ($p = 0.06$ or > 0.06).

Considering the aggregate dynamics of indicators of the clinical and laboratory state of nutritional status in the post-operative period, one can indicate a relatively fast stabilization in patients of the main, first, group. In patients of the control group, improvement/normalization of the given values was observed significantly at a slower pace, with a lag of 3–5 days. The generally accepted approach to assessing the effectiveness of nutritional support in the post-operative period in cancer patients is the determination of the dynamics of indicators of blood cholesterol, total and direct bilirubin, and total blood protein [5], [6], [4], [13], [14]. The determination of bilirubin levels in this work for technical reasons was not possible, in connection with which indicators of a biochemical analysis of blood comparable in significance were taken into account.

According to the results of this work, according to a combined analysis of clinical and laboratory data, enteral nutrition comes to the fore in the relative effectiveness of nutritional support, which is confirmed in a number of the literature [7], [10], [15], [16], [17].

It seems rational to assert that the effectiveness of enteral/probe nutrition prevails for this group of patients, provided there is no pronounced intestinal paresis and persistent congestive discharge from the stomach in the early post-operative period.

The work presents and takes into account surgical interventions performed in a planned manner, that is, in patients without the previous acute involvement of the abdominal organs in the pathological process that contributes to the development of dynamic and mechanical intestinal obstruction.

An analysis of the data obtained using statistical processing of data indicates a more favorable effect of enteral nutritional support on the dynamics of the total blood protein while maintaining an elevated level of serum transaminases, as significant diagnostic criteria (de Ritis coefficient) for the involvement of the hepatic parenchyma in the pathological process as a result of cholestasis [4], [10].

In general, the results obtained on the basis of a specific contingent (cancer patients in the early post-operative period) sufficiently suggest and reflect the positive aspects of the use of the enteral route of nutritional support in comparison with exclusively parenteral, provided there is no pronounced post-operative intestinal paresis and dynamic intestinal obstruction [5], [8], [12].

These results, most likely, are due to the preservation of parietal digestion in the gastrointestinal tract, the preservation of a relatively satisfactory passage of the intestine with the possibility of absorption of nutrients in the intestine while maintaining or activating its functional activity in the early post-operative period [1], [3], [6], [12], [18].

The obtained results of this study, despite the relatively small size of the sample, allow to outline the preferable possibility of using enteral replacement in patients in the earlier post-operative period after surgery in the hepatopancreatoduodenal zone due to a definite and statically reflected more rapid positive dynamics of the results of biochemical metabolism and specially dependent values of the total blood count (lymphocytes). Apparently, the results obtained are associated with an earlier activation of parietal digestion and a decrease in the risks of maintenance before the operating room and development after the operating nutritional deficiency.

However, due to a narrowly focused view of a specific problem, this work does not allow to fully disclose separately the positive role of parenteral nutrition in maintaining the nutritional status of these patients, since the main leitmotif of the work was a comparative analysis of the effectiveness of two methods of nutritional support.

Undoubtedly, there is a clinical effect of isolated parenteral nutrition in this group of patients can be of great importance and even prevail over enteral support in the general mass or in most other groups of cancer patients undergoing volumetric surgery. This direction requires further analysis and study of many positive characteristics of parenteral and mixed nutrition in this category of patients.

Conclusions

1. When carrying out nutritional support in cancer patients operated on for tumors of the hepatopancreatoduodenal region, in the early post-operative period, the enteral route of administration of nutrient mixtures may be preferable, provided there is no pronounced intestinal paresis and congestive gastric discharge.
2. Enteral nutrition in the early post-operative period in patients of this profile seems more appropriate in view of the fairly stable and better SGA and NRI values of the assessment methods and the relatively rapid normalization of the main indicators of the blood biochemical composition in comparison with patients exclusively on parenteral nutrition.
3. Carrying out enteral nutrition in the early post-operative period in cancer patients operated on for tumors of the hepatopancreatoduodenal region in combination with intensive care measures can reduce the number of hospital days, both in the ICU and in the hospital.

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