SIBO in Upper Gastrointestinal Tract Surgery

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Highlights

- Surgery related to gastric cancer, pancreatic cancer, IBD and metabolic surgery is related to high incidence of SIBO (31%), confirmed in our study. SIBO is related to metabolic complications in patients with solid organ transplantation related to increased mortality.
- The incidence of SIBO is currently underestimated and related to high incidence of metabolic consequences which urgently require appropriate intervention and treatment.
- SIBO further exacerbates and impairs the mechanisms triggered by surgery, chemotherapy and radiotherapy, with consequent micronutrient deficiencies, limited immunosuppressive resorption and efficiency, also in patients with solid organ transplantation and impact clinical signs presentation.
- SIBO should be systematically screened and treated in patients undergoing longer upper gastrointestinal tract resections and solid organ transplantation which already are in higher risk of post-surgical nutritional deficiency to significantly improve treatment outcomes and prevent the development of short and long-term complications.

Background. Longer surgical resections of upper gastrointestinal tract are at higher risk for developing Small Intestinal Bacterial Overgrowth (SIBO); SIBO is characterized as an excessive growth of bacteria in the small bowel, prompting a wide variety of enteral and systemic symptoms and is related to development of short – and long-term complications (1, 2). The predominant phyla in normal gut microbiota are Bacteroidetes (19,7%), Firmicutes (40%), Actinobacteria (20%) and Proteobacteria (2,15%) (1, 3, 4). In dysbiotic SIBO environment an excess number of colon dominant bacteria colonizing the small intestine, responsible for digestive symptoms such as bloating, abdominal pain, nausea, and diarrhea (5–8). The suggested pathophysiologic mechanisms of SIBO in upper abdominal surgery include changes in anatomical features due to technical reconstruction to priory and other surgery, adhesions after surgery, influx of substances in the intestine and changed gastric acidity (9–11).

Despite considerable advances in upper gastrointestinal cancer, metabolic and bariatric surgery, and solid organ transplantation (12) the underestimated incidence of malabsorption, small intestinal bacterial overgrowth, and the consequences due to the surgery itself significantly reduces the quality of patients care, affects the incidence of postoperative and metabolic complications, irrespective of the type of surgical resection (13). In patients with solid organ transplantation SIBO is associated with a reduced likelihood of recipient survival, increased prevalence of antibiotic resistance genes and graft survival due to reduced metabolization of the immunosuppressive drugs. Also, dysbiotic environment in solid organ transplantation patients is interfere in degradation, biosynthesis, and negative energy metabolism with metabolic deterioration.

Malnutrition triggers a weight loss, muscle mass reduction, and essential nutrient deficiencies, it increases the risk of tumor recurrence thus detrimentally impacting patients' quality of life and prognosis (12, 13). In addition, gut and pancreatic insufficiency represent

modifiable targets in the interdisciplinary approach to recovery of high quality of life (13). Mandatory therapeutic interventions in group of organ transplantation patients suffering SIBO is related to improved organ functioning, reduced incidence of infection complications and reduced incidence insufficient immunosuppressive profile/treatment related to graft rejection.

Micronutrient deficiencies are also prevalent after upper gastrointestinal resection surgery, as functional and anatomical modification because of surgical resection and reconstruction impact their absorption (12). Surprisingly, these deficiencies appear to be similarly prevalent in patients who have undergone surgery, with iron, vitamins A, B1, B12, D and E deficiencies commonly observed in up to 78,3% of patients (12, 13). Recognizing and treating the distinct consequences associated with each type of deficiency underscores the importance of implementing preventive measures, early detection, and prompt management (12, 13).

Aims. The aim of our study was to evaluate the exact incidence of SIBO after total and subtotal gastrectomy due to gastric carcinoma, after pancreatic carcinoma surgery, after bypass bariatric surgery and reconstruction due to inflammatory bowel disease. The objective of the study was first to compare symptoms, (neo)adjuvant chemo/radiotherapy, treatment and eating patterns in patients with and without SIBO and secondly to evaluate the importance of diagnosing SIBO and treatment to prevent SIBO – related short- and long-term complications.

Methods. In observatory randomized analytical cross – sectional study, 157 patients after longer partial gastrointestinal tract resections underwent a hydrogen (H 2) breathing test (BT) with glucose substrate (25 g/200 mL of water). Participants were instructed to ingest a low-fermentation diet 24 h before the exam and avoid smoking and physical activity on the day of the exam. Subjects fasted overnight (12 h) and during the H2 BT. At the start of the test, a basal sample of expired air was collected by means of an H2 BT device. If the first measure of H 2 was < 10 ppm, the participants ingested 25 g of glucose diluted in 200 mL of water. Every 20 min, in total 120 min 6 expired air samples were collected. An elevation of more than 12 ppm according to the basal value, within 120 min was deemed to be a positive result, indicating SIBO. Demographic, anthropometric data, symptoms, antibiotic treatment, (neo)adjuvant chemo/radiotherapy and eating patterns were analyzed with a questionnaire.

Results. Of the 157 patients included 56 had bypass bariatric surgery, 7 had subtotal gastrectomy, 30 had total gastrectomy, 9 had subtotal pancreatectomy, 29 had cephalic duodeno-pancreatectomy or total pancreatectomy and 26 had resection of the small bowel due to Chron's disease. Glucose H 2 BT was positive in total of 48/157 (31%) patients. A positive test was associated with flatulence and bloating ($p = 0,002$) and taking antibiotics as a child ($p = 0,011$). There was no statistically significant difference in demographic data, eating patterns and quality of life.

Conclusions. The incidence of SIBO in patients that underwent subtotal and total gastrectomy, pancreatic resection due to pancreatic carcinoma, bypass bariatric surgery procedure and surgical reconstruction due to inflammatory bowel disease is worryingly high, being 31% in total. SIBO occurs more frequently in patients with longer upper gastrointestinal tract resections related to cancer due to altered physiological defense mechanisms, cancer related cachexia and nutritional disorders. SIBO further exacerbates and impairs the mechanisms triggered by surgery and chemotherapy and radiotherapy, with consequent micronutrient deficiencies and clinical signs. The incidence of SIBO is currently underestimated, which could be connected to developing systemic complications, malabsorption, and its consequences. The results of our study confirm that there we need to systematically address diagnosis and treatment of SIBO in patients undergoing longer upper gastrointestinal tract resections which already are in higher risk of post-surgical nutritional deficiency to significantly improve treatment outcomes and prevent the development of short and long-term complications.

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