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Multimodal prehabolitation and nutritional optimization in a malnourished gastric cancer patient undergoing total gastreectomy: A Case Report

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Abstract

Background: Patients with gastric cancer often develop severe malnutrition and impaired oral intake, which are associated with increased postoperative complications and reduced tolerance to oncologic treatments. Enhanced Recovery After Surgery (ERAS) pathways emphasize early multimodal prehabilitation and targeted nutritional optimization to improve surgical outcomes.

Case presentation:A 54-year-old male with subcardial gastric adenocarcinoma and absolute dysphagia was referred to a multimodal prehabilitation program prior to neoadjuvant chemotherapy. Multidisciplinary management included nutritional, physiotherapeutic, and psychological interventions. Due to complete dysphagia, exclusive home enteral nutrition via jejunostomy was initiated and individualized to meet caloric and protein requirements, with progressive adjustment based on serial assessments. As chemotherapy proceeded, oral intake gradually resumed, supported by oral nutritional supplements, while enteral support was tapered. Preoperatively, immunonutrient-enriched supplements and preoperative carbohydrate loading were implemented according to ERAS recommendations. The patient underwent total gastrectomy with Roux-en-Y reconstruction and experienced an uncomplicated postoperative course. Early postoperative feeding was introduced on postoperative day 3 with a stepwise progression from clear liquids to fortified soft diet, supported by high-calorie, high-protein oral supplements and frequent dietetic counseling. Despite transient nutrition-impact symptoms, the patient achieved near-complete nutritional intake at discharge and continued outpatient multimodal follow-up.

Conclusion: This case illustrates that early, individualized nutritional intervention integrated within a multidisciplinary prehabilitation and ERAS framework can effectively mitigate malnutrition and support recovery in patients undergoing major gastric surgery.

Introduction

Malnutrition is a frequent and clinically significant problem in patients with gastric cancer and it is associated with increased postoperative complications, longer hospital stays, and higher healthcare costs. Reduced oral intake, tumor-related obstruction, and systemic inflammation contribute to progressive nutritional decline, making early screening and intervention a priority for surgical pathways [2,3].

Enhanced Recovery After Surgery (ERAS) programs have been widely implemented to improve perioperative outcomes and reduce resource utilization. Key components include early mobilization, pain control, and early nutrition, but implementation varies across institutions and evidence on optimal feeding strategies after major upper gastrointestinal surgery remains heterogeneous [1,4].

Prehabilitation, as part of a multimodal ERAS approach, aims to enhance patients' physical and nutritional status before surgery, potentially improving functional recovery and reducing postoperative morbidity. However, the short interval between diagnosis and surgery in oncologic care, and the presence of obstructive symptoms, often limit the feasibility of nutritional optimization and require rapid, individualized interventions [1,7].

This case describes the organization and clinical impact of a multidisciplinary prehabilitation pathway for a patient with gastric cancer and absolute dysphagia. The report highlights how individualized enteral nutrition, integrated with physiotherapy and psychological support, supported treatment tolerance and facilitated early postoperative recovery within an ERAS framework. The case underscores the importance of structured nutritional management to improve outcomes and streamline perioperative care in major gastric surgery.

Case report

This report describes the case of a 54-year-old male who, due to epigastric pain, dyspepsia, and weight loss, underwent esophagogastroduodenoscopy (EGDS) in June 2024, revealing a subcardial gastric carcinoma located approximately 4 cm distal to the

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cardia (Siewert type III). Histological examination showed moderately differentiated tubular adenocarcinoma.

Positron emission tomography–computed tomography (PET-CT) demonstrated gastric and locoregional lymph node involvement only, making the patient eligible for neoadjuvant FLOT chemotherapy for four cycles. An otolaryngology evaluation for swallowing assessment revealed absolute dysphagia secondary to a stenosing tumor. Consequently, a Witzel jejunostomy was placed in July, and enteral nutrition (EN) was initiated according to a regimen defined by the treating physicians.

Following multidisciplinary evaluation, during the week preceding the start of neoadjuvant chemotherapy, the patient was referred to the outpatient clinics of the General and Upper Gastrointestinal Surgery Unit at the University Hospital of Verona for enrollment in a prehabilitation program. Three outpatient pathways were initiated: nutritional, psychological, and physiotherapeutic. The patient, alert, autonomous, and cooperative, was assessed in the nutrition clinic. Past medical history was unremarkable; he reported previous alcohol consumption and active smoking (10 cigarettes/day).

Anthropometric measurements showed a body weight of 60 kg and height of 1.74 m, corresponding to a BMI of 18.8 kg/m², with a reported weight loss of approximately 21% over the previous three months. Nutritional Risk Screening (NRS-2002) yielded a score of 4, indicating high nutritional risk. Relevant laboratory parameters included hemoglobin, C-reactive protein (CRP), and albumin (Table 1), collected prior to outpatient follow-up visits.

After assessment of nutritional status and calculation of caloric and protein requirements, the initial EN regimen was found to be inadequate to meet nutritional needs. Home enteral nutrition (HEN) was therefore individualized to promote gradual weight recovery by introducing a hypercaloric (1.5 kcal/mL), high-protein, fiber-enriched formula due to untreated constipation. Water intake via the feeding tube was increased, and the patient was educated on tube flushing and feeding pump management. The infusion rate of the formula remained unchanged (Figure 1). Additionally, whey protein supplementation via the feeding tube was prescribed within 30–60 minutes after physiotherapy sessions.

After the first chemotherapy cycle, the patient gradually regained the ability to consume liquids and foods with progressively increasing texture. Oral intake was resumed with liquid foods and oral nutritional supplements. The HEN program was initially maintained until significant oral intake was achieved. At the end of chemotherapy cycles, EN support was gradually reduced, and oral intake was maintained as complementary nutrition, with initial weight gain observed (Table 1).

Restaging examinations showed partial response, with computed tomography confirming persistent gastric disease. The case was discussed at a multidisciplinary meeting, and based on the partial response to chemotherapy, radical surgery was indicated.

During dietary reassessment in the weeks preceding surgery, immunonutrient-enriched ONS were prescribed at a dose of two per day during the week prior to hospitalization. The patient continued physiotherapy and psychological support.

Four months after diagnosis, the patient was admitted for total gastrectomy. On the evening before surgery and up to two hours preoperatively, carbohydrate loading was administered using a liquid ONS containing maltodextrins only. The patient underwent total gastrectomy with Roux-en-Y esophagojejunostomy and D2 lymphadenectomy. Digestive continuity was restored with a mechanical end-to-side esophagojejunostomy and a side-to-side jejunojejunostomy. The jejunostomy was removed.

The postoperative course was uneventful. On postoperative day (POD) 1, physiotherapy rehabilitation was initiated. On POD 3, bowel function resumed, and a dietetic consultation was requested to establish postoperative refeeding and provide nutritional counseling. Early refeeding, based on patient tolerance, initially consisted of fractionated clear liquid diet supported by hypercaloric, high-protein liquid ONS. If tolerated, this progressed to a fractionated, fortified pureed diet with continued ONS support. Patients are generally discharged on a fractionated soft diet with ONS supplementation if nutritional requirements cannot be met through oral intake alone.

During early refeeding, the patient experienced nutrition-impact symptoms, including early satiety, poor appetite, bowel disturbances, and nausea, resulting in reduced intake. The dietitian performed regular assessments and tailored dietary recommendations during hospitalization.

At discharge, the patient's weight was approximately 2 kg lower than at admission. He was able to meet nearly all nutritional requirements with a fractionated soft diet. Nutritional education was provided to the patient and his wife, along with written dietary instructions. Weight trends and the nutritional pathway are reported in the table. After discharge, the patient continued outpatient follow-up with a multimodal approach, including ongoing nutritional support.

Discussion

This case highlights the pivotal role of early, individualized nutritional management within a multimodal prehabilitation framework for patients undergoing major upper gastrointestinal surgery. Severe malnutrition and absolute dysphagia represent well-known risk factors for poor surgical outcomes, including increased postoperative complications, prolonged hospital stay, and higher mortality rates. In patients with gastric cancer, malnutrition is often multifactorial, resulting from reduced oral intake,

tumor-related obstruction, systemic inflammation, and the metabolic effects of cancer cachexia [5].

Current international guidelines emphasize the need for early nutritional screening and intervention in oncologic patients, particularly when major surgery is planned [3,4]. In the present case, the high NRS-2002 score and significant preoperative weight loss justified immediate nutritional intervention. Exclusive enteral nutrition via jejunostomy represented the most appropriate strategy to ensure adequate caloric and protein intake in the context of absolute dysphagia, in line with ESPEN recommendations favoring enteral over parenteral nutrition whenever the gastrointestinal tract is functional [4,6].

Preoperative nutritional optimization is a cornerstone of prehabilitation programs and has been shown to improve functional capacity, reduce postoperative complications, and enhance tolerance to oncologic treatments [7]. In this patient, personalization of home enteral nutrition, including the use of hypercaloric and high-protein formulas enriched with fiber, allowed partial recovery of nutritional status despite ongoing neoadjuvant chemotherapy. Adequate protein provision, combined with physical exercise, is particularly important to counteract muscle loss and sarcopenia, which are frequently observed in gastric cancer patients and are independently associated with worse outcomes [8].

The gradual transition from exclusive enteral nutrition to combined oral intake and supplementation during chemotherapy further underscores the importance of dynamic nutritional monitoring and flexibility in nutritional planning. Oral nutritional supplements play a key role in maintaining adequate intake during periods of reduced appetite or early satiety and have been shown to improve nutritional status and quality of life in patients with gastrointestinal malignancies [9].

In the perioperative setting, adherence to ERAS principles, including preoperative carbohydrate loading and early postoperative refeeding, contributed to an uncomplicated postoperative course. Carbohydrate loading up to two hours before surgery has been demonstrated to reduce insulin resistance, attenuate the surgical stress response, and improve patient comfort without increasing the risk of aspiration [1,10]. Early oral feeding after gastrectomy, when clinically feasible, is associated with faster recovery of bowel function, reduced length of hospital stay, and no increase in anastomotic complications [11].

Despite early refeeding, nutrition-impact symptoms such as early satiety, nausea, and bowel disturbances were observed, as commonly reported after total gastrectomy. These symptoms often limit oral intake and require close dietetic follow-up and patient education to prevent further nutritional deterioration [12]. In this context, the structured involvement of a dietitian throughout hospitalization and after discharge was essential to tailor dietary recommendations, optimize symptom management, and support long-term nutritional adaptation.

Overall, this case reinforces the concept that nutritional care should be considered an integral component of oncologic and surgical treatment rather than a supportive measure alone. A multimodal, multidisciplinary approach that integrates nutritional therapy, physical rehabilitation, and psychological support appears crucial to optimize perioperative outcomes in patients with gastric cancer undergoing major surgery.

Conclusion

This case demonstrates that structured, multidisciplinary prehabilitation—integrating individualized enteral nutrition, physical rehabilitation, and psychological support—can be effectively implemented within an ERAS pathway for patients with gastric cancer and severe dysphagia. Early nutritional optimization through home enteral feeding and postoperative use of oral nutritional supplements **can promote** recovery, minimized perioperative risk, and facilitated progression to surgery. The experience underscores the value of proactive nutritional management as a core component of perioperative care, with potential benefits for clinical outcomes, patient functional status, and healthcare resource utilization in major upper gastrointestinal surgery.

No additional data were created over and above those reported.

The author declares no conflicts of interest.

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Table 1. *Changes in nutritional parameters and intake over time*

	120 days before surgery (T0)	45 days before surgery (T1)	30 days before surgery (T2)	7 days after surgery (T3)
Weight (kg)	60	64	66	63
BMI (kg/m^2)	18,8	21	22	21
Energy intake via enteral nutrition (kcal)	1500	1500	1250	-
Protein intake via enteral nutrition (g)	60	80	50	-
Energy intake orally (kcal)	-	330	900	1630
Protein intake orally (g)	-	11	36	70
Total energy intake (kcal)	1500	2330	2150	1630
Total protein intake (g)	60	91	86	70
NRS - 2002	4	1	1	3
Hemoglobin (g/dL)	11,7	14,2	14,6	12.9
CRP (mg/L)	135	96	51	87
Serum albumin (mg/dL)	30,2	34,4	34,9	33,1

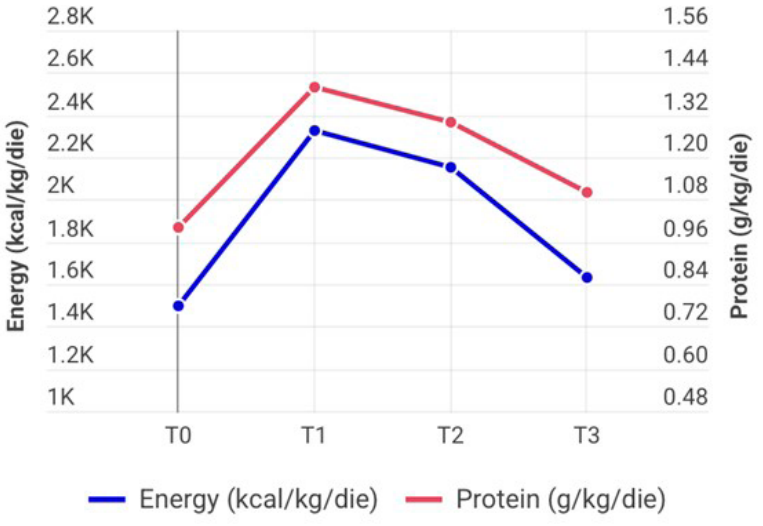


Figure 1. *Trend of caloric and protein intake across prehabilitation and the immediate postoperative period (T1–T4)*

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