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Assessment of enteral nutrition through feeding stomas or gastric tubes in digestive surgery

Casimir F.P. Rahantasoa Finaritra, Aurélia Rakotondrainibe, Fanjandrainy Rasoaherinomenjanahary, Andriambelo Tovohery Rajaonera, Luc Hervé Samison

Faculté de Médecine d'Antananarivo - BP 375, Antananarivo

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Abstract

Ostomy feeding remains a reference approach for enteral nutritional assistance. In Madagascar, the techniques are still conventional surgical procedures due to the lack of adequate endoscopic equipment. This study aims to evaluate the benefits and risks of enteral nutrition with a two-week follow-up. Included patients who had benefited from enteral nutrition by tube feeding using nasogastric, gastrostomy, and jejunostomy tubes over six months in Joseph Ravoahangy Andrianavalona Hospital. Prevalence, age and gender, current body mass index (BMI), weight, nutritional grade, initial pathology, psychological status, comorbidities, type of feeding stoma, and the surgical technique (gastrostomy or jejunostomy) were studied. After 15 days, the effectiveness of enteral nutrition was assessed using BMI, serum albumin, C-Reactive Protein (CRP) level, as well as postoperative complications and quality of life. The patient's outcome on the 15th day has been determined. The Chi-square test analyzed the associations and Mann Whitney test compared the effects of enteral nutrition by ostomy and gastric tube use. Forty-two patients were included, aged 47(17-78). The sex ratio was 0.5. Initially, the body mass index was 17(12-23) kg/m^2, the serum albumin value 3.4 (2.5-4.7) gr/dl with a median CRP level of 16 (2-74.2) mg/l. Nutritional assistance resulted in a weight variation between baseline and 15th day. Comparing enteral nutrition by ostomy and gastric tube, only variation of C Reactive Protein on the 15th day has a significative difference. Mortality was 33% (gastrostomy), 31% (jejunostomy), 24% (nasogastric tube). Nutritional support and the choice of ostomy or gastric tube for enteral nutrition were not associated with mortality. The effectiveness of nutritional assistance is still questionable in this study if the results are more promising in the literature. The death rate linked to the initial pathology and the general state of the patients is still considerable, hence the interest in decision-making in multidisciplinary consultation meetings.

Keywords: Body mass index, madagascar, enteral nutrition, nutritional assessment, ostomy

Introduction

Undernutrition reflects a mismatch between the body's protein and energy requirements, with tissue losses having deleterious consequences for the body [1,2]. Since its description in 1980 by Gauderer and Ponsky, the creation of an ostomy for enteral nutrition has been one of the alternatives for prolonged medium and long-term enteral nutrition [2]. European reviews still mention the difficulty of its indication, as the impact of the intervention on the improvement of the general state of the patients must be assessed by evaluating the benefits in terms of nutrition and the risks of the operation with a quality of life that can sometimes be poor [3]. A feeding stoma can be for palliative purposes or as a perioperative preparation for esophageal surgery.

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Corresponding Author: Aurélia Rakotondrainibe, Faculté de Médecine d'Antananarivo - BP 375, Antananarivo,
Email: aaurelia.rakotondrainibe@gmail.com

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Indeed, the "Société française d'Anesthésie et de Réanimation" (SfAR) and the "Société Francophone de Nutrition Clinique et Métabolisme" recommend perioperative nutritional management in order to reduce the operative risks linked to undernutrition [4]. In Madagascar, techniques are still conventional with a surgical approach due to inadequate endoscopic equipment. Hence the question: "What is the impact of nutritional rehabilitation by stoma in the Joseph Ravoahangy Andrianavalona University Hospital, Antananarivo - Madagascar?" The main aim of the present study was to evaluate the benefits and the risks of enteral feeding in digestive pathologies. The specific objectives were to describe the main indications for enteral feeding, evaluate the evolution of the nutritional status of the patients and assess the quality of life of the patients.

Materials and Method

It was conducted a prospective case series, monocentric over a period of six months at the Joseph Ravoahangy Andrianavalona University Hospital (CHU-JRA). The study was approved by the University Hospital J.R. Andrianavalona and the Department of Surgery and the Department of Anesthesia and Resuscitation of the Faculty of Medicine of Antananarivo. This study included patients aged at least 18 years, all genders included, operated for a feeding gastrostomy or jejunostomy following upper aerodigestive cancers or non-oncological stenosing esophageal lesion. Also included were patients who had received enteral nutrition via a nasogastric tube. Patients who had received oral nutrition with a "homemade" diet were not included in the study. The classification of age, gender, and ASA (American Society of Anesthesiologists) was collected. In order to assess the nutritional efficacy of the feeding stomas, the team systematically took weight and height to calculate the body mass index (BMI) at the time of the study, the usual weight. Also, the initial pathology, risk factors of undernutrition such as psychological status, comorbidities (obesity, chronic inflammatory disease, autoimmune disease, long-term corticosteroid treatment, immune status, oncological pathology, treatment), and the morbidity of the surgery to determine the nutritional grade. Preoperative nutritional preparation (adapted according to the results of the preoperative check-ups [hemoglobin, blood ionogram, serum albumin, C-Reactive Protein or CRP level]) was assessed. In addition, the emergency or a scheduled characteristic of the surgery and the type of feeding stoma were assessed. In Madagascar, due to the limited technical resources, the feeding stomas were made by a surgical approach according to the Fontant or Witzel method. After a fortnight, the same parameters (weight gain, BMI, serum albumin, CRP level for adjusting serum albumin value) were reassessed. Postoperative complications were classified according to the Clavien-Dindo score. This score classifies surgery-related complications from I to V. The apparition of gastroesophageal reflux, inhalation pneumonitis, postoperative infection, and peri-stomal lesions also allowed the quality of the stoma and were assessed. Patients' quality of life according to their stomas was also assessed by the EuroQol-5D, evaluating the level of depression and self-esteem (good, middle, bad); patients also rated their satisfaction on a scale of 0 to 10. Continuous variables are expressed as median with extremes and categorical variables as frequency. The Chi-square or exact Fisher tests were used for analyzing association between parameters. Mann Whitney comparison test was used to note the similarity or dissimilarity between enteral nutrition by ostomy or gastric tube after 15 days. Participants were not remunerated; the anonymity of the patients was respected.

Results

At the end of the study, 42 patients were included, aged 47 (17-78) years, and half (52%) of them were older than 50 years. There was no gender predominance, and the sex ratio was 0.5. The ASA score was more significant than or equal to 2 in 78% of cases (Table 1). The weight of the patients was 47 (34-67) kg with a BMI at the time of the study of 17 (12-23) kg/m². Weight loss greater than 10% of the initial weight was noted in 18 patients (42%). The serum albumin value was 3.4 (2.5-4.7) gr/dl with a median CRP level of 16 (2-74.2) mg/l (Table 2).

Table 1. Profile of study population

		n	%
Gender	Female	21	50
	Male	21	50
Age (years)	< 20	5	12
	[20-30]	9	21
	[30-40]	6	14
	[40-50]	4	10
	[50-60]	8	19
	[60-70]	9	21
	≥70	1	2
IPS[1]	IPS <2	16	38
	IPS ≥2	26	62
AFC[2]	1	23	55
	2	18	43
	3	1	2
ASA[3]	1	11	26
	2	22	52
	3	9	21
	4 à 6	0	0
Oncological diseases		30	71

[1]: Indice de Performans Status; [2]: Association Française de Chirurgie; [3]: American Society of Anesthesiologists

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Table 2. Nutritional status of the study population before enteral nutrition

		n	%
Intake weight variation	Weight loss	24	57
	Weight gain	15	36
	No weight variation	3	7
Serum albumin (g/L)	≥35	13	31
	[30-35]	12	29
	<30	17	40
CRP level (mg/L)	<6	26	62
	≥6	16	38
Nutritional grade	2	17	40
	3	22	52
	1 et 4	3	7

Twenty-five (59%) patients had a feeding jejunostomy versus three (7%) feeding gastrostomies; fourteen (33%) patients were malnourished with a gastric tube (Table 3). Fifteen feeding stomas procedures (35%) were performed under local anesthesia.

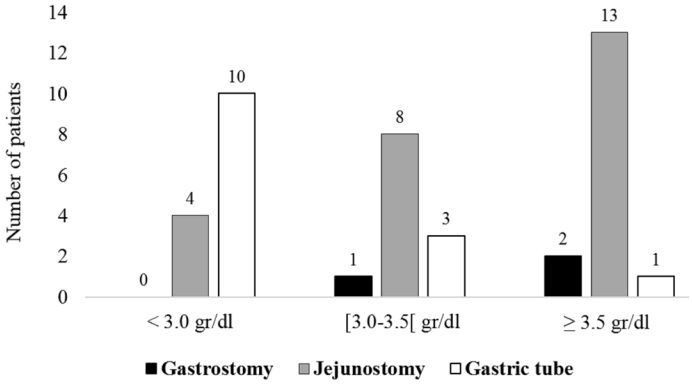

Figure 1. Serum albumin at D15

The targeted caloric intake was between 2500 and 3000 Kcal/d with hyper protein diets, fractionated (Fortimel®, Fresubin®, Supportan®, Diben®). After a 15-day follow-up, the weight gain was 2 (1-5) kg.

The indications of the route of enteral nutrition were given after multidisciplinary concertation in 74% of cases (n=31).

Table 3. Comparison of effects of enteral nutrition at the 15th day (D15)

		n (%)	Ostomy		Gastric tube	P
			Gastrostomy	Jejunostomy		
EuroQol-5D (D15)	Good		0 (0%)	6 (14%)	0 (0%)	0.543
	Middle		2 (5%)	10 (24%)	12 (29%)	
	Bad		1 (2%)	8 (19%)	3 (7%)	
Clavien Dindo Score (D15)	I		1 (2%)	19 (45%)	13 (31%)	0.471
	II		1 (2%)	1 (2%)	2 (5%)	
	III		1 (2%)	1 (2%)	0 (0%)	
	IV		0 (0%)	3 (7%)	0 (0%)	
Weight variation (D15)	Weight gain		1 (2%)	13 (31%)	1 (2%)	0.300
	Weight loss		2 (5%)	12 (29%)	10 (24%)	
	No weight variation		0 (0%)	0 (0%)	3 (7%)	
Serum albumin variation (D15)	Increased serum albumin		1 (2%)	14 (33%)	10 (24%)	0,294
	Decrease serum albumin		2 (5%)	11 (26%)	4 (9%)	
CRP variation (D15)	Increased CRP level		2 (5%)	10 (24%)	4 (9%)	0.021
	Decreased CRP level		1 (2%)	15 (36%)	10 (24%)	
Outcome at D15	Patient survival		2 (5%)	18 (43%)	10 (24%)	0.351
	Death		1 (2%)	7 (17%)	4 (9%)	

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More than half (55%) of the interventions were performed in an emergency. The introduction of enteral nutritional assistance (via stoma or gastric tube) was not associated to the variation between the initial serum albumin level and the serum albumin level at D15 (p=0.115) and did not cause a change between initial and D15 CRP levels (p=0.561). At D15, serum albumin at D15 was 3.7 (2.2-5.0)gr/dl (figure 1) and CRP levels were 15 (1-68.2) mg/l. Median weight was 46 (35-69) kg BMI was 17 (10-24) kg/m² at D15. An augmentation of weight (+6 (1-15) kg) and serum albumin (+0.2 (0.1-1.5) gr/dl) were observed after nutritional support; a decrease of -3.5 (1-9) kg and -0.2 [0.1-1.1] gr/dl (serum albumin) were also noticed (Table III). Accelerated rehabilitation was recommended in 76% (n=32). This technique promotes early oral refeeding and early lifting after digestive surgery. However, complications were found; the main complications included: local infection (n=5), failure to refeed (n=2), poor tube fixation leading to tube removal (n=2), evisceration (n=1), pneumopathy (n=3). Whatever the type of nutritional support, there was no significant association with variations of weight, serum albumin or CRP levels, or with the occurrence of complications at D15, or patient outcome (p>0.05). The choice of ostomy type or gastric tube was significantly associated with variations of CRP at D15 (p=0.042) but not with the weight variations (p=0.086) nor serum albumin variations (p=0.091). The presence of an ostomy did not impaire patients' quality of life (p=0.091). Eleven (26%) patients died after 15 days, with 33% for those who had gastrostomy, 31% with jejunostomy and 24% when patients had nasogastric tube. The parenteral and/or enteral nutrition support and more specifically, the choice of enteral nutritional support by ostomy or gastric tube was not associated with the occurrence of death (p=0.487).

Discussion

Indication

In the present study, the indication for a feeding stoma (n=28) predominated over enteral feeding via the gastric tube (n=14). Ostomies are to be preferred for a predictable feeding period of more than four weeks, in particular, for home feeding, in case of esophageal or gastric obstruction, a swallowing disorder (neurological, ENT disease), or in case of severe undernutrition requiring an energy intake not covered by oral feeding [6]. A meta-analysis of data published in the literature in 2005 reviewed the issue [7]. Patients who did not receive a nasogastric tube tended to have fewer infectious pulmonary complications. Enteral nutrition is less expensive, more physiological, easier to administer at home, maintains intestinal trophic, and has less risk of infectious morbidity. Enteral feeding can be done orally with nutritional supplements through a gastric tube (nasogastric, pharyngostomy, oesophagostomy, gastrostomy), duodenal (nasoduodenal, extended gastrotomy), jejunal (nasojejunal or jejunostomy). Nutrition via a feeding stoma tube is less invasive and causes less discomfort than the nasogastric tube [7]. In the present study, the use of ostomy or gastric tube was not associated with quality of life and in comparison with gastric tube, the difference of quality of life was similar with ostomy.

Perioperative preparation [8]

The patients had a BMI of 17 (12-23) kg/m². If the patient is undernourished with a BMI less than or equal to 18, the operative risk is high, leading to a possible report of the surgical indication. Indeed, severe malnutrition with a serum albumin level below 25g/dL is a poor prognostic factor [8]. Following a consensus conference in December 1994, the French National Authority for Health (HAS, "Haute Autorité de Santé") recommends an initial refeeding by gastric tube for a minimum of seven days if there is important stenosis in the upper digestive tract [12]. For patients at high risk of anesthesia, local anesthesia was performed in the present study under the supervision of an anesthetist.

Feeding protocol [12]

In the results presented, the diet was fractionated and high in protein. For an adult male, the recommended energy intake is, on average, 2.400 to 2.600 calories per day, depending on activity. For an adult woman, it is 1,800 to 2.200 calories. In 95% of cases, the polymeric solution with fibers (semi-elemental solution: more expensive, not more efficient, decreasing gastric emptying, increasing the risk of diarrhea, without increasing digestive tolerance and nitrogen balance). Hypercaloric solutions can reduce volumes and/or flow rates, but the risk of diarrhea is introduced too quickly. Feeding can be intermittent or by bolus over a short period, continuous at a regular rate for several hours, or possibly cyclical with continuous feeding. In principle, start with 500 ml over 24 hours, i.e., 21 ml/hour, and then, depending on tolerance, increase by 500 ml every 24 hours to reach the target in 3-4 days, i.e., an increase in the rate of 21 ml each day. In the presence of diarrhea and/or intestinal bloating, start with 250 ml/24^{h} and increase by 250 ml each day, i.e., 11 ml/hour [12]. Diarrhea should not be considered a failure either but should be investigated as a cause of diarrhea or as a result of poor adherence to the administration rules.

Efficiency of stoma feeding

Enteral nutrition, initially developed in France by Etienne Levy in the early 1970s, has become a primary refeeding technique [3]. More physiological than parenteral nutrition, it represents the gold standard in the administration of nutritional assistance today [3].

Van Dyck et al. [8] had shown that enteral nutrition reduced iatrogenic infectious morbidity in patients and stimulated their immune system and systemic inflammatory response. Paradoxically, a multicentre trial in Scandinavia on 453 patients conducted by Senesse P et al. [13] did not show a significant difference between enteral and parenteral nutrition. Nevertheless, about enteral nutrition, nutrition by ostomy was associated with more inflammatory phenomenon, also, comparing to gastric tube,

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there was more elevation of CRP when ostomy was indicated. Feeding stomas had the highest mortality, with one-third of patients affected. The main evaluation criteria in the present study were based on: weight, BMI, Nutritional Grade, albumin, and CRP. In the literature, the Mini Nutrition Assessment (MNA) score is also recommended to assess the state of undernutrition [12]. The MNA score is based on the occurrence of anorexia in less than three months, recent weight loss in three months, motor skills, psychological stress, neuropsychological problems, and Body Mass Index [12].

Feeding stoma monitoring

Infectious complications, such as ostomy site infection (n=5) and pneumonia (n=3), followed by mechanical complications such as poor fixation of the ostomy feeding tube (n=2), were the main complications found. Possible complications are also screened when assessing the effectiveness of the digestive stoma refeeding. Complications related to the ostomy tube are nil for surgical gastrostomies, 12.1% for radiological gastrostomies, and 16% for Percutaneous Endoscopic Gastrostomies (PEG) [8,9]. The latter are mainly represented by: peristomal leakage due to delayed healing, local infection, gastric hypersecretion, a tube that is too "loose," or excessive torsion in the stoma pathway [9]. The following have also been observed: buried bumper syndrome, poor tube fixation, stoma irritation, reflux leading to pneumopathy, and failure to refeed [11]. In a meta-analysis of 5,752 patients with a feeding stoma comparing surgical, radiological, and endoscopic approaches, procedural mortality was 2.5% vs. 0.3% vs. 0.5% for PEGs, and 30-day mortality was 29% vs. 13.3% vs. 15.4% respectively [9]. According to regression analysis: independent predictors of these early morbidities were: advanced age, pressure sores, hypoalbuminemia, severe undernutrition, progressive disease, pulmonary infection, presence of comorbidities, institutionalization, and length of hospitalization before gastrostomy [11-13]. Early and late bronchopneumonia are common and are the main causes of mortality [12]. The severity depends on the cough reflex - pharyngeal reflex - ciliary transport - virulence of bacteria, their concentrations, and the host (defenses). Tubes of the ostomies promote bronchopneumonia by increasing gastroesophageal reflux, esophageal motor disturbances, alteration of the lower and upper esophageal sphincter, and an increase in the contents that may reflux [11]. Some complications were found in this study, especially aspiration pneumonitis and some lesions around ostomy.

Suggested actions according to current recommendations

The present study's monitoring criteria were based on weight, BMI, albumin, and CRP. According to the recommendations, nutritional efficacy is assessed based on compliance with the prescription, clinical monitoring (with weight measurement twice a week, body composition every 15 days), biological monitoring (albumin every 15 days, pre albuminemia with CRP, osmolality twice a week to detect possible micronutrient deficiencies) [13]. Serum albumin reflects protein metabolism. On the other hand, albumin measurement allows us to distinguish between an isolated intake deficiency where it is normal and malnutrition due to hypercatabolism, where the albumin level will fall rapidly. Hypoalbuminemia is determined when the level is ≤35 g/l [13]. CRP is an inflammatory protein. Its half-life is 12 hours. An elevated CRP (>20 mg/l) reflects an inflammatory state and, therefore, a risk of hypercatabolism and, therefore, a high risk of undernutrition, particularly in the elderly [13]. Other parameters can also reflect the evolution of the nutritional status of patients. Transthyretin reflects short-term protein synthesis (half-life =48 hours). It is, therefore, a very good marker for monitoring nutrition. Low transthyretinemia level is defined as a level ≤110 mg/l. The orosomucoid, whose pathological threshold is 1.2 g/l, the serum lymphocyte level, when it is less than 1000/mm³, although not very sensitive, indicates profound undernutrition. In addition to these main assays, more specific micronutrient assays (vitamins and/or trace elements) can be added according to the clinical context [9]. In the current Malagasy context, some of these tests are not yet available, so it would be essential to introduce them into practice to improve management.

The Nutritional Risk Index is another index for assessing nutritional status [12]. In the present study, no index was investigated other than the nutritional grade, which was easier and faster to assess. The NRI is calculated as follows: NRI = (1.489 x Albumin (g/l)) 41.7 x (Current weight / Usual weight). When the index is above 100, the nutritional status can be considered satisfactory. Mild undernutrition is defined as between 97.5 and 100, moderate undernutrition between 83.5 and 97.5, and severe undernutrition when it is less than 83.5 [1,2]. Calculating this score would allow a more refined consideration of the patient's nutritional status to assess their nutritional status.

This study was limited by cognitive biases, as patients and their relatives may have difficulty following the diet protocol, which may affect therapeutic efficacy.

Conclusion

The indication for a feeding stoma was far superior to that of feeding via a nasogastric tube in this study, with a significant impact on complications but no significant difference in efficacy. This effectiveness of feeding assistance is still debatable in the present context if the results are more promising in the literature. This could be related to the comorbidity of the patients due to the initial oncological pathology. The nutritional evaluation criteria were clinical-biological and repeated. The rate of death associated with the initial pathology and the patients' general state remains considerable in our study, hence the interest in decision-making in a multidisciplinary consultation meeting. In developed countries, these stomas can be installed radiologically, endoscopically using the "Pull" or "Introducer" method, or laparoscopically. These approaches are less invasive and more

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beneficial for a patient who is already fragile from the start, hence the interest in developing these techniques locally.

Conflict of interests
The authors declare that there is no conflict of interest in the study.

Financial Disclosure
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Ethical approval
This study was approved by the hierachy of the unity and the CHU JRA.

Patient informed consent :
This study is an original article where we have studied the patients' files. The patient give their consent for the intervention. Document which is in the patient hospital file.

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