
Nutrition for Surgical Patients

Essay

Submitted for partial fulfillment of Master Degree in
General Surgery

By

Usama Saber Ahmed

M.B.B.Ch.

Under the supervision of

Prof Dr. Khaled Zaky Mansour

Professor of General Surgery

Faculty of Medicine

Ain Shams University

Prof Dr. Amr Ahmed Abdelaal

Assistant professor of General Surgery

Faculty of Medicine

Ain Shams University

Dr. Hany Said Abdel Baset

Lecturer of General Surgery

Faculty of Medicine

Ain Shams University

Cairo 2009

Introduction

The link between poor nutritional status and post-operative complications was first identified in the 1930s. Nutrition plays a key role in perioperative care. Appropriate intervention in the pre-operative phase can positively affect post-operative outcome with a reduction in complications and length of stay ([White, 2006](#)).

Malnutrition predisposes to several severe complications, including a tendency to infection, difficulty of scar formation, respiratory failure, cardiac failure, and decrease in hepatic protein synthesis, reduction of glomerular filtration and of gastric acid production. Malnutrition also contributes to increase morbidity in hospitalized patients. These complications lead to a delay in the duration of hospital stay, arise in costs and in mortality, especially in surgical patients. The nutritional risk is used to classify patients as low or high risk and so, the nutritional assessment of hospitalized patients is converted from a diagnostic tool into a prognostic tool. There are several prognostic indexes of varied complexity combining anthropometric measurements with laboratory tests ([Acuña et al., 2003](#)).

Surgical trauma increases immune system suppression and deepens malnutrition. The immune disorders and malnutrition are worse in the early postoperative period which considerably affects the process of wound healing, intestinal barrier function and the number of post-operative complications. ([Slotwinski et al., 2007](#))

One of the earliest responses to infection is cytokine mediated anorexia which is released by host defense mechanisms. These cytokines reduce nutrient intake through effects on the central nervous system.

They also cause the sequestration of critical nutrients such as iron, copper and zinc in order to allow the host to gain an advantage over invading organisms. It is a benefit to bypass the action of the body's host defense mechanisms by feeding patients who do not or cannot ingest their normal diet ([Donabedian, 2006](#)).

Nutritional support of surgical patients can be carried out with different modalities, depending on the underlying disease and on the patient's general condition. Parenteral and/or enteral nutritional treatment contributes to eliminating or decreasing nutritional deficiencies and helps recovery of a normal protein, carbohydrate and fat as well as hydroelectrolytic balance respectively prior to the surgical treatment, ([Karcz et al., 2006](#)).

Lack of intestinal stimulation is associated with intestinal mucosal atrophy, diminished villous height, bacterial overgrowth, reduced lymphoid tissue size, reduced Ig A production, and impaired gut immunity. The full clinical implications of these changes are not well realized, although bacterial translocation has been demonstrated in animal models. The most efficacious method to prevent these changes is to provide nutrients enterally ([Perez et al., 2006](#)).

Standard enteral preparations have been modified by the addition of immunonutrients, such as arginine, glutamine, omega-3 fatty acids, nucleotides and others. These substrates have been shown to up-regulate host immune responses, to control inflammatory responses and to improve nitrogen balance and protein synthesis after injury. A study reported that in patients with cancer of the gastro-intestinal tract the nutritional supplementation given only preoperatively was as effective as the combined pre- and postoperative (perioperative) approach, and it

could reduce gastrointestinal side effects. This is probably due to the effect of the immune-enhancing diet on the immune and inflammatory responses ([Dominioni et al., 2003](#)).

Aim of the work

The aim of this study is to review and highlights the impacts of the nutritional status in surgical patients.

Contents

- Introduction.
 - Aim of the work.
 - Review of literature.
 - Nutritional assessment.
 - Classifications of malnutrition in surgical patients.
 - Wound healing.
 - Nutritional intervention in surgical patients.
 - Parenteral feeding.
 - Enteral feeding.
 - Immunonutrition.
 - Nutrition for Patients with Abnormal Organ Function.
 - The rationale of early enteral nutrition.
 - Summery.
 - Conclusion.
 - References.
 - Arabic summery.
-

References

Acuña K, Portela M, Costa-Matos A, Bora L, M. Rosa Teles M (2003): Nutritional assessment of adult patients admitted to a hospital of the Amazon region. *Nutr. Hosp*; 18: 138-146.

Dominioni L, Rovera F, Pericelli A, Imperatori A (2003): The rationale of early enteral nutrition. *Acta Bio Medica* 2003; 74: 41-44.

Donabedian H (2006): Nutritional therapy and infectious diseases: a two-edged sword. *Nutr J*; 5: 21.

Karcz W, Gluszek S, Kot M, Matykiewicz J (2006): Influence of nutritional treatment on the postoperative course in patients with gastric cancer. *Advances in Medical Sciences*; 51: 278-282.

Perez M, Lim E, Calvano S, and Lowry S (2006): Systemic Response to Injury and Metabolic Support In: Brunicki C (ed.) *Schwartz's manual of surgery* 8th edition. New York: McGraw-Hill, 3-31

Slotwinski R, Olszewski W, Slotkowski M, Gustaw Lech G (2007): Can the Interleukin-1 Receptor Antagonist (IL-1ra) Be a Marker of Anti-Inflammatory Response to Enteral Immunonutrition in Malnourished Patients after Pancreaticoduodenectomy. *J Pancreas*; 8:759-769.

White R (2006): Peri-operative nutrition — the role of the pharmacist. *Hospital Pharmacist*; 13: 361- 3 6 4.

المخلص العربي

لقد عرفت العلاقة بين سوء التغذية ومضاعفات ما بعد إجراء العمليات الجراحية لأول مره في الثلاثينات من القرن الماضي. إن التغذية تلعب دوراً رئيسياً في عناية ما بعد إجراء العمليات الجراحية و يؤثر التدخل المناسب في مرحلة ما قبل الجراحة علي نتيجة ما بعد الجراحة تأثيراً ايجابياً كما يقلل من المضاعفات و يقلل من مدة الإقامة بالمستشفى.

يؤدي سوء التغذية الي الكثير من المضاعفات منها قابلية المريض للإصابة بالعدوي وصعوبة تكوين الندبات الجراحية والفشل التنفسي وهبوط عضلة القلب ونقص بروتينات الكبد وتقليل الترشيح الكلوي و نقص الحمض المعوي. كما يؤدي سوء التغذية الي زيادة الوفيات بين مرضي المستشفيات وطول مدة الإقامة بالمستشفى و زيادة تكلفة العمليات الجراحية.

يستخدم مصطلح الخطر الغذائي لتصنيف المرضى إلي منخفض و عالي الخطورة ويتم ذلك بطرق مختلفة منها مقاييس الانثربولوجي و الاختبارات المعملية بذلك يتحول التقييم الغذائي للمرضي من أداة تشخيصية إلي أداة تنبؤية.

تقلل الصدمة الجراحية من قدرة الجهاز المناعي للجسم و تزيد من سوء التغذية. وفي الفترة المبكرة ما بعد إجراء العمليات الجراحية تؤثر كلاً من الاضطرابات المناعية و سوء التغذية علي التئام الجروح وكذلك علي وظيفة المناع المعوي بالإضافة الي الكثير من المضاعفات الأخرى.

فقدان الشهية من أول الأعراض التي تظهر علي المريض عند الإصابة بالعدوي وذلك لإفراز السيتوكينات التي تقلل الشهية بتأثيرها علي الجهاز العصبي المركزي.

النقص الحاد لبعض المواد الغذائية الهامة مثل الحديد و النحاس و الخارصين يساعد علي الإصابة بالعدوي و اختراق الميكروبات للجسم.

إن الإهتمام بتغذية المريض قبل إجراء العمليات الجراحية يزيد من قدرة الجهاز المناعي والهدف من ذلك الوصول الي المستوي الطبيعي للبروتينات و الكربوهيدرات و الدهون وكذلك الأملاح الموجودة بالجسم ولا يتم ذلك إلا بمعرفة طبيعة المرض والحالة العامة للمريض.

هناك بعض التغييرات التي تحدث عند الصيام منها خمول الأمعاء وضمور البطانة المعوية و قصر الأهداب المعوية و تكاثر البكتيريا و ضمور النسيج الليمفاوي و نقص الأجسام المناعية - أ مما يقلل من قدرة الأمعاء علي المقاومة و يسمح بإنتقال البكتيريا من داخل التجويف المعوي إلي الدورة الدموية و يمكن منع كل ما سبق بالتغذية عن طريق الفم.

و عند إضاف بعض المغذيات المناعية الي المستحضرات الغذائية مثل الجلوتامين والارجنين و الأحماض الدهنية و الاوميغا - 3 و النيكليوتيدات و بعض المواد الأخرى حسنت المناعة و انخفضت معدلات التهاب موضع الجراحة وارتفع مستوي النيتروجين و البروتين عند قياسيهما بعد إجراء العمليات الجراحية.

هناك دراسة أظهرت ، إن أعطاء المكملات الغذائية لمرضى سرطان الأمعاء قبل إجراء العمليات الجراحية كَانََ فعَالًا كإعطائهم هذه المكملات الغذائية قبل و بعد إجراء العمليات الجراحية. مما قلل من الأعراض الجانبية المعوية والإلتهابات وكان ذلك بسبب تأثير الوجبات المحفزة للمناعة على مناعة الجسم.

التغذية لمرضى الجراحة

رسالة مقدمة توطئة للحصول على درجة الماجستير

في الجراحة العامة

مقدم من

الطبيب/ أسامة صابر احمد

بكالوريوس الطب و الجراحة

تحت إشراف

الأستاذ الدكتور/ خالد زكى منصور

أستاذ الجراحة العامة

كلية الطب - جامعة عين شمس

الدكتور/ عمرو احمد عبد العال

أستاذ مساعد الجراحة العامة

كلية الطب - جامعة عين شمس

الدكتور/ هاني سعيد عبد الباسط

مدرس الجراحة العامة

كلية الطب - جامعة عين شمس

كلية الطب

جامعة عين شمس

القاهرة 2009

Contents	Page
Introduction	1
Aim of the work	4
Review of Literature	
Nutritional assessment	5
Classifications of malnutrition in surgical patients	22
Wound healing	34
Nutritional intervention in surgical patients	
Parenteral feeding	48
Enteral feeding	82
Immunonutrition	104
Nutrition for Patients with Abnormal Organ Function	111
The rationale of early enteral nutrition	121
Summary	126
Conclusion	130
References	131
Arabic Summary	---

List of abbreviation

AuSPEN = Australian Society for Parenteral and Enteral Nutrition

ATI = Abdominal Trauma Index

ATP = adenosine triphosphate

BCM = Body cell mass

BIA = Bioimpedance analysis

BIS = bioimpedance spectroscopy

BMI = Body mass index

CVC = central venous catheter

DHA = docosahexaenoic acid

DPEJ = Direct percutaneous endoscopic jejunostomy

DRI = dietary reference intakes

DXA = Dual-energy x-ray absorpiometry

ECW = Extracellular water

EPA = eicosapentanoic acid

EN = Early nut

FFM = Fat free mass

GI = gastrointestinal

HPN = home parenteral nutrition

ICW = Intracellular water

ICUs = intensive care unit

IED = immune-enhancing diets

IL-1 = interleukin-1

IMN = immunonutrition

INR = international normalized ratio

ISS = injury severity score

PEG = percutaneous endoscopic gastrostomy

PEGJ = Percutaneous Gastrojejunostomy

PEM = protein energy malnutrition

PN = parenteral nutrition

PNAC = parenteral nutrition–associated cholestasis

PRG = Percutaneous radiological gastrostomy

RQ = respiratory quotient

SCFAs = short-chain fatty acids

SGA = Subjective global assessment

SIRS = systemic inflammatory response syndrome

TBK = total body potassium

TBN = total body nitrogen

TBW = Total body water

TEN = Total enteral nutrition

TNF = tumor necrosis factor

TPN = total parenteral nutrition

UUN = urinary urea nitrogen

List of figures

		Page
Figure 1	Overnutrition and undernutrition lead to inflammatory activity	23
Figure 2	Vicious circle of the development and progression of disease-related malnutrition	26
Figure 3	Nutrient Impacts on the Phases of Wound Healing	37
Figure 4	A PICC enters the basilic vein at left antecubital fossa below the elbow	53
Figure 5	Radiograph after PEG. No leakage of the contact media from the gastrostomy tube is found	87
Figure 6	Percutaneous Endoscopic Gastrostomy	88
Figure 7	Endoscopic PEG method	90

List of tables

		Page
Table 1	Daily calorie and nitrogen requirements	44
Table 2	Indications for Peripheral Parenteral Nutrition	51
Table 3	Peripheral lines	52
Table 4	peripheral and central venous lines	57
Table 5	Some available solutions for i.v. feeding	76
Table 6	Daily Vitamin Requirement	84
Table 7	Daily Mineral Requirement	85
Table 8	Complications of enteral nutrition	99
Table 9	The effect of immunonutritional regimens on immune function in clinical trials	105
Table 10	Modulatory effects of key nutrients	106
Table 11	Nutrition in short bowel syndrome	116

Introduction

The link between poor nutritional status and post-operative complications was first identified in the 1930s. Nutrition plays a key role in perioperative care. Appropriate intervention in the pre-operative phase can positively affect post-operative outcome with a reduction in complications and length of stay ([White, 2006](#)).

Malnutrition predisposes to several severe complications, including a tendency to infection, difficulty of scar formation, respiratory failure, cardiac failure, and decrease in hepatic protein synthesis, reduction of glomerular filtration and of gastric acid production. Malnutrition also contributes to increase morbidity in hospitalized patients. These complications lead to a delay in the duration of hospital stay, arise in costs and in mortality, especially in surgical patients. The nutritional risk is used to classify patients as low or high risk and so, the nutritional assessment of hospitalized patients is converted from a diagnostic tool into a prognostic tool. There are several prognostic indexes of varied complexity combining anthropometric measurements with laboratory tests ([Acuña et al; 2003](#)).

Surgical trauma increases immune system suppression and deepens malnutrition. The immune disorders and malnutrition are worse in the early postoperative period which considerably affects the process of wound healing, intestinal barrier function and the number of post-operative complications. ([Slotwinski et al;2007](#))

One of the earliest responses to infection is cytokine mediated anorexia which is released by host defense mechanisms. These cytokines reduce nutrient intake through effects on the central nervous system.