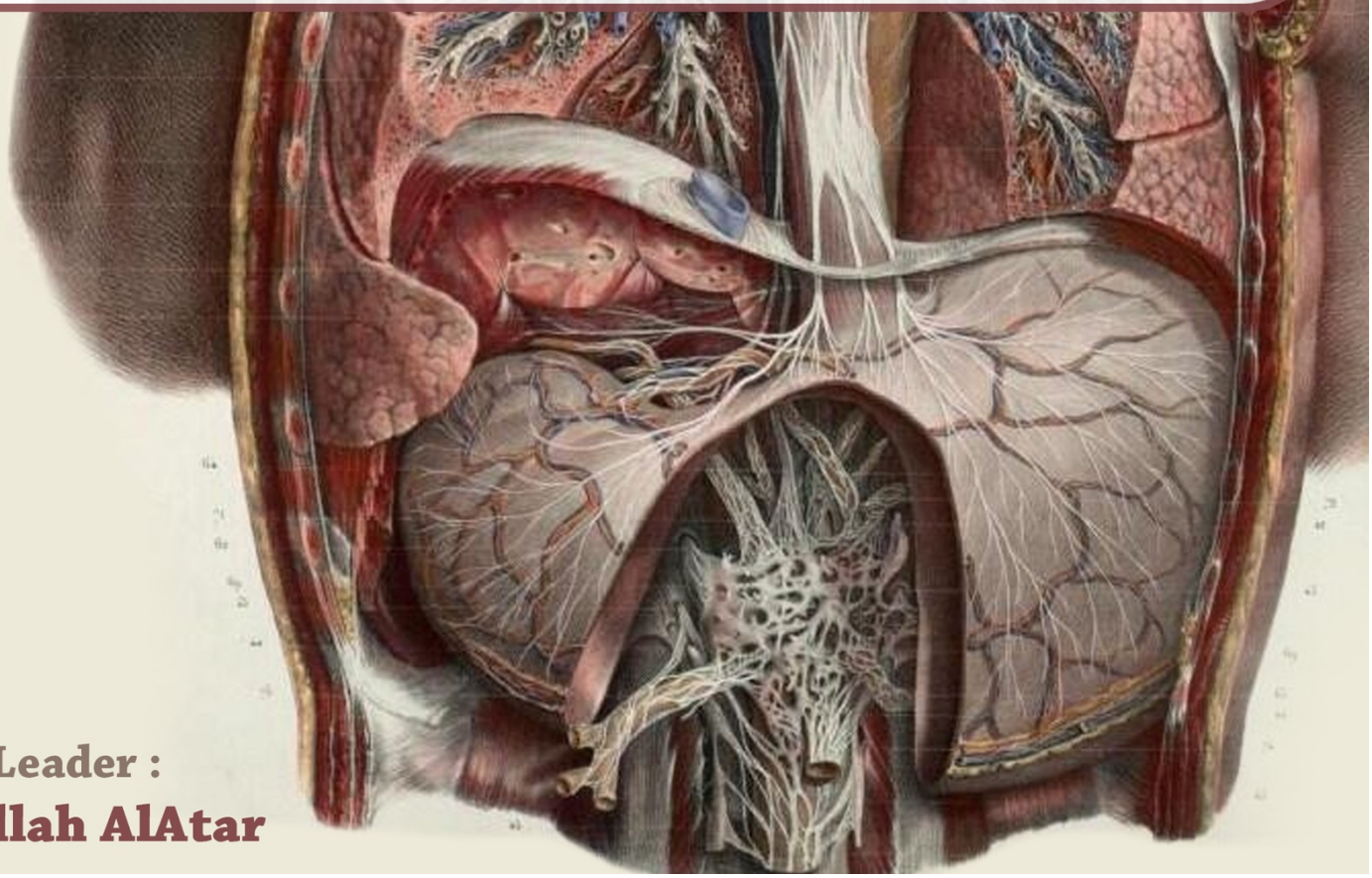
# 433 SURGERY TEAM

## SURGICAL NUTRITION


**Done By:**

1- Abdulrahman Albasseet 2- Ziyad Alajlan

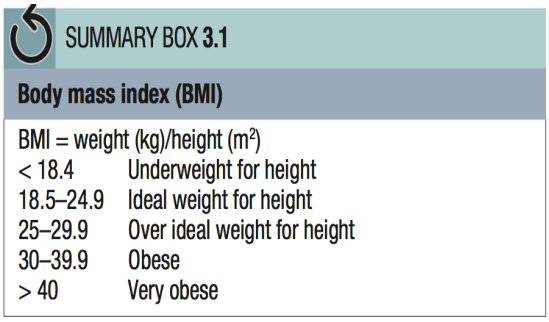




Team Leader :

**Abdullah AlAtar**

# ❖ Nutritional assessment

- Clinical assessment
  - ➢ Weight loss
  - ➢ 10% =mild malnutrition
  - ➢ 30% = severe malnutrition
  - ➢ Body mass index



SUMMARY BOX **3.1**

**Body mass index (BMI)**

BMI = weight (kg)/height ($m^2$)

| | |
|---|---|
| < 18.4 | Underweight for height |
| 18.5–24.9 | Ideal weight for height |
| 25–29.9 | Over ideal weight for height |
| 30–39.9 | Obese |
| > 40 | Very obese |

- Anthropometric assessment
  - ➢ Triceps skin fold thickness
  - ➢ Mid arm circumference
  - ➢ Hand grip strength

- Blood indices
  - ➢ Reduced serum albumin, prealbumin or transferrin
  - ➢ Lymphocyte count

No index of nutritional assessment shown to be superior to clinical assessment

# ❖ CASES:

**Case1**: 55yo male with Crohn's disease—failure on Remicade and needs an ileocolic resection

**Case2**: 55yo male, otherwise healthy has a right hip fracture, needing a repair

**Case3:** 55yo male, otherwise healthy, just diagnosed with sigmoid cancer on routine screening. For sigmoid resection

**Case4:** 55yo male, healthy, involved in an industrial accident. Has 40% BSA burns and is vented in the ICU in shock

- This is not so much a talk on nutrition as it is on malnutrition
- We are trying to minimize or prevent malnutrition (and its complications) in our patients

## ❖ The Basics

The principal components of a normal diet are energy (carbohydrate and lipid), nitrogen, trace elements, minerals and vitamins

- A healthy adult requires 20-25kcal per kilo per day (20-30% from fat), 1gm/kg of protein per day
- Metabolic stress associated with sepsis, trauma, surgery, ventilation, increases energy requirements to 35-40kcal/kg/d
- The notion that malnutrition affects surgical outcomes was first reported in 1936 in a study that showed that malnourished patients undergoing ulcer surgery had a 33% mortality rate compared to 3.5% in well nourished individuals (Studley, HO, JAMA 1936; 106:458)
- The stress of surgery or trauma increases protein and energy requirements by creating a hypermetabolic and catabolic state
- A redistribution of macronutrients (fat, protein, glycogen) from the labile reserves of adipose tissue and skeletal muscle to more metabolically active tissues such as liver, bone, and visceral organs occurs and this leads to protein-calorie malnutrition
- This leads to impaired complement activation and production, bacterial opsonization, impaired function of neutrophils, macrophages and lymphocytes

### • These factors result in:

- Increased susceptibility to infection
- Poor wound healing (including anastomotic breakdown/leakage, poor graft adherence etc)
- Increased frequency of decubitus ulcers
- Bacterial overgrowth in the bowel
- Abnormal nutrient losses in the stool

**Therefore, in our surgical patients, malnutrition results in:**

- Disturbed cellular and organ function resulting in impaired cardiac and respiratory muscle function, atrophy of smooth muscle in the GI tract, impaired immune function
- This leads to loss of fat, muscle, skin and ultimately bone and viscera with consequent weight loss and increases in ECF

- Nutritional requirements decrease as an individual's BMI decreases, probably reflecting more efficient utilization of ingested food and a reduction in the work capacity at the cellular level….

**However**, this combination of decreased tissue mass and reduction in work capacity impedes homeostatic responses to stressors such as critical illness or surgery

- This dysregulatory mechanism worsens as the malnourishment worsens

## Case1:

**55yo male with Crohn's disease has failed Remicade and needs an ileocolic resection.**

What are the surgical nutritional issues?

### • Pre-op Nutritional Assessment:

- Pre-op nutritional assessment is a key element of the surgical history in non-emergent surgery; however, there is no one single, simple and reliable technique for assessing nutritional status
- **On history**, ask about chronic medical or comorbid conditions (DM, IBD, CV disease, EtOH abuse etc), recent hospitalizations or current hospitalization, past surgery (esp GI surgery) that may contribute to malnourishment
- Vitamin or mineral use
- Wt loss or gain, N+V+D, diet history

### • Physical Exam:

- **Head and Neck**: hair loss, bitemporal wasting, conjunctival pallor, xerosis, glossitis, bleeding/sore gums, angular cheliosis, stomatitis, poor dentition, thyromegaly
- **Extremities**: edema, muscle wasting, loss of sq fat
- **Neurologic:** evidence of peripheral neuropathy, reflexes, tetany, decreased mental status
- **Skin:** ecchymosis, petechie, pallor, pressure ulcers, wound problems/infection

- **Anthropometric measurements:**
  - **BMI**: body mass index (weight(kg)/height(m) squared)
  - BMI<18.5 implies nutritional impairment and a BMI<15 is associated with significant mortality
  - **Unplanned weight loss** of >10% over a six month period is a good prognostic indicator of a poor clinical outcome
  - **Others**: triceps skinfold thickness and mid-arm muscle circumference.

- **Labs:**
  - **Protein status—affected by previous intake, muscle mass, duration of current illness, blood loss, wound healing, infection, GI absorption**
    - **Serum albumin**—half life 18-20d; low levels are markers of a negative catabolic state and a predictor of poor outcome; levels are depressed in surgery, hepatic and renal disease, critically ill
      - Mild (28-35), moderate (21-27), severe (<21)
      - **Serum transferrin**: half-life 8-9d; reflects protein status over last 2-4wks; also reflects iron status (therefore low value reflects decreased protein status only in the setting of normal iron)
      - Normal 200-400mg/dL; mild (150-200), moderate (100-150), severe (<100)
      - **Serum prealbumin (transthyretin):** short half-life; influenced by renal/hepatic disease
      - Normal 17-42mg/dL; moderate (11-17), severe (<10)
      - **Other tests**: retinol-binding protein, BUN/creatinine, Fe/vitamin levels (if indicated), Ca, Mg, PO4, Mg, TSH

## ❖ Malnourishment:

- **Weight loss (%):**
  Mild (80-90), moderate (70-80), severe (<70)

- **Recent weight change:**
  >5% over 1 month or >10% over 6 months signifies mod-severe malnutrition

**For Case1:**

- What does he need and how?
- Would you do anything pre-op and why?

- If he's malnourished there is some evidence to support pre-op nutritional supplementation decreases post-op complications
- Once you've decided to supplement the patient, estimate the patient's energy requirement using the REE (calculated by the Harris-Benedict equation). Similarly, calculate protein and fluid requirements, and add trace elements, minerals and vitamins
- 2 routes of delivery: enteral and parenteral
- You can also just use oral supplements (Boost, ensure etc)

## Case2:

**55 year old healthy male has fractured hip and needs surgery**

When can you safely feed him?

- Even though the stress of the surgery results in a net catabolic state, the body is able to adapt for 5-7d
- Supplemental feeding can wait that long if the patient is not malnourished previously

## ❖ Routes of Feeding

- Enteral vs Parenteral
- **If you can use the gut, use it**
- Enteral is much more cost effective with fewer complications than parenteral—it is also thought to preserve gut barrier function

**Table 3.2 Causes of anorexia in surgical patients**

- Intestinal obstruction
- Ileus
- Cancer anorexia
- Depression, anxiety, pain
- Drugs, e.g. opiates
- Oral ulceration/infection
- General debility/weakness

- ## Enteral Feeding:

### ➢ Nasogastric:

- Short term, requires fully functional GI tract, can be inserted orally
- **Insertion method:** blindly at bedside; by radiology or endoscopically
- **Benefits:** easily inserted and replaced; can use bolus feeds
- **Complications:** sinusitis, aspiration, airway obstruction (postcricoid ulceration), nasal neucrosis, pneumothorax, displacement, occlusion

### ➢ Nasoenteric:

- Short term; used in patients with aspiration risk or poor gastric emptying; requires continuous infusion
- **Insertion methods:** blindly at bedside, in OR, endoscopically, radiologically
- **Benefits**: reduces aspiration risk; some tubes allow suction of stomach while simultaneously feeding small bowel
- **Complications**: sinusitis, aspiration, airway obstruction (postcricoid ulceration), nasal neucrosis, pneumothorax, displacement (esp into stomach), occlusion, pneumotosis, intestinal ischemia/infarction, blockage, unable to check residuals

### ➢ Gastrostomy:

. Long term tube; requires well emptying stomach; not a good choice for patients with significant reflux and aspiration. Used when the upper alimentary tract is obstructed, pseudobulbar palsy or esophageal fistula or stricture.

- **Insertion methods**: surgically, endoscopically, radiologically
- **Benefits**: allows bolus feeding, can be placed at bedside, low profile tubes may decrease dislodgement
- **Complications**: bleeding, retching, abdominal wall infection, perforation of other abdominal organs, migration of parts of the tube, aspiration, dislodgement, occlusion, bowel obstruction, pneoumoperitoneum, dislodgment/malposition

### ➢ Transgastric jejunostomy

- Long term; requires continuous infusion; use in patients with aspiration risk or poor gastric emptying
- **Insertion**: surgically, radiologically, endoscopically
- **Benefits**: reduces aspiration risk, allows suction of stomach while feeding small bowel; may be used immediately after placement; may be converted to g-tube
- **Complications**: same as gastrostomy

### ➢ Jejunostomy

- Short or long term; requires continuous infusion;use in patients with aspiration risk or poor gastric emptying; difficult to replace
- **Insertion**: surgically, endoscopically, radiologically
- **Benefits**: reduces aspiration risk, may be used immediately after insertion
- **Complications**: same as g-tube but also higher obstruction risk

## Indications for Enteral Nutrition

1. Malnourished patient (like cancer patient) expected to be unable to eat adequately for > 5-7 days
2. Adequately nourished patient expected to be unable to eat > 7-9 days
3. Adaptive phase of short bowel syndrome. If there is suspension of short bowel syndrome you start patient enteral feeding if he responds poorly move to TPN.
4. Following severe trauma or burns

## Contraindications to Enteral Nutrition Support (give TPN or PPN)

1. Malnourished patient expected to eat within 5-7 days
2. Severe acute pancreatitis (grade D or E on CT scan or CRP>150). If pt has tenderness on examination keep him NPO with either TPN or feed him using naso jejunal tube or nasogastric tube to reduce symptoms. If no tenderness feed him normally

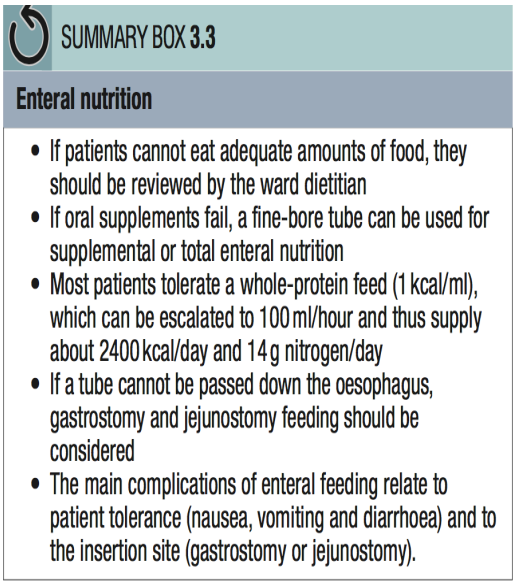
3. High output enteric fistula distal to feeding tube. Fistulas: <200 low output, 200-500 moderate output, >500 high output.
4. Inability to gain access
5. Intractable vomiting or diarrhea
6. Expected need less than 5-7 days if malnourished or 7-9 days if normally nourished

## Indications to consider small bowel access:

1. Gastroparesis like in diabetic pt / gastric ileus
2. Recent abdominal surgery
3. Sepsis
4. Significant gastroesophageal reflux
5. Pancreatitis
6. Aspiration
7. Ileus
8. Proximal enteric fistula or obstruction

### Complications of Enteral Nutrition Support

1. Nausea and vomiting
2. delayed gastric emptying
3. Malabsorption


SUMMARY BOX 3.3

**Enteral nutrition**

- If patients cannot eat adequate amounts of food, they should be reviewed by the ward dietitian
- If oral supplements fail, a fine-bore tube can be used for supplemental or total enteral nutrition
- Most patients tolerate a whole-protein feed (1 kcal/ml), which can be escalated to 100 ml/hour and thus supply about 2400 kcal/day and 14 g nitrogen/day
- If a tube cannot be passed down the oesophagus, gastrostomy and jejunostomy feeding should be considered
- The main complications of enteral feeding relate to patient tolerance (nausea, vomiting and diarrhoea) and to the insertion site (gastrostomy or jejunostomy).

## Case3:

**55yo male for elective sigmoid resection**

When do you feed post-op and how?

- NPO until co-ordinated bowel function?
- Cochrane reivew 2008
- Others: ambulation, gum chewing, fluids to DAT progression

## Case4:

**55yo male, severe burns (>40% BSA)—admitted to ICU; intubated and ventilated**

What is the best way to provide nutritional support?

**Canadian Clinical Guidelines for Nutritional Support in Mechanically Ventilated, Critically Ill Adult Patients**

- Heyland, DK et al
- Journal of Parenteral and Enteral Nutrition, 2003

- Strongly recommend enteral over parenteral nutrition
- Start nutrition early (within 24-48h) of admission to ICU (enteral)
- There is no benefit for arginine as a supplement in diets in the critically ill yet
- Fish oils, borage oils, and antioxidants may be of benefit in ARDS
- Glutamine supplementation should be used in trauma, bone marrow transplant and burn patients
- Consider prokinetics early with initiation of enteral feeds
- Small bowel feeding may be associated with a reduction in pneumonia in the critically ill being enterally fed
- Keep HOB at 45 degrees
- In patients requiring short term TPN or supplemental TPN, consider withholding lipids
- Keep blood sugar levels tightly controlled

## • Parenteral Nutrition:

Should be considered when enteral is not an option or is providing incomplete nutritional support (eg. Mechanical obstruction, acute GI bleeding, ileus, high output fistulas, severe intractable diarrhea, short bowel syndrome, severe hemodynamic instability

- **Routes**: Peripheral vs Central
- Consider withholding if BS excessively high, BUN >100, significant hemodynamic instability
- Consists of glucose, fat, proteins, vitamins and trace minerals/elements
- 2 in 1 or 3 in 1 solutions

## Indications for Parenteral Nutrition Support

1. Chief indication is intestinal failure.
2. Malnourished patient expected to be unable to eat > 5-7 days i.e. He can't use his GIT for long time *AND* enteral nutrition is contraindicated
3. Patient who is scheduled for surgery and his **nutritional status is low.**
4. Patient with **short bowel syndro**me and will go for life home TPN.
5. Patient with electrolyte imbalance. It can be corrected by TPN.
6. Patient failed enteral nutrition trial with appropriate tube placement (post-pyloric)
7. Enteral nutrition is contraindicated or severe GI dysfunction is present

## Parenteral Nutrition Monitoring:

- Monitoring is to detect deficiency states.

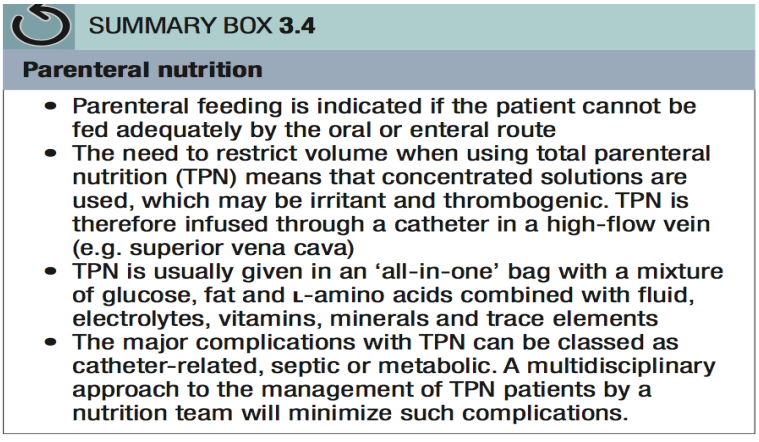
- Check daily electrolytes and adjust TPN/PPN electrolyte additives accordingly

−Check accu-check glucose q 6 hours (regular insulin may be added to TPN/PPN bag for glucose control as needed)

- Check triglyceride level within 24 hours of starting TPN/PPN

- Check pre-albumin weekly once a week

− Check LFT's weekly twice a week



SUMMARY BOX **3.4**

**Parenteral nutrition**

- Parenteral feeding is indicated if the patient cannot be fed adequately by the oral or enteral route
- The need to restrict volume when using total parenteral nutrition (TPN) means that concentrated solutions are used, which may be irritant and thrombogenic. TPN is therefore infused through a catheter in a high-flow vein (e.g. superior vena cava)
- TPN is usually given in an 'all-in-one' bag with a mixture of glucose, fat and L-amino acids combined with fluid, electrolytes, vitamins, minerals and trace elements
- The major complications with TPN can be classed as catheter-related, septic or metabolic. A multidisciplinary approach to the management of TPN patients by a nutrition team will minimize such complications.

## How to Order

- First calculate the total caloric need of the patient (25-35kcal/kg/day)
- Then determine protein needs (1-2gm/kg/day)—each gm of protein has 4.3kcal
- Generally 30% of calories should be via lipid (fat) and the rest by glucose (carbohydrates)

- **Remember:**
  - 1mL 20% lipid gives 2 kcal
  - 1g dextrose gives 3.4 kcal
  - 1g protein gives 4.3 kcal

- To each bag is added necessary vitamins, minerals, trace elements etc
- Bloodwork is done regularly looking at extended lytes, transaminases, cholesterol profile, coagulation parameters, CBC

- **Complications:**
  - Line related (mechanical or septic)
  - hyperglycemia (or hypoglycemia)
  - cholestasis, hepatic steatosis, biliary sludge
  - aluminum toxicity
  - possible increased rates of bacterial translocation
  - elevation of BUN (hyperosmolar dehydration)
  - hyperlipidemia
  - refeeding syndrome
  - electrolyte abnormalities
  - metabolic acidosis
  - EFA deficiency, $CO_2$ retention, hyperammonemia