Surgery is stressful for patients and the families alike

Surgery

Produces
- physiological,
- metabolic and
- psychological changes
Physiological and metabolic effects of surgery

- Increased level of stress hormones
- Decreased immunity
- Inflammation
- Increased catabolism
- Decreased anabolism

If these changes are not managed appropriately, they may lead to poor outcome in spite of a perfect technical operation.
Integrative approach for patients undergoing surgery
- Prepare patient and family for surgery
- Develop positive attitude
- Develop social support
- Manage depression
- Stop smoking
- Use CAM therapies to reduce stress and anxiety
- Stop herbal medications and supplements before operation

Nutrition
- Causes significant clinical malnutrition in normal volunteers (Benedict, 1915)
- Leads to increased morbidity and mortality (holocaust evidence in world war II)

Effects of malnutrition in surgical patients
- Patients undergoing surgery for peptic ulcer disease who had lost more than 20% of their body weight had substantial increase in their post operative mortality, when compared with patients who had lost less than 20%

In the ICU, it was discouraging to note that some patients who underwent successful surgery would die. On analysis it showed that they actually died of starvation. They could not eat and they did not have enough reserve tissue to draw on.
• Innovative and pioneering research on development of the central venous feeding technique known as intravenous hyperalimentation or Total Parenteral Nutrition (TPN)

Stanley Dudrick

Malnutrition

• Impairs immune system
• Impairs wound healing
• Increases risk for infection
• Decreases muscle strength
• Decreases mobility
• Effects other organs – kidney, heart, lungs, GI
• Increases need for prolonged intubation

This ..........

• Prolongs patient’s surgical recovery
• Increases length of hospital stay
• Increases rate of re-admissions
• Increases patient dissatisfaction
• Increases health care cost

• “Every surgeon intuitively knows that operating on a debilitated or malnourished patient can spell disaster and often become a rueful and costly experience “
  
  Meguid M, Laviano A
  Ann Thorac Surg 2001;71:766-8

• Does a patient’s preoperative nutrition status have impact on surgical outcome?
• What are the preoperative risk indicators?
• How to assess preoperative nutritional status, and
• How to manage nutrition support in peri-operative period
Management of patients undergoing major abdominal surgery

- Nothing by mouth
- Nast-gastric decompression
- Clear liquid diet
- Full liquid diet
- General diet in 5-6 days

Enhanced Recovery After Surgery (ERAS) program

- Extensive preoperative education
- Avoidance of naso-gastric decompression
- Multimodal management of post-operative nausea
- Avoidance of fluid overload
- Avoidance of excessive use of opiates
  - Early and appropriate nutrition
  - Early ambulation

Fasting until flatus

- Exposing GI tract to early nutrition may cause
- Nausea and vomiting
- Abdominal and bowel distention
- Risk of anastomotic dehiscence
- Risk of abdominal wound dehiscence
- Aspiration pneumonia

Effect of Enhanced Recovery of Patients After Surgery (ERAS) Protocol

- Proper nutritional assessment is important and necessary to evaluate patients who are at risk
- Proper peri-operative nutritional support can restore many of the bio-chemical and immunological abnormalities seen in malnutrition.

• Most patients undergoing elective surgery easily tolerate brief periods of starvation.
• About 30% of the patients in the hospital are under-nourished.
  – Many patients are malnourished at the time of admission.
  – In many of these patients, malnutrition may progress throughout the hospitalization.
Nutritional Assessment - Clinical

- History of poor appetite
- History of recent unintentional weight loss
- Body mass index (BMI) kg/m²
  - Normal: 18.5 - 25
  - Increased morbidity: <18.5
  - Obesity - increased complications: >30
- Triceps skin fold thickness:
  - <10mm in male and <13mm in female
- Handgrip dynometry

Nutrition Assessment: Biochemical Markers

- Creatinine Height Index
- Serum Proteins
  - Albumin
  - Transferrin
  - Prealbumin

Nutritional assessment

- Immunological Markers
  - Total lymphocyte count: <1550 cells/µL
  - Delayed percutaneous hypersensitivity
- Indirect calorimetry and body composition analysis

Routes to deliver nutritional support

- Enteral
- Parenteral
- Combination

Enteral nutrition

- Easy and safe to administer
- Maintains GIT integrity
- Positive effect on immunity of small bowel
- Prevents bacterial translocation to blood and lymphatic circulations
- Less costly than TPN
- Less infectious and metabolic complications than TPN
Contraindications

- Complete bowel obstruction
- Paralytic ileus
- Intractable vomiting
- Severe GI bleeding
- Acute abdomen due to any cause
  - Acute severe pancreatitis
  - Generalized peritonitis
- High output fistula
- Shock

Routes of enteral nutrition

- Short-term supplementation
  - Nasogastric tube
  - Nasoenteric tube
- Long-term supplement
  - Gastrostomy
  - Jejunostomy

Parenteral nutrition

- If enteral nutrition is not possible in the malnourished or at-risk patients
  - Primary therapy
  - Supplemental therapy

Complications of parenteral nutrition

- Cather related:
  - Mechanical - pneumothorax, arterial puncture, central vein thrombosis
  - Sepsis
  - Blockage of the catheter
- Metabolic:
  - Hyper or hypoglycemia, electrolyte and acid/base imbalance, hepatic dysfunction
- GI changes:
  - Atrophy of intestinal mucosa, bacterial and toxins translocation

Nutritional goals in surgical patients

- Calories:
  - 25-30 kcal/kg of actual or adjusted body weight
- Protein:
  - 1.5gm/kg, for ICU patients 2.0 to 2.5 gm/kg
- Macronutrient distribution:
  - Carbohydrates: 50-60% of total energy requirements
  - Protein: 20-25% of total energy requirement
  - Fat: 10-30% of total energy requirement
Complications of overfeeding

- Carbohydrate:
  - Hyperglycemia
  - Hypercarbia
  - Fatty liver
- Lipids:
  - Hypertriglyceridemia
  - Hypoxia
  - Infections
- Protein:
  - Azotemia

Guidelines for nutritional support

- Preoperatively, malnourished patient should be nutritionally supported if possible
- It should be immediately started in a malnourished patient
- It should be initiated in normally nourished patient when he/she has been without sufficient nutrient intake for 5-7 days
- It should be initiated immediately when illness is expected to prevent oral intake for 7-10 days

Average Disease and Nutrition Severity, Length of Stay, and Total Charges of Nutritional Intervention Subgroups

<table>
<thead>
<tr>
<th>Nutritional Intervention subgroup</th>
<th>Average maximum disease severity score</th>
<th>Average maximum nutrition severity score</th>
<th>Average LOS</th>
<th>Average total charges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not early and not sufficient</td>
<td>43.6</td>
<td>7.7</td>
<td>14.8</td>
<td>$38,578</td>
</tr>
<tr>
<td>Sufficient</td>
<td>43.8</td>
<td>8.0</td>
<td>14.0</td>
<td>$36,863</td>
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<tr>
<td>Early</td>
<td>31.0</td>
<td>7.7</td>
<td>13.3</td>
<td>$36,542</td>
</tr>
<tr>
<td>Early and sufficient</td>
<td>38.1</td>
<td>9.8</td>
<td>11.9</td>
<td>$34,602</td>
</tr>
</tbody>
</table>

Source: Journal of Surgical Research 95, 73-77 (2001)

Immuno-nutrition

- Intended for critically ill patients at risk for infections and for use in the post-operative period
- They contain increased protein, immuno-stimulatory amino acids and lipids

Immune enhancing nutrition

- Glutamine
- Arginine
- Omega 3 fatty acids
- Nucleotides

Pre-operative immuno-nutrition

- Decreased incidence of infectious complications and length of stay
- Reduces systemic inflammation
- Limits stimulation of immune response
- Avoids sepsis-related production
- Promotes increased mucosal barrier permeability
- Improves immune response

Source: Ann Surg Oncol 2007;14:2798-2806
Potential risks of CAM therapies

- Large number of US population (over 40%) uses CAM therapies, yet many are reluctant to disclose their use to the physicians, even if asked directly
- Many herbal medicines possess significant potent pharmacological activities.
- They may interact with a drug in a harmful way
- This lack of communication could be dangerous

<table>
<thead>
<tr>
<th>Product</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glutamine</td>
<td>Decreases intestinal permeability and immune function</td>
</tr>
<tr>
<td>Melatonin</td>
<td>Decreases sleep disturbance</td>
</tr>
<tr>
<td>Valerian</td>
<td>Decreases sleep disturbance</td>
</tr>
<tr>
<td>Ginkgo biloba</td>
<td>Improves memory and cognitive function</td>
</tr>
<tr>
<td>Ginseng</td>
<td>Increases energy and reduces fatigue</td>
</tr>
<tr>
<td>St. John’s Wort</td>
<td>Improves mood and reduces anxiety</td>
</tr>
<tr>
<td>St. John’s Wort</td>
<td>Increases bleeding risk</td>
</tr>
<tr>
<td>St. John’s Wort</td>
<td>Increases blood pressure</td>
</tr>
<tr>
<td>St. John’s Wort</td>
<td>Increases risk of bleeding</td>
</tr>
<tr>
<td>St. John’s Wort</td>
<td>Increases risk of falls</td>
</tr>
<tr>
<td>St. John’s Wort</td>
<td>Increases risk of hypoglycemia</td>
</tr>
</tbody>
</table>

Key aspects of peri-operative care

- Avoid long periods of pre-operative fasting
- Re-establish oral feeding as soon as possible
- Integrate nutrition into overall management of patient
- Pay careful attention to metabolic control, e.g., blood sugar
- Reduce factors which may exacerbate stress-related catabolism or impair G.I. function
- Early mobilization
### EXAMPLE OF STANDARD PARENTERAL NUTRITION REGIMEN

- Non-protein energy: 2200 kcal
- Nitrogen: 13.5g
- Volume: 2500ml
- Sodium: 115mmol
- Pottasium: 65mmol
- Calcium: 10mmol
- Magnesium: 9.5mmol
- Phosphate: 20mmol
- Zinc: 0.1mmol
- Chloride: 113.3mmol
- Acetate: 135mmol
- Adequate vitamins and trace elements

- Most patients undergoing elective surgery can withstand brief periods of starvation without affecting short or long term outcomes
- However, patients with cancer, major trauma, head injuries, sepsis and certain types of surgeries may need short or long term nutrition support.