Pre-Operative Nutrition and Carbohydrate Loading

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Overview

- Surgical stress
- Insulin resistance
- Pre-operative fasting
- Carbohydrate loading
- Enhanced recovery
- Immunonutrition
Background

- Surgical patients are at risk of nutritional depletion
  - Inadequate intake before and after surgery
  - Disease impact
  - Surgical stress

- Patients with preoperative under-nutrition have a higher risk of postoperative complications

- Better outcome if malnourished patients are feed for 7-10 days prior to surgery
Surgical Stress

• Release of stress hormones and inflammatory markers
  – Decrease the action of insulin
  – Mobilisation of energy substrates
  – Negative nitrogen balance

• Suppression of the immune system
Insulin Resistance

- Glucose uptake is reduced and breakdown increased

  HYPERGLYCAEMIA

- Magnitude of resistance
  - Size of operation
  - Amount of blood lost
  - Complications during surgery

- Independent factor of length of stay
Insulin Resistance

• Associated with
  – Reduced muscle function
  – Prolonged fatigue
  – greater inflammatory response
  – increased complications
  – poor wound healing
  – longer hospital stays
  – higher morbidity and mortality rates
Pre-Operative Fasting

- Traditional prolonged fasting
  - Associated with delayed recovery
- Safe ingestion of clear fluids up to 2 hours before surgery
- Guidelines:
  - Solid food up to 6 hours before
  - Clear fluids 2 hours before surgery
- Minimal nutritional value in clear fluids
Carbohydrate Loading

- insulin resistance
- Carbohydrate uptake, utilisation, storage
- Protein breakdown
- Catabolism
Carbohydrate Loading

• Promotes an anabolic state
• 50g CHO
  – Produces insulin release similar to that seen after a mixed meal
• Recommendations
  – 100g CHO the night before surgery
  – 50g CHO the day of surgery
• Specially designed products to provide this
Carbohydrate Loading

- 20% reduction in length of stay
- up to 50% reduction in insulin resistance
- 50% reduction in loss of lean body mass
- reduce patient discomfort
  - thirst
  - hunger
  - anxiety
  - fatigue
Randomized Controlled Trial

• Assess the effect of pre-op oral carbohydrate following elective colorectal resection:
  – Length of post-op stay
  – Return of gastrointestinal function
  – Grip strength

• 36 patients randomised to
  – Water
  – Carbohydrate
  – Fasting

Randomized Controlled Trial

• Length of stay
  – Water group = 13 days
  – Carbohydrate group = 7.5 days
  – Fasted group = 10 days

• Gastrointestinal Function (time till first flatus/bowel movement)
  – Water group = 3 days/5 days
  – Carbohydrate group = group 2 days/2 days
  – Fasted group = 3 days/3.5 days

• Reduction in Grip Strength
  – Water group = 8%
  – Carbohydrate group = 5%
  – Fasted group = 11%

Carbohydrate Loading with Protein

• Could there be further benefits with the inclusion of protein?
• 48 patients:
  – carbohydrate only (100g carbohydrate)
  – combined carbohydrate and protein drink (100g carbohydrate and 28g protein)
  – water

Henriksen et al, 2003
Carbohydrate Loading with Protein

- No difference in gastric emptying
- Greater reduction of glycogen synthase activity in the control group
- Muscle function
  - Both intervention groups had improved muscle function
  - No significant difference between individual groups but became significant when intervention groups were pooled together

Henriksen et al, 2003
Carbohydrate Loading and Diabetes

- Type 2 diabetics compared to non-diabetic control
  - Gastric emptying times were similar
  - Peak glucose concentrations were higher and occurred later in diabetic group
  - No difference between diet/oral medication controlled and insulin-controlled diabetes
  - No association between gastric emptying, glucose concentrations or HbA1c

Gustafsson et al, 2008
Incorporation into Enhanced Recovery Programs

- Multiple evidence-based interventions aimed at:
  - Minimise surgical stress
  - Speed recovery
  - Reduce hospital stays
  - Lessen health care cost
- Include nutritional interventions:
  - CHO loading
  - Avoid long fasting periods
Incorporation into Enhanced Recovery Programs

- Shorter hospital stays
- Faster return to normal functions
  - Mobility
  - Bowel function
  - Food
- Reduced morbidity / complications
Immunonutrition

• What it is?
  – Amino acids (glutamine & arginine)
  – Omega-3 fatty acids
  – Nucleotides (RNA)

• What can they do?
  – Boost immune system
  – Reduce inflammatory markers
  – Improve wound healing
Clinical Trials

- 150 patients undergoing gastrointestinal surgery for malignancy
  - 18% post operative complications compared to 42%
  - length of hospital stay was reduced by 3 days

- 60 patients undergoing elective surgery for gastric cancer
  - infectious complications reduced from 28% to 7%
  - duration of SIRS reduced from 1.34 days to 0.77 days

Braga et al, 2002
Okamoto et al 2009
Clinical Trials

• 56 patients with gastrointestinal tumours undergoing surgical intervention
  – no differences in inflammatory markers, post-operative complications or length of stay

  Gunerhan et al, 2009

• 100 patients undergoing elective surgery for benign or malignant gastrointestinal illness
  – no differences in infectious complications, mortality or length of stay

  Helminen et al, 2007
Guidelines

• Use EN preferably with immuno-modulating substrates (arginine, o-3 fatty acids and nucleotides) perioperatively independent of the nutritional risk for those patients:
  – undergoing major neck surgery for cancer (laryngectomy, pharyngectomy)
  – undergoing major abdominal cancer surgery (oesophagectomy, gastrectomy, and pancreatoduodenectomy)
  – after severe trauma

• Whenever possible start these formulae 5–7 days before surgery and continue postoperatively for 5 to 7 days after uncomplicated surgery.
Conclusion

• Preoperative nutritional support can help lessen surgically induced stress, speed recovery and improve outcomes

• Combined approach
  – 7-10 days nutritional support to severely malnourished
  – Avoid long fasting periods
  – Carbohydrate loading prior to surgery
  – Use of immunonutrition in some surgical groups
References


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