

# Pre-Operative Nutrition and Carbohydrate Loading

Caroline Kratzing

Specialist Dietitian

Addenbrooke's Hospital

Cambridge University Hospitals Foundation Trust

# 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 = 13days
  - Carbohydrate group = 7.5days
  - Fasted group = 10days
- Gastrointestinal Function (time till first flatus/bowel movement)
  - Water group = 3days/5days
  - Carbohydrate group = group 2days/2days
  - Fasted group = 3days/3.5days
- 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

# 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

# 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

## 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

# Clinical Trials

- 56 patients with gastrointestinal tumours undergoing surgical intervention
  - no differences in inflammatory markers, post-operative complications or length of stay
- 100 patients undergoing elective surgery for benign or malignant gastrointestinal illness
  - no differences in infectious complications, mortality or length of stay

Gunerhan et al, 2009

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 Grade A
- Whenever possible start these formulae 5–7 days before surgery and continue postoperatively for 5 to 7 days after uncomplicated surgery. Grade C

## Conclusion

- Preoperative nutritional support can help lessen surgically induced stress, speed recovery and improve outcomes
- Combined approach
  - 7-10days nutritional support to severely malnourished
  - Avoid long fasting periods
  - Carbohydrate loading prior to surgery
  - Use of immunonutrition in some surgical groups

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