The refeeding syndrome

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The refeeding syndrome was first reported among prisoners released from concentration camps following the Second World War.

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http://iconicphotos.wordpress.com/tag/wwii/
The refeeding syndrome

A potentially lethal complication of restoration of nutrients in patients who are severely malnourished from whatever cause.

Patients at particular risk of developing the refeeding syndrome
Patients at particular risk for the refeeding syndrome

- Severely malnourished patients (kwashiorkor or marasmus)
- Anorexia nervosa
- Postoperative and ICU patients
- Paediatric patients
- Chronic malnutrition (malabsorptive syndromes, carcinoma, elderly, renal insufficiency, pulmonary and cardiac disorders)
- Chronic alcoholism
- Uncontrolled diabetes mellitus
- Long term antacid or diuretic users
- Post-bariatric surgery for obesity
Severely malnourished patients
Anorexia nervosa
Postoperative and ICU patients
Chronic alcoholism
Long term antacid or diuretic users
Post-bariatric surgery for obesity
The reported incidence is underestimated, and thus clinicians must be educated how to recognize this syndrome.
Pathogenesis of RFS
STARVATION (↓ GLUCOSE)

- INSULIN ↓
- GLUCAGON ↑

LIVER
GLYCOGENOLYSIS

ADIPOSE TISSUE
GLUCONEOGENESIS
FATTY ACIDS & GLYCEROL

MUSCLE
GLUCONEOGENESIS
AMINO ACIDS

Ketone bodies and free fatty acids replace glucose as a major energy source
During starvation, **phosphate** and **kalium** are lost from cells in proportion to the breakdown of glycogen and protein.

(kalium - the main intracellular cation balancing the negative charge of proteins)
Cosequences of refeeding (glucose load)
REFEEDING - GLUCOSE LOAD

- ↑ UPTAKE OF: GLUCOSE, PHOSPHATE, POTASSIUM, MAGNESIUM AND WATER.
- ↑ UTILISATION OF THIAMINE.
- ↑ INSULIN SECRETION
- ↑ GLYCOGEN AND PROTEIN SYNTHESIS

REFEEDING SYNDROME
- HYPOPHOSPHATEMIA
- HYPOMAGNESEMMIA
- HYPOKALIEMIA
- SODIUM AND WATER RETENTION
- THIAMIN DEFICIENCY
• **Hypophosphatemia:**
  - Reintroduction to CHO
  - Insulin secretion increases
  - Glucose taken up rapidly into cells, taking phosphorus with it

• **Hypokalemia:**
  - Reintroduction to CHO
  - Insulin secretion increases
  - Cellular uptake of K

• **Hypomagnesemia**
  - Cellular uptake of magnesium after feeding
• Hyperglycemia
  – Reintroduction to CHO rapidly
  – Insulin resistance

• Vitamin Deficiency
  – Rapid depletion after onset of refeeding due to their role in biochemical functions

• Thiamin (vit. B1):
  – Already depleted stores → further decrease
  – Wernicke’s Encephalopathy
  – Lactic Acidosis
• Trace Element Deficiency
  – Results from increased enzymatic activity (DNA/RNA metabolism and oxidative/reductive processes)
• Zinc & selenium
Are phosphates important?
Do we really need them?
What about magnesium and kalium?
Contraction of muscles (ventilation, rehabilitation)
Lack of phosphates

- Reduction of ATP production (disregulation of pumps and enzymatic pathways) and creatine kinase (myocyte dysfunction, rhabdomyolysis)

- Decrease of 2,3-DPG production (shift of haemoglobin dissociation curve to the left, tissue hipoxia)
• The major clinical manifestations of refeeding syndrome are the results of reduced ATP in metabolic pathways and reduced 2,3 DPG in erythrocytes.
Refeeding syndrome can affect every system in the body.
Signs and symptoms of RFS

- Hypophosphatemia: hemolysis, anemia, inadequate oxygen delivery to tissues, multiple organ failure
- Hypomagnesemia: tremors, muscle twitching, cardiac arrhythmias and paralysis
- Hypokalemia: cardiac abnormalities
Signs and symptoms of RFS

- Thiamin deficiency: beri-beri, lactic acidosis, Wernicke’s Encephalopathy
- Disturbances of body-fluid distribution: oedema
- Hyperglycemia: hyperosmosis, coma
Intervention
Intervention

1) Gradually correct starvation
   – Start with less than calculated amount of calories

2) Advance calories and volume
   – Monitor cardiac and respiratory side effects

3) Correct vitamin and mineral deficiencies
   – Especially with symptoms
Intervention

4) Nutrition support in patients at risk should be increased slowly
   – Assuring adequate amounts of vitamins (2xRDA, Tiamine 300 mg/d) and minerals

5) Organ function, fluid balance and serum electrolytes
   – Monitor daily during 1st week, less frequently after
Intervention

6) Monitor for neurological, hematological and metabolic complications
Key messages:

• Identify patients at risk
• Start with adequate assessment and prepare care plan
• Before refeeding, electrolyte disorders should be corrected and the circulatory volume carefully restored.
Key messages:

• Careful monitoring of electrolytes on a daily basis
• Slow, gradual feeding
• If the refeeding syndrome occurs – stop nutrition and correct imbalances before next attempt to feeding
Dziękuję bardzo
Thank you
Dëkui
Paldies
Tänan väga
Çok teşekkürler
Paljon kitoksia