Case Report

A CASE OF ICU TREATMENT OF ANOREXIA WITH BMI<10. CAN WE AFFORD FASTER WEIGHT GAIN?

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Summary

Treating anorexic patient with BMI<10 is a difficult task. Recommendations for nutrition include prescription of daily calories according to the 'starting low and going slow' rule, and a goal for the initial weight gain <1kg /week to prevent a re-feeding syndrome. We present a patient with BMI=8.8 and severe re-feeding syndrome admitted in ICU, with more rapid initial weight gain in 14 days (5kg) under continuous monitoring of vital functions and parameters in ICU. Before transfer to ICU a re-feeding syndrome developed, with liver dysfunction with cytolysis, severe muscle weakness, encephalopathy and neuropathy, bradycardia and hypotension.
Treatment in ICU was 14 days with parenteral, enteral and oral nutrition, correction of electrolyte disturbances and vitamin deficiencies. Human serum albumin and fresh frozen plasma in moderate amounts in the first 10 days were applied. The weight gain for 2 weeks was 5 kg. The electrolytes were balanced, as well as liver tests and vital functions. No signs of edemas and fluid overload were present. The patient was able to sit, stand and walk and was transferred to a gastroenterology department for inpatient treatment. After 2 months a weight of 45 kg (BMI=15) was achieved. The approach to reach greater weight gain by providing protein as human serum albumin and fresh frozen plasma plus enteral nutrition, avoiding high carbohydrates has an important implication for the safety and efficiency of treatment in severely malnourished patients with anorexia nervosa.
Keywords: anorexia nervosa, refeeding syndrome, ICU, albumin

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Introduction

Anorexia nervosa (AN) is a severe and chronic disturbance in eating, most common in young women and adolescents. It is characterized by disturbances in eating behavior, excessive concern about body shape or weight, and deliberate weight loss. After 10-year disease about 5-15% of the AN patients die. This is mainly due to malnutrition, and particularly to the restricting type of the disease [1, 2]. AN is the most frequent cause of malnutrition in girls and young women. Body mass index (BMI) lower than 13 kg/m^2 is common in patients with a

long-term disease. It was suggested in the past that a BMI lower than 10-11 kg/m^2 was the limit of life in adults [3].

The diagnostic criteria for anorexia nervosa [4] are:

- Refusal to maintain weight at or above a minimally normal weight for age and height (e.g. more than 15 percent below ideal body weight)
- Intense fear of weight gain or becoming obese, even though underweight.
- Disturbance in the way in which one's body weight or shape is experienced, undue influence of body weight or shape on self-evaluation, or rejection of the seriousness of the current low body weight.
- In postmenarcheal females, amenorrhea, i.e. absence of at least three successive menstrual cycles.
- Types:
- Restricting Type: during a current episode of anorexia nervosa, the person has not been regularly engaged in binge-eating or purging behaviour (i.e. self-induced vomiting or the misuse of laxatives, diuretics, or enemas).
- Binge-Eating/Purging Type: during a current episode of anorexia nervosa, the person has been regularly engaged in binge-eating or purging behaviour.

Treatment includes medication, family and behavioral therapy, nutrition counseling, diet, nutritional supplements etc.

Re-feeding syndrome (RS) is the most severe complication during re-feeding of AN patients who are severely malnourished and receive a brisk and large load of energy substrates, particularly carbohydrates. It is characterized by fluid and electrolyte, cardiac, haematological and neurological complications (Figures 1, 2, and 3). Furthermore, the refeeding syndrome could increase the risk of death in most severely malnourished patients [5-8]

The best way to treat re-feeding syndrome is to prevent it by keeping a slow and progressive initial administration of energy substrates, a limited carbohydrate load and avoidance of a high sodium intake. Careful monitoring of body weight, urine output and heart rate may give early warning of its onset. Signs of peripheral edema, heart failure or altered mental status must be watched for and, during the first few days, phosphorus, magnesium and electrolyte levels, as well as renal function must be checked very closely.

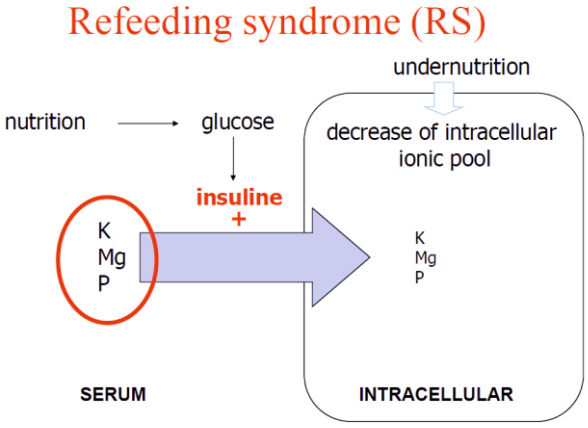

Figure 1. Mechanism of development of re-feeding syndrome: During re-feeding, a great load of carbohydrates moves in intracellular space, with K^+, Mg^{2+} and PO_4^{3-}, thus creating severe hypokalemia, hypomagnesaemia and hypophosphatemia (adapted from [6, 7, 8])

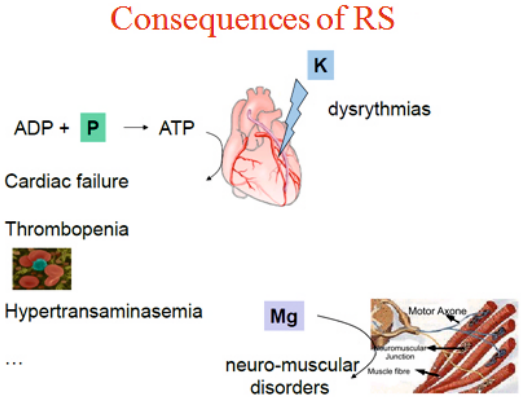

Figure 2. Consequences of RS (adapted from [6, 7, 8])

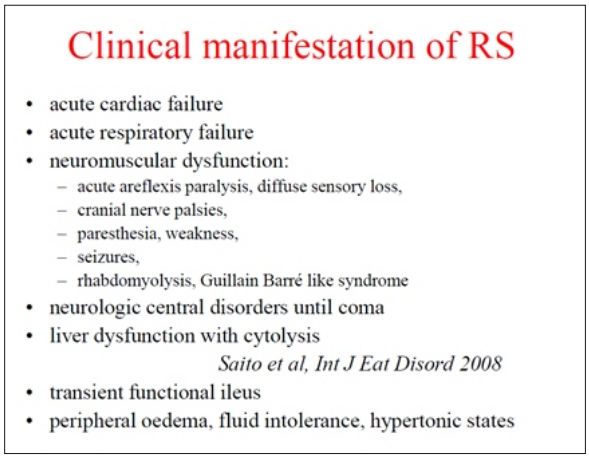

Figure 3. Clinical manifestations of RS (adapted from [7])

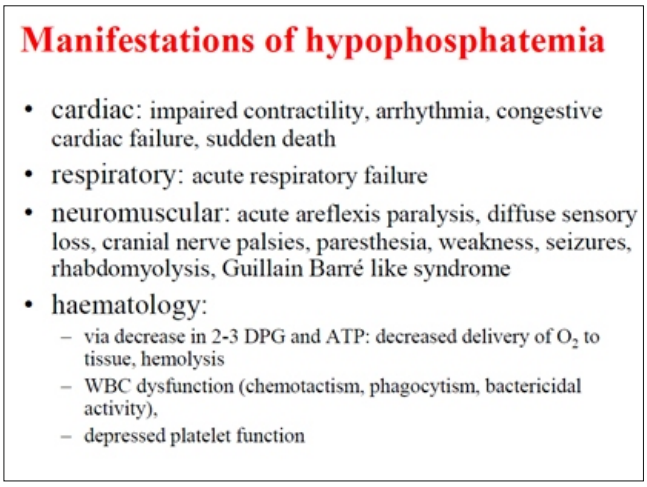

Figure 4. Manifestations of hypophosphatemia (adapted from [7])

Deficiencies should be corrected before starting re-feeding. Supplements of micronutrients (vitamins and electrolytes) must be administered as needed, and patients who develop hypophosphatemia or any other deficiency should be vigorously repleted. In severely malnourished patients with probable preexisting deficiencies and no contraindications, supplements of phosphates, thiamine, potassium and a multivitamin product should be given routinely and increased according to monitored values.
Recommendations for initial nutrition in anorexic patients are given in Figure 5.

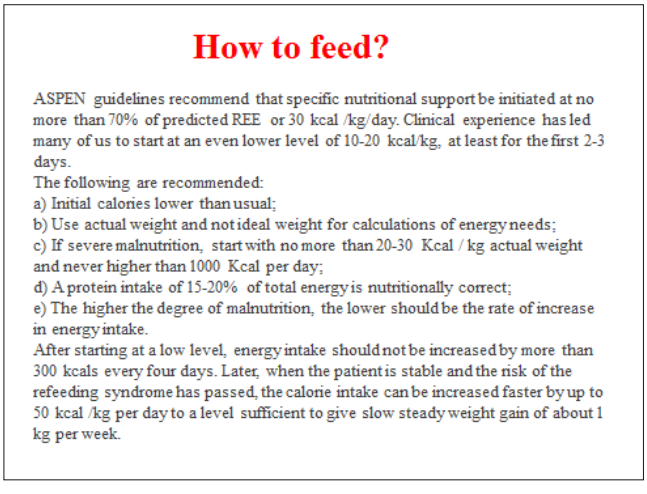

Figure 5. Guidelines for re-feeding [9]

Clinical case

A 32-year-old woman with 16-year-history of anorexia nervosa (weight=27 kg, height=175 cm BMI=8.8) was admitted to ICU department of University Hospital-Pleven, after one day treatment in a second-level hospital in the region. She was transferred in a severe condition with severe muscle weakness, encephalopathy and neuropathy, bradycardia, and hypotension.
Her level of consciousness was diminished (Level P:" Response to pain (P): Difficult to wake up but will respond to pain. The patient cannot answer questions properly."). Blood pressure was 90/60 mm Hg recumbent, pulse was 54/min regular, body temperature was 36.4^{0}C. Her bulbar conjunctivae were not icteric, and palpebral conjunctivae were slightly anemic. The thyroid gland was not palpable. Chest and abdominal examination showed no abnormality. Slight pitting edema in bilateral pretibial regions was detectable. There was no abnormal pigmentation, cyanosis, or peripheral lymph node swelling. Neurological examination revealed severe muscle weakness and neuropathy.

Initial hematological tests revealed a normocytic normochromic anemia with hemoglobin of 114 g/l. Blood chemistries were as follows: aspartate aminotransferase (AST) 2995 IU/l, alanine aminotransferase (ALT) 2264 IU/l, lactate dehydrogenase 371 IU/l, alkaline phosphatase (AP) 608 IU/l, GGTP 356 IU/l, total bilirubin 34.8 mmol/l, creatine kinase 84 IU/ml, total protein 50.3 g/l, albumin 37.5 g/d, creatinine 36.97 μmol/l, BUN 7.16 mmol/l, Na=127 mequiv/l, K=2,7 Cl 103 mequiv/l, calcium 2.3 mequiv/l, Glu=1.7 mmol/l. Urinalysis was unremarkable.

Ultrasonography (USG) of the abdomen indicated fatty liver.

Re-feeding syndrome was presented with liver dysfunction with cytolysis, severe muscle weakness, encephalopathy and neuropathy, bradycardia, hypotension.

Treatment in ICU was carried out for 14 days with parenteral, enteral and oral nutrition, correction of electrolyte disturbances and vitamin deficiencies. Human serum albumin and fresh frozen plasma in moderate amounts in first 10 days were applied. Nutritional and caloric supply are shown in Figure 6 and Figure 7.

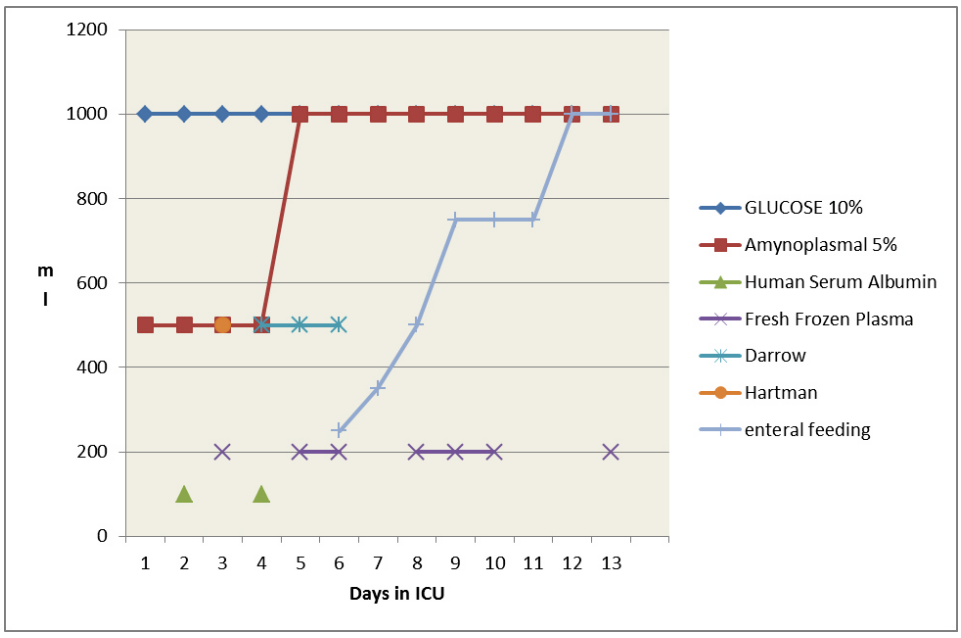

Figure 6. Parenteral and enteral nutrition

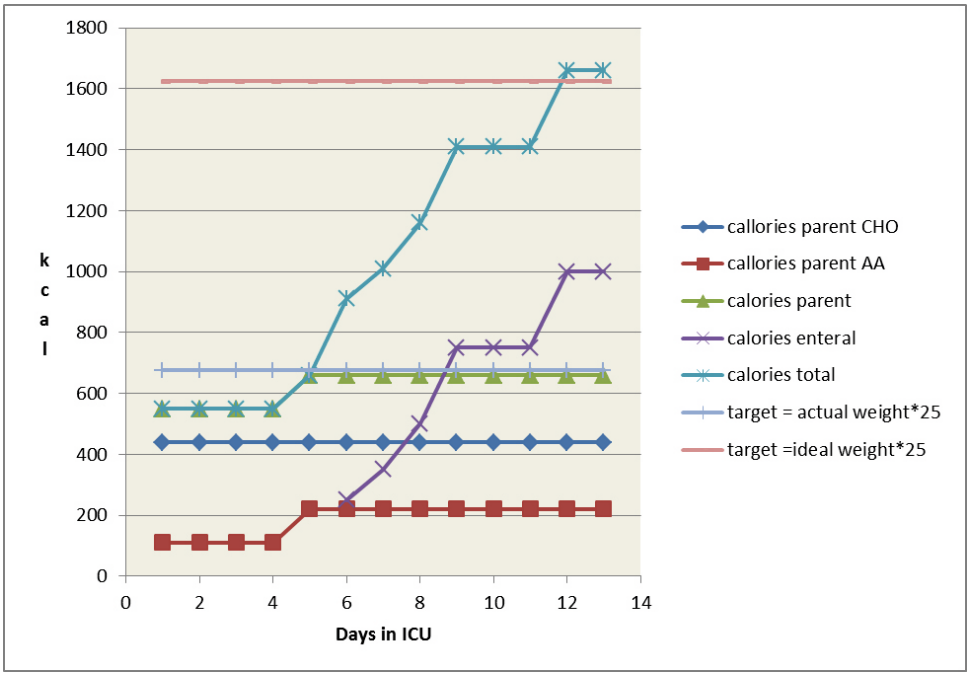

Figure 7. Energy targets and supply

Weight gain for 2 weeks was 5 kg. The electrolytes were balanced, as well as liver tests and vital functions. No signs of oedemas and fluid overload were present (Figure 8).

The patient was able to sit, stand and walk, and was transferred to gastroenterology department for inpatient treatment. After 2 months, weight of 45 kg (BMI=15) was achieved.

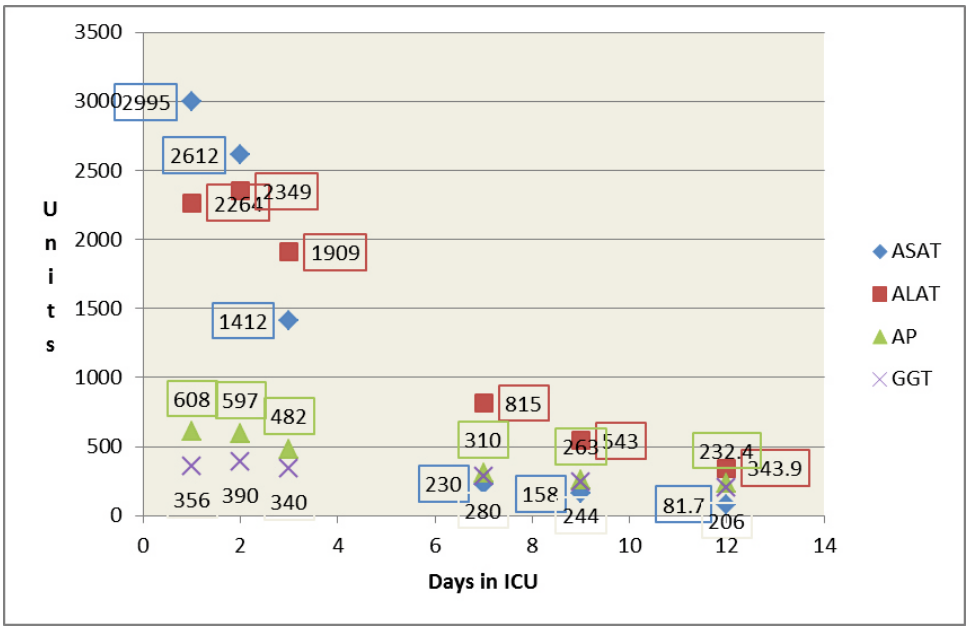

Figure 8. Dynamics of ASAT, ALAT, AP, GGT during treatment in the ICU

Discussion

Treating such a patient is a very difficult task. It has been shown that AN patients with very low BMI have high mortality [3].

A recent study has reported treatment in ICU and prognosis in 41 anorexia nervosa (AN) patients suffering from very severe malnutrition (mean BMI: 10.1 0.57 kg/m2). They were compared to 433 less malnourished AN. In 27% of the patients, all nutritional marker levels were in normal range. All patients received prudent tube-refeeding: energy was increased from 12 to 40 kcal/kg/day, protein from 1.0 to 1.5 g/kg/day within 10 days. During stay, 1 patient died, 2 others suffered from myocardial infarction, 2 othersf - from acute pancreatitis, and 5 - from mental confusion. Compared with the other 443 AN patients, the 40 remaining patients had worse 6-yr prognosis: 2 died (7% vs 1.2%), 29% had severe outcome (vs 10%), and only 41% recovered (vs 62%) [10].

Vignaud et al. [11] have studied treatment of patients with AN and RS in ICU, and found significant difference in caloric intake on the first day between patients who developed RS and those who did not (23.2 ± 5 Kcal/kg n=7 for AN with RS vs 14.1 ± 3 Kcal/kg; n = 61 for AN not RS p=0.02) The mortality rate was 71% (5 of 7) for patients with re-feeding syndrome and 3% (2 of 61) for patients without the syndrome ($P < 0.001$). Their conclusion is that "… The frequency of AN in ICU patients is very low and the crude mortality in this group is about 10%. Prevention and early-detection of re-feeding syndrome is the key point".

Our patient had been treated for day in a second-level hospital. After some initial parenteral nutrition, her condition deteriorated rapidly – obviously she developed RS with hepatic cytolysis and encephalo- and neuropathy. She was transferred to our ICU department in a severe condition –with bradycardia, hypotension, encephalo- and neuropathy. Her condition was diagnosed as an AN with RS. Although we had no data for PO_4^{3-} blood levels the first 24 hours, she received phosphorus (0.25 mmol/kg BW/24 h, potassium phosphate), KCl (0.1 g/kg/day). Rigaud et al. [10] suggest systemic use of phosphorus and i.v. lipids in all patients with severe AN.

Intravenous lipids were not prescribed to our patient, because signs of acute hepatic failure and fatty liver were present.

We thought that in our patient, very high levels of ASAT and ALAT were signs of severe hepatocyte cytolysis, caused by RS. Indeed Ozawa [12] attributes high level of transaminases to two possible sources:

- Severe malnutrition in a patient with AN and very low BM, indicating depletion of all energy sources and causing multiorgan failure, requiring urgent calorie repletion (sources are liver, heart, kidneys, muscles etc.).

- RS induced aminotransferase increase with liver as a main source (it starts after re-feeding and is not so marked).

In the first case, Japanese authors suggest, that "When marked elevation of aminotransferase levels is found in anorectic patients, immediate treatment, including bed rest and calorie repletion, should be instituted. Parenteral alimentation is an acceptable method for calorie repletion".

In the case reported, we probably had both reasons for transaminase elevation presented: very severe malnutrition and possible high carbohydrate load in the first day in the second-level hospital.

We used moderate amounts of human serum albumin (HAS) and fresh frozen plasma (FFP). The use of HSA and FFP for correction and prevention of fluid and electrolyte shifts between intra-, extra-cellular and intravascular space in a patient with RS have not been studied yet. Indeed, in a recent review [13] "… A restricted use of HSA is recommended".

After 14 days of ICU treatment our patient had a weight gain of 5 kg, with normalized liver enzymes, no signs of edema, heart failure or pulmonary edema. We do not attribute this quite high weigh gain solely to fluid retention. The patient was severely malnourished with "shrunk" cells volume, extra- and intravascular space. Restoration of normal nutrition "expanded" those spaces, and we assume that adequate fluid, electrolyte, and oncotic balance is important.

Conclusion

The approach to achieve greater weight gain by providing protein as human serum albumin and fresh frozen plasma plus enteral nutrition, avoiding high carbohydrates has important implications for the safety efficiency of treatment in severely malnourished patients with anorexia nervosa and correcting disbalance of re-feeding syndrome. Treatment provided in ICU could help prevent and treat complications by applying a more vigorous approach.

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