

ACUTE REFEEDING SYNDROME



“Liberation”. A female inmate of Bergen-Belsen breaks down and kisses the hand of British soldier Lieutenant Martyn Wilson, April 1945. (Imperial War Museum).

I went to Belsen. It was a vast area surrounded by barbed wire....Outside the camp, which is amidst bushes, pines, and heather, all fairly recently planted, were great notices in red letters DANGER - TYPHUS...some men of the Yeomanry arrived. The people crowded around them kissing their hands and feet - and dying from weakness. Corpses in every state of decay were lying around, piled up on top of each other in heaps. People were falling dead all around, people who were walking skeletons. One woman came up to

a soldier who was guarding the milk store and doling the milk out to children, and begged for milk for her baby. The man took the baby and saw that it had been dead for days, black in the face and shriveled up. The woman went on begging for milk. So he poured some on the dead lips. The mother then started to croon for joy and carried the baby off in triumph. She stumbled and fell dead in a few yards....

About 35,000 corpses were reckoned, more actually than the living. Of the living there were about 30,000. The SS men were driven and pushed along and made to ride on top of the loaded corpses and then shovel them into their great open mass graves....jeering crowds gathered around them and they had to be kept under strong guard....

In one place hundreds had been shoveled into a mass grave by bulldozers; in another Hungarian soldiers were putting corpses into a grave that was sixty feet by sixty feet and thirty feet deep. It was almost half full. Other and similar pits were being dug. Five thousand people had died since we got into the camp. People died before my eyes, scarcely human, moaning skeletons, many of them gone mad. Bodies were just piled up. Many had gashed wounds and bullet marks and terrible sores....In one compound I went, I saw women standing up quite naked, washing among themselves. Nearby were piles of corpses.

Other women suffering from dysentery were defecating in the open and then staggering back half dead, to their blocks. Some were lying groaning on the ground. One had reverted to the absolute primitive....I went to the typhus ward, packed thick with people lying in dirty rags of blankets on the floor, groaning and moaning. By the door sat an English Tommy talking to the people and cheering them up. They couldn't understand what he said and he was continually ladling milk out of a cauldron. I collected some women who could speak English and German and began to make records....All of them said that in a day or two more, they would have gone under from hunger and weakness....

There were a very large number of girls in the camp, mostly Jewesses from Auschwitz. They have to be healthy to survive. Over and over again I was told the same story. The parades at which people were picked out arbitrarily for the gas chambers and the crematorium, were many were burnt alive. Only a person in perfect health survived. Life and death was a question of pure chance...People at Auschwitz were saved by being moved away to work in towns like Hamburg and were then moved back to Belsen as we advanced. At Auschwitz every woman had her hair shaven absolutely bald. I met pretty young girls whose hair was one inch long. They all had their numbers tattooed on their left arm, a mark of honour they will wear all their lives....

Hundreds of people came up to me with letters, which I have taken and am sending back to London to be posted all over the world. Many have lost all their relatives. "My father and mother were burned. My sister was burned". This is what you hear all the time. The British Army is doing what it can. Units are voluntarily giving up blankets. Fifty thousand arrived while I was there....sweets and chocolate and rations have been voluntarily given.

Then we went to the children's hut. The floors had been piled with corpses there had been no time to move....Men had been hung for hours at a time, suspended by their arms,

hands tied behind their back...Beatings in workshops were continuous and there were many deaths there...

That night when I got back at about eleven o'clock very exhausted, I saw the Jewish padre again and talked to him as he was going to bed. Suddenly he broke down completely and sobbed. The next morning I left this hell....As I left I had myself deloused and my recording truck as well. To you at home, this is one camp. There are many more. This is what you are fighting. None of this is propaganda. This is the plain and simple truth.

Patrick Gordon-Walker; BBC, 24 April 1945

The hellish visions of Bergen-Belsen would psychologically damage all who entered the camp in April 1945 for the rest of their lives. Despite massive efforts by the British Army to save them, well over 10,000 survivors would die from the effects of disease and starvation in the ensuing weeks following their liberation. Most had simply reached a point of no return, many seemingly having lost even the will to live any longer. Many others that seemed savable inexplicably died soon after attempts to feed them. These puzzling deaths were the first indication of a syndrome that had previously been unknown to medical science - the "Refeeding Syndrome".



The British Army torch the Bergen-Belsen camp in an effort to control rampant typhus.

ACUTE REFEEDING SYNDROME

Introduction

Refeeding Syndrome is the term used to describe the adverse metabolic effects and clinical complications when a starved or seriously malnourished individual commences feeding via oral enteral or parenteral routes.

The syndrome is under recognized and can be fatal.

The principle metabolic effects include:

- **Hypophosphatemia:**
 - ♥ This is a hallmark feature.
- Hypokalemia
- Hypomagnesemia
- Acute thiamine deficiency.

Patients at risk of refeeding syndrome should be referred to:

- **A specialist Dietitian**
- **Gastroenterologist.**

Pathophysiology

Refeeding syndrome is most likely to occur in the **first week** of refeeding.

It results from **rapid shifts** in **electrolytes** as well as rapid **thiamine depletion**

Physiological effects of acute refeeding in a seriously starved patient include:

1. Hypophosphataemia:
 - The body enters into fasting (starvation) state and becomes catabolic (breaking down muscle mass). Phosphate is lost from muscle, then lost from the body in the urine.

Though serum phosphate levels can be normal, **total body stores** are **depleted**.

Severe hypophosphataemia can be precipitated by:

- **Increased glycolysis** (which generates ATP by utilizing phosphate) during **refeeding with carbohydrates** when carbohydrate replaces body fat as the main source of energy.
- Cellular reuptake via insulin.

The already depleted phosphate stores are further reduced, leading to **significant hypophosphataemia**.

2. Insulin release:

On refeeding, the patient begins to use glucose as the primary source of energy. This results in greatly increased insulin release.

As glucose is taken up into the cells, so too is potassium and magnesium, which can lead to:

- Hypokalaemia
- Hypomagnesaemia

3. Thiamine depletion:

- Any available thiamine is rapidly utilised as a coenzyme for the increased carbohydrate metabolism.

Glycolysis-induced thiamine depletion can lead to Wernicke's encephalopathy.

Risk assessment

Patients classified as **high risk** have two or more of the following:

1. BMI less than 18.5 kg/m²
2. Frail elderly patients assessed by the dietitian as being at nutritional risk
3. Unintentional weight loss greater than 10% within the last 3 - 6 months
4. Little or no nutritional intake for more than 5 days
5. Morbidly obese patients with rapid weight loss (e.g. after gastric ballooning or banding)
6. Oncology therapy (i.e chemo or radiation treatments) especially head/neck/gastrointestinal patients
7. Major stressors without food for > 3 days

8. Post-operative or fasted for long periods of time

Patients classified as **extremely high risk** have one or more of the following:

1. BMI less than 16 kg/m²
2. Anorexia nervosa
3. Unintentional weight loss greater than 15% within the last 3 - 6 months (includes obese patients)
4. Little or no nutritional intake for more than 10 days
5. Low levels of potassium, phosphate or magnesium prior to feeding
 - ♥ However normal serum levels do not mean that the patient is not at risk. Their **total body stores** may be significantly depleted.
6. Chronic malnutrition:
 - Alcoholism
 - Marasmus
 - Kwashiorkor
 - Hunger strikers
 - Malabsorption states

Clinical features

Clinical features of refeeding syndrome include:

1. Severe hypophosphataemia which may result in:
 - Neuromuscular disturbances:
 - ♥ Progressive myopathy to paralysis
 - ♥ Confusion and seizures.
 - Cardiorespiratory disturbances:
 - ♥ Respiratory muscular failure.
 - ♥ Heart failure

- ♥ Arrhythmias.
 - Haematological disturbances:
 - ♥ Haemolysis
 - ♥ Impaired leukocyte function
 - ♥ Thrombocytopenia
 - Rhabdomyolysis
2. Hypomagnesemia which may result in:
 - Arrhythmias
 - Seizures
 3. Hypokalemia which may result in:
 - Arrhythmias
 - Muscle weakness
 4. Acute thiamine deficiency:
 - Wernicke's encephalopathy.

Investigations

1. FBE
2. U&Es/ glucose
3. Magnesium
4. Calcium/ Phosphate
5. LFTs
6. Folate/ B12

Management

Feeding is commenced with **concurrent electrolyte** and **thiamine** replacement.

Close laboratory monitoring is required.

Close guidance by a Dietician is required.

1. Fluid resuscitation, as required.

- Care must be taken to avoid fluid overload:

In the severely starved individual, cardiac mass may be significantly depleted, leading to the risk of fluid overload and cardiac failure if fluid provision is too rapid.

2. Calories:

- Start slowly (e.g. 30% to 50% of estimated caloric requirement) and increase gradually over a week to the patient's estimated needs.

3. Micronutrients:

Multivitamin and trace element supplementation:

- Zinc/ iron/ selenium
- Folate/ B12/ B6 (pyridoxine)/ Fat soluble vitamins

4. Thiamine:

- Thiamine 100 mg b.d at least 30 minutes before each feeding.

5. Potassium:

The amount and route of administration will be determined by the severity of deficiency.

In general terms:

The normal level of potassium is 3.5 - 5.0 mmol / L.

Low normal 3.5 - 4.0 mmol / L.

Mild hypokalemia 3.0 - 3.5 mmol / L

Moderate hypokalemia 2.5 - 3.0 mmol / L.

Severe hypokalemia Less than 2.5 mmol / L.

Exact dosing regimens should be guided by a **Dietician or Gastroenterologist**

6. Magnesium:

The amount and route of administration will be determined by the severity of deficiency.

In general terms:

Normal	0.8 to 1.0 mmol/L
Mild hypomagnesaemia	0.6 - 0.8 mmol / L
Moderate hypomagnesaemia	0.4 - 0.6 mmol / L.
Severe hypomagnesaemia	< 0.4 mmol / L.

Exact dosing regimens should be guided by a **Dietician or Gastroenterologist**

7. Phosphate:

The amount and route of administration will be determined by the severity of deficiency.

In general terms:

Normal:	0.8 mmol/L - 1.5 mmol/L.
Mild hypophosphataemia:	0.7 - 0.8 mmol/L.
Moderate hypophosphataemia:	0.50 - 0.7 mmol/L.
Severe hypophosphataemia:	≤ 0.5 mmol/L.

Exact dosing regimens should be guided by a **Dietician or Gastroenterologist**

Disposition:

Patients at risk of refeeding syndrome should be referred to:

- **A specialist Dietitian**
- **Gastroenterologist.**
- **Severe cases should also be referred to HDU/ICU.**

References

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Dr J. Hayes
August 2016.