

## GLYCOGEN STORAGE DISEASE TYPE 1B

Priority patient: must not wait in A&amp;E

Label

**Risk of hypoglycaemic coma: NEVER LEAVE THE PATIENT WITHOUT A SUPPLY OF SUGARS**  
**Risk of neutropenia - gastrointestinal inflammatory diseases**

Do not wait for signs of hypoglycaemia, in all cases initiate management as set out below

## 1 EMERGENCY

Capillary and venous **blood glucose**, blood gases and lactate, electrolytes, urea, creatinine, triglycerides, AST, ALT. **If fever:** FBC - CRP - PCT + tests for infection depending on the clinic. Must not delay treatment.

## 2 IF HYPOGLYCAEMIA &lt; 60 mg/dL (=3.3 mmol/L)

- Administration of **1ml/kg of 30% glucose** (max. 30 mL) orally or enterally if conscious or **3mL/kg of 10% glucose IV** if unconscious (30% glucose also possible via central line or intraosseous route, some teams allow 1 ampoule of 30% glucose via a peripheral venous line in cases of refractory hypoglycaemia).
- Check capillary blood glucose 5 minutes later.
- If still hypoglycaemic, give a second administration of glucose and check capillary blood glucose 5 minutes later.
- **URGENTLY** set up an infusion (2 quick attempts at a peripheral venous line, otherwise intraosseous) without delaying the glucose administration.
- Immediately start an infusion even if blood glucose levels have been corrected: Infusion using **10% glucose** with standard electrolyte additions\* (not pure 10% glucose)

Age	0-24 months	2-4 years	4-14 years	>14 years - adult	MAX FLOW RATE
Infusion flow rate	6ml/kg/h (10mg/kg/min)	5ml/kg/h (8mg/kg/min)	3.5ml/kg/h (6mg/kg/min)	2.5ml/kg/h (4mg/kg/min)	<b>120ml/h (3L/24h)</b>

\*e.g.: Polyionic, Bionolyte, B45, Glucidion, etc. if no solutes available, 10% glucose + 4g/L of NaCl (70 meq/L) and 2g/L of KCl (27 meq/L)

**If unable to infuse the patient** => Nasogastric tube or gastrostomy: prepare the IV fluids listed above and pass them through the tube at the same rates.

- **CONTRAINDICATION to glucagon.**
- If there are no gastrointestinal disorders and if the preparation is available: instead of infusion, **emergency diet** by continuous enteral feeding using nasogastric tube or gastrostomy (preparation known to the parents from the diet sheet)
- Discontinue Dapaglifozine in case of lactic acidosis

**NEVER clamp off the glucose infusion: neither in A&E, in theatre, nor when moving the patient (porter / nurse): NEVER, RISK OF DEATH**

## 3 CIRCUMSTANCES IN WHICH THERE IS A RISK OF HYPOGLYCAEMIA

- Any circumstance in which the patient is deprived of a carbohydrate supply, e.g. in case of **vomiting, food refusal, diarrhoea or fasting**.  
=> Infusion via peripheral line, or continuous enteral feeding of "emergency diet" to be started **IMMEDIATELY**.
- **Failure to respect meal times (WARNING:** blood glucose levels can fall very rapidly within 5 minutes!). Hence, in the absence of hypoglycaemia or a situation creating a risk of hypoglycaemia: **Strictly respect** (to within 5 minutes) the **meal times** of the "maintenance diet".

## 4 If fever &gt; 38.5°C / neutropenia

- If a viral source evident and no frank inflammatory syndrome: give symptomatic treatment.
- If bacterial cause suspected and/or neutropenia < 500/mm<sup>3</sup>:
  - Broad-spectrum antibiotic therapy (e.g. TAZOCILLIN IV as monotherapy) while waiting for bacteriology results + G-CSF 5µg/kg/day by subcutaneous route.
  - If cellulitis or abscess: always add subcutaneous G-CSF 5µg/kg/day whatever the neutrophil count.

## 5 If flare-up of gastrointestinal inflammation: Abdominal pain, diarrhoea, rectal bleeding

- Fasting with infusion as described above, plus analgesics. During working hours, discuss with the specialist team treatments aimed at the gastrointestinal condition (Pentasa enemas, corticosteroids, etc.) and/or subcutaneous G-CSF 5µg/kg/day whatever the neutrophil count. Look for source of infection with stool virology, coproculture and C.difficile detection.
- If abundant rectal bleeding with deglobulization: consider endoscopic haemostasis.
- If severe flare-up with fever: give antibiotic therapy aimed at the gut using third-generation cephalosporins (C3G) and Flagyl

## 5 MONITORING

- Check capillary blood glucose 1 h after starting the infusion, then every 3 h.
- Adjust the rate of infusion of 10% glucose + electrolytes by +/- 5 mL/h. Target: capillary blood glucose between 60 and 120 mg/dL.
- If hyperlactataemia > 5 mmol/L: check blood gases - lactate every 4h. If hyperlactataemia > 10 mmol/L, add thiamine (B1) 100 to 200 mg/day orally or IV.

**PATHOPHYSIOLOGY:**

Inherited metabolic disease due to deficiency in glycogen utilisation, characterised by:

- **Profound hypoglycaemia after a short period of fasting (2 to 4 h depending on the patient).** Usual treatment: Meals at precise times of day containing precise quantities of carbohydrates (starch without rapidly acting sugars), with controlled lactose and fructose intake. Maizena/Glycosade intake (**uncooked** corn starch, **not heated**) and/or night time enteral feeding with a precise rate of carbohydrate intake. If intercurrent disease: emergency diet by continuous 24/24 enteral feeding via NG tube / gastrostomy, with precise carbohydrate intake rate.
- **Disorder of platelet aggregation**, hence **risk of bleeding** during surgery.
- Permanent or cyclic **neutropenia** responsible for bacterial infections, particularly affecting the skin. In some cases, the patient has maintenance therapy with G-CSF and/or an antibiotic prophylaxis, and more recently Dapaglifozin.
- An **inflammatory gastrointestinal disease, similar to Crohn's**: abdominal pain, aphthous ulcers, diarrhoea which may contain mucus and blood, abscess at the anal margin. The treatment can include: enteral feeding with Modulen®, 5-ASA, corticosteroids or TNF blockers (Remicade, etc.), G-CSF, and, recently, Dapaglifozin.
- The possible **complications** during the course of the disease are: renal involvement (tubular disease, renal failure), hepatic involvement (hepatomegaly, cytolysis, adenomas), hypertriglyceridaemia, hyperlactataemia and hyperuricaemia.

● **DRUG CONTRAINDICATIONS / GENERAL ADVICE:**

**Prohibited:** antiplatelet drugs (acetylsalicylic acid, NSAIDs), **glucagon**, avoid Ringer's lactate

- **Never exceed the patient's usual fasting time: if admitted to hospital for a different reason, maintain the patient's usual diet (including quantities of carbohydrate), administration of cornstarch and the precise meal times (which the parents will know)**
- **If the patient has to be fasted (e.g. for surgery), give the infusion described overleaf.**
- Do not forget vitamins and trace elements when intake is exclusively parenteral.
- **In case of admission to hospital** (or attendance at A&E): patients must take with them their usual treatments and the special products that they have in order to prepare an emergency diet.
- The emergency treatment will be reassessed with the metabolic medicine specialist during the day.

**SURGICAL PRECAUTIONS: THROMBOPATHY**

**Anaesthetic protocol: Contact the referring doctor in order to plan for precautionary measures.**

- No risk of liver failure; no drug contraindicated apart from aspirin and NSAIDs;
- No additional risk with standard anaesthetic agents.
- **But: POTENTIAL RISK OF BLEEDING / THROMBOPATHY**

**BEFORE SURGERY:**

- Investigation of haemostasis prior to planned surgery (and if any sign of bleeding: ecchymoses, haematoma, gingival bleeding, epistaxis → investigation of platelet function in addition)
- **Glucose infusion** (10% glucose + electrolytes) at a rate adjusted for age, according to the table above, starting ideally 24 h before surgery.
- **The day before any surgical procedure: ORAL EXACYL** (tranexamic acid - antifibrinolytic) (1g/10mL syrup or as 500 mg tablets) **20 mg/Kg/day** divided into 3 doses (max 1g x 3/day). Warning: will lower the seizure threshold: If patient epileptic, weigh up the need for treatment.

**DURING SURGERY:**

- **If surgery involves bleeding:** at induction give **EXACYL IV 500mg/5mL 10mg/Kg** (max 0.5 to 1g as slow IV over 15min)
- **In addition to exacyl, if history of bleeding or known thrombopathy:**
  - **For minor surgery as outpatient: OCTIM® nasal spray** (150µg per spray): 2 inhalations in one nostril 30 minutes before the operation. Contraindication: child under 2 years of age.
  - **If risk of bleeding, or actual bleeding: MINIRIN® IV** (injectable desmopressin 1ml = 4µg) by slow IV over 30 minutes, starting 1 hour before the surgical procedure: **0.3µg/kg** to be diluted in 50ml of normal saline, then after seeking haematologist's opinion, to be repeated after 12 h and/or 24 h if bleeding is abundant. At the same time, restrict fluids for 24 h, hence the need for a central line to enable a concentrated infusion of glucose to be given (restriction 20ml/kg/24h). If central line not possible, closely monitor the blood sodium level
- **If severe bleeding complication: consider platelet transfusion.**

**AFTER SURGERY:**

- Continue the glucose infusion post-operatively until the usual oral feeding is restored (normal quantities for 2 successive meals, respecting the patient's usual meal times and diet).
- **Monitor blood glucose and lactate every 3 h + ABG if lactate >4mmol/L** during and immediately after surgery.

**EXACYL ORALLY or by slow IV infusion IN ALL CASES: 20 mg/Kg/day** divided into 3 doses (max. 1g x 3/day) 5 to 15 days as long as the risk of bleeding persists.

**REFERENCE DOCTORS AND CONTACT DETAILS**

On-call telephone numbers for metabolic emergencies of:

At night, only the medical teams can call in emergency situations and only if the emergency certificate has not been understood or if the clinical state or test results are worrying. As far as possible make calls before night time.

Secretarial issues must be dealt with via the medical secretariat during the week or by email addressed to the patient's referring metabolic doctor.

Certificate issued on

Dr