An extremely obese young man with newly diagnosed diabetes — classification dilemmas

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Obesity is typically associated with type 2 diabetes. Type 2 diabetes is also accompanied by lipid metabolism disorders, hypertension, and liver steatosis [1]. Type 1 diabetes is characterized by the presence of autoantibodies that damage the pancreas. Moreover, young people suffer from types of diabetes other than those listed above, for example, genetically determined diabetes [1]. A correct diagnosis of the type of diabetes mellitus is necessary for effective treatment.

Baseline data: A 29-year-old, extremely obese man [body mass index (BMI) 55.4 kg/m², weight 200 kg] was transferred to our clinic from another hospital's emergency department, due to a newly diagnosed diabetes hyperglycemic hyperosmolar state and ketogenesis (glycaemia: 1269 mg/dL, serum sodium concentration:137 mmol/L, sodium corrected value: 160 mmol/L, pH: 7.34, HCO^{3-}: 18.7 mmol/L, base deficit: –6.1 mmol/L, effective plasma osmolality: 415 mOsm/kg H_2O; urine test results: glucose 447.7 mmol/L and ketones 15 mg/dL). The patient declared typical symptoms, and signs of hyperglycaemia: polydipsia, polyuria, and weight loss. Moreover, fever and dysuria have been for several days. First hospitalization: the patient received insulin and fluids, among others.

Initial treatment of acute condition and management during hospitalization in the department: Initial diagnosis: newly diagnosed diabetes mellitus in an extremely obese man hyperglycemic hyperosmolar state with ketogenesis.

Abnormalities in the patient's blood tests on admission to our hospital: blood glucose level: 350.2 mg/dL, glycated hemoglobin (HbA_{1c}) 12.2%, sodium level: 151 mmol/L, sodium corrected value: 156 mmol/L, pH: 7.382, HCO3-: 23.7mmol/L, base deficit: 0.2 mmol/L, effective plasma osmolality: 340.9 mOsm/kg H_2O.

Abnormalities in the urine test on admission to our hospital: glucose: low concentration, ketones: high concentration.

In our hospital, glycaemia, water-electrolyte abnormalities, and acid-base abnormalities were corrected during the first three days.

Initially, the patient was treated with intravenous insulin, followed by subcutaneous injections. During hospitalization, the patient was educated to count the carbs and adjust insulin dose (functional intensive insulin therapy). Metformin and liraglutide were added to the treatment simultaneously (after normalization of acid-base abnormalities). Metformin and liraglutide were added because the patient was suspected of having type 2 diabetes.

Due to bacteremia *Methicillin Sensitive Staphylococcus Aureus*, the patient spent almost a month in the hospital to receive intravenously antibiotic-cloxacillin. During hospitalization, inflammation parameters (CRP) and creatinine gradually improved [initially CRP value: 67.78 mg/L, creatinine: 2.33 mg/dL, glomerular filtration rate (GFR): 33 mL/min/1.73m², at the end of hospitalization CRP value: 9.63mg/L, creatinine 0.66mg/dL, GFR 143 mL/min/1.73 m²].

During hospitalization, the metformin dose was gradually increased to 3 x 850 mg; the liraglutide was progressively increased to 1.8mg, whereas the insulin dose was steadily reduced. Ultimately, insulin administration was finished, and the patient achieved satisfactory glycaemia (fasting glycaemia 112–118mg/dL, postprandial glycaemia 93–122mg/dL).

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CLINICAL VIGNETTE

The patient's blood was collected during hospitalization for autoantibodies characteristic of type 1 diabetes. The patient was diagnosed with diabetes mellitus, hypertension, hypertriglyceridemia, liver steatosis, bacteriemia *Methicillin Sensitive Staphylococcus Aureus* during hospitalization, binge eating disorder. After almost a month of hospitalization, the patient was discharged home in good condition. Aims of the patient's therapy: weight reduction, proper nutrition, physical activity, quitting smoking, and pharmacotherapy:

— liraglutide 1.8 mg subcutaneously once a day (due to suspected type 2 diabetes mellitus);
— metformin 850 mg three times a day (due to suspected type 2 diabetes mellitus);
— amlodypine 5 mg once a day (due to hypertension);
— ramipril 10 mg once a day (due to hypertension);
— probiotics two times a day for 10 days (due to antibiotic therapy);
— fluoxetine 20 mg once a day, after a week increasing the dose to 40 mg, after the next two weeks increasing the dose to 60 mg (due to binge eating disorder);
— topiramate 50mg once a day (due to binge eating disorder).

Final diagnosis: Six months later the patient came to the diabetologist (outpatient clinic) with the results of tests for autoantibodies. All tested autoantibodies were present in the patient's blood exceeding laboratory standards (normal range): anty-islet antigen 2 antibodies (anty-IA2), glutamic acid decarboxylase autoantibodies (anty-GAD), and against islet cells autoantibodies (anty-ICA)]. The doctor diagnosed the patient with type 1 diabetes.

It is worth emphasizing that the patient left the hospital without insulin during clinical remission. This remission lasted at least another six months with good metabolic control (fasting glycaemia 100–120 mg/dL, postprandial glycaemia 90–120mg/dL).

What is interesting, from the beginning of hospitalization to the visit to the diabetologist, the patient reduced his body weight by 31 kg (he weighed 169 kg during the visit to the diabetologist).

Final treatment: The autoantibody result suggested that patient, who is now in clinical remission of type 1 diabetes, will require future insulin therapy [1]. In type 1 diabetes, combined metformin and insulin treatment are used in selected cases because obesity and insulin resistance may benefit from metformin treatment). Liraglutide at the dose of 3 mg is registered for treating obesity. The doctor instructed the patient to continue metformin at a dose of 3x850 mg and increase the dose of liraglutide to 3 mg. He was also recommended to follow proper nutrition and physical activity. Moreover, he was advised to monitor glycaemia and administer insulin (functional intensive insulin therapy method), in case with repeated glycaemia over 140 mg/dl. The patient was recommended to show up on a control visits regularly.

Considering the above example, remember that patients with extreme obesity may also have autoimmune diabetes. In the patient described above, exogenously administered insulin after clinical remission is essential [2]. The benefit of treatment with liraglutide in obese patients suffering from type 1 diabetes mellitus is weight reduction, which lowers insulin requirements and has a beneficial effect on glycemia [3]. Metformin also improves metabolic control in patients with type 1 diabetes and excess body fat [4]. Weight reduction (by changing eating habits and physical activity) in obese patients with type 1 diabetes improves insulin sensitivity [5].

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