Hepatic complications in poorly controlled type 1 diabetes mellitus: a case report

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Abstract

We present the case of a 13-year-old male with poorly controlled type 1 diabetes mellitus who developed significantly deranged liver transaminases following an episode of diabetic ketoacidosis. A liver biopsy diagnosed glycogenic hepatopathy (GH). We believe the combination of GH and ischaemic hepatitis led to his presentation.

The link between type 1 diabetes mellitus (T1DM) and hepatic abnormalities is well established. Hepatic complications in children are primarily associated with poor glycaemic control.1

We present the case of a 13-year-old male with poorly controlled T1DM who developed severely deranged liver transaminases following an episode of diabetic ketoacidosis (DKA).

Discussed are two diagnoses we believe contributed to this clinical picture.

Case report

The subject is a 13-year-old male with poorly controlled T1DM (average glycosylated haemoglobin 90 mmol/mol (10.4%) and marked lipohypertrophy). Four years after diagnosis he presented following a school camp with respiratory distress, decreased level of consciousness (GCS 10), poor perfusion (capillary refill time 4 seconds) and pH 6.92. His heart rate was 152 and blood pressure was 150/86 mmHg. This was his fourth episode of DKA.

The next day, following administration of intravenous fluids and insulin, he was noted to have hepatomegaly. Investigations showed markedly raised transaminases—maximum ALT 1196 IU/L (30 × upper limit of normal [ULN]), AST 3969 IU/L (80 × ULN) and GGT 647 IU/L (15 × ULN). Synthetic liver function remained normal. Ultrasound revealed hepatomegaly (span 26 cm) with increased echogenicity but normal blood flow. He had associated renal impairment (maximum creatinine 167 micromol/L).

Hepatitis A, B, C, HIV, cytomegalovirus, toxoplasma and leptospira serology were negative. Epstein-Barr virus and parvovirus serology were consistent with past infection. Toxicology and metabolic screens (including ceruloplasmin, alpha-1 antitrypsin and alpha fetoprotein) were negative.

Autoantibody titres (including smooth muscle antibody) and immunology screens were negative apart from an ANA titre of 1/320.

Percutaneous liver biopsy showed normal architecture with glycogen accumulation in the hepatocytes. There was mild macrosteatosis but no inflammation or fibrosis.
Figure 1. Liver biopsy showing swollen hepatocytes with glycogen accumulation and glycogenated nuclei (arrows). There is mild macrosteatosis without lobular or portal inflammation or fibrosis

His liver enzymes slowly improved with improved glycaemic control and normalised by day 16.

Discussion

In 1930 Mauriac noted hepatomegaly, impaired growth, pubertal delay and Cushingoid features in poorly controlled diabetic children.² The term glycogenic hepatopathy (GH) has been applied to diabetic patients (including adults) with hepatic glycogen deposition in the absence of other features of Mauriac syndrome.² GH usually presents with hepatomegaly and moderately elevated transaminases (up to 10 times ULN) in the setting of poorly controlled T1DM. It is believed to be the consequence of recurring fluctuations in insulin and glucose levels.³

During periods of hyperglycaemia, glucose passively diffuses into hepatocytes independent of insulin. Once treated, the presence of insulin promotes the conversion of glucose to glycogen inside the hepatocytes.³ GH is indistinguishable from non-alcoholic fatty liver disease without a biopsy and is reversible (transaminases usually normalise within 2 to 4 weeks) with improved glycaemic control.

Ischaemic hepatitis (IH) is characterised by a sudden reversible rise in serum transaminases in the setting of hypoxia or hypovolaemia. IH has been clearly described in adults and is generally associated with cardiac failure. We have only
found one case where IH was described in association with DKA and no liver biopsy was performed.⁴

While hypotension has previously been considered a key feature of IH, it does not need to be present for the diagnosis.⁵ Our subject was poorly perfused and subsequently developed renal impairment despite an absence of hypotension. Liver necrosis has been suggested as being a mandatory finding in IH, but its presence is not universal in patients who otherwise fit the criteria for this diagnosis.⁶ Our subject did not have evidence of necrosis on his biopsy.

Our subject had features of two pathologies—GH and IH. Individually, neither diagnosis sufficiently explained the overall clinical picture. Furthermore IH is commonly described in conjunction with other forms of liver pathology, for example in congestive heart failure.

Therefore, we believe the sudden, dramatic and reversible rise in liver enzymes in our patient occurred due to the combination of GH and IH. This would appear to be an important complication of poorly controlled diabetes in the setting of DKA.

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