Serendipitous computed tomographic diagnosis of an underlying cause for diabetes mellitus

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CASE REPORT

A 62-year-old man presented with non-specific abdominal pain, which was most marked in the left iliac fossa. He had a 15-year history of diabetes and had been jointly managed by an endocrinologist and his family physician. He was known to have mild renal impairment, which was felt to be secondary to his diabetes. He also had a past history of diverticular disease that had been diagnosed clinically without the use of imaging and had been managed conservatively.

Physical examination demonstrated mild tenderness in the left iliac fossa in keeping with a presumptive diagnosis of diverticular disease. The patient otherwise appeared well, and it was commented that he must enjoy the outdoor life as he had a tanned appearance. Laboratory tests revealed a slight leukocytosis and an elevated fasting serum glucose level of 8 mmol/litre, (normal range 3.6–5.6 mmol/litre). The serum creatinine was also elevated at 230 μmol/litre, (normal range 55–133 μmol/litre).

Owing to his elevated creatinine level, a computed tomography scan was performed without intravenous contrast enhancement. Images of the lower abdomen confirmed the diagnosis of diverticulitis (not shown). Images of the upper abdomen revealed a dense liver (*Figure 1*) and fatty replacement of the pancreas (*Figure 2*). Based on these findings, a diagnosis of haemochromatosis (bronzed diabetes) was made. The diagnosis was confirmed by an ultrasound guided core biopsy of the liver, which demonstrated excessive iron deposition with associated cirrhosis in keeping with haemochromatosis.

INTRODUCTION

The diagnosis of haemochromatosis is usually based on excessive total body iron content, which is confirmed through core liver biopsy or through increased exchangeable iron content as measured by dry weight iron measured by phlebotomy. The alternative name for the diagnosis is bronzed diabetes named after the characteristic tanned appearance that these patients often have. Diabetes may be present in up to two thirds of patients with primary haemochromatosis. There is a higher incidence of associated cirrhosis in those patients with diabetes (Dymock et al, 1972). This article presents a case of known diabetes, where the cause of the patient's diabetes was fortuitously discovered to be haemochromatosis during a computed tomography (CT) scan performed for other reasons.

Figure 1. Axial non-contrast computed tomography through the liver demonstrates increased attenuation of the liver relative to the spleen. The Houndsfield attenuation level was measured as 81Hu.

DISCUSSION

Haemochromatosis is a condition characterized by excess deposition of iron in various parts of the body, with preferential accumulation within the liver. In the typical person, out of a total daily oral intake of approximately 10 mg, 1.0–1.5 mg of iron is absorbed daily through the digestive tract, which serves to compensate for losses associated with haemolysis and normal metabolic processes. In the average healthy male, total body content of iron is 3–4 g, most of which is utilized and sequestered in blood products and various enzymes. In haemochromatosis, total body iron content can surpass 50 g, with preferential deposition in the liver.

Iron toxicity within the liver results in increased lipid peroxidation, free radical formation, release of hydrolytic enzymes and collagen deposition. The associated clinical presentation of hyperpigmentation (thus the term bronzed diabetes) is secondary to hyperstimulation of melanocytes from exposure to free iron.

The evolution of hepatic damage in haemochromatosis begins in the periportal region and extends peripherally,

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Figure 2. Axial non-contrast computed tomography at the level of the pancreatic head shows fatty replacement of the pancreatic head (asterisk). Again the liver is seen to be of high attenuation.

resulting in macronodular cirrhosis. Hepatocellular carcinoma may present in 15–30% of cirrhotic livers (Jager et al, 1997).

Classically, the serum ferritin has been used as a screening tool for haemochromatosis. However, the positive predictive value of elevated serum ferritin is less than 50% (Valberg et al 1978). Some authors have suggested that non-contrast CT should be used as a tool to monitor total iron content. On non-contrast CT, normal liver attenuation is between 60 and 62 Houndsfield units (Hu). With haemochromatosis, the attenuation value is increased, giving an appearance that has been termed 'a white liver sign'. Typically, attenuation levels of between 72 and 79 Hu have been described (Howard et al, 1983). It has been shown that when an empirical cut-off of 72 Hu was used, sensitivity and specificity of 63–67% and 96–100% respectively were achieved (Valberg et al, 1978).

Haemochromatosis may also be diagnosed on magnetic resonance imaging, where the liver appears of generalized low signal on all imaging sequences.

Other radiological findings associated with haemochromatosis involve the musculoskeletal system, with the classic findings of concentric joint space narrowing, subchondral bone sclerosis, beak-like osteophytes, bone cysts and marginal sclerosis, typically manifested in the second and third metacarpophalangeal joints. Radiological evidence of osteoarthritic changes are present in approximately 50% of patients with haemochromatosis, whereas chondrocalcinosis is present in 30% (Jager et al, 1997) and usually manifests in the menisci of the knee, the triangular cartilage of the wrist, the annulus fibrosis of the intervertebral discs and the plantar fascia.

Because of its relative economy, the serum ferritin remains the test of choice for monitoring and screening. Definitive diagnosis requires histological confirmation from core liver biopsy.

Unlike other cases in the literature where CT is has been used in the diagnosis and follow up of haemochromatosis, this case indentified haemochromatosis to be the unexpected underlying cause for the patient's well-established diabetes. **HM**

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