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Case Report

Radiographic appearances of a continuous glucose monitor in a patient with lipodystrophy ☆

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ABSTRACT

We report the case of a 50-year old woman with a known history of lipodystrophy. A pelvic radiograph was taken for the investigation of right hip pain. The image shown demonstrates an indeterminate artefact projected over the right iliac fossa. A previous CT renal study was reviewed, demonstrating the same device in the subcutaneous tissues of the contralateral left lower quadrant which on close inspection was consistent with a continuous glucose monitoring device. Features of lipodystrophy were also noted on review of the CT imaging.

Although many devices such as vagal stimulators and prosthetic valves are easily recognized by radiologists on radiographic images, they may be less familiar with devices such as continuous glucose monitors. The aim of this case report is to familiarize radiologists with the appearances of continuous glucose monitors to allow for effective reporting.

Introduction

Continuous glucose monitors (CGMs) were introduced to the market place in 1999 and have revolutionized diabetic patient care. The most well-known form of glucose testing is the common point of care finger-prick device, an out-dated and pain-inducing 50-year-old technology. The CGM is a subcutaneously inserted device with the sensor in the interstitial space, measuring the patient's glucose levels in their interstitial fluid throughout the day [1,2]. The automatic monitoring of blood glucose levels allows continuous and accurate readings, enabling diabetic patients to monitor glucose levels day and night. The use of CGMs is not only an integral part of diabetic care in the medical world but their use expands into the competitive athletic sphere. Athletes take part in varied and often rigorous training regimes where there is a threat of hypoglycemia, depending on the intensity and duration of the training session. By using CGMs athletes can personalize strategies to temper glycemic excursions, particularly in a subgroup of diabetic patients with hypoglycemia unawareness or where the nutritional intake will vary depending on competitive season or otherwise [3].

This technology has meant that recognition of such devices should be common practice for reporting radiologists. We aim to familiarize radiologists with the appearance of CGMs from

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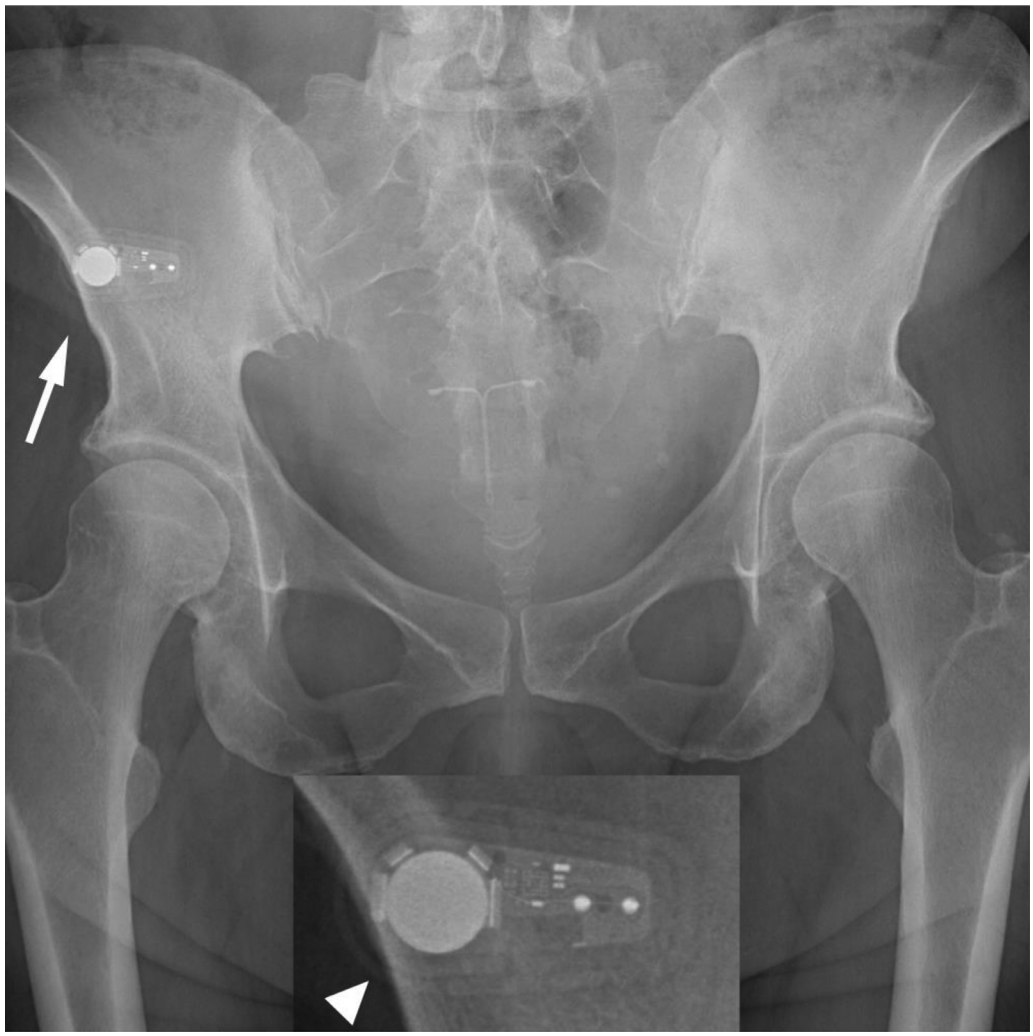

Fig. 1 – Pelvic radiograph of the 50-year-old woman demonstrating the continuous glucose monitor device (arrow) projected over the right iliac fossa, with magnified picture inset (arrow head).

an interesting case of lipodystrophy observed in our institution.

Case report

A 50-year-old lady presented with chronic right hip pain for which a pelvic radiograph was performed to investigate. The pelvic radiograph demonstrated mild bilateral degenerative hip joint changes and 2 medical devices (Fig. 1). One of these devices was an intrauterine device, seen projected over the midline of the pelvis. The second device was seen but not a recognized device and required further review of prior cross-sectional imaging. A previous CT renal study showed a percutaneously placed device overlying the left gluteal region (Fig. 2). While this was on the contralateral side to the device seen on the pelvic radiograph, it was identical in appearance on CT and noted to be a CGM. Features of lipodystrophy were also observed, including diffuse cutaneous thickening and a paucity of subcutaneous fat (Fig. 3). Review of the patient's history confirmed the diagnosis of lipodystrophy and associated diabetes mellitus.

Discussion

CGMs are a non-invasive form of monitoring glucose levels in patients with diabetes. Radiology has an important role in both the recognition and utilisation of CGMs. They consist of a small sensor that is inserted just under the skin, typically on the abdomen or upper arm (Fig. 2A). The sensor measures glucose levels in the interstitial space and sends this data via a transmitter to a remote receiver, providing a real-time measurement. In addition to stand alone monitors, combination CGM-insulin pumps exist which can titrate insulin dose to glucose levels. While generally safe and effective, risks include skin irritation or allergic reactions [4]. In radiology, they can also be utilized during more prolonged scans or procedures

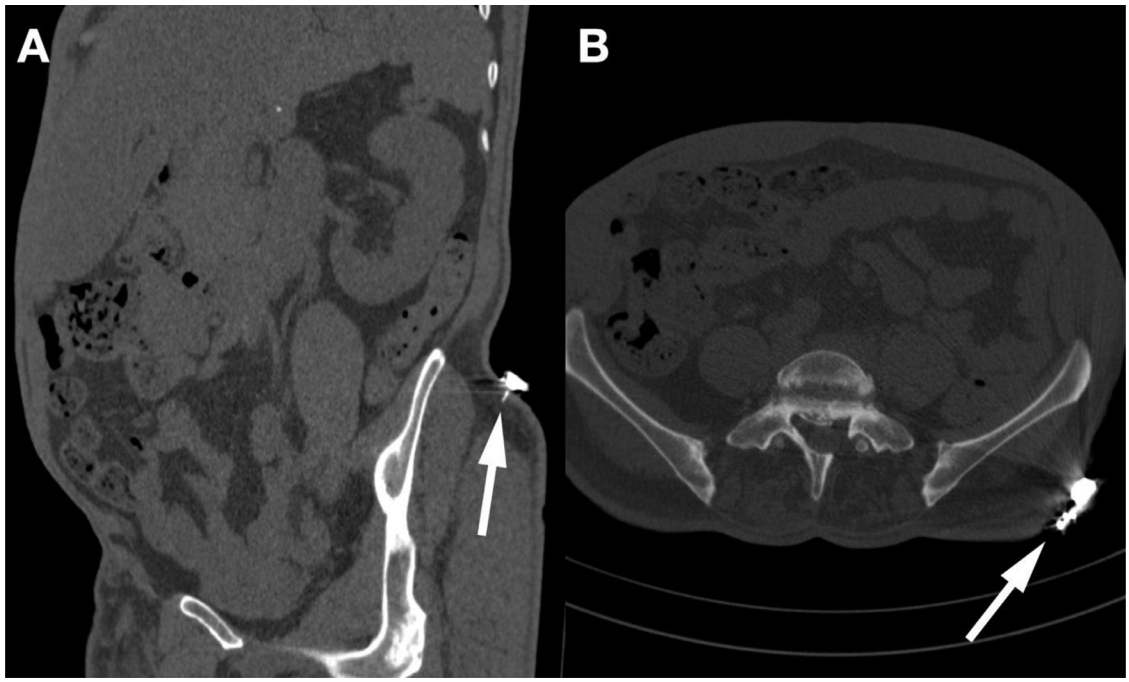

Fig. 2 – CT coronal oblique (A) and axial images (B) at the level of the iliac crests, showing a percutaneous device with subcutaneous sensor in the interstitial space, superficial to the level of the left gluteal musculature, in keeping with a continuous glucose monitor.

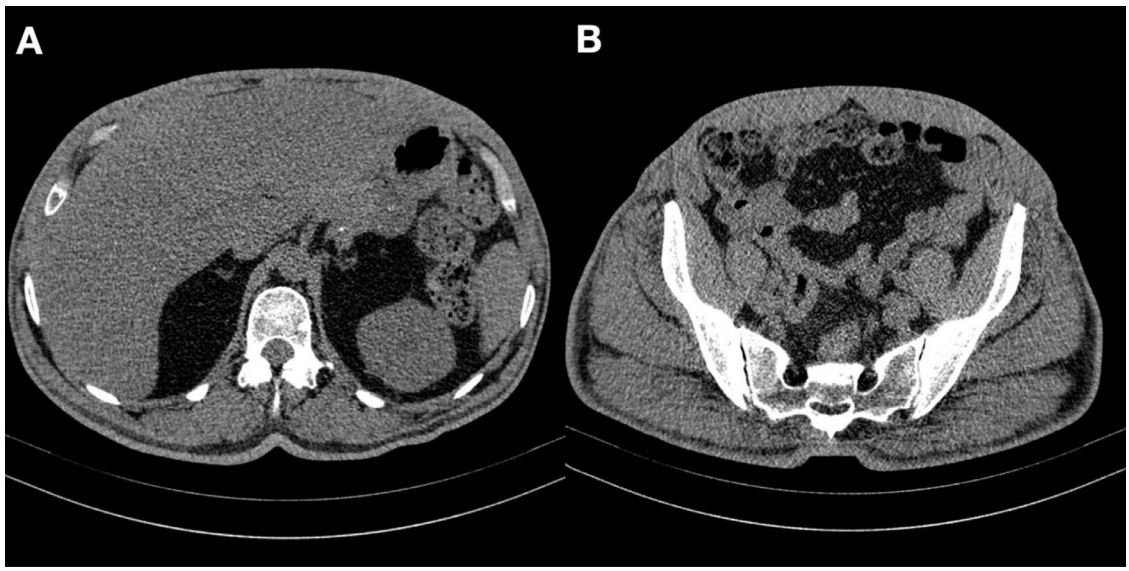

Fig. 3 – Axial noncontrast CT images at the level of the mid abdomen (A) and pelvis (B) demonstrating loss of subcutaneous fat and diffuse cutaneous thickening, in keeping with features of lipodystrophy.

to ensure glucose levels remain within normal limits and reduce the risk of complications [5]. While studies have shown minimal effect on the components of CGMs during MRI scanning, they generally remain contraindicated and labelled as "MR unsafe" [6]. Additionally, we suggest that CGMs may be used to measure glucose levels prior to administration of certain radiological medications such as intra-articular steroids, which may have a relative contraindication above a certain glucose level. For these reasons, we believe that this technology should be recognizable by reporting radiologists, as illustrated in these radiographic and CT images.

The development of insulin resistance and diabetes mellitus secondary to lipodystrophy was the indication for CGM placement in our patient. Lipodystrophy is a spectrum of

diseases defined by the loss of adipose tissue, insulin resistance and a deranged metabolic profile and can be genetic or acquired [7]. Acquired forms can be autoimmune in nature or related to drugs, such as highly active antiretroviral therapy (HAART) induced partial lipodystrophy in patients with HIV, the most common subtype of acquired lipodystrophy [8,9]. Interestingly, features of lipodystrophy were noted on the CT, including diffuse cutaneous thickening and a paucity of body fat. As well as loss of subcutaneous fat, lipodystrophy can result in accumulation of fat in other areas of the body. This can include visceral fat in the liver (which can lead to hepatomegaly or cirrhosis) or in the heart (which can precipitate many cardiac pathologies including heart failure) [10]. Overall, lipodystrophy is a relatively rare disease and not often encountered in our center, thus presenting a further opportunity to familiarize radiologists with some of the CT features of lipodystrophy by presenting images of our case study.

Patient consent

Informed written consent has been obtained and granted by the patient to whom this case report pertains.

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