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Abstract
Fat necrosis of the breast is a well-recognised complication of unfractionated heparin. The following is a case of fat necrosis due to low-molecular-weight heparin in a 91-year-old woman admitted to hospital with unstable angina.

Keywords: heparin, fat necrosis, breast

Introduction
Fat necrosis of the breast has been reported previously in cases with unfractionated heparin (UH), but not (to our knowledge) with low-molecular-weight heparin (LMWH).

Case report
A 91-year-old woman with diabetes and hypertension was admitted with angina-like pain. Clinical examination was normal. Her ECG revealed sinus tachycardia with ST depression in lateral leads. A diagnosis of unstable angina was made and she was treated with subcutaneous enoxaparin. A troponin level taken at 12 hours was normal and chest pain settled over the next few days.

Five days after admission she complained of breathlessness. A repeat chest X-ray was unremarkable. A CT pulmonary angiogram was performed. This showed minor bibasal collapse with small pleural effusion but no pulmonary embolus. However, there was extensive induration of the skin and subcutaneous fat of the upper part of the left breast and the reporting radiologist raised the suspicion of breast carcinoma.

Subsequent clinical examination revealed a hard indurated area fixed to the skin over the upper and inner quadrant of the left breast (Figure 1). There was bruising of the overlying skin. A few patches of ecchymosis were also noted over other parts of her body, but none was noticed at the injection site on the abdomen. A repeat coagulation screen and platelet count were normal.

A mammogram revealed asymmetrical nodular densities over the upper and inner quadrant of the left breast. Targeted ultrasound of this area was consistent with fat necrosis. She was subsequently discharged with advice to avoid heparin in future. Four months later, clinical examination of the left breast was normal and a mammogram revealed considerable reduction of asymmetry of the previously affected area.

Discussion
Tissue necrosis is a rare, but well-recognised complication of subcutaneous injection of UH or LMWH. Fat necrosis is uncommon with LMWH therapy [1]. Very rarely it can be due to incorrect (intradermal) administration [2]. In the majority of cases, pathogenesis remains uncertain. An immune-mediated reaction can explain necrosis at sites distant from the injection, and type I, III, and IV hypersensitivity...
reactions have been suggested [3]. These different mechanisms possibly explain the different intervals between the initiation of treatment and onset of necrosis, which varies from less than 24 hours to 10 days [4]. The target antigen is a complex of heparin and platelet factor IV, a heparin-binding protein located in the intracellular alpha granules of resting platelets [5]. This patient had never received heparin before. Most patients who develop heparin-induced skin necrosis do not have thrombocytopenia [6].

To our knowledge, this is the first case of fat necrosis of the breast due to LMWH. There have been two case reports after intravenous [7] and subcutaneous [8] injection of UH. The latter patient also developed multiple bruises unrelated to sites of subcutaneous injection similar to the case described in this paper, but the mammographic and sono-graphic findings did not change during 1 year of follow-up.

Fat necrosis of the breast can develop after trauma, surgery or radiotherapy. This patient had no history of injury. Not all patients present with a clear history and as the commonest presentation is that of a lump, there is often the suspicion of underlying malignancy [9]. Mammographic and sonographic follow-up are usually adequate as the majority of the lesions reduce in size [10]. The lesions are non-progressive so biopsy is not necessary.

Patients should avoid all forms of heparin in future. Alternative anticoagulants such as danaparoid or hirudin can be used. Warfarin is also safe.

Key points
- LMWH can cause fat necrosis of the breast.
- Platelet count is not predictive.
- An alternative anticoagulant should be used instead of heparin in affected patients.

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References