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Case Report

Silicone deposition and adverse pulmonary events secondary to breast implant rupture ☆,☆☆

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ABSTRACT

Silicone breast implants are common but may be associated with a number of complications including implant rupture. This case reports a 38-year-old woman with bilateral breast implants who presented with breast unevenness, triggering a cascade of investigations that identified implant rupture. A computed tomography scan of the thorax showed subpleural enhancing nodules in the left lung of equal density as the implants, repeat computed tomography thorax months later showed no interval changes. In this case, extracapsular rupture causing deposits of silicone via the lymphatic system into the lungs resulted in nodules visible on imaging. Reassuring radiological findings and lack of red flag symptoms led to radiological follow-up and avoided the need for invasive procedures such as biopsy. The authors aim to remind clinicians of the importance of maintaining a high index of clinical suspicion for implant-related pathology and to add to current literature regarding this rare complication.

Introduction

Silicone breast implants have been in use around the world for decades. The first report of a silicone breast implant being utilized for breast augmentation in a female patient was in 1964 [1]. Correcting asymmetry, aesthetic appeal, increasing self-esteem, reconstruction following mastectomy and gender affirmation surgery are some of the potential indications for breast prostheses to be implanted [2–4]. There is significant variation among various types of breast implants and techniques that have evolved over the decades. The 2 main types of breast implants in general use are silicone implants and saline implants [5].

Having breast prostheses implanted, a relatively common procedure, can be associated with a number of complications. Rupture of implants due to aging and degeneration of the implant or trauma may cause reaction with surrounding tissue or spread of the material to lymph nodes [6,7]. Capsular contracture is another potential complication. This is thought to be a local inflammatory reaction that results in excessive fibrotic proliferation through the production of collagen and results in excessively tender and firm breasts and, if severe enough, may require corrective surgery [8].

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Rupture of a breast implant may be intracapsular or extracapsular depending on whether or not the silicone gel within the implant extrudes through the fibrous capsule formed around the prosthesis once it is implanted [9]. Magnetic resonance imaging (MRI) has been found to be the most sensitive imaging modality in terms of evaluation of rupture of silicone implants, followed by ultrasound and mammography respectively [9]. Small, unpolymerized silicone molecules may sometimes diffuse through the outer layer of the breast implant. This is known as a 'gel bleed' and these molecules may then travel through the lymphatic system and deposit at distant sites, including the pulmonary system [10]. This care report presents a rare pulmonary complication of silicone breast implants and explores its implications.

Case report

A woman in her 30s with a history of bilateral breast implantation 4 years prior as well as a medical history of chronic obstructive pulmonary disease (COPD), presented to the emergency department with acute onset chest pain and shortness of breath. In view of a high D dimer and thus, suspicion of a pulmonary embolism, a computed tomography (CT) pulmonary angiography was performed, providing a baseline image that further imaging pertaining to this case report was compared to. This showed a small left sided effusion in an otherwise normal lung. Pulmonary embolism was excluded. The effusion was not amenable to diagnostic tap and resolved spontaneously on follow up imaging. A few months later, the patient presented to her plastic surgeon after noting breast unevenness. Pockets of fluid surrounding the left breast implant were discovered on examination.

Ultrasound and magnetic resonance imaging (MRI) of the breasts confirmed implant rupture associated with silicon-like nodules in the left internal mammary chain. The linguini sign in keeping with intracapsular rupture of the left implant and extracapsular leak was evident on MRI and can be seen in Fig. 1. A follow up ultrasound of the breasts 1 year later noted internal heterogeneous echogenicity from the intracapsular rupture as seen in Fig. 2. Axillary lymph nodes also exhibited a snowstorm appearance on ultrasound indicating potential silicon deposition as can be seen in Fig. 3.

A computed tomography (CT) scan of the thorax performed 3 years after diagnosed implant rupture showed new subpleural enhancing nodules in the left lung; 2 in the upper lobe, 1 in the lingula and the largest 1 in the lower lobe at 1.2cm, as can be seen in Figs. 4 to 7. These nodules were of equal density as the implants and were not present prior to the rupture. A positron emission tomography (PET) CT scan showed no abnormal glucose tracer uptake thus excluding pathological features as seen on Fig. 8.

The patient was referred to respiratory physicians to exclude malignant potential of the discovered subpleural nodules, given her smoking history. During the same period, the patient also noted frequent hematuria and was referred to nephrology and urology specialist for investigation. CT of the kidneys, ureter and bladder was normal, autoimmune screen was negative, and urinalysis did not show any signs of pro-

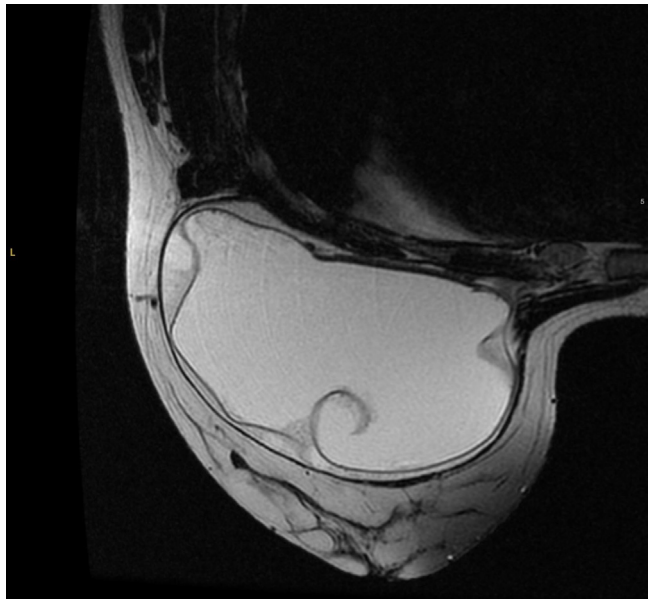

Fig. 1 – Linguini sign in keeping with intracapsular rupture of the left implant.

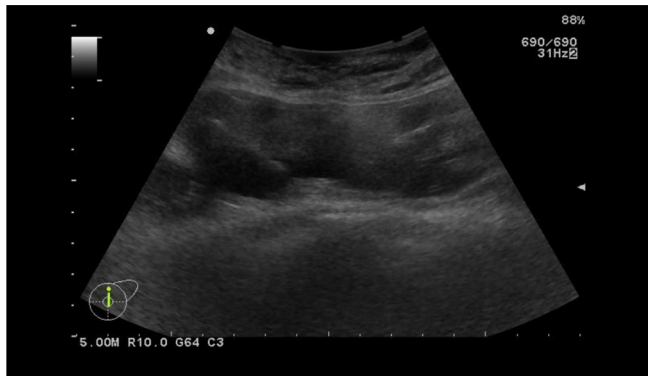

Fig. 2 – Internal heterogenous echogenicity of the left implant 1 year from first presentation.

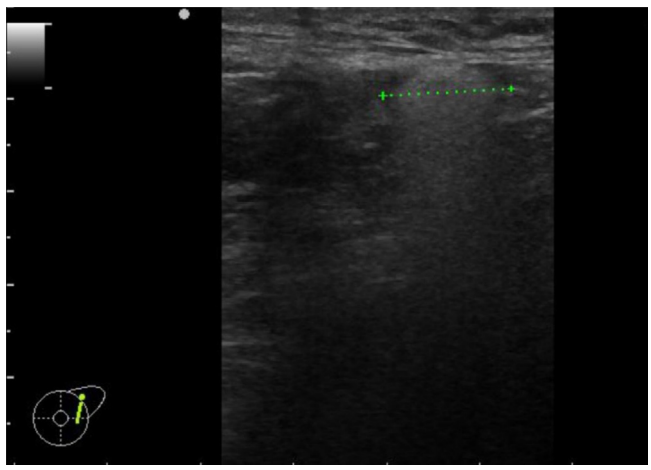

Fig. 3 – Snowstorm appearance of axillary lymph node.

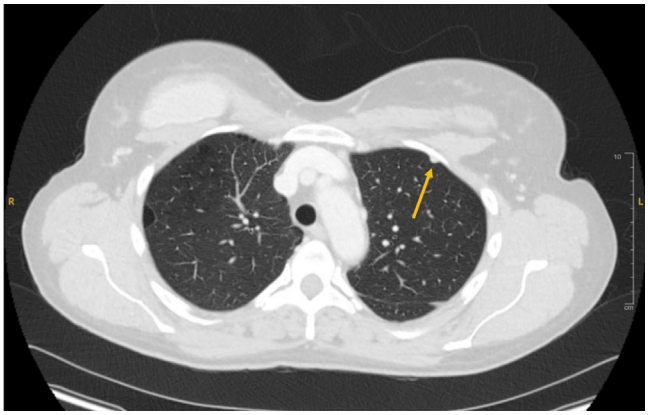

Fig. 4 – A 5 mm subpleural solid nodule on left upper lobe 3 years from first presentation.

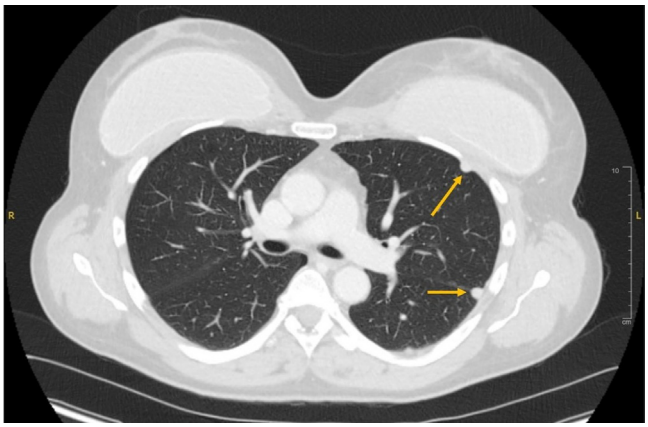

Fig. 5 – Two 6 mm nodules in upper lobe and intrafissural.

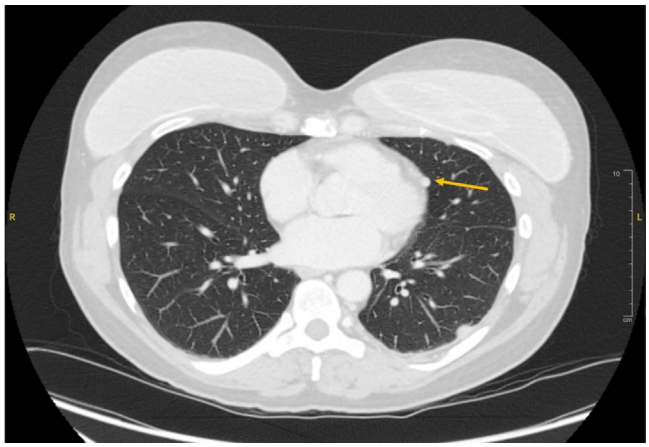

Fig. 6 – A 5 mm subpleural lingular nodule.

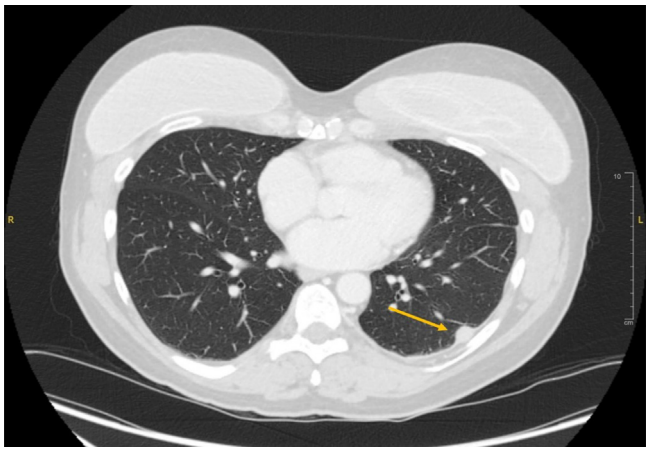

Fig. 7 – A 1.2 cm subpleural nodule in left lower lobe.

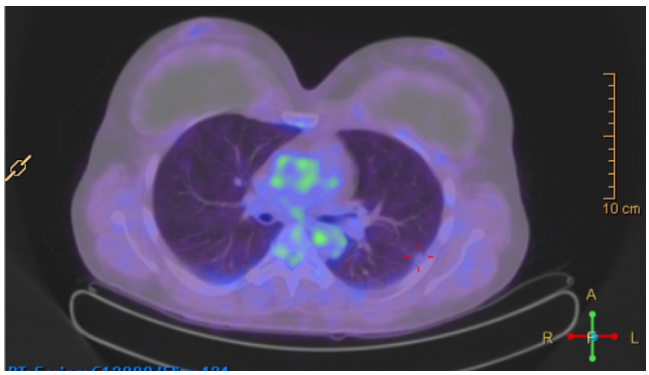

Fig. 8 – Noteable lack of tracer uptake over largest nodule in left lower lobe 3 years from first presentation.

teinuria. The cause of the hematuria was therefore not determined, and symptoms eventually resolved spontaneously without any intervention.

Respiratory examination was unremarkable, and she remained otherwise asymptomatic. There were no interval changes of the lung nodules on repeat imaging 1 year later. The combination of the benign radiological features with lack of interval change, clinical context of implant rupture, lack of uptake on PET scan and a low Brock score of 6% signified a low likelihood of malignancy and a decision to follow up radiologically was made following extensive multidisciplinary team discussion including breast and plastic surgeons, radiologists, pathologists, oncologists and respiratory physicians.

The patient had both implants replaced 4 years after diagnosis of the rupture. An axillary ultrasound; 3 years after the implant was replaced showed persistant silicon nodules Fig. 9. Furhtermore a repeat CT thorax 6 years after diagnosis of rupture and 2 years after the implants were replaced showed no new nodules while nodules that were present initially remained stable in size and structure Fig. 10. Discussion in further multidisciplinary team meetings concluded that the nodules were most likely silicon deposits particularly since CT density of the nodules were identical to the breast implants at 91 Hounsfield Units [HU] and invasive procedure such as biopsy were deemed unnecessary. The patient remained well, no respiratory intervention apart from follow-up was necessary and she returned to her usual routine. The patient was

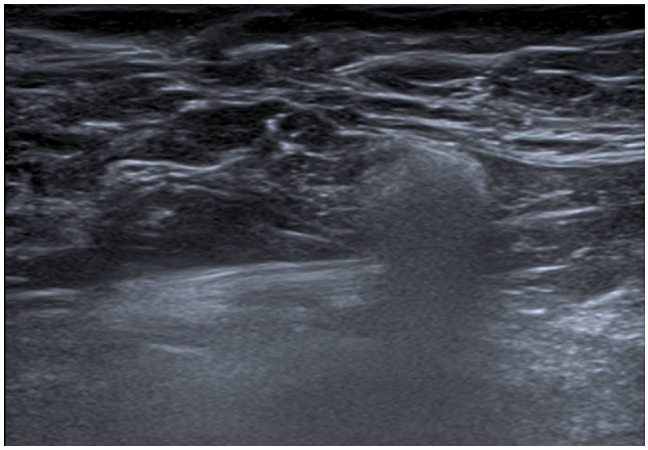

Fig. 9 – Persistent axillary silicon nodes 3 years after implant replaced.

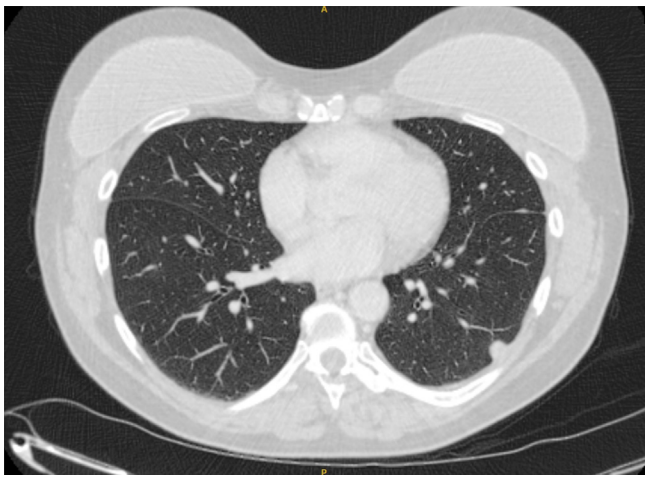

Fig. 10 – Stable 1.2 cm left lower lobe nodule 2 years after implants replaced.

being followed up every 6 to 8 months at the time of writing. No further imaging is planned, unless the patient develops symptoms.

Discussion

This case report aims to add to limited existing data of one of the rare complications of a relatively common procedure. Breast implant rupture may be intracapsular or extracapsular [11]. Based on the radiological and clinical findings in our case, we propose that a 'gel bleed' occurred causing silicone, via the lymphatic system, to deposit in the lungs. Although the deposition of silicone in the lung may produce symptoms such as cough, fever and dyspnoea, the patient in this case was entirely asymptomatic from a respiratory perspective [12,13]. Notably, our patient reported concurrent hematuria and an incidental small left-sided pleural effusion was seen on imaging. No direct causality could be established between the ruptured breast implant and these clinical features in our case and autoimmune disease was excluded biochemically.

Silicone granulomas, a benign inflammatory response to silicone, may present with clinical and radiological features that may mimic lung cancer [14]. Once new subpleural enhancing nodules were demonstrated on follow-up CT, the main concern was to excluding malignancy. Histological confirmation may be necessary when these lesions show significant uptake of fluorodeoxyglucose (FDG) on PET scan to exclude malignancy. In our case however, a PET scan showed no significant uptake, and on CT, the nodules in the lung were of the same density as the breast implants at 91 Hounsfield Units [HU]. This result was further supported by a radiologist specializing in chest imaging and hence given these reassuring radiological findings and lack of red flag symptoms reported by the patient, the decision at a multidisciplinary team level, was to follow up the nodules radiologically at 1 year and at 5 years without the need for biopsy.

This would follow the Fleischner criteria (2017) which advices follow up scan for characteristic nodules. Furthermore the "BTS Guideline for the Investigation and Management of pulmonary nodules" [15] advices that nodules with a homogenous, smooth, lentiform, solid shape on the pleura or perifissural as was the case here, does not require further investigation.

The use of imaging modalities while avoiding biopsies to detect gel bleeding is become increasingly accepted in common practice [16,17].

Conclusion

By reporting this case, we aim to remind clinicians of the importance of maintaining a high index of clinical suspicion for implant-related pathology, particularly in cases with unusual and seemingly unrelated systemic symptoms. Moreover, this case adds to current limited data on rare complications of a relatively common procedure, thereby improving clinical recognition, management and outcomes for patients with complications related to their breast implants.

Learning points

- It is important to maintain a high index of clinical suspicion for implant-related pathology, particularly in cases with unusual and seemingly unrelated systemic symptoms.
- Symptoms that are seemingly unrelated may be linked to a common pathology.
- Timely multidisciplinary team discussion may prevent unnecessary invasive procedures such as biopsies.

Patient consent

Informed consent from the patient were obtained for this case report.

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