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Case report

A rare case of siliconomas resulting from free silicone injections in breast tissue

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Abstract. One of the most common complications of free silicone injection at multiple sites is its leakage and more rarely its migration through the lymphatic system with a resulting local inflammatory reaction of granulomatous type, known as "siliconoma". This report describes the case of a young woman who came to our attention for bilateral mastodynia and palpable tumefactions in breast and gluteal region, a few years after percutaneous injections of free liquid silicone for breast augmentation. (www.actabiomedica.it)

Key words: Siliconomas, Breast, Mammography, Ultrasound, MRI, CT

Introduction

Siliconoma is the term used to describe a foreign body reaction in the human body caused by the presence of silicone. Liquid silicone has been injected for soft tissue augmentation for nearly 6 decades, in several States outside of Italy. The procedure consisted of injecting medical or, in many cases, non-medical liquid silicone into the retromammary space, between the pectoralis major muscle and the fibroglandular breast tissue component. Silicone injections are more affordable than its alternatives, which make it an attractive option for individuals who desire soft tissue augmentation. Liquid silicone was an ideal implantable substance, thanks to its properties: chemically inert, non-carcinogenic, easily malleable and not supporting bacterial overgrowth (1).

The use of liquid injectable silicone for soft tissue augmentation became popular internationally during the 1940s and spread by the 1960s (2). Breast augmentation with injection of free liquid silicone has been performed from the early 1960s but was abandoned by most practitioners after a 1969 publication described multiple long-term adverse effects (3) and it was declared illegal in the 1970s even if the procedure remains available in parts of Asia, Eastern Europe and South America largely owing to its low cost (4). Currently, injectable silicone is FDA-approved only for ophthalmic use in retinal detachment. However, it is used off-label for lip and nasolabial fold enhancement, as well as treatment of flexible acne scars, HIV-associated lipoatrophy, and certain foot problems (2).

But this practice had generated significant controversies, due to several complications that might lead to complex management issues and health risks.

Various complications have been described after the use of liquid silicone and range from localized inflammation (abscesses, fistulas, granulomas), siliconoma formation, and migration of the material to severe systemic inflammation, associated or not with infectio (5).

The most common long-term complication is free silicone leakage and its migration through the lymphatic system, which induces a granulomatous local inflammatory reaction, known as siliconoma. In 1965, Sternberg and Winer used the term siliconoma to characterize a foreign body reaction type in the breast tissue and face

of patients who had received injectable silicone (6). And the first concerns about the use of medical-grade silicone were published in 1977 by Wilkie, who reported the appearance of granulomas as a complication of silicone injection (7). Siliconomas are usually located in breast parenchyma, axillary lymphnodes, muscles of the thoracic cage, arms and also in more caudal locations, such as the abdominal wall or the inguinal region (8).

Case presentation

A Brazilian 50-year-old woman came to our observation, reporting breast tension, bilateral mastodynia and palpable subcutaneous nodules at breast self-examination.

Her medical history was significant for bilateral breast augmentation, obtained through liquid silicone percutaneous injections, about 10 years ago. The clinical examination revealed the presence of painful nodules of the mammary glands and also of the gluteal region, where the patient denied injections.

Several instrumental investigations were performed to detect as well as we can the clinical suspicion of free silicone leakage.

Based on the history, examination and diagnostic imaging, a diagnosis of siliconomas due to free silicone injections was made.

At first a breast ultrasound was performed, which showed bilateral multiple confluent hypoechogenic elements. Apparently these formations are similar to simple breast cysts, but the difference is the dirty acoustic shadowing, which defines the characteristic "snowstorm" pattern.

Then a mammography was conducted: the examination detected confluenting multiple round nodular opacities (Figure 1).

Ultrasound of the abdominal wall and gluteal region showed hypoechoic glandular parenchymas, representing the fibroadipose component, with multiple bilateral nodular areas in the subcutaneous tissue compatible with siliconomas (Figure 2).

The Bilateral Breast MRI, without and with contrast, detected the presence of several siliconomas:

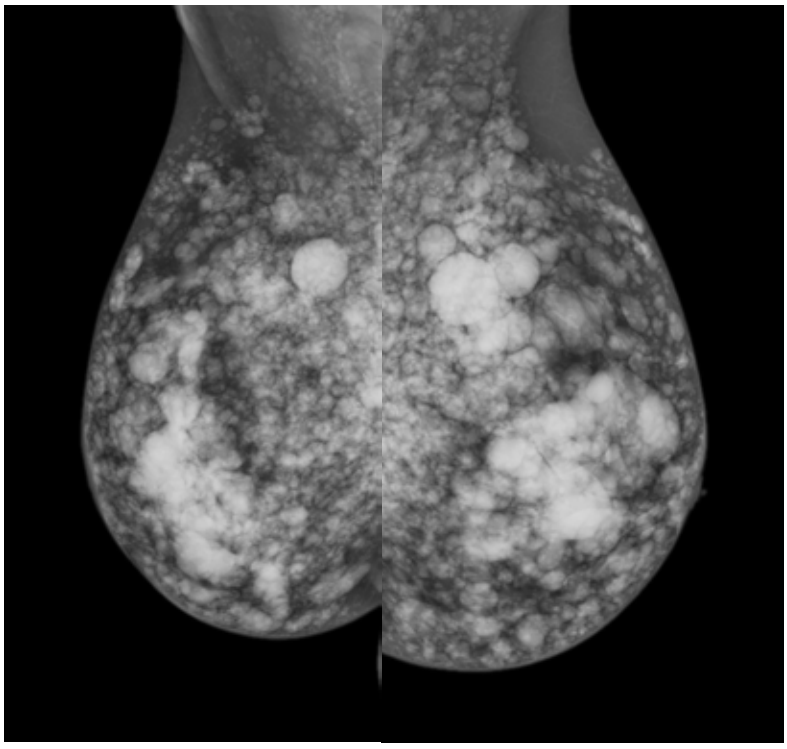

Figure 1. Mammography detected multiple bilateral high-density siliconomas.

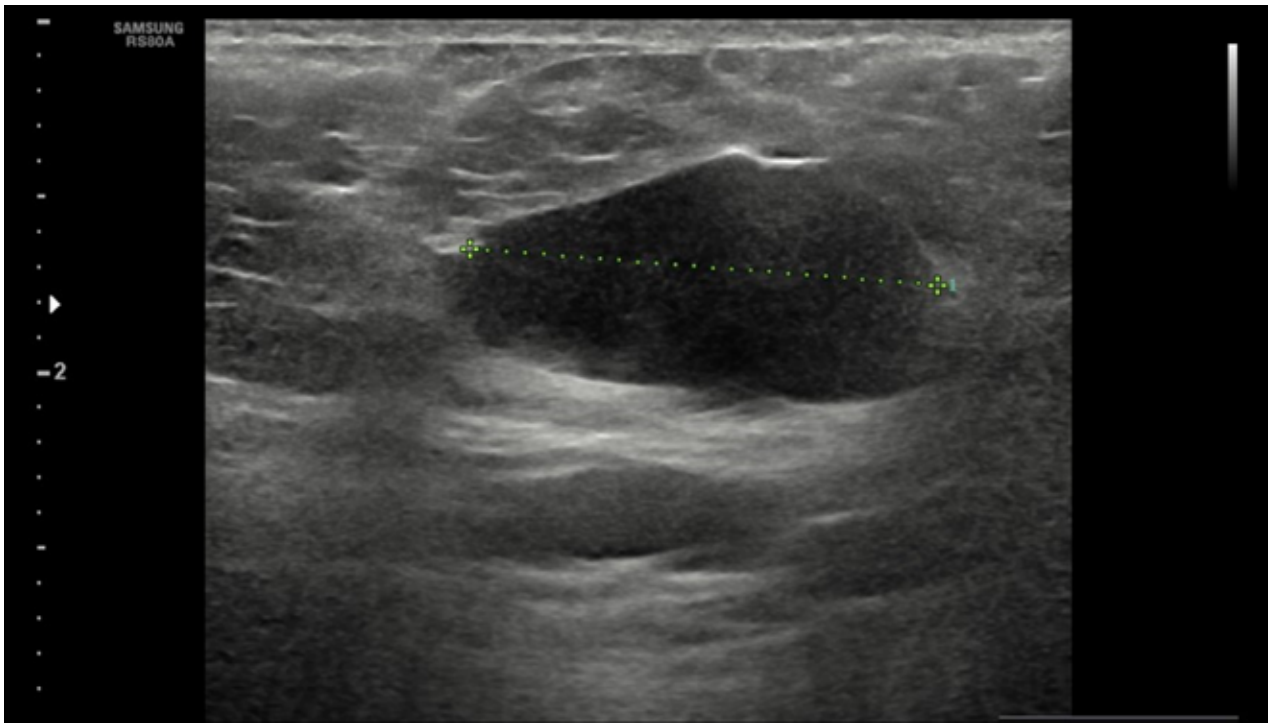

Figure 2. Abdominal ultrasound showed a nodular area in the subcutaneous tissue compatible with siliconoma, measured 2,67 cm.

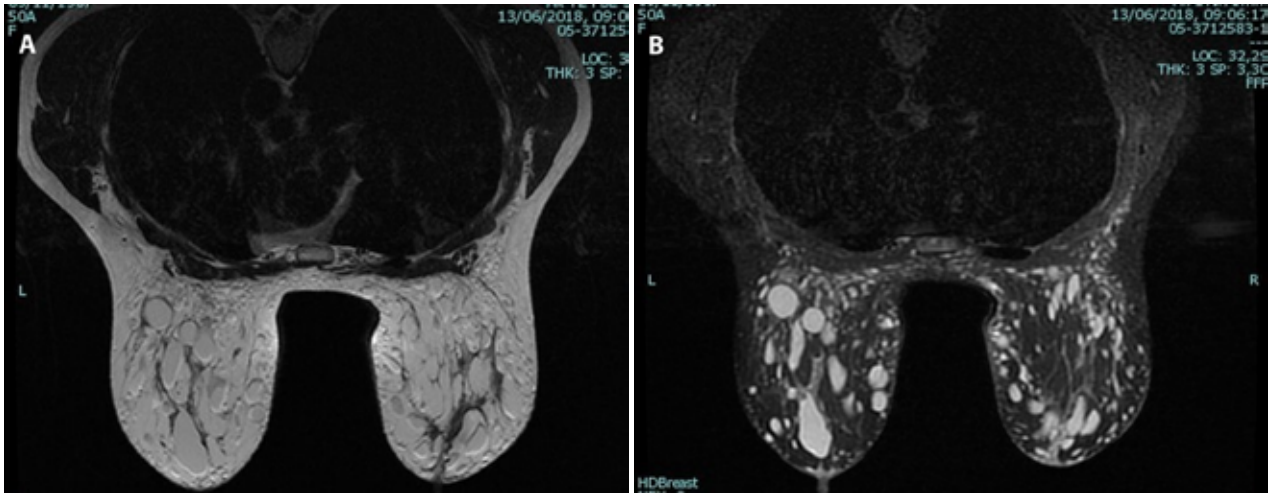

Figure 3. Axial MR breast images - T2 on the left (a) and axial MR breast images – STIR on the right (b) show multiple well-delimited oval lesions in both breasts.

well-delimited oval lesions with diameters ranging from a few mm up to 20-25 mm, spreading bilaterally up to the axil (Figure 3a, 3b).

At least, in the Total Body CT, performed without intravenous contrast, there was evidence of multiple, round hypodense areas in the breast, where silicone was injected, and in the gluteal region, where the patient denied the invasive procedure. It's interesting to note that the silicone migration through the lymphatic system was implied into the formation of siliconomas even in caudal regions, and not only in the site of the injection (Figure 4a, 4b).

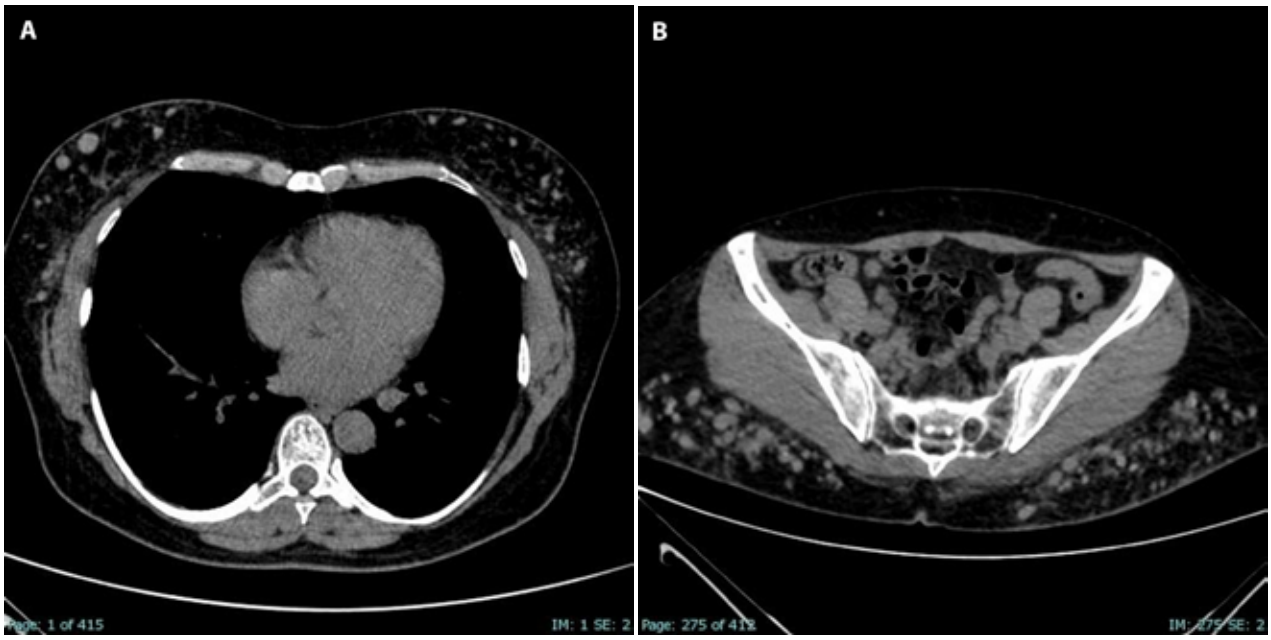

Figure 4. CT without contrast breast images, on the left, (a) and of the glutean region on the right (b) detect multiple siliconomas in the soft tissues.

Discussion

Two greatly different methods of silicone injection have been described for breast augmentation, one involving medical grade silicone with microdroplet technique and the other with large volumes of industrial grade silicone injected by practitioners who can be either unlicensed or unskilled (9). Both techniques are demonstrated to cause similar adverse effects and have since been declared illegal in most countries.

Complications related to injectable silicone range from minor to serious and are reported to occur 8–20 years (range, 6–36 years) after silicone placement (2).

Liquid silicone breast injections have a variety of known, well documented side effects, including mastodynia, granuloma formation, skin discolouration, skin irregularities and mastitis. In addition, also respiratory conditions such as pulmonary edema and pneumonitis secondary to silicone liquid-induced emboli are reported as serious complications and may lead to death (10).

These severe complications can often be attributed to the use of unregulated, intentionally altered, or contaminated silicone injected in large volumes by non-medical personnel in non-clinical settings (2).

In a case series of 28 patients, the average time between treatment and complication was 9 years, the earliest occurred within 1 year from injection, while the latest was recorded at 20 years (1). Despite the most common complaint being mastodynia, the more clinically challenging complaint is from granuloma formation within the breast and, at times, along the chest wall and in the supraclavicular region (11).

Silicone itself is hydrophobic and, when injected, it disperses in the dermis as droplets that tend to attract macrophages and giant cells. The latter surround the silicone in a foreign body reaction (12). The injected material can migrate through lymphatic channel, ductal system or direct invasion (13). Granuloma formation has been attributed to a natural host response to wall off exogenous substances too large to be ingested by macrophages (14). It is impossible to distinguish the cause of silicone granulomas, and it may not result from one single cause. Possible theories for the cause of granulomas include the use of

impure industrial grade silicone, improper technique, too much silicone injected at one time, or the fact that some people naturally react this way to silicone (15). The incidence of granuloma formation in patients injected with medical silicone is relatively low, although some reports have suggested they may occur in up to 20 percent of patients receiving injections. Granulomatous reactions may occur from 3 weeks to 20 years after injection and can be severely debilitating, adversely affecting quality of life (16). The likelihood of development of siliconoma is higher with large volumes of injection material in one area promotes migration through the subcutaneous plane due to gravity or by trapping and circulation of silicone microdroplets via macrophages, lymphatic, and/or blood vessels (5).

Granuloma are clinically indistinguishable from breast cancers, as both form hardened, irregular masses. Furthermore, the fact that the silicone obscures the breast parenchyma renders mammographies virtually non-diagnostic; the accessibility with ultrasound is also impaired owing to posterior shadowing characteristics termed "snow storm" appearance (17). A study by Scaranelo and de Fatima Ribeiro Maia showed most frequent findings of mammogram and ultrasonogram were mammographic macronodular and mixed macronodular and micronodular patterns. Majority of ultrasonographic findings revealed the presence of marked echogenicity with snowstorm patterns. They concluded that both mammogram and ultrasonogram play role in identify free silicone in the breast tissue (17).

MRI is a superior diagnostic imaging modality in cases of free liquid breast augmentation. Using a combination of fat suppression, water suppression, T1, T2 and silicone weighting, one is able to distinguish between a wide variety of materials used to augment the breasts through direct injection, such as free silicone, paraffin, saline or autologous fat (18). In addition, MRI is able to differentiate between reactive silicone granulomatous tissue and breast cancer, even in cases where the two entities are in close proximity (19). This is an obvious advantage over ultrasound or CT scan.in diagnosis evaluation (20).

In this report, the clinical examination confirmed the presence of solid subcutaneous nodules in the reported areas, in absence of erythema or ulcerations.

The clinical differential diagnosis considered erythema nodosum, scleroderma, panniculitis, disfiguring nodules, lymphedema and siliconoma, sometimes with latent periods of decades (21).

The follow-up is necessary to monitor the evolution of siliconomas over the time.

Surgical removal of affected tissue is commonly mandatory for therapeutic purpose. Total mastectomy is an appropriate option for severely damage breast (22).

In our case, the patient refused to undergo surgery.

This case highlights the potential for serious multiple long-term adverse effects developing years after free silicone injections. In fact, although the procedure has been declared illegal in several States, complications related to its previous spread are still found today in the clinical practice. As there can be a long period of latency before the aforementioned complications of liquid silicone injections can occur, we recommend careful follow-up for these patients (23). In case of clinical suspicion, the patient's radiological screening is indicated in order to exclude the onset of siliconomas in the injection site, as well as in caudal areas.

Conclusion

The management of silicone mastopathy is unfortunately not standardized. Currently MRI is the gold standard procedure to provide an early diagnosis, to monitor these patients and to personalize therapeutic intervention.

Ethics Approval and Consent to Participate: Written consent was obtained from the patient to publish the case report.

Consent to Participate and for Publication: Written informed consent for publication was obtained from the patient.

Conflict of Interest: Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article.

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