

# **Silicone Migration from Rupture Breast Implant. What Should Be Done? Report of Three Cases and Review of Literature**

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## Abstract

Silicone implants are widely used in aesthetic and reconstructive breast surgery. Rupture of a breast implants is a well-known complication. Silicone leakage from a rupture or silicone bleeding can accumulate in lymphnodes because the silicone migrates through the lymphatics, and it can reach local or distant nodes. The systemic effects of silicone are unknow and object of debate. We report three cases of silicone migration from breast implants rupture in oncological patients. We aim to describe the correct diagnosis and treatment according to the date of the literature

## Introduction

Over the past few decades, silicone implants have been widely used worldwide for breast augmentation and breast reconstruction.

Rupture of a breast implants is a well-known complication <sup>[1]</sup>. These implants can be composed entirely with silicone or can be a dual lumen implants, consisting of an inner saline construct and outer silicone shell. The median life expectancy of silicone implants is approximately 10-16 years. At least 15% or more of modern breast silicone implants are expected to rupture between the 3<sup>rd</sup> and 10<sup>th</sup> years after implantation.

This prosthesis can undergo a tearing process, for example due to a serious traumatic event or simply due to aging of the material.

When the silicone breast implant is placed, the organism forms a fibrous capsule around the implant. This is a relatively hypocellular membrane of rather uniform thickness, rich in collagen. The rupture of breast implants can be intra or extracapsular. Most implant rupture (77-89%) are intracapsular <sup>[2]</sup>.

The intracapsular rupture is a disruption of implant shell without extrusion of silicone through the fibrous capsule. The extracapsular rupture is defined as rupture of the implant envelope and surrounding fibrous capsule, with silicone extending into adjacent breast tissue. Then another possibility is the "gel bleed". Gel bleed is a phenomenon that is inherent to all types or models of silicone breast implants, regardless of whether they are soft and round or cohesive anatomically shaped. Small unpolymerized silicone molecules permeate through the intact elastomer shell of the implant and can travel through the lymphatics<sup>[3][4]</sup>. The silicone migrates through the lymphatics, and it can reach local or distant nodes<sup>[5]</sup>.

In case of intracapsular rupture, there are no deleterious consequences on the patient's safety, the patient sometimes does not even understand what is occurring, while extracapsular rupture involves more important and diverse health risks, depending on the material which is used in the implant.

Extracapsular rupture of silicone implants occurs when the silicone gel is not very cohesive or has a liquid consistency. When the gel is compact, it cannot escape from the periprosthetic capsule, which is why the rupture of the shell will only result in a slightly deformed prosthesis but a stable arrangement of particles (that are firmly attached to each other) is still observed. The situation changes diametrically when the silicone is liquid or not very compact; for example, as mentioned, in very old or poor quality prostheses. Silicone gel has the ability to leak from the periprosthetic capsule and, unlike saline, is not absorbed by the body.

Liquid silicone gel can spread to other parts of the body, such as to the lymph nodes or lungs. In non-ordinary cases, lumps, also called silicone granulomas, may form in the arm, axillary area, chest area or other parts of the body. The risk of having inflammation of the breast, swollen lymph nodes or a very rare tumor called anaplastic large cell lymphoma (ALCL) cannot be ruled out.<sup>[5]</sup>

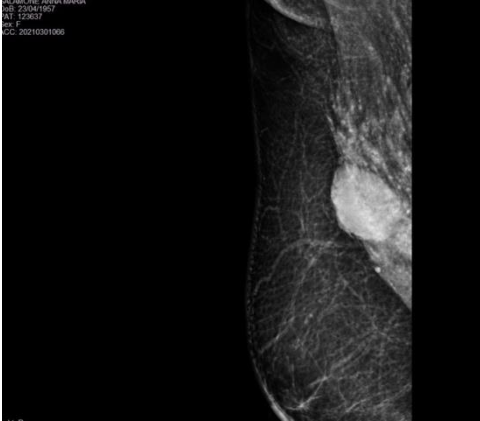
## **Cases Report**

### **First Case**

A 48-year-old female underwent right mastectomy for breast cancer and reconstruction with silicone prosthesis.

After 5 years of routine follow-up, the patient experienced rapid enlargement of her reconstructed right breast. Findings were suspicious for implant rupture and seroma formation so surgery was performed on the patient to replace the damaged prosthesis with a new one. After six months patient complained of swelling in the right axillary extension. She underwent Rx-mammography and a radiopacity of about 3 cm was detected at the axillary extension. (Fig. 1).

A siliconoma was visible on ultrasonography, correlating with the mammographic and palpatory. After that, the right axillary region underwent excision of the aforementioned neoformation. Upon histological investigation, a lymph node invaded with silicone was found.



*Fig.1: Mediolateral view of mammography images demonstrating an enlarged lymph node with the dense internal material in the right axilla.*

## **Second Case**

A 67-year-old female underwent nipple-sparing mastectomy with right axillary lymphadenectomy in the 2010. Upon histological evaluation, only one of the thirteen excised breasts showed metastases to the sentinel lymph node.

A prosthetic fracture and right axillary neoformation were discovered in October 2014.

She underwent a right axillary lymphadenectomy and prosthetic replacement for this reason. There were 11 lymph nodes removed, eight of which had histologically confirmed lymphadenopathy caused by silicone deposits, and three metastasis sites.

During the follow-up a right retropectoral lymphadenopathy and left axillary lymphadenopathy were discovered in 2016 during a PET scan. Ultrasound showed the classic sign of “snowstorm” appearance in cases of silicone deposition within the node. (Fig.2)

Because of the possibility of metastatic colonization, a lymphadenectomy was performed. The pattern of silicone lymphadenopathy was visible in the excised lymph nodes. (Fig.3)

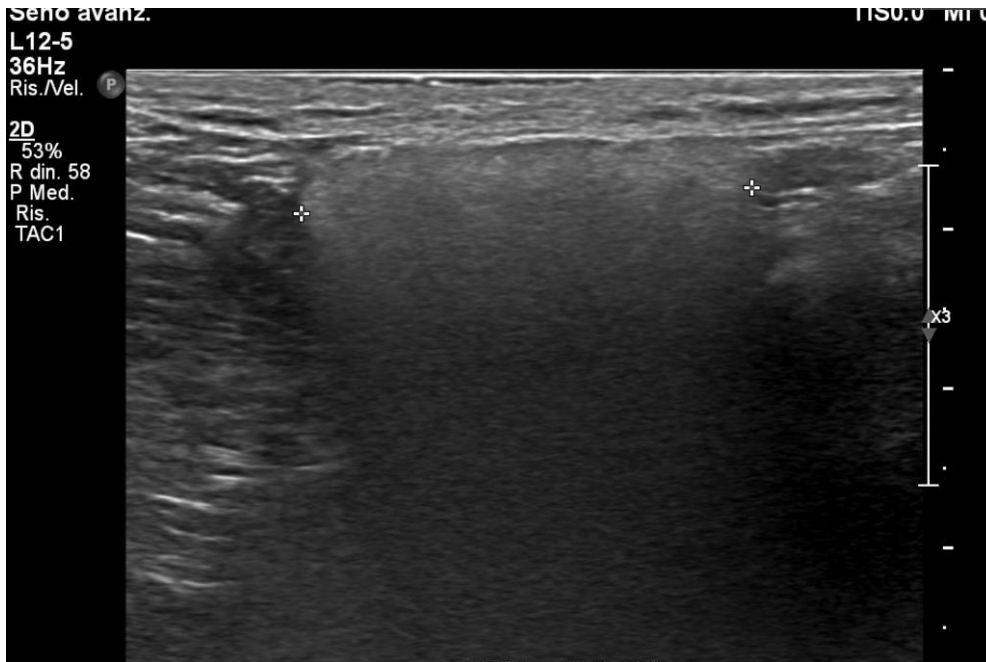


Fig. 2: Case 1: Left axillary ultrasonography shows that the lymph node there looks like a snowfall.

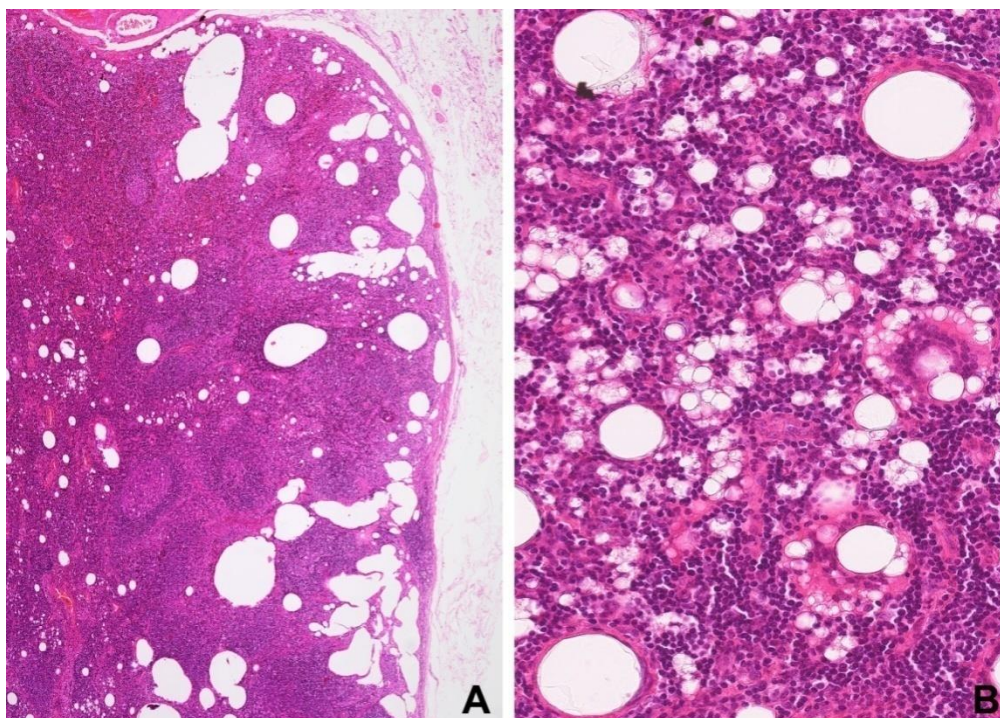


Fig. 3 Axillary lymphonode. The histology of lymph node with silicone/polyurethan reaction shows numerous empty vacuoles of variable size and shape, easily recognizable at low magnification in the cortical areas (A), and a granulomatous inflammation with vacuolated macrophages and foreign body giant cells containing refractile and non-polarizable material (B). Original magnification: A 20x; B 200x. Hematoxylin and Eosin stain.

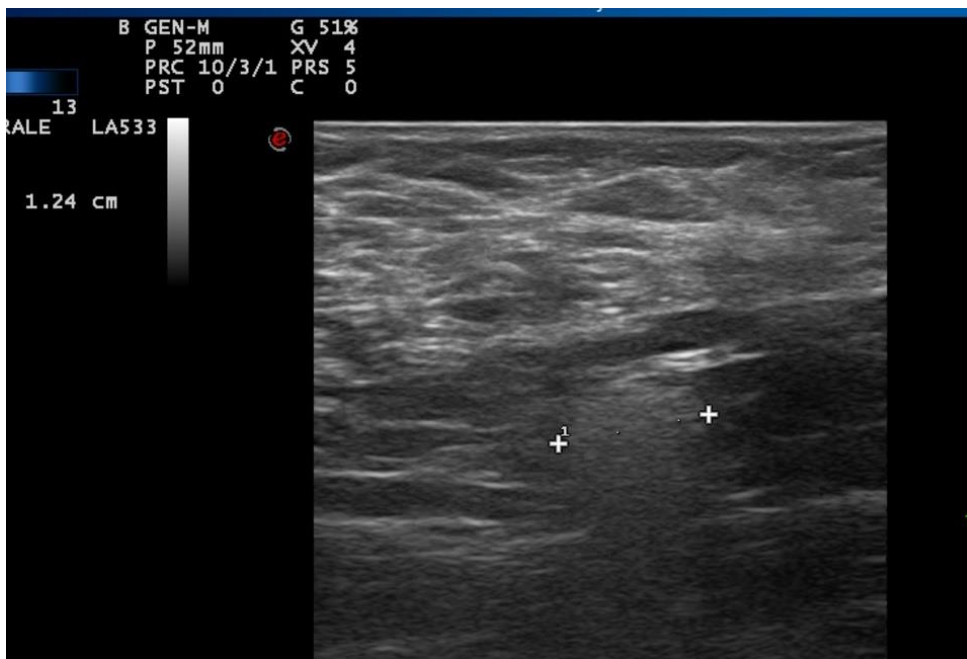
### Third Case

In 2010 a 55-year-old patient underwent left mastectomy for breast cancer, reconstruction with silicone prosthesis, right symmetrization mammoplasty with prosthesis.

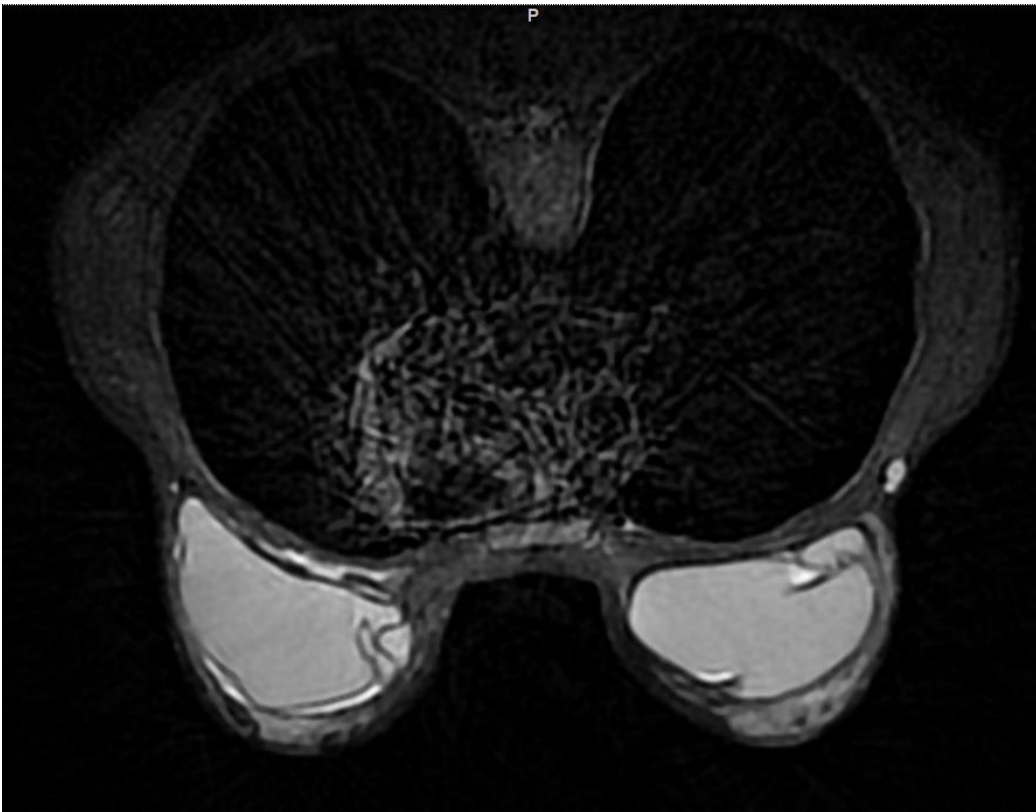
In the September of 2021 she was referred to the our breast department because she noticed a tender and palpable mass in right inguinal region. She underwent ultrasound exam showing an enlargement of lymphonode with the characteristic sign of "snowstorm" (Fig.4), pattern typical of silicone colonization.

So the patient underwent breast MRI that showed bilateral prosthesis rupture .(Fig.5)

Then the lymphonode was removed during the surgery to change the broken mammary prosthesis. (fig.6).



*Fig. 4: Silicone-covered right inguinal lymph node. "Snowstorm sign"*



*Fig. 5: Rupture implants: In the left breast, present linguine signs: hypodense folded wavy lines within the silicone gel, often arranged more or less parallel to the fibrous capsule. Represent the collapsed silicone shell, a certain sign of rupture. In the right breast, there is a keyhole sign: local invagination of the silicone membrane, where the two membranes do not touch.*



*Fig. 6: Rupture implants with extrusion of the high cohesive gel*

## **Discussion**

Over the past few decades, breast implants have been widely used worldwide for breast augmentation and breast reconstruction.

Based on annual statistics, it is estimated that approximately 1.5 million women undergo breast implant surgery each year, including nearly 450,000 in the United States. Breast implants are increasingly used for aesthetic purposes and for breast augmentation and reconstruction in patients with breast cancer after mastectomy. <sup>[5]</sup>

The breast prosthesis guarantees long-lasting integrity thanks first of all to the use of cohesive gel for the prosthesis' filling, which replaced the old generation implants, where the replacement of the prosthesis after approximately 10 years prevented the leakage of silicone drops from causing inflammatory at the tissue level. Furthermore, the thin outer shell (designed to obtain a natural result) is often replaced by a multi-layer coating which guarantees greater resistance. <sup>[6]</sup>

Fourth and fifth generation implants have been developed, including form stable and shaped implants, which are the devices currently in use. These implants have thicker shells combined with a more cohesive gel filler and are manufactured in both textured and smooth shell models <sup>[7]</sup>

Silicone-associated lymphadenopathy occurs following the deposition of silicone in lymph nodes. When implant rupture occurs, it can be intracapsular or extracapsular. Intracapsular rupture is defined as disruption of the implant shell without extrusion of silicone through the fibrous capsule. Extracapsular rupture is defined as macroscopic silicone extending beyond the fibrous capsule.

Silicone can enter surrounding tissue following frank rupture of the implant or a 'gel bleed' deriving directly from the outer silicone shell of the prosthesis. In each of these cases, silicone outside of the implant can travel through the lymphatic system into regional and distant lymph nodes.

Axillary lymphadenopathy in any patient with a history of breast cancer should raise concern for recurrence and prompt aggressive evaluation to avoid delays in diagnosis. Migration of silicone is not always limited to the corresponding axillary lymph nodes and spread to the internal mammary and inguinal nodes as well as the abdominal wall and lower back have all been reported in the literature <sup>[8-9-10]</sup>

Typically, patients with silicone lymphadenopathy present with a hard, tender palpable mass without fever because silicone prostheses are biologically inert, and there is no evidence that silicone lymphadenopathy is immunologically active.

Imaging is important in distinguishing reactive lymphadenopathy related to silicone deposition from metastatic disease, in patient with history of breast cancer<sup>[3]</sup>

Axillary lymph nodes may be seen on mammogram if included in the field of view. Lymph nodes with silicone inside show up as a thick opacity with regular outlines on mammographic x-rays (Fig. 1). The most accurate method to distinguish reactive vs metastatic lymphadenopathy is with ultrasound, as it can show a classic snowstorm appearance in cases of silicone deposition within the node. (Fig. 2) Silicone-sensitive MRI may not always exhibit high signal intensity as silicone may variably infiltrate the node.<sup>[11]</sup>

Instead, MRI is considered the most accurate imaging modality for evaluation of silicone implant rupture, with reported sensitivity of 72–94%. MRI signs of intracapsular rupture include the linguine sign (most specific), teardrop/keyhole appearance, or a subcapsular line. Extracapsular rupture appears as parenchymal silicone outside fibrous capsule.<sup>[3]</sup> (Fig. 5)

FNA cytology is an accurate initial investigation technique that can contribute to diagnosis of lymphadenopathy.<sup>[12]</sup> If FNA is inconclusive, or if other, more aggressive diagnoses are suspected, excisional biopsy is advisable for histological diagnosis and to exclude concomitant malignancy.

Tatabowski *et al* described fine needle aspiration cytology of an enlarged axillary lymph node in a patient with silicone breast implants in situ for 14 years. A cellular sample was obtained in which there were numerous mononucleated and giant multinucleated macrophages with striking cytoplasmic vacuolisation, containing refractile, homogeneous, and faintly yellow (Papanicolaou staining) material that was not birefringent, identified as silicone by analytical electron microscopy. Some macrophages were asymmetrically distorted by rigid silicone globules. Histological examination of the resected lymph node confirmed this picture.<sup>[13-14]</sup>

Then it's important a short consideration about the rare cases of lymphoma associated to breast implants. Produced from apparently inert, non-toxic materials, breast implants have largely been considered safe and relatively risk-free. Extensive epidemiological studies do not support a causal relationship between breast implants and breast cancer or any other types of cancer, definite or atypical connective tissue disease, adverse offspring effects, or neurologic disease.<sup>[15]</sup>

Nonetheless, although extremely rare, a distinct group of lymphomas are increasingly being reported in association with breast implants. Breast implant-associated anaplastic large cell lymphoma (BIA-ALCL) is a form of non-Hodgkin T-cell lymphoma. Most cases presented with a seroma, with the capsule and breast near the implant typically affected. However, cases of axillary lymphadenopathy have also been reported<sup>[15-16]</sup>

## Conclusion

Rupture of silicone breast implants is known complication associated with both cosmetic augmentation and breast reconstruction. In each of these cases, silicone outside of the implant can travel through the lymphatic system into regional and distant lymph nodes. In cases with involvement of the lymph nodes, after examination to identify and confirm the nature of lymph node enlargement including history taking, radiology, FNA, it's necessary to excisional biopsy.

## Declarations

### Conflict of interest

The Authors declare that there is no conflict of interest.

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