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Tumor Remnant After Silicone Implant en Block Capsulectomy: The Magnetic Resonance Role

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Short report

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Abstract

Recently, there has been an increase in surgeries to treat silicone implants complications. These procedures are generally related to diseased fibrous capsules, whose most common clinical manifestation is capsular contracture. Other frequently found presentations are intracapsular collection and local inflammatory signs. The causes of these complications are not well established. Some reports associate them with the implant texture, gel bleeding, silicone-induced granuloma, and infectious processes. Although rare, there is an association with malignant neoplasia in the literature, where Breast Implant-Associated Anaplastic Large Cell Lymphoma (BIA-ALCL) is the most severe complication. Patients often do not perform a Magnetic Resonance (MRI) scan for the explant surgical programming.

The accuracy of MRI to assess fibrous capsule tumor remnants depends on the surgical time. The ideal time for the evaluation is up to 72 hours after the surgical time when the repair tissue starts to appear. Up to 2-3 weeks after surgery, MRI can provide information regarding the presence of a residual tumor. After this period, the presence of scar tissue impairs the analysis.

This short report discusses the role of MRI in the evaluation of residual fibrous capsules in the postoperative period.

Introduction

Recently, there has been an increase in therapeutic surgeries to treat silicone implants complications.[1] These procedures are generally related to diseased fibrous capsules, whose most common clinical manifestation is capsular contracture.[2] Other frequently found clinical presentations are intracapsular collection and local inflammatory signs. The causes of these complications are not well established. Some reports associate them with the implant texture, gel bleeding, silicone-induced granuloma of breast implant capsule (SIGBIC), and infectious processes.[3,4] Although rare, there is an association with malignant neoplasia in the literature, where Breast Implant-Associated Anaplastic Large Cell Lymphoma (BIA-ALCL) is the most severe complication. Patients often do not perform a Magnetic Resonance (MRI) scan for the elective explant surgical programming.[2,3,4,5]

MRI is indicated as the gold-standard method for evaluating silicone implants and can document locoregional complications.[6]

After the surgical injury, the complex wound healing process is activated. Basically, the healing process consists in four phases. The first phase of the healing process is the hemostasis, followed by the inflammatory, the proliferative and the maturation phases. Immediately after the surgical procedure, the hemostasis consists of an outpouring of lymphatic fluid and blood until adequate hemostasis is achieved. The inflammatory phase lasts several days (0-3 days) and begins with hemostasis and chemotaxis. Neutrophils, monocytes, and endothelial cells adhere to a fibrin scaffold formed by platelet activation.[7,8]

The transition between the inflammatory and proliferative/ granulation phase is hard to distinguish, since the latest starts by days 5 through 7, and is ongoing all the time in background. In this phase, reepithelization starts. The last phase, the maturation or remodeling starts around week 3 and can last up to 15 months. (Figure 1)[7,8]

However, most patients who undergo silicone explant surgery do not perform a preoperative MRI scan for surgical programming. Many patients undergo mammography and ultrasound as preoperative tests, but these tests have limitations for evaluating implants. Magnetic Resonance for surgical programming allows assessing implant integrity, measuring intracapsular collections and masses, evaluating the fibrous capsule's integrity and pericapsular changes, and showing the fibrous capsule's relationship with the pectoral muscle, the skin and subcutaneous tissue, and assess axillary extensions. This information can influence the surgical plan, aiming to reduce surgical time and reduce postoperative complications.[9]

The post-surgical remnant fibrous capsule remains the main complication, especially in diseased capsules. The most common fibrous capsule disease is a SIGBIC. Less frequent but more complex is when a malignant neoplasm infiltrates the fibrous capsule. The malignant neoplasm could be stromal, epithelial, or BIA-ALCL. The diagnosis in these patients is incidental in the histological evaluation of the surgical specimen. When malignant neoplasm is diagnosed in the fibrous capsule in these conditions, with compromised surgical margins, the management of these patients is challenging.

Ideally, MRI to assess remnant tumor should be performed in the first hours after the procedure, during the inflammatory phase. However, MR indication is usually due to compromised margins during the frozen section examination of breast specimens or after the definitive histological result. Until the third stage, before the maturation phase, MRI allows evaluating the tumor remnant since the malignant cells enhance more than normal tissue and the early wound complex. Still, with time, the distinction between wound healing tissue and remnant tumor cells becomes more difficult due to similar contrast enhancement.

This short report presents two patients with malignant breast neoplasms who did not undergo preoperative MRI. Both patients showed compromised margins on the histological fibrous capsules analysis.

The first case illustrates a patient who chose implants removal due to clinical complaints, diagnosed as Breast Implant Illness. The histology of the surgical specimens showed the in-situ ductal carcinoma invading the fibrous capsule of the right breast, in addition to free silicone corpuscles in the fibrous capsule and intense bilateral inflammatory process. The immediate postoperative MRI examination observed remnant fibrous capsules with high parietal contrast enhancement, associated with collections, more evident in the right breast, and signs of bilateral silicone-induced granuloma. (Figure 2) The ultrasonographic scan showed the same findings. (Figure 3)

The second case is of a patient with BIA-ALCL diagnosed by puncture of intracapsular collection in the left breast. The Positron Emission Tomography (PET-CT) showed only rare fibrous capsule uptake foci,

with no signs of extracapsular disease. (Figure 4) However, retrospectively, it was possible to observe intracapsular masses in the left breast. The surgical specimen showed margins compromised by the neoplasm. An early post-surgical MRI was performed for a better evaluation. The MRI images showed bilateral remnant capsules associated with collections. In the left breast, infiltrative tissue is also observed that the neoplasia invades the pectoral muscles. (Figure 5)

We illustrate another patient who performed explant surgery due to severe rheumatological complaints credited to BII. The patient did not perform the pre-operatory breast MRI. Fifteen days after surgery, she presented inflammatory signals in the left breast at the surgical wound site, associated with spontaneous secretion. The inflammatory process was refractory to 3 cycles of antibiotic and anti-inflammatory therapy. The diagnostic MRI showed residual fibrous capsule associated with a small collection and intense peri-capsular inflammatory reaction. The reported process extends to the skin and subcutaneous. (Figure 6)

The images presented show the role of MRI to assess postoperative control of breast malignant tumors involving the implants fibrous capsules. It is noteworthy that the ideal time to determine tumor remnants by MR imaging is 72 hours postoperatively. However, in diagnostic scans performed up to the first 2-3 weeks, it is possible to distinguish residual neoplastic tissue from wound healing tissue.

Abbreviations

- Breast Implant-Associated Anaplastic Large Cell Lymphoma (BIA-ALCL)
- Magnetic Resonance (MRI)
- Silicone-Induced Granuloma of Breast Implant Capsule (SIGBIC)
- Positron Emission Tomography (PET)

Declarations

CONFLICT OF INTEREST

The authors declare no conflict of interest.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Waived from the type of manuscript.

CONSENT FOR PUBLICATION

Informed consent for publication was obtained from the patients, to use the images in scientific publication.

AVAILABILITY OF DATA AND MATERIAL

Not applicable.

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Figures

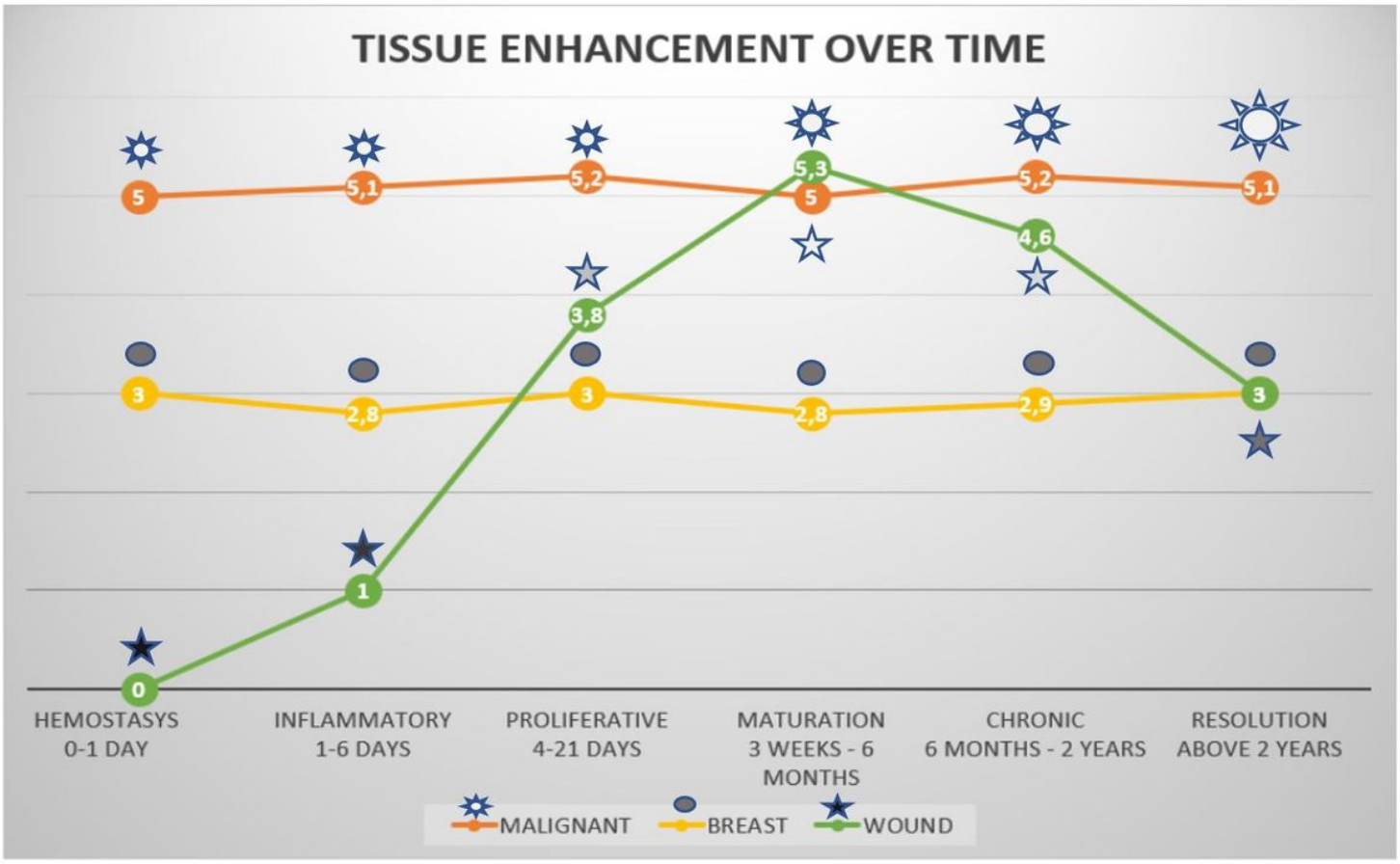

Figure 1

The graph shows the enhancement intensity of Magnetic Resonance Imaging (MRI) over time, divided into hemostasis, inflammatory, proliferative, maturation, chronic, and resolution phases. The curves compare the enhancement pattern of wound healing, normal parenchyma, and malignant neoplasm. The malignant enhancement pattern (spiculated nodule) does not change over time, but there is an increase in the lesion dimensions over time. Normal breast tissue (oval nodule) remains unchanged over time. On the other hand, wound healing tissue variates in enhancement according to time but does not change in dimensions. The most significant difference between the wound tissue and the malignancy is in the first few weeks.

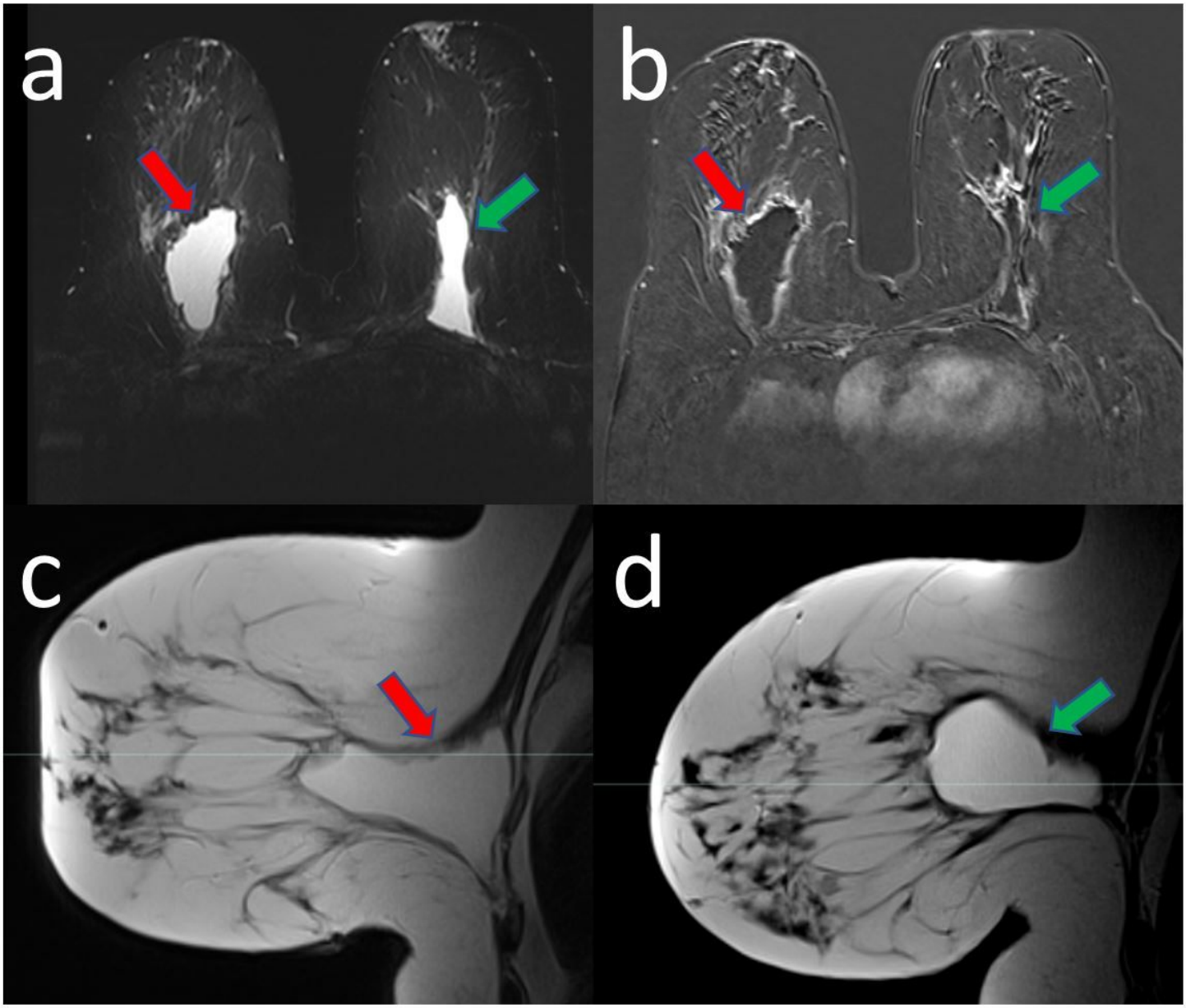

Figure 2

(a, b, c and d). Magnetic Resonance (MRI) of a residual ductal carcinoma in situ in a 63-year-old woman with silicone implants for ten years, 4 days after surgery. Axial STIR sequence (a), axial post-contrast sequence (b), right proton density (PD) sequence (c), and left PD sequence (d). The right subpectoral residual capsule (red arrow) with DCIS, and the left with silicone-induced granuloma (green arrow) are illustrated. The capsule infiltrates the muscle, special in the DCIS capsule.

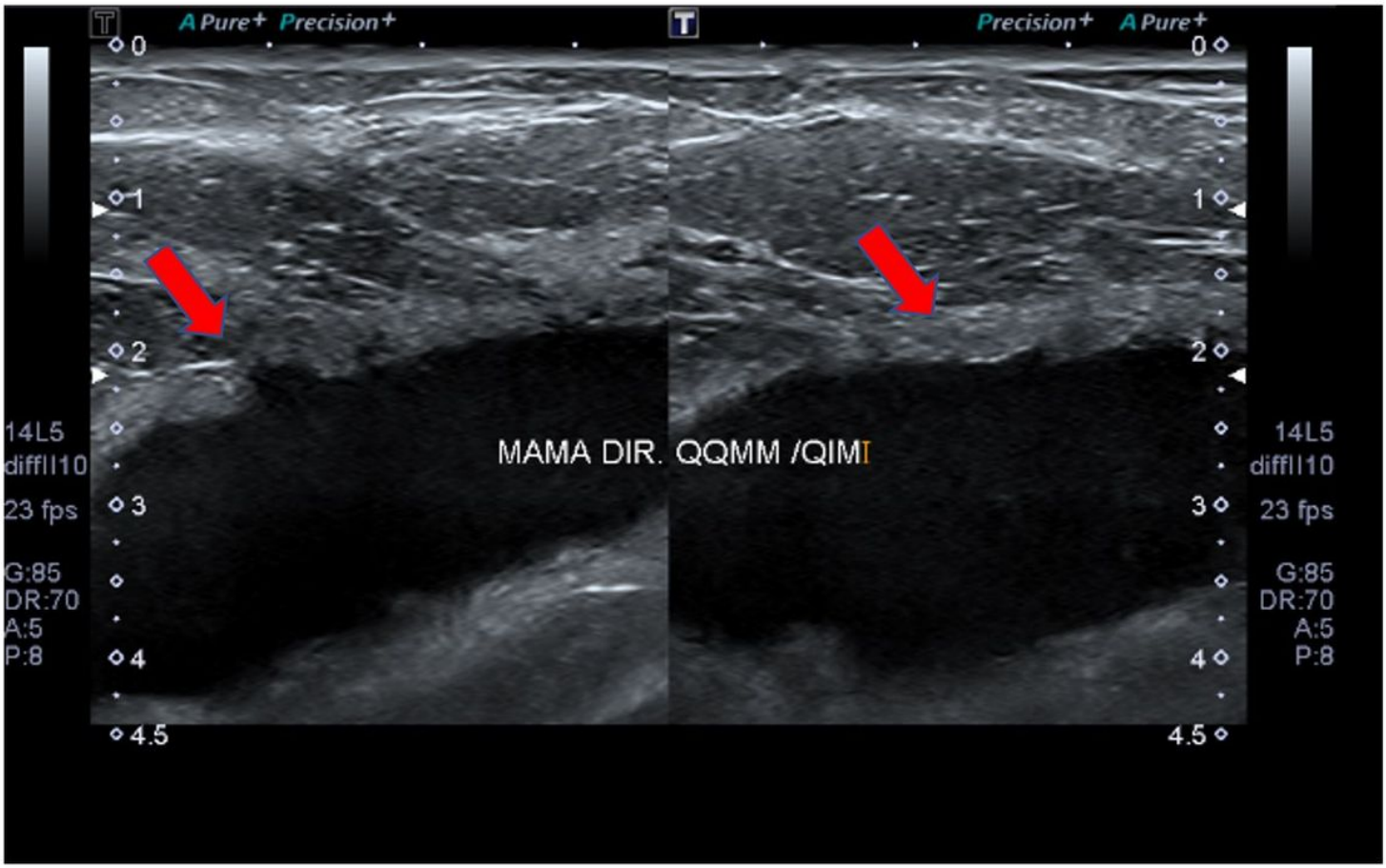

Figure 3

Breast ultrasound of the same patient showing the infiltrative irregular capsule associated with fluid collection.

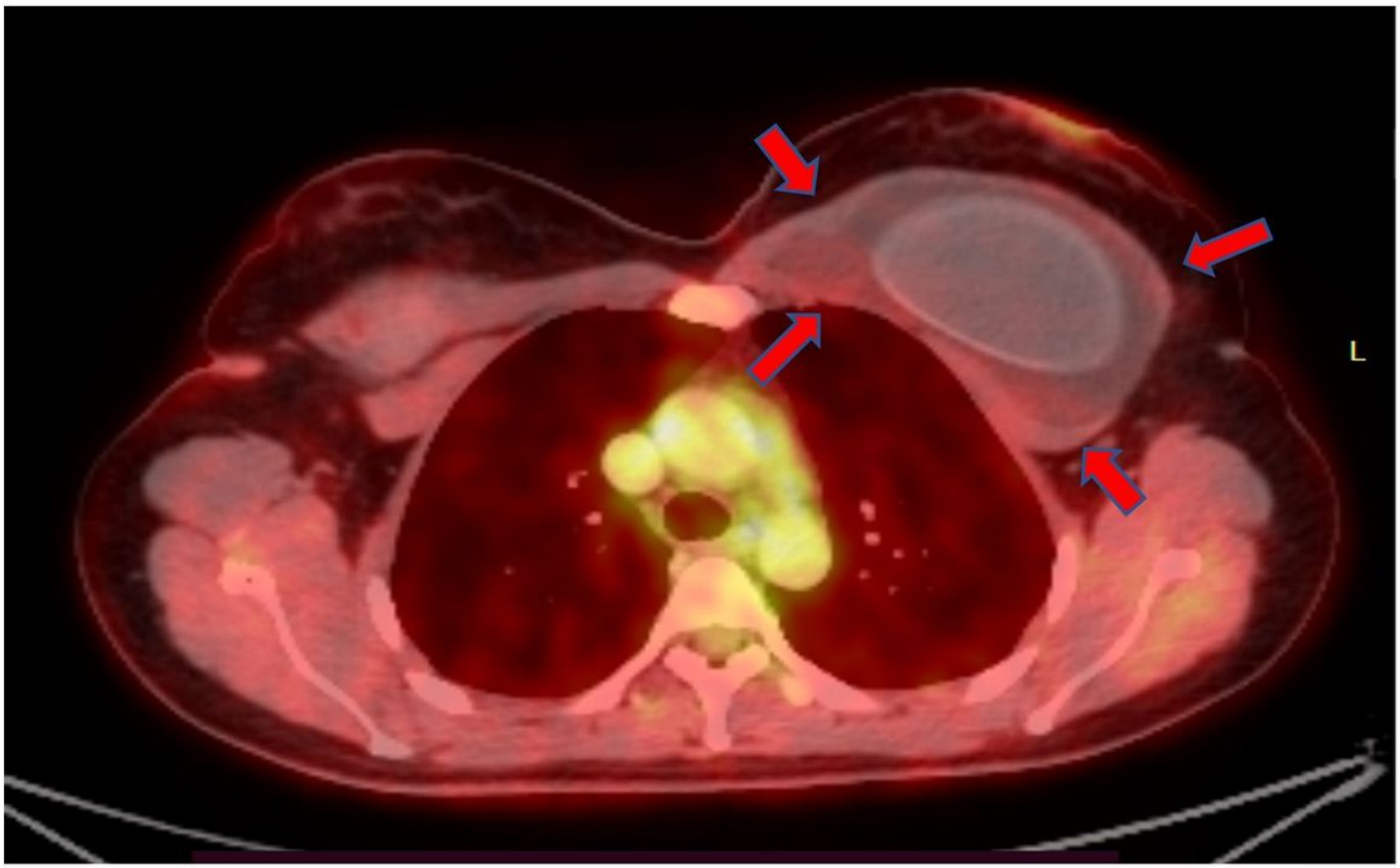

Figure 4

Pre-operatory PET-CT of BIA-ALCL. Intracapsular collection associated with masses in a 32-year-old woman with silicone implants for 6 years. Intracapsular fluid collection without suspicious uptake. It is possible to see intracapsular masses (red arrows), unspecific.

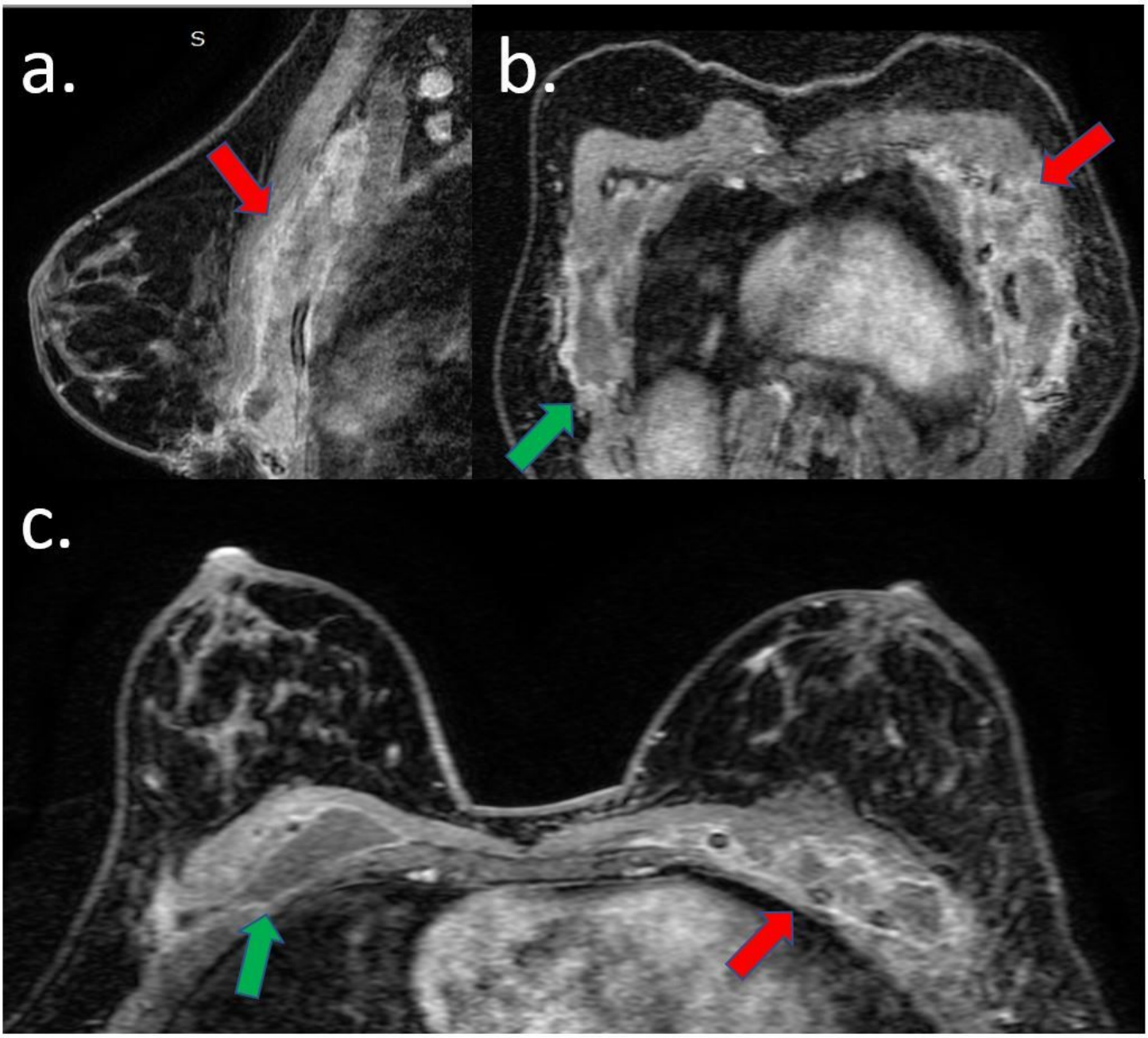

Figure 5

Ten days Post operatory scan of the same patient. Sagittal (a), coronal (b) and axial (c) post-contrast sequences. The right subpectoral residual capsule (green arrow) with SIGBIC, and the left with BIA-ALCL (red arrow) are illustrated. The capsule infiltrates the muscle, better shown in the sagittal image (a). A drain is also observed inside the surgical site.

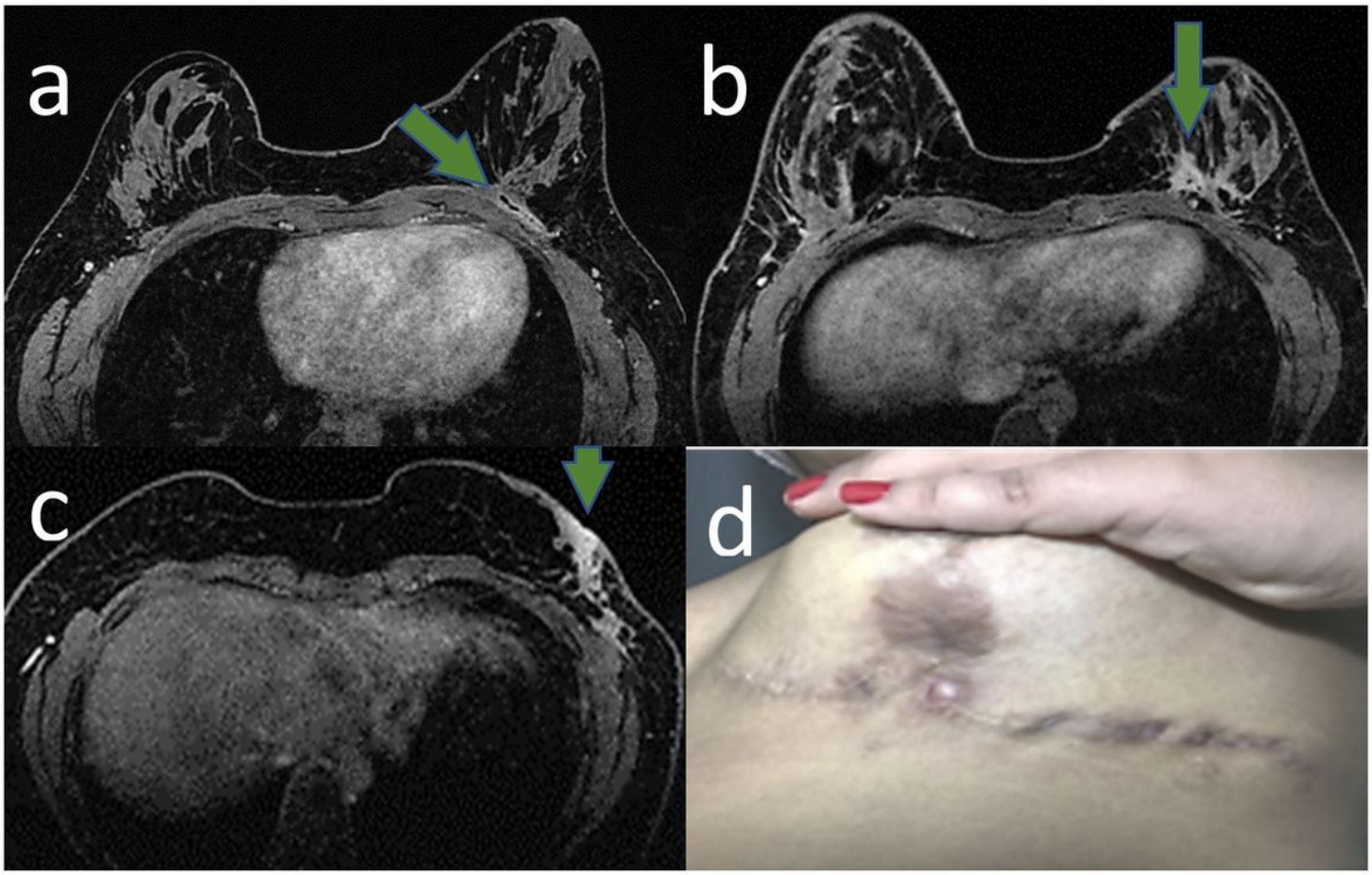

Figure 6

(a, b, c and d). Magnetic Resonance (MRI) of a residual diseased capsule in a 27-year-old woman with silicone implants for 7 years, 4 months after surgery. Axial post contrast sequences in different positions (a, b and c), Residual fibrous capsule in the sub glandular space. The residual fibrous capsule shows high contrast enhancement that extends to the subcutaneous and skin, in the site of the surgical scar. Photography of the skin in the site of the complication showing inflammatory signs.