



## IMAGING DIFFERENTIAL DIAGNOSIS OF PMMA AND LIQUID SILICONE

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**ABSTRACT**

**Introduction:** Imaging differential diagnosis of polymethylmethacrylate (PMMA) and liquid silicone is important for both reaching a diagnosis itself and differentiating lesions; thus, allowing a correct evaluation of the material used as filler.

**Objective:** The analysis of cases in which PMMA and silicone were used as fillers and the differentiation of both fillings by magnetic resonance imaging. **Methodology:** A retrospective study of the records of 12 patients who had undergone filling with either PMMA or silicone. Magnetic Resonance Imaging (MRI) was used as a form of diagnosis and/or treatment follow-up. **Conclusion:** MRI is considered the gold standard test for clinical diagnosis since liquid fillers are difficult to be identified in the physical exam. Its use allows the possible differentiation between procedures performed with PMMA and silicone.

**KEYWORDS :** PMMA, Liquid Silicone, Magnetic Resonance.

**INTRODUCTION**

The use of tissue fillers for aesthetic purposes has increased in recent years, especially for treating lipodystrophy in HIV patients. Polymethylmethacrylate (PMMA) and silicone are fillers used for that purpose,<sup>1</sup> being commonly used in cosmetic surgery due to their long-lasting effects and few complications.<sup>2</sup> The use and safety of PMMA in gluteal augmentation was demonstrated by Chacur et al. in a study with the largest sample size in the world: Gluteal Augmentation with Polymethylmethacrylate: a 10-year cohort study. The authors analyzed 2,770 cases of patients who underwent gluteal augmentation and their mild adverse events, which were found at a very low rate of 1.88%.<sup>3</sup>

Nevertheless, some complications may occur, such as inflammatory granuloma at the application site or elsewhere, even several years after the procedure.<sup>2</sup>

Imaging differential diagnosis is important for both reaching a diagnosis itself and differentiating lesions; thus, allowing a correct evaluation of the filling material.<sup>3</sup>

Several studies have investigated the increase in the use of this method of imaging, as MRI has been successfully employed to accurately identify foreign materials used as tissue fillers.<sup>4</sup> When it comes to silicone bags (prostheses),<sup>5</sup> MRI is an option to assess the integrity of the implant as its sensitivity and specificity are above 90% in the evaluation of the rupture of the prosthetic implant.

In a study comparing physical examination and MRI, the clinical examination was 30% sensitive and 88% specific, being proven the use of MRI as a complementary test in cases of prostheses and tissue

fillings.<sup>5</sup> MRI can assist surgeons in monitoring the patient, detecting any problems both in the period immediately after the procedure and in future follow-ups, in documenting the results of the procedure, and, mainly, in detecting the material of the implant so that they can use an appropriate medical conduct according to the identified material.

**METHODS**

This was a retrospective study which involved a series of cases of patients who had undergone gluteal augmentation with both PMMA and liquid silicone. These patients, who had a history of going through a filling procedure with silicone, went to the clinic either to have it done with PMMA or to try to solve a problem related to a previous filling implant.

This case report was submitted to Plataforma Brasil (an online system run by the Brazilian federal government), and approved by the Research Ethics Committee of the Universidade Veiga de Almeida (UVA/RJ) (CAAE protocol number 23252819.8.0000.5291).

**RESULTS**

Many patients present lipodystrophy (figure 1) of the gluteal region and seek treatment with tissue fillers in the area to make their body contour closer to its normal. In these cases, PMMA intramuscular implants have proven to be the safest choice with the least adverse effects among augmentation techniques.<sup>3</sup>

The use of PMMA for biostimulating subcutaneous tissue and normalizing body contour improves the results in severe cases of lipodystrophy<sup>6</sup> (figure 2).



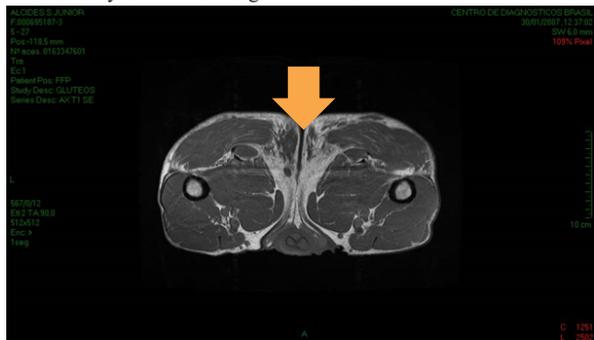
**Figure 1** - In the coronal T2 image with no suppression of the fat signal taken pre-procedure, an important retraction of the subcutaneous fat tissue (shown by the arrows) can be seen in the medial gluteal region close to the intergluteal cleft, which is compatible with lipodystrophy.



**Figure 2** - In the T1-weighted image in the sagittal plane, a thin layer of subcutaneous fat (shown by the arrow) between the gluteus maximus (shown by the circle), which has a reduced volume, and the skin can be observed; thus, being compatible with the clinical picture of lipodystrophy.

**Polymethylmethacrylate (PMMA)**

PMMA intramuscular implants result in vascularized tissue integrated with muscle which produces a signal similar to that of the adjacent muscles in MRI, as seen in T1 (figure 3). When used subcutaneously, the similarity to the muscle signal remains.



**Figure 3** - In the axial T1 image after the procedure, the presence of material with an isointense signal to the muscle on T1, bilaterally injected in the intergluteal cleft (shown by the arrow), can be seen, as well as an increase in the muscular volume of the gluteus maximus, which is compatible with PMMA.

**SILICONE**

Silicone, on the other hand, due to its high molecular weight and oily characteristics, shows a hyperintense signal in T2 and a suppression of the fat signal both intramuscularly and subcutaneously. Silicone can be seen as small rounded bodies with a marked tendency to fall down due to gravity (figure 4). This radiological manifestation demonstrates a real and devastating consequence of the use of liquid silicone in implants.



**Figure 4** - In the sagittal T2 image with suppression of the fat signal, filling of the subcutaneous cellular tissue and the gluteus maximus muscle with hyperintense material can be seen, which is compatible with silicone. The arrow points to the material with an inverted teardrop-like shape in the muscle.

Our team is a reference in PMMA treatments for different purposes, either aesthetic or repairing<sup>37-9</sup>. At times, patients come to the clinic with problems related to the use of fillings. For a correct evaluation and management of these patients' cases, to know the material used in their implants is absolutely essential. Many of the cases are reported as PMMA by the patient and, unfortunately, by the radiologist. However, biopsy shows the presence of silicone – an illegal substance related to the use of bad techniques being performed mainly by non-doctors.

Magnetic resonance imaging, with the technology currently available, has all the conditions to provide the diagnosis of the type of material, location, and volume used. MRI is considered the gold standard test for correctly evaluating tissue filling. The method enables the identification of subcutaneous abscesses and granulomas, demonstrating that the complementary test is also part of the diagnosis, showing its extremely important role in the diagnosis, and, most importantly, avoiding invasive examinations. The use of both clinical examinations and imaging techniques, particularly MRI, allows for a correct diagnosis<sup>5</sup> of the material and its anatomical characteristics so that appropriate monitoring and therapies are used.

Finally, in cases of judicialization, MRI must provide the correct diagnosis of the implant material, avoiding the need for a tissue biopsy or, if the latter turns out to be necessary, using it to corroborate the MRI result. The advent, from that moment, of the systematization and correct diagnosis given by the radiologist in the MRI could even avoid inappropriate scientific publications<sup>10</sup> and the dissemination of controversial information by the lay press concerning filling materials and their results.

In this way, this study will assist in the resolution of a pertinent and current problem, which is the differentiation between PMMA and liquid silicone, an issue that is still critical and lacking relevant scientific bases among professionals of the medical field.

**CONCLUSION**

The present study allows radiologists to make a differential diagnosis between filling materials. The technology available in the MRI along with the accurate interpretation of the radiologist are essential tools for the use of adequate therapeutic conduct and monitoring of patients with liquid implants.

In this study, we demonstrated that it is possible to differentiate procedures performed with PMMA from the ones with silicone.

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