

# Polymethyl-Methacrylate Hypersensitivity with Associated Folliculitis Decalvans After Cranioplasty: A Case Report

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**ABSTRACT:** Polymethyl methacrylate (PMMA) has been routinely used as bone cement, being well tolerated by most patients. The authors report the case of a 42-year-old patient that underwent cranioplasty with PMMA prosthesis, that reported progressive and persistent skin symptoms starting 45 days after surgery. Dermatologic evaluation revealed an extensive reddish scar plaque, associated with polytrichia and alopecia, located only in the left parieto-occipital region, above the PMMA cranioplasty. Scalp biopsy and bone cement specific patch test revealed both folliculitis decalvans (FD) and weak PMMA hypersensitivity. The patient was managed with dapsone for FD, and graft removal was not necessary. This is the second case of post-cranioplasty PMMA hypersensitivity, and the first report of potential contact dermatitis induced FD.

**KEYWORDS:** Bone cement, polymethyl methacrylate, cranioplasty, allergic reaction, delayed hypersensitivity.

## Introduction

Polymethyl methacrylate (PMMA) is a synthetic resin that constitutes a large group of polymers with acrylic acid as their base.

Since its introduction, in 1940, it has been routinely used as bone cement, due to its interesting and favorable properties such as radiolucency, stable elasticity, consistency and flexible intraoperative modeling.

Additionally, it is well accepted by the majority of patients, due to its low immunogenicity and intrinsic toxicity.

As it generates little inflammatory activation, PMMA hypersensitivity cases are rare.

The symptoms may range from mild skin lesions to anaphylactic shock and death [1].

However, allergic reactions, especially mild ones, are not always easily recognizable and can disguise themselves as various dermatologic pathologies, such as folliculitis decalvans (FD) [2].

PMMA allergy after cranioplasty was reported only once before [3], and here we present the second case, that was also associated with biopsy confirmed FD.

## Case Report

A 42-year-old female patient who had undergone a left decompressive craniotomy due to an intraparenchymal hematoma, secondary to a ruptured left middle cerebral artery aneurysm, underwent cranioplasty with implantation of a PMMA prosthesis.

During neurosurgical follow-up, the patient reported that, approximately 45 days after surgery, the operated region became “more sensitive and painful”, in addition to persistent focal hyperemia.

On examination, the patient presented hyperemia and meliceric crusts on the left parieto-occipital region of the scalp, with no other phlogistic or infectious signs.

The patient was referred for dermatological evaluation, which took place almost 2 years later.

Meanwhile, the patient was treated for seborrheic dermatitis with ketoconazole shampoo, in addition to using various topical products on her own, with inconsistent results.

Dermatological evaluation revealed an extensive reddish scar plaque, associated with polytrichia and alopecia, located only in the left parieto-occipital region, above the PMMA cranioplasty (Figure 1).



**Figure 1.** This image, taken during dermatological evaluation, shows an extensive reddish scar plaque, associated with polytrichia and alopecia, located only in the left parieto-occipital region, above the PMMA cranioplasty. The letters (A) and (P) correspond to anterior and posterior orientation, respectively.

The team requested a scalp biopsy, which showed a pattern compatible with folliculitis decalvans, but unable to completely rule out contact dermatitis (dermal and perifollicular lymphocytic infiltrate, accompanied by neutrophils and eosinophils, with decreased skin appendages).

Treatment with dapsone 50mg per day was started and had an excellent response.

In addition, due to the clear temporal and anatomical correlations between the PMMA prosthesis and folliculitis decalvans, a patch test for bone cement components was performed, which exhibited a weak reaction to PMMA.

After the diagnosis of PMMA hypersensitivity, graft removal was considered.

However, it was disregarded due to the good control of symptoms with pharmacological treatment, the weak allergic reaction demonstrated in the patch test and the reluctance of the patient and her family members to undergo a new surgery.

Currently, the patient is under dermatological follow-up and maintains a good response to dapsone, with only mild hyperemia in the affected region.

The authors certify that they have obtained all appropriate patient consent forms before the beginning of the article's production.

## Discussion

Although it is believed that PMMA has very little allergenic capacity, multiple studies, both *in vitro* and *in vivo*, have shown specific acquired immune reactions to the compound [4].

Furthermore, PMMA hypersensitivity has been infrequently reported in orthopedic implants, and there is one case report of such phenomenon in the context of cranioplasty [3].

In most cases, hypersensitivity presents as contact dermatitis, with few patients experiencing systemic symptoms, and they generally appear 24-48h after exposure to the material [1].

Interestingly, both cases of post-cranioplasty PMMA hypersensitivity had a delayed onset, with a latency period of more than 37 days [3].

This finding, however, is most likely coincidental rather than a true correlation between graft site and time to symptom onset.

There are no reports linking allergic reactions to FD, thus leaving our case in a limbo. FD is a primary neutrophilic cicatricial alopecia, characterized by areas of follicular pustules, lack of ostia, diffuse and perifollicular erythema, follicular tufting, and, oftentimes, hemorrhagic crusts and erosions [5].

It appears that *Staphylococcus aureus* and host immune response difficulty play an important role in its development, however, the triggering factors are not well understood.

FD has been occasionally reported after scalp injury, which would explain its occurrence in our patient, but its pathogenetic significance is not clear [5].

Contact dermatitis, on the other hand, can sometimes mimic the clinical presentation of FD, but in these cases, biopsy results show clear signs of the former and none of FD, in contrast to the findings in our patient [2].

Thus, although both FD and PMMA hypersensitivity are simultaneous in our case, no cause-and-effect can be inferred.

Our case represents the second report of post-cranioplasty PMMA hypersensitivity, and it reinforces the necessity of considering this differential diagnosis, even in late onset and unusual presentations.

Pre-operative screening, however, is not recommended, given the rarity of this condition (prevalence of between 0.6 and 1.6% in the general population) [6].

Additionally, regarding FD triggering factors, this case might represent another scalp injury triggered FD, consolidating this entity, or the very first reported case of FD triggered by contact dermatitis.

## List of abbreviations

Polymethyl methacrylate (PMMA);  
folliculitis decalvans (FD).

## Conflict of interest

None to declare.

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