

# Inflammatory foreign body reaction caused by resorbable materials used for orbital fractures repair

## A case report

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### Abstract

**Rationale:** Resorbable materials have been recommended for orbital fractures repair. Many literatures reported the advantages of resorbable materials in clinical applications, but few reports about complications.

**Patient concerns:** In this study, we encountered a 14-year-old boy treated for the orbital fracture by using resorbable plate, in whom inflammatory foreign body reaction was detected. In addition, this patient had repeated history of skin allergy and upper respiratory tract infection.

**Diagnoses:** Intraoperative observation showed that the resorbable material near the orbital rim was covered by granulation and inflammatory tissues, without purulent secretions. The histological examination revealed inflammatory foreign body reaction to the resorbable plate.

**Interventions:** Debridement was taken to remove the mass on the left lower eyelid. At the outpatient examination, a small amount of granulation tissue was found at the incision. Then, secondary surgery for exploration and removal of the resorbable material was carried, 9 months after the first surgery.

**Outcomes:** One month after the surgery, the skin retraction, ectropion, and edema gradually improved.

**Lessons:** Inadequate degradation of resorbable materials and patient's medical history of allergies may cause an inflammatory foreign body reaction. Therefore, it is prudent to choose resorbable materials for patients.

**Abbreviations:** CT = computed tomography, PLGA = poly(L-lactide-co-glycolide).

**Keywords:** genetic proclivity for hypersensitivity, inflammatory foreign body reaction, orbital fracture, resorbable implants

## 1. Introduction

Resorbable materials are widely used for rigid internal fixation during maxillofacial surgery.<sup>[1,2]</sup> There are many advantages such as availability, easy to shape, smooth surface and smooth edges, and absorbability, but few complications have been reported.<sup>[3–5]</sup> It was found during the clinical use that the resorbable materials, although with good biocompatibility, may

cause foreign body reaction.<sup>[6]</sup> We describe a case of inflammatory foreign body reaction in a 14-year-old boy treated for the orbital fracture by using resorbable plate.

## 2. Case presentation

A 14-year-old boy was involved in a car accident 2 years ago, which caused orbital floor fracture and 3 mm enophthalmos of the left eye. His medical history indicated skin allergies in February, April, and August, and upper respiratory tract infection every year since the birth. To improve the enophthalmos of the left eye, he was treated for orbital floor fracture using a 0.5-mm thick implant made of a resorbable material (PolyMax RAPID, L099493). One gram of intravenous cefradine was given 30 minutes before the surgery. One month after operation, the patient suffered from upper respiratory tract infection again, with lower eyelid swelling of the left eye, but the skin was not sore or inflamed. After the upper respiratory tract infection was cured, the lower eyelid swelling did not reduce. The patient visited our outpatient clinic 4 months later complaining of a palpable mass, measuring 5 × 3 × 3 mm, on the left lower eyelid (Fig. 1A). The mass was painless, visible, and soft. The patient was treated with erythromycin eye ointment, which was ineffective. After a month, the patient underwent debridement of the mass, which was found to be filled with granulation tissues, without purulent secretions.

When the patient was reviewed, a small amount of granulation tissues had grown from the incision (Fig. 1B). On examination, the patient was afebrile, and other vital signs were normal. Best-corrected visual acuity was 1.0 in the right eye and 0.8 in the left

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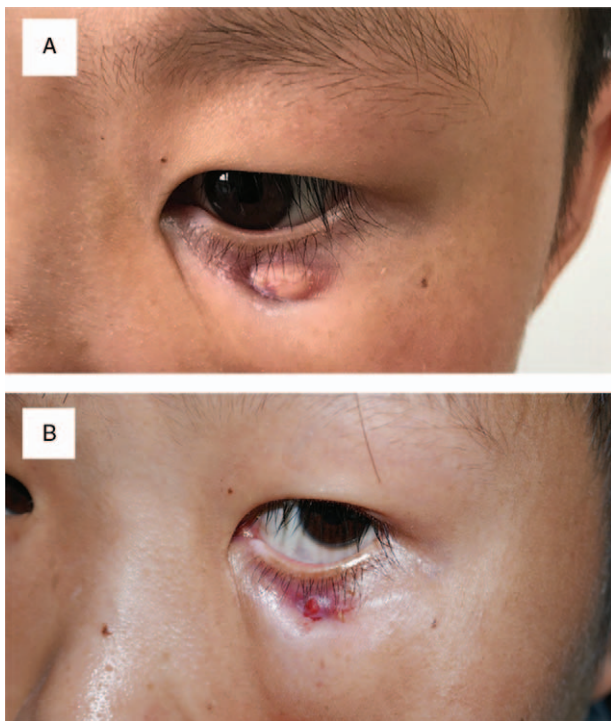
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**Figure 1.** (A) Five months postoperation, a palpable mass appeared on the left lower eyelid. The mass was painless, visible, and soft. Note the significant skin retraction and mild ectropion on the left lower eyelid. (B) A small amount of granulation tissues grew from the incision, after debridement.

eye, consistent with the previous postoperative results. Intraocular pressures in both eyes were normal. Skin retraction occurred at the incision of the mass, with mild ectropion. There was no obvious abnormality in the right eye. Auxiliary examination of orbital computed tomography (CT) showed no abnormalities in

the eyeball and orbit, but bilateral maxillary sinusitis. The diagnosis was inflammatory foreign body reaction.

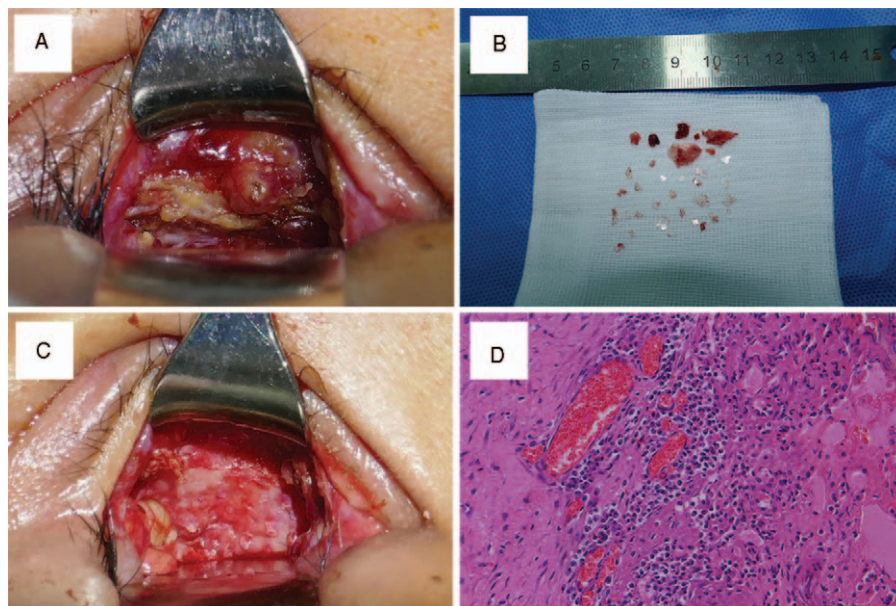
The patient had secondary surgery for exploration and removal of the resorbable material, 9 months after the first surgery. Intraoperative observation showed that the resorbable material near the orbital rim was covered by granulation and inflammatory tissues, without purulent secretions (Fig. 2A). The absorbable plate had degraded, thinned, and broken into small fragments (Fig. 2B). The plate and granulation tissues were removed, and the original fracture area was found to be extensively covered by fibrous tissues (Fig. 2C). A fistula had formed at the intersection of the skin and the resorbable plate on the lower eyelid. We removed all the granulation tissues in the fistula and closed the eyelid incision with 5-0 silk suture. The histological examination revealed fine fragments of resorbable plate with inflammatory cells infiltration, granulation tissues formation, and fibrous tissues hyperplasia (Fig. 2D). One month after the surgery, the skin retraction, ectropion, and edema gradually improved (Fig. 3A).

### 3. Patient consent

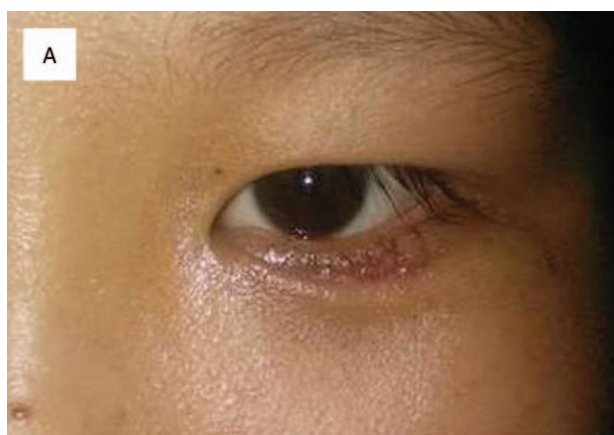
The patient provided written consent for the use of his images.

### 4. Discussion

Resorbable materials have become available for many years. The ideal resorbable materials are sufficiently rigid and biocompatible, which can provide optimal stability for bone healing and are completely eliminated in a predictable time frame.<sup>[7]</sup> Because of these attractive advantages, resorbable materials have been recommended for orbital fracture repair.<sup>[1,2]</sup> However, resorbable materials have not always performed well for orbital reconstruction.<sup>[8]</sup> One problem is that the materials cannot be used in larger fracture defects, and another important issue is that the materials may cause inflammatory foreign body reactions.



**Figure 2.** (A) The resorbable material near the orbital rim was covered by granulation and inflammatory tissues, without purulent secretions. (B) The RAPID absorbable plate was degraded, thinned, and broken into small fragments, 9 months after the surgery. (C) The original fracture area was covered by fibrous tissues. (D) Fine foreign body fragments, granulation tissues formation and fibrous tissues hyperplasia were seen (H&E,  $\times 200$ ). H&E=hematoxylin and eosin.



**Figure 3.** (A) Postoperative clinical review showed that the skin retraction, ectropion, and edema had significantly improved.

There are many factors affecting the occurrence of inflammatory foreign body reactions, such as the chemical composition, size, shape, surface texture of resorbable materials and the blood supply, temperature, and hypersensitivity of recipient environment.<sup>[9]</sup> Among these, the most studied is the chemical composition. Polyglycolic acid and polylactic acid are the most common polymers used to make absorbable plates and screws.<sup>[10]</sup> Plate's degradation performances and rates are determined by the mixing ratio of lactic acid isomers or glycolic acid. Animal experiments have shown that when the absorbable plates cannot be completely degraded or the degradation product exceeds the maximum clearance of the animal, the residual materials and the degradation products may cause inflammatory foreign body reaction.<sup>[9]</sup> When resorbable materials are used in other parts of the human body, the incidence of postoperative inflammatory reaction is about 4%.<sup>[6]</sup> Microscopy showed numerous birefringent polymer particles, and granulation tissues formed by macrophages, multinucleated foreign bodies, and fibroblasts.<sup>[6]</sup> The plate used in our surgery is manufactured from 85:15 poly(L-lactide-co-glycolide, PLGA). Previously published data by Jeon et al reported that PLGA plates caused delayed inflammatory foreign body reactions when used for maxillofacial fracture repair.<sup>[11]</sup>

In addition, this patient had repeated history of skin allergy and upper respiratory tract infection. A CT scan showed bilateral

maxillary sinusitis, indicating genetic proclivity for hypersensitivity. The immune response plays a key role in the pathogenesis of allergic diseases. If the physiological function and self-regulation are weak, the reactivity to external factors is enhanced. In this patient, the interval from surgical fixation to the onset of inflammatory foreign body reaction was 1 month, which was earlier than the 9 to 23 months reported in a previous study.<sup>[11]</sup> This might be related to the patient's proclivity for hypersensitivity. The more sensitive the body, the more intense is the reaction to a foreign body. So, clinical symptoms will appear relatively early in such cases. The absorbable plates were degraded, thinned, and broken into small fragments of 1 to 2 mm, 9 months after the surgical repair of orbital fractures.

Once the patient has a severe foreign body reaction, a second operation is needed to remove the remnant materials and granulation tissues. It is necessary to obtain detailed medical history before orbital repair surgery. For patients susceptible to allergies, the resorbable material should be chosen with great care. Moreover, longer and closer follow-ups should be conducted by surgeons.

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