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CASE REPORT



## Pneumosinus dilatans following dermal filler injections

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### ABSTRACT

When an adverse event occurs after a dermal filler treatment, simple ultrasound can be of help for diagnosis. But sometimes a more sophisticated imaging technique as MRI is needed to find the true reason for a complication. As in the case of pneumosinus dilatans after injection of a dermal filler, we present. The relation of this rare disorder and filler injection is discussed.

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### Introduction

A wide variety of dermal fillers is available for clinical use (1). Most fillers are biodegradable and subsequently resorbed by the tissue in several months to years. Non-resorbable fillers have a much higher complication rate and are therefore banned in many countries. In others, however, their use is still permitted. Given the permanent nature of these substances, new cases of filler complications can occur many years after treatment (2).

Complications are either inflammatory or non-inflammatory. The latter ones comprise nodules as a result of accumulation of filler material (3). Muscular movement may push fillers from deep facial planes to a more superficial one, either along existing anatomical connections or through puncture holes created during placement of the filling substance. Other non-inflammatory nodules after filler injections are caused by treatment errors, e.g. high G-prime hyaluronic acid beneath thin skin.

Many times, ultrasound imaging is sufficient to elucidate the pathogenesis (4). Recently, we were confronted with a case that needed more extensive imaging, which resulted in a previously not reported filler complication diagnosis.

### Case report

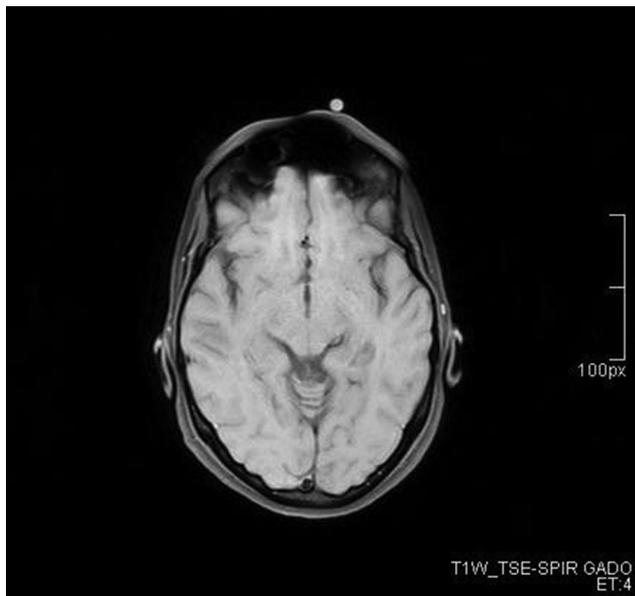
A 42-year-old Caucasian woman was referred to the complication consultation hours at the Department of Dermatology at the Erasmus University Medical Center (Rotterdam, the Netherlands). She presented with a non-growing, non-painful 1,5 × 2,5 cm circumscribed thickening on the forehead just above the left eyebrow. This was barely visible, but clearly palpable as a stone-hard nodule. The nodule was first noticed three years earlier after a vacation in Thailand. Four years before that (in 2012), the patient had an esthetic procedure with (what she referred to as) permanent fillers in a Dutch clinic. She

had no history of excessive reaction after the filler treatment, paranasal sinus infection, a family history of skeletal malformation or any trauma in the area after the treatment. Although the thickening had not changed in the last three years, it became increasingly disturbing for the patient. An ultrasound examination three years earlier reported subcutaneous foreign material in this location. The plastic surgeon consulted at that moment advised a conservative approach. During her consult at our department ultrasound imaging showed a hyperechoic protuberance that continued seamlessly into the adjacent bone. MRI showed a prominent pneumatized left paranasal frontal sinus with normal cutis and subcutis (Figures 1 and 2), consistent with the diagnosis pneumosinus dilatans.

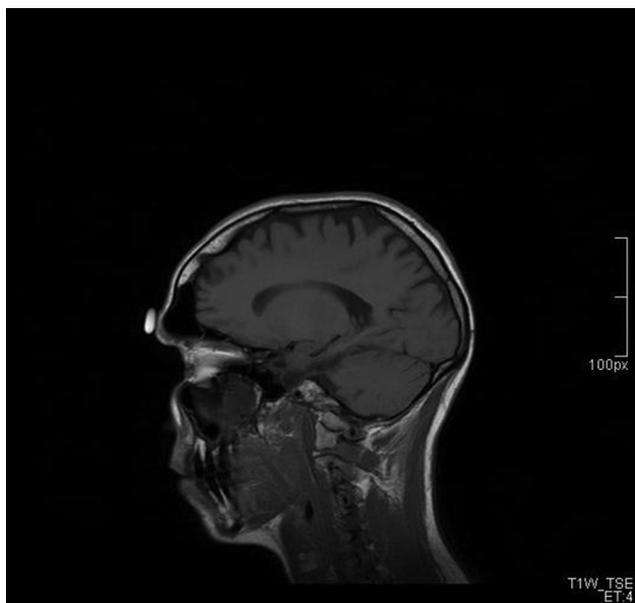
### Discussion

Pneumosinus dilatans is a rare condition, primarily located on the forehead presenting with a growing and frequently painful mass. The most likely pathogenesis is that of a one-way ball valve mechanism. Theory suggests that the expansion of the sinus is caused by a progressive increase of pressure inside the sinus, caused by one-way valve obstruction at a nasal ostium (5). The sinus may be preexisting (congenital) or acquired after bone pathology with diffuse bone remodeling. This can be caused by trauma, surgery or infection.

In our hospital, no remnants of permanent fillers were seen in sonography or with MRI in this patient. Yet, three years earlier an ultrasound image consistent with exogenous material was apparently observed. This raises the question about the product used. In 2006 Dutch authorities advised against the use of permanent fillers. In 2012 manufacturers did not supply these substances anymore. We feel that contrary to her recollection, a nonpermanent



**Figure 1.** MRI Transverse view. Swelling left supraorbital marked with a vitamin capsule.



**Figure 2.** MRI Sagittal view. Pneumatized frontal sinus left. Normal aspect of cutaneous and subcutaneous tissue.

resorbable filler (e.g. hyaluronic acid or calcium hydroxyapatite) was probably used.

There are no indications that a dermal filler itself can cause bone remodeling. Although some permanent fillers have shown calcification around the fillers as late complication. Bacterial inoculation during a filler injection can cause bone pathology as osteomyelitis, which can lead to weakening of the bone in the affected area. Bacteria related gas-formation has also been proposed. In particular, *S. Aureus* is implicated because of its ability to develop pneumocele in lung infections (5). One paper reports the inadvertent penetration of a 22 G canula through temporal bone, leaving filler intracranial. Subsequent experimentations showed that the minimum force required for penetration of the bone in this area with a 15 mm 18 G canula (diameter 1.27 mm) was 40 N. Simple mathematics learn that with a 27 G needle (diameter 0.41 mm) only 1/10 of this force is needed (6).

Although the patient recalled no specific painful or extensive downtime, penetration of the outer cortex of the bone might well have been the case with her. Also, an infection might have occurred. Both could have led to the ball-valve mentioned above.

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