

# Delayed intraventricular pneumocephalus following shunting for normal pressure hydrocephalus

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## Introduction

Pneumocephalus is the presence of gas in the cranial cavity. It is usually seen in the setting of trauma or cranial surgery. Very rarely, it is reported as a delayed complication of ventriculoperitoneal (VP) shunt placement for hydrocephalus secondary to trauma, tumor or aqueduct stenosis.<sup>1</sup> Herein we describe a case of pneumocephalus presenting months after placement of a shunt for normal pressure hydrocephalus (NPH).

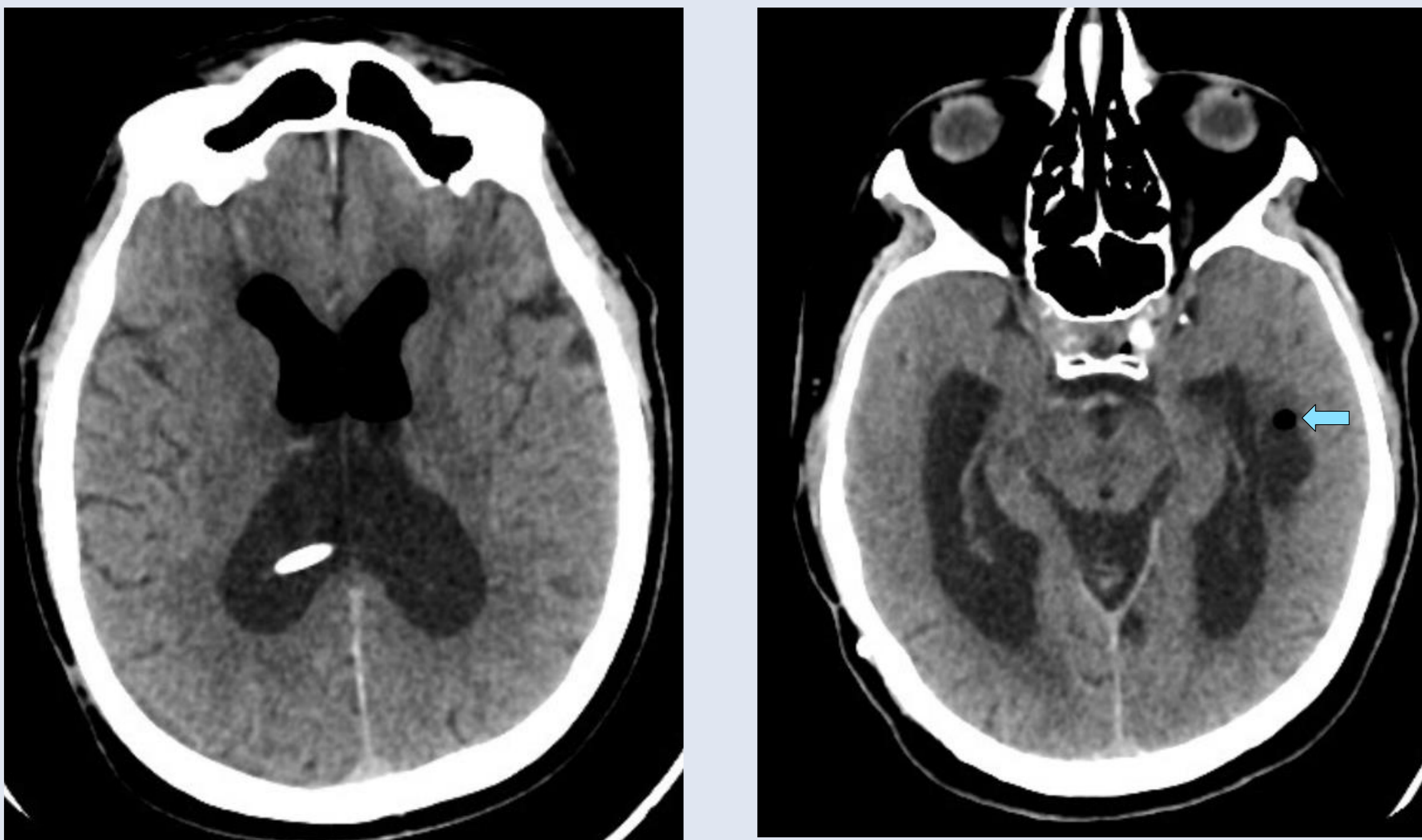


Fig. 1 and 2: CT in the emergency department showing massive intraventricular pneumocephalus and a porencephalic cyst in the left temporal lobe (blue arrow).

## Discussion

The siphon effects of shunts can cause an excessively negative intracranial pressure. In combination with skull base defects, this can lead to the ingress of air through the defect (ball valve mechanism), causing pneumocephalus. The skull base defect mostly occurs as a result of erosion secondary to long-standing raised intracranial pressure due to hydrocephalus or a tumor.<sup>2</sup> In this case, the skull base defect was probably congenital, since the patient had a normal pressure hydrocephalus.

Pneumocephalus following VP shunting for NPH has only been described once as an early-onset (day after surgery) complication caused by air entry through the opening made in the dura to place the ventricular catheter.<sup>3</sup> To the best of our knowledge, the current case report is the first to describe delayed pneumocephalus after VP shunting for NPH.

## Conclusion

**This is the first case report of delayed pneumocephalus following ventriculoperitoneal shunt insertion for normal pressure hydrocephalus. The combination of an occult, presumed congenital, skull base defect and the insertion of a shunt resulted in intraventricular and intraparenchymal pneumocephalus.**

## Case report

Following the diagnosis of NPH, we placed a pressure-regulated VP shunt in our 81-year old patient, resulting in an improvement of his symptoms. 10 months later, he presented with a subacute deterioration of his gait. CT scan showed major intraventricular pneumocephalus (Fig. 1) as well as a left-sided temporal porencephalic cyst with a small, bony defect in the left petrous bone (Fig. 2). A temporal skull base plasty using a pericranial flap was performed with postoperative gradual improvement of his symptoms. A CT scan 2 months later showed a complete resolution of the pneumocephalus and porencephalic cyst (Fig. 4 and 5).

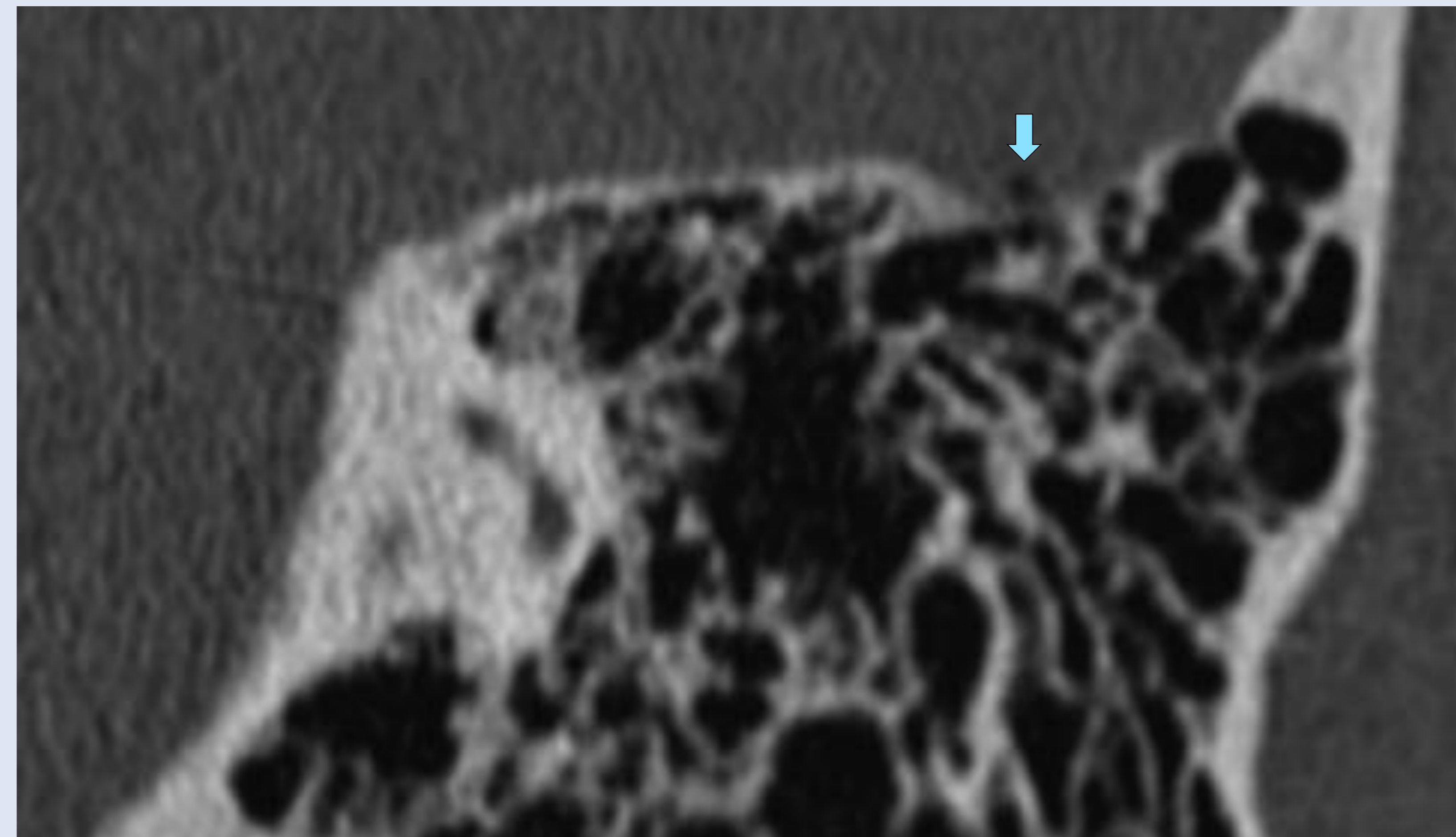


Fig. 3: High resolution skull base CT showing an intraparenchymal air bubble, associated with a small underlying bony defect in the posterior part of the left petrous bone (blue arrow).

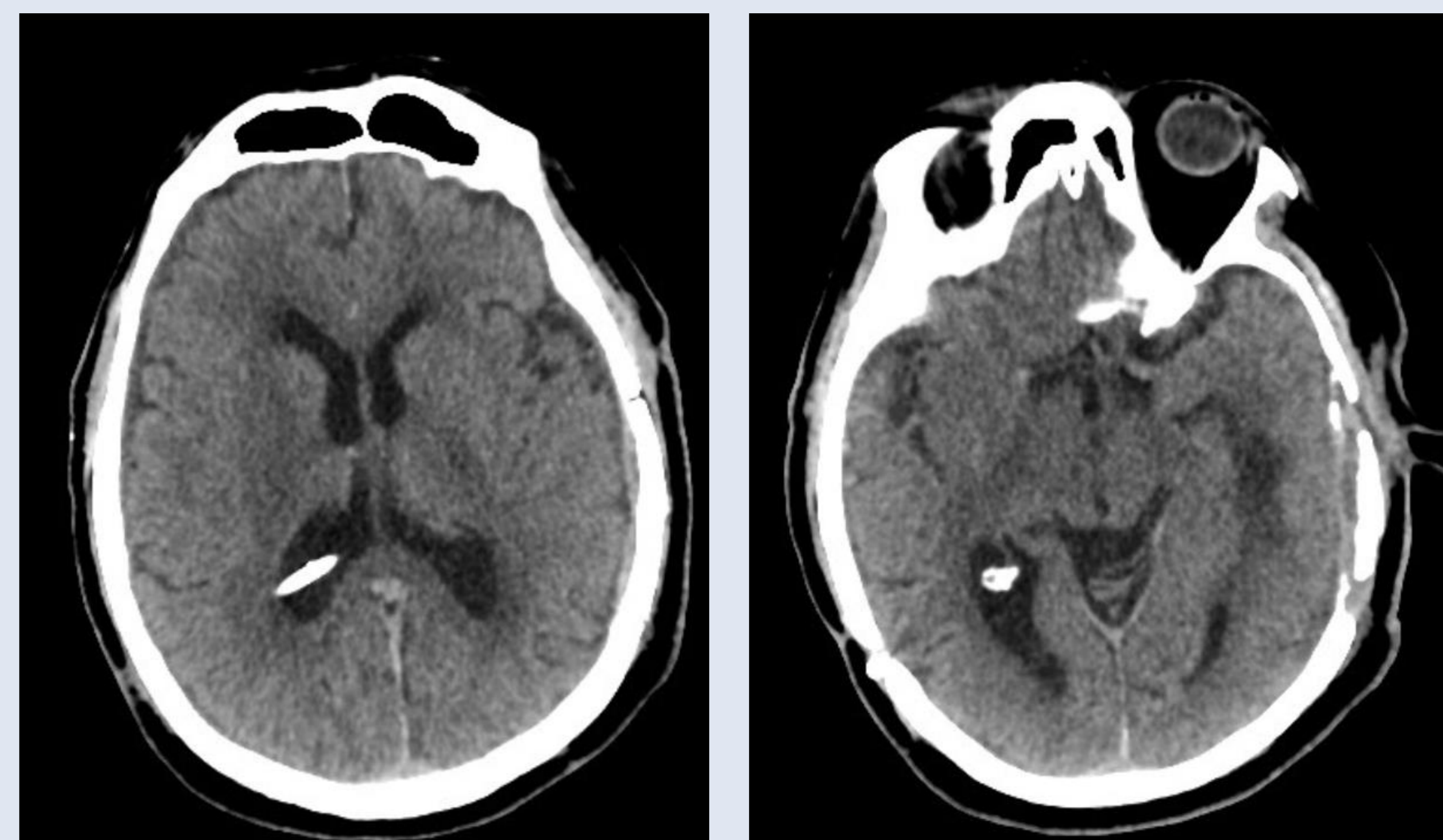


Fig. 4 and 5: CT-scan 2 months after temporal skull base plasty with a pericranial flap showing a complete resolution of the pneumocephalus.

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3) Barada W, Najjar M, Beydoun A. Early onset tension pneumocephalus following ventriculoperitoneal shunt insertion for NPH. Clinical neurology and neurosurgery, 2009.