

## TENSION PNEUMOCEPHALUS AFTER SURGICAL EVACUATION OF CHRONIC SUBDURAL HEMATOMA: CASE REPORT AND PATHOPHYSIOLOGICAL MECHANISM

### *Neumoencéfalo a tensión después de evacuación quirúrgica de hematoma subdural crónico: Reporte de caso y mecanismo fisiopatológico*

FERNANDO CELI<sup>1a</sup>, GIANCARLO SAAL<sup>2b</sup>

<sup>1</sup>Department of Neurosurgery of the Jose Casimiro Ulloa Emergency Hospital, Lima, Peru.

<sup>2</sup>Department of Neurosurgery, Guillermo Almenara National Hospital, Lima, Perú.

<sup>a</sup> Resident of Neurosurgery, <sup>b</sup> Neurosurgeon

#### ABSTRACT

**Introduction:** Pneumocephalus is a frequent complication following neurosurgical procedures. The diagnosis is based on tomographic findings and the clinical evolution of the patient. Therefore, we detail the physiopathological mechanisms that trigger this complication.

**Clinical Case:** We present the clinical case of a 85-year-old man who underwent a keyhole craniotomy and subdural drainage placement due to the diagnosis of a chronic subdural hematoma (CSDH) and subsequently developed sudden tension pneumocephalus which triggered the death of the patient due to intracranial hypertension.

**Conclusion:** Tension pneumocephalus is a life-threatening complication that must be suspected early and must be treated as an emergency.

**Keywords:** Hematoma, Subdural, Chronic, Pneumocephalus, Drainage, Craniotomy (Source: MeSH NLM)

#### RESUMEN

**Introducción:** El neumoencéfalo es una complicación frecuente después de procedimientos neuroquirúrgicos. Su diagnóstico se basa en hallazgos tomográficos y en la evolución clínica del paciente. Por ello, detallamos los mecanismos fisiopatológicos que conllevan a esta complicación.

**Caso clínico:** Presentamos el caso clínico de un paciente de 85 años quien se sometió a una craneotomía keyhole más colocación de un dren subdural por diagnóstico de hematoma subdural crónico (HSDC) y posteriormente desarrolló neumoencéfalo a tensión de manera súbita que desencadenó en su muerte por hipertensión endocraneal.

**Conclusión:** El neumoencéfalo a tensión es una complicación que debe sospecharse tempranamente y debe ser tratada como una emergencia ya que pone en riesgo la vida de la persona.

**Palabras Clave:** Hematoma Subdural Crónico, Neumoencéfalo, Drenaje, Craneotomía, (Fuente: DeCS Bireme)

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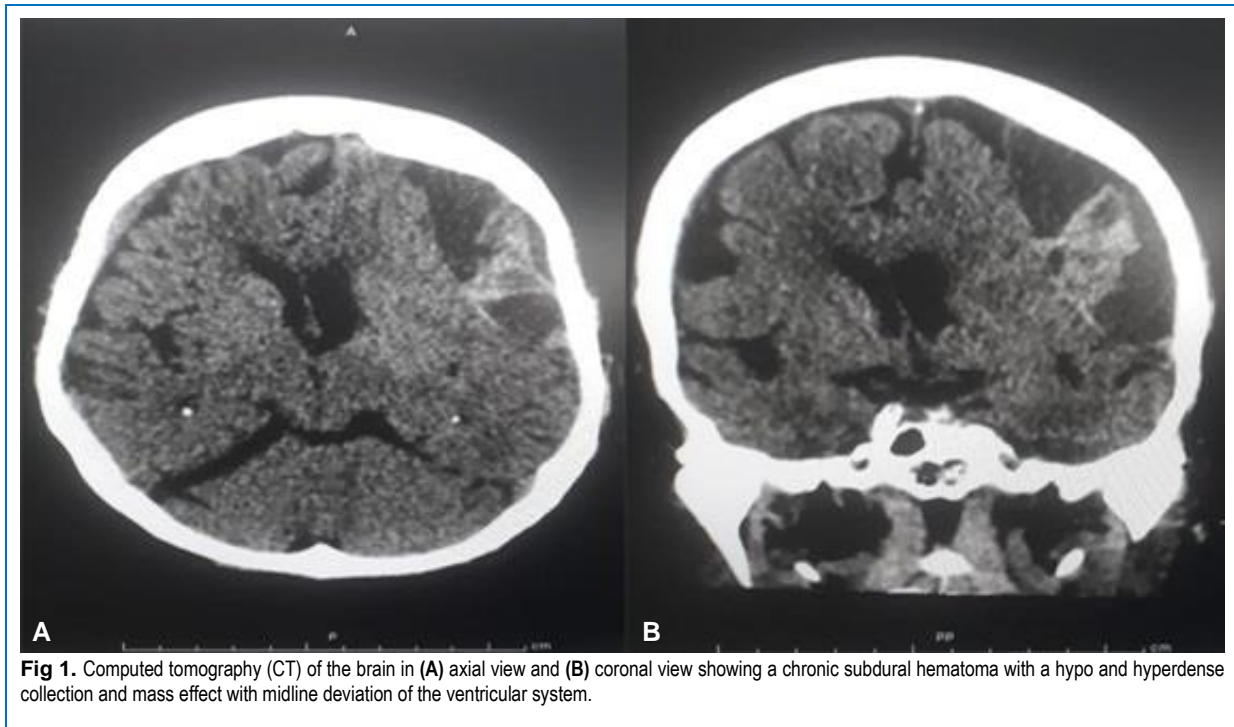
**P**neumocephalus is a very common but underestimated complication in neurosurgical procedures.<sup>1-3</sup> The air that enters through the bone defect performed during surgery,

generates changes in intracranial pressure, which permits the massive entrance of air generating a mass effect that can be dangerous for the patient.<sup>4</sup>

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We report the case of tension pneumocephalus that occurred after the evacuation of a chronic subdural hematoma.

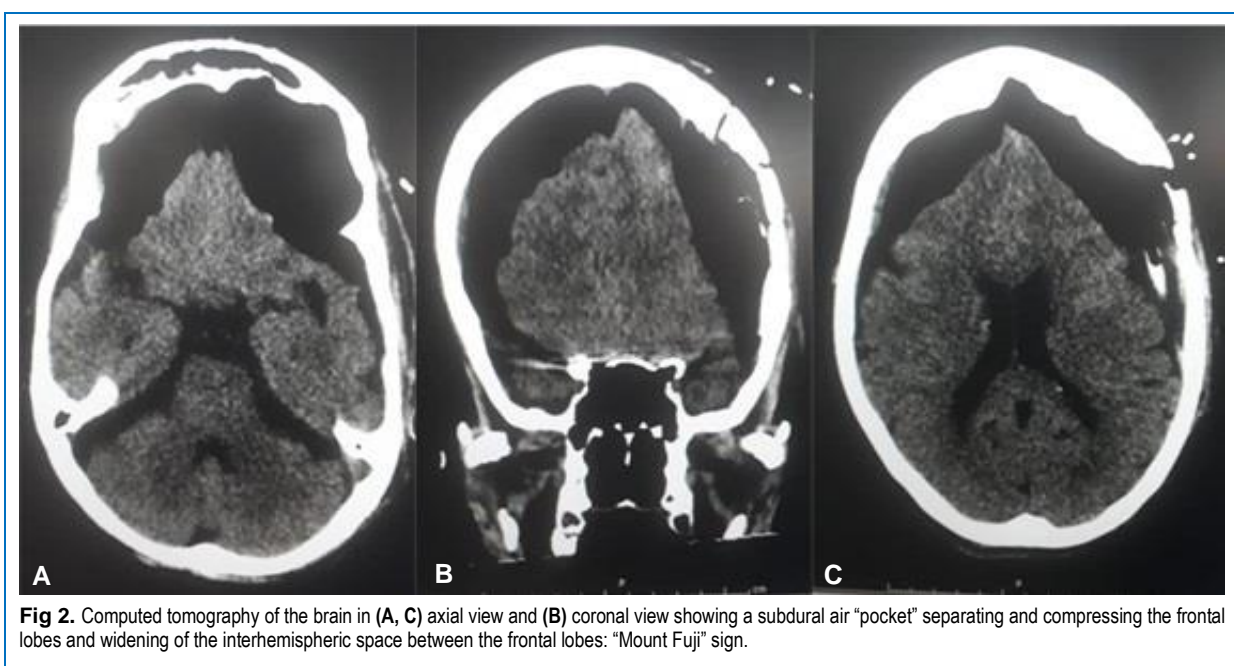
## CLINICAL CASE

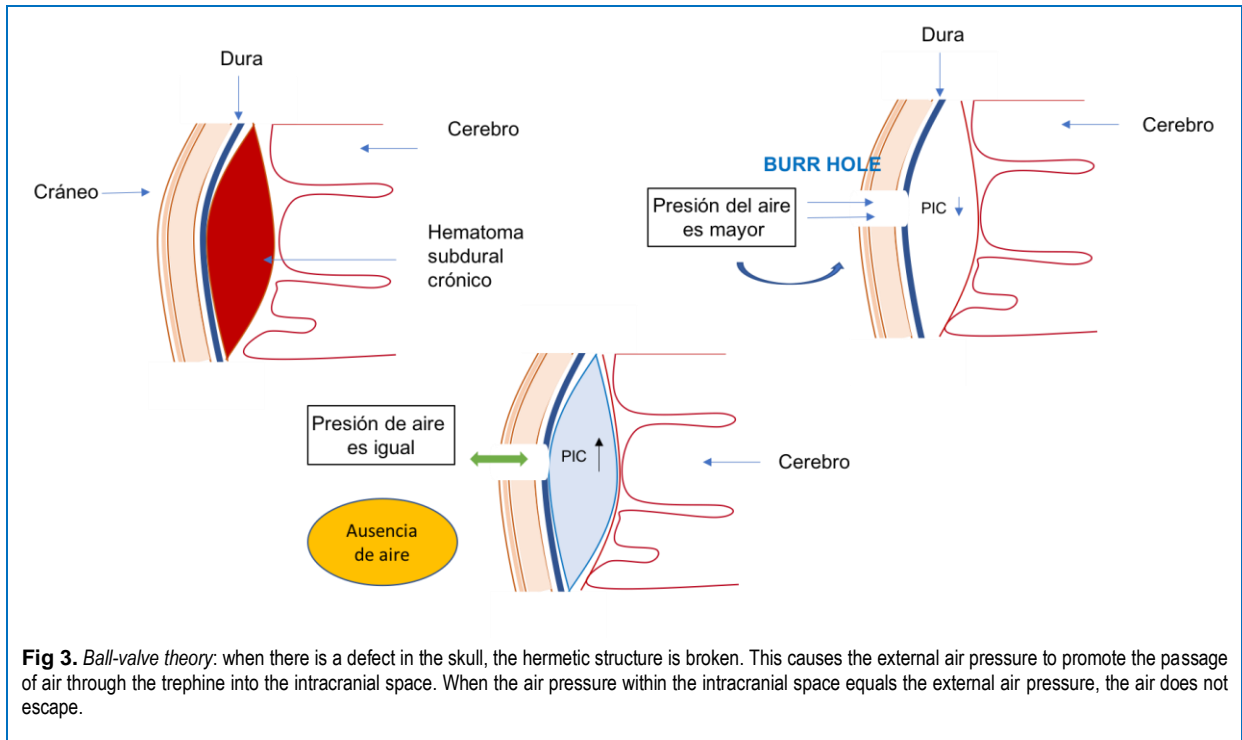
**History and examination:** An 85-year-old female with a history of uncontrolled high blood pressure and head trauma four weeks ago, who was admitted to the emergency with a two-week history of headache, recurrent falls, and decreased level of consciousness. Neurological examination revealed right hemiparesis and Glasgow coma scale (GCS) score was 11/15 (E4 V3 M4).

A preoperative computed tomography (CT) scan showed a subdural collection in the left subdural space (*Figure 1*).

**Treatment:** The patient underwent a left-sided keyhole craniotomy with hematoma evacuation and subdural drainage catheter placement. The post-operative brain CT scan revealed massive subdural pneumocephalus which separated the brain from the falx cerebri: The Mount Fuji sign (*Figure 2*).

**Clinical evolution:** The evolution was unfavorable, presenting rapid neurological deterioration until his death on the 2nd postoperative day.





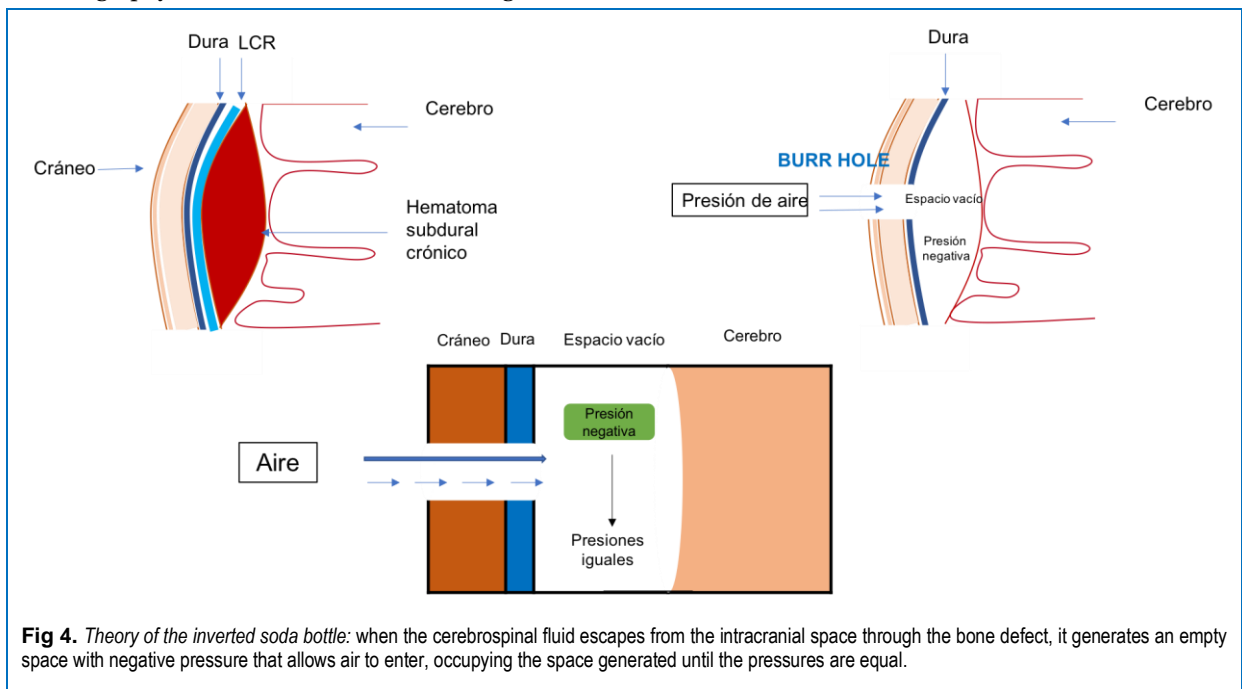
**DISCUSSION**

Pneumocephalus is a common complication after neurosurgical procedures and in cases of head trauma.<sup>1,2</sup> In our case, the patient presented pneumocephalus after a craniotomy and evacuation of chronic subdural hematoma, which is like that reported by other authors.<sup>4-7</sup> The incidence of pneumocephalus in chronic subdural hematoma surgery is between 2.5% to 16%.<sup>3</sup>

Cerebral tomography is the most common tool to diagnose

this pathology entity.<sup>3</sup> In our patient, the control cerebral tomography showed air in the subdural space bilaterally, which separated and compressed the frontal lobes, showing widening of the interhemispheric space; These findings are known as the “Mount Fuji” sign.<sup>1,3,8</sup> We must bear in mind that air can be identified from a volume of 0.5cc in a tomography.<sup>3</sup>

There are many theories that explain this pathological condition, but two are the most accepted: the ball valve theory (Figure 3), described by Walter Dandy in 1926,<sup>8</sup> and the inverted soda bottle theory (Figure 4), described by Horowitz and Lunsford in 1964.<sup>9</sup>



This pathology is common and if it is underestimated it can threaten the life of the patient, as in our case. It is essential to know how to recognize the clinical manifestations, images, and when to give medical or surgical treatment.

## CONCLUSION

Tension pneumocephalus is an underestimated entity that can be life-threatening. Signs and symptoms of pneumocephalus are non-specific and the diagnosis must be made by non-contrast CT scan.

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### Disclosures

The authors report no conflict of interest concerning the materials or methods used in this study or the findings specified in this paper.

### Authors Contributions

*Conception and design:* Celi, Saal. *Drafting the article:* Celi. *Critically revising the article:* Saal. *Reviewed submitted version of manuscript:* Saal. *Approved the final version of the manuscript on behalf of all authors:* Saal.

### Correspondence

Giancarlo Saal Zapata. Department of Neurosurgery. Guillermo Almenara National Hospital. 800 Grau Avenue. La Victoria. Lima 13, Perú. E-mail: [gian\\_carlo1987@hotmail.com](mailto:gian_carlo1987@hotmail.com)