

## Symptomatic Pneumocephalus After Lumbar Spinal Surgery - A Case series

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**Conflicts of Interest:** Nil

### Abstract

Pneumocephalus means air inside the calve rial cavity (1). It may present in epidural space, sub-Dural space, sub arachnoid, intra ventricular and intra parenchymal space (2,3,4). Most common cause of pneumo cephalus is skull injury. Other causes are cranial surgeries and cranial procedures and infections. Pneumocephalus due to spinal surgery is very rare. Here we are reporting a case series of Lumbar spinal surgeries related pneumocephalus and review the relevant literatures.

**Keywords:** Pneumocephalus, Spine, Surgery, Calverial Cavity, Skull Injury

### Introduction

Pneumocephalus (PNC) is known as intra cerebra laerocele or pneumatocele inside the calve rial cavity. In 1866, during autopsy of a trauma patient, Thomas

identified the PNC (6). Most common cause of pneumocephalus is skull injury. Air trapping occurs due to skull fractures.

Mostly in skull bone and mastoid and frontal sinus fractures (7,8).

Other causes are neurosurgical interventions, otolaryngo logical procedures (e.g., paranasal sinus surgeries), diagnostic interventions (e. g. pneumoence phalo graphy) and infections (2,3,4,). Pneumo cephalus during spinal surgeries are very rare. The incidence of Dural tears during spinal surgeries ranges from 0.3% to 5.9% (5,9) and Dural tears that occur during spinal surgeries do not usually cause pneumocephalus, pneumorrhachis, or both. CSF leakage during spinal surgery may lead to meningitis, arachnoiditis, epidural abscess, Dural-cutaneous fistula, and rarely pneumocephalus. After

review of 120 lumbar spinal surgeries performed between 2018 to 2021 in Career Institute of Medical Sciences and Hospital, Lucknow. We found only 4 cases of Pneumocephalus after Lumbar spinal surgery.

#### **Case discussion**

After review of 120 spinal surgeries performed between 2018 to 2021 in Career Institute of Medical Sciences and Hospital, we found pneumocephalus in only 4 cases. All were men with mean age of 43.5 without any comorbidities. In all cases, Dural tear and Cerebrospinal fluid leak was present which was closed during surgery. All these patients were asymptomatic for first 5 days. One patient developed severe headache on post-operative day 6 and one patient developed generalized tonic clonic seizures on post-operative day 8. One patient developed generalised Tonic Clonic Seizures with left sided hemiparesis on post-operative day 6 and another patient developed headache with recurrent vomiting on post-operative day 9. NCCT head of these cases had revealed Pneumocephalus. All these cases were managed conservatively by keeping the patient in supine position with O<sub>2</sub> by mask, intravenous antibiotics, proper hydration and antiepileptic's drugs. Serial Computerized Tomography of head were performed to assess the recovery of patient. All these cases were improved and discharged and advised follow up in neurosurgery outdoor.

#### **Discussion**

Pneumocephalus means collection of air within the cavity of calvaria. Pneumocephalus after spinal surgery is rare (9). Exact mechanism of Pneumocephalus after spinal surgery is still not clear. There are many proposed hypothesis about the mechanism of Pneumocephalus after lumbar spinal surgeries.

In one hypothesis, it was suggested that due to continuous cerebrospinal fluid leakage causes negative pressure in subarachnoid spaces that is replaced by air (1,2). In other hypothesis one-way ball valve mechanism was proposed, in which Dural defect acts as a one-way valve and air is to be trapped inside the cavity (7,8). Nitrous Oxide (N<sub>2</sub>O) theory and Gas forming bacteria are the other proposed hypothesis of spinal surgeries induced pneumocephalus (1,7,8).

As per our hypothesis, fluid moves from higher pressure to lower pressure.

Due to Dural tear or undetectable tear, cerebrospinal fluid flow through it. In the sitting or standing position after lumbar surgery, cerebrospinal fluid pressure at lumbar region is higher than intracranial pressure, so that trapped air moves from bottom to top and reaches intracranial cavity.

During movement from spine to cranial cavity pressure inside the air bubble also decreases, so that air bubble increases in volume and causes significant Pneumocephalus. Diagnosis can be made by X-ray, computerized tomography and Magnetic Resonance Imaging, in which computerized tomography is more specific, so computerized tomography is gold standard investigation for Pneumocephalus diagnosis (1,2,7,9).

Pneumocephalus can be managed conservatively with bed rest, head elevation usually by 30 degrees, Oxygen supplementary therapy. Tension Pneumocephalus is an emergency and relieved by surgical interventions like craniotomy or twist drill trephination (1).

#### **Conclusion**

During lumbar spine surgeries, Dural tear is not uncommon, and it cause rare and life-threatening complication of pneumocephalus. Meticulous closure of Dural tear during lumbar spinal surgery is very essential

and close observation of these cases is necessary in post operative period (10).

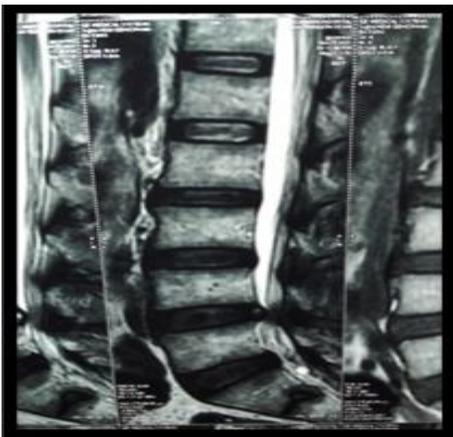


Fig 1: Spinal Cord compressed between lumbar vertebra 4 and 5 due to disk thickened Ligamentumflavum



Figure 2a

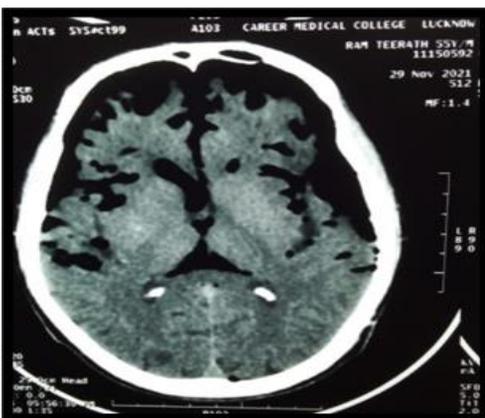


Figure 2b

Fig 2 : Diffuse pneumocephalus after lumbar spinal surgery.

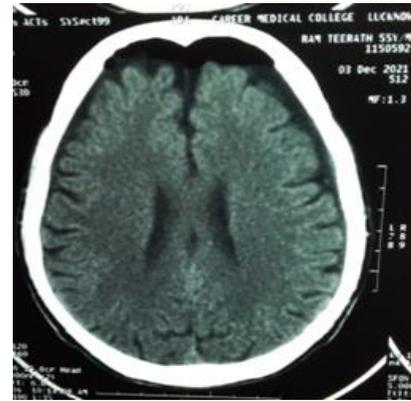


Fig 3: Resolving Pneumocephalus

### References

1. Z. Kizilay1, A. Yilmaz1 and O. Ismailoglu, "Symptomatic Pneumo cephalus after Lumbar Disc Surgery: A Case Report", k Open Access Maced. Journ. Med. Sci., Vol. 3(1), Mar. 2015, pp.143-145.
2. J. Osama, Abu-Hamdiyah, S. Al-Sharie, S. Awadi, A. J. Mohammad and K. Athamneh, "Pneumo cephalus secondary to a spinal surgery: A literature review and a case report", Intl. J. Surg. Case Reports, Vol. 86, 2021, pp. 106342.
3. M.D.Jung Ho Yun, Y. J. Kim, D. S. Yoo and J. H. Ko, "Diffuse Pneumocephalus :A Rare Complication of Spinal Surgery ",J Korean Neurosurg Soc, Vol. 48, 2010, pp. 288-290.
4. E. Karavelioglu, O. Eser, and A. Haktanır, "Pneumo cephalus and Pneumorrhachis after Spinal Surgery: Case Report and Review of the Literature", Neurol. Med. Chir. (Tokyo) Vol. 54, 2014, pp. 405–407.
5. Dabdoub CB, Salas G, Silveira ED, Dabdoub CF (2015) Review of the management of pneumo cephalus. Surg Neurol Int 6:155
6. Kaye AH (2005) Head injuries. In: Essential Neuro surgery, vol 4, 3rd edn. Blackwell Publishing, Hoboken, pp. 40–55
7. Rahamimov N, Mulla H, Freiman S (2010) Cerebrospinal fluid leakage and pneumo cephalus

secondary to spine stab wounds. *J Orthop Traumatol* 11 (1):57–59

8. Schirmer CM, Heilman CB, Bhardwaj A (2010) Pneumo cephalus: case illustrations and review. *Neurocrit Care* 13 (1):152–158

9. Webber-Jones JE (2005) Tension pneumo cephalus. *J Neurosci Nurs* 37(5):272

10. Yun JH, Kim YJ, Yoo DS, Ko JH (2010) Diffuse pneumo cephalus: a rare complication of spinal surgery. *J Korean Neuro surg Soc* 48(3):288–290