



## A Rare Complication of Delayed Pneumocephalus after Pan Facial Fracture Management: A Case Report

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### Abstract

Pneumocephalus is a neurological emergency that commonly encountered after neurosurgical procedures but may appear in those maxillofacial trauma cases which are associated with head injury. In our specialty the incidence of pneumocephalus is very rare but life threatening because we are not much known about it. In best of my knowledge no any report published in the specialty of ours literature till today. I present a case of delayed pneumocephalus after correction of pan facial trauma. The diagnosis was made by computer tomography (CT) and managed conservatively within two weeks. The aim of this case report is to present, discuss and aware the dental clinician for a rare but life-threatening case of delayed pneumocephalus after pan-facial fracture management.

**Keywords:** Pan Facial Trauma; Pneumocephalus; Head Injury; CSF Leak

### Abbreviations

CSF: Cerebro Spinal Fluid; CT: Computer Tomography; NOE: Nasoorbitoethmoidal; GCS: Glasgow Coma Scale; GA: General Anesthesia; IMF: Inter Maxillary Fixation.

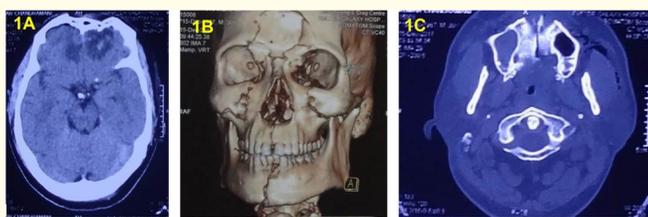
### Introduction

Pneumocephalus is a pathological condition in which air present in the intracranial cavity [1]. It is a rare but life-threatening condition particularly if left untreated [2]. It may develop secondary to neurosurgery procedures; trauma (barotrauma, basilar skull fracture, and sinus fracture); gunshot wound to the head; positive pressure mask ventilation in head trauma; infection; invasive procedures and tumor invasion or it may be iatrogenic [1,3-8]. The clinical appearance of this condition is well known and was 1<sup>st</sup> described by Thomas in 1866 during the autopsy of a trauma patient [4]. The clinical features of pneumocephalus are present as headache, nausea and vomiting, seizure, dizziness and decreased neurological status [1, 4]. The previous studies showed that 75%-80% of pneumocephalus were appearing in only 0.5%-1% of all head trauma cases [9-11]. The aim of this case report is to present, discuss and aware the dental clinician for a rare case of delayed pneumocephalus after pan-facial fracture management.

### Case Report

A 30 year old male patient was admitted to Galaxy Emergency Hospital (Patna) on 15<sup>th</sup> December 2017 with a history of facial and frontal injury due to road traffic accident. At the time of admission his Glasgow Coma Scale of 9/15 and the vital signs were normal. An attendant gave the history of loss of consciousness, vomiting, headache, bleeding from facial laceration, nose and mouth, and loss of teeth. After stabilizing the patient CT brain and CT face with 3D reconstruction were done. CT brain and CT face with 3D reconstruction reveals bilateral fracture of both frontal table and bifrontal contusion with minimal tension pneumocephalus (Figure 1A) and multiple facial fractures (Frontal bone, Nasoorbitoethmoidal (NOE), Le Fort 1 and Le Fort 2, and Mandibular symphysis) and Mid-palatal split respectively (Figure 1B and 1C). After three days of injury cerebrospinal fluid (CSF) rhinorrhea occurred and persist for next 5 days.

On the basis of clinical and CT findings neurosurgeon make decision to manage patient conservatively. After 4 days of rhinorrhea cessation and attending GCS 15/15 they give clearance of maxillofacial correction under general anesthesia without interfering frontal bone fracture. Finally patient was advised for surgery and informed written consent was obtained.



**Figure 1:**

**A:** CT scan of brain shows bilateral fracture of both frontal table and bifrontal contusion with minimal tension pneumocephalus.

**B:** 3D reconstruction CT of face shows fracture of frontal bone and multiple facial bones.

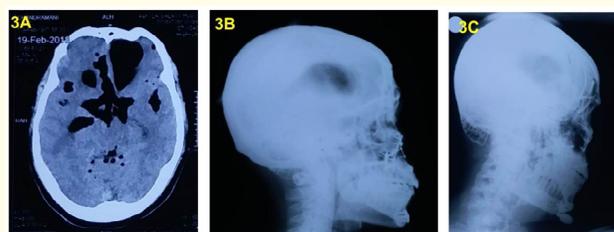
**C:** CT face shows mid palatal split.

On 28<sup>th</sup> December 2017, through sub-mental intubation patient was taken under GA. Patient underwent open reduction and internal fixation of pan-facial fractures through an existing right laceration, upper vestibular incision in relation to right maxillary 1<sup>st</sup> molar to left maxillary 1<sup>st</sup> molar and lower anterior vestibular incision. First, mandibular symphysis was reduced and fixed with the help of 2 mm titanium mini plates and screws. Secondly, nasal bone was reduced and occlusion achieved. Thirdly, inter maxillary fixation done through arch bars and wires. Fourthly, all other fracture sites was reduced and fixed with the help of 1.5 mm titanium mini plates and screws. Finally wound was closed with the help of 3.0 vicryl and IMF released. Postoperative period was uneventful. After three weeks (18<sup>th</sup> January 2018) arch bar was removed. After 6 months no fresh complaints, proper mouth opening and satisfactory profile as showed in (Figure 2).



**Figure 2:** 6 months postoperative profile photographs shows satisfactory esthetic and functional profile.

After 1 month (19<sup>th</sup> February 2018) of arch bar removal, patient readmitted to hospital with chief complaints of intermittent 8 to 10 drops of watery discharge (CSF) from nose, headache, nausea and vomiting, difficulty in swallowing and decreased neurological status (GCS 11/15). After stabilizing the patient CT brain was done that reveals development of massive delayed pneumocephalus that involves frontal lobe, ventricles and basal cisterns (Figure 3A). Then our consultant neurosurgeon advised tube feeding, high flow oxygen administration @ 9 liter/hour through oxygen mask, keeping head of the bed elevated, prophylactic antibiotics, analgesic and frequent neurologic check. After that we noticed slow but progressive clinical improvement in patient. 72 hours of post-treatment neurosurgeon further advised CT brain but patient refused due to economic crisis. Then skull (lateral view) was done which showed marked progressive reabsorption of pneumocephalus (Figure 3B and 3C). At the time of discharge (after two weeks of treatment) his GCS was normal with no CSF leak.



**Figure 3**

**A:** CT scan of brain shows pneumocephalus development that involves frontal lobe, ventricles and basal cisterns.

**B and C:** Skull (lateral view) radiographs shows progressive reabsorption of pneumocephalus.

### Discussion

Pneumocephalus term was coined and first used by Wolff in 1914 [4]. It can be acute and delayed or early and late. If pneumocephalus develops within 72 hours of probable etiology then it is called acute and after 72 hours is called delayed. Other classification system of pneumocephalus describes early that developed within 7 days and late that developed after 7 days of probable etiology [9]. According to Volodymyr et al in 2013 reported pneumocephalus is a complication of head injury in 3.9% to 9.7% and 100% after supratentorial craniotomy [3]. In other hand development of pneumocephalus in second post-operative weeks is very rare and it accounts only 11.8% [9]. My case belongs to delayed or late category of pneumocephalus that was very rare as per literature review.

Most of the authors agreed probable etiology of pneumocephalus is secondary to head trauma, neurosurgical procedures, ENT procedures, lumbar puncture, barotrauma, tumors, CNS infection, nitrous oxide, spinal anesthesia, positive pressure ventilation, HBO therapy, radiotherapy and iatrogenic [1,3-8,10,12]. In present case probable etiology of pneumocephalus development was frontal sinus injury. Exact pathogenesis of pneumocephalus development is not known till today but there are two possible mechanisms that explain pneumocephalus development. First, ball valve mechanism (unidirectional air flow into intra cranial cavity) and second, inverted soda pop bottle phenomenon (may be due to CSF leak negative intra cranial pressure) [2,4,11]. In this case intermittent CSF leak present that strongly support inverted soda pop bottle phenomenon for the development of pneumocephalus.

Common clinical features of pneumocephalus are headache, nausea and vomiting, CSF rhinorrhea, seizure, dizziness and decreased neurological status [3,9,11]. In the present case, intermittent 8 to 10 drops of CSF discharge from nose, headache, nausea and vomiting, swallowing difficulty and decreased neurological status (GCS 11/15) were the clinical features. That was similar to common clinical features of pneumocephalus. Swallowing difficulty may be due to compression of associated brain structures. According to most authors, CT brain is the gold standard radiographic tool for the diagnosis of pneumocephalus [1,10,13]. In present case CT brain confirmed the development of pneumocephalus too.

Pneumocephalus is a rare emergency neurological condition that may appear before or after the management of frontal sinus and/or pan facial trauma cases. If pneumocephalus is left untreated it may causes mortality. Management of pneumocephalus was either conservative or surgical [2,4,9]. The conservative management involves oxygen therapy, keeping the head of the bed elevated, prophylactic antibiotic therapy especially post trauma cases, administering pain and antipyretic medications if needed and frequent neurologic checks. Dabdoub in 2015 reported, if patient placing in the fowler position of 30°, avoiding Valsalva maneuver, administering pain and antipyretic medication then reabsorption of pneumocephalus occurred in 85% of cases after 2-3 weeks of treatment and rest 15% was managed surgically. Pankaj in 2008 reported that the use of an oxygen mask increased the reabsorption of pneumocephalus compared to a nasal catheter [9,10]. The present case report shows good clinical and radiographic improvement within two weeks after taking almost similar conservative measures.

## Conclusion

In conclusion, delayed pneumocephalus is very rare but life-threatening complication in those oral and maxillofacial trauma cases which are associated with head injury. They may occur before or after the maxillofacial trauma management. It may affect our specialty but till date I have not found any report in the literature of our specialty. The incidence of pneumocephalus is higher in posttraumatic period and lower in postoperative period particularly in that pan facial cases which will associate with head injury. Management of such cases requires special attention to face the challenges of pneumocephalus at any time. In present scenario CT brain is a gold standard radiographic tool for diagnosis of pneumocephalus.

## Conflict of Interest

None declared.

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