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Pneumocephalus with Sinusitis

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Abstract

A pediatric case was seen in accident and emergency and was suspected to have meningitis because of severe headache, high fever, vomiting with mucoid nasal discharges following an attack of cough and cold. A CT scan of brain revealed small Frontal Pneumocephalus with right sided Pansinusitis. A FESS procedure was carried out, but the condition continued worsening on and a repeat CT scan showed that though the sinus pathology has resolved but the PNC had increased in size along with development of a Subdural Empyema which had to be drained (craniotomy) by a Neurosurgeon. It emphasizes that even a small Pneumocephalus with sinusitis is its Intracranial complication and even after FESS intervention it may progress to a Subdural empyema.

Keywords: ***URTI (upper respiratory tract infection); Sinusitis; ICC (intra cranial complication); Pneumocephalus (PNC); SDE (subdural empyema); FESS (functional endoscopic sinus surgery)***

1. Introduction

Pneumocephalus is a condition where air is present intracranially between the potential spaces of meninges like epidural, subdural and subarachnoid or within the brain parenchyma and within the ventricular cavities. PNC is produced by trauma, tumours or sinus infections. Small air collection is difficult to identify and may be initially overlooked in CT scans. Trauma is the most common cause of PNC which may be accidental or iatrogenic. In non-traumatic (infectious) causes the most common is Otomastoiditis and rarely by sinusitis. A PNC can be a sign of ICC of Infectious sinusitis. Small PNC is usually resolved by itself or by conservative treatment, but a bigger PNC can progress to a Tension PNC which is a neurological emergency and has a high rate of morbidity and mortality. Pediatric patients have a higher chance of intracranial complications from chronic bacterial sinusitis and may produce ICC like PNC, SDE or cerebral abscess.

Material and Method- The purpose of this case report is to review and discuss the role of early imaging, relevance of clinical symptoms and variable presentations of sinusitis with PNC and also to discuss the related neuroanatomical considerations, pathogens and clinical course of this pathology. A pediatric case is presented with its atypical presentation in his history, signs and symptoms with required investigations and accordingly the management. A short discussion has been also done with the same pathology from the literature [1].

2. Case Presentation

A 12-year-old Boy, very ill looking and irritable but conscious with cough and cold, presented with pediatric emergency. He had high grade fever for four days with persistent headache and projectile vomitings. He had recurrent attacks of cough and cold from the age of five years onwards but never was diagnosed as asthmatic. On examination he was found alert with a Glasgow Coma Scale of 15/15 and with normal vitals. There was no neck stiffness and neurologically no deficit was detected. CBC showed a leucocytosis of 19000/cmm. A provisional diagnosis of acute URTI with meningitis was made and a conservative treatment was started, and a CT scan of brain was advised which revealed (FIG. 1) small PNC in the frontal region and opacification in all the PNS (FIG. 2) on right side.

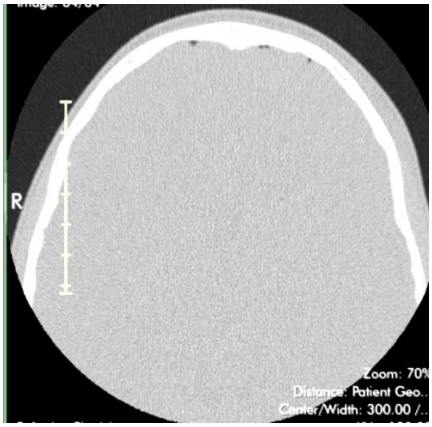

FIG. 1. **Axial CT scan, showing small pneumocephalus in the frontal region.**

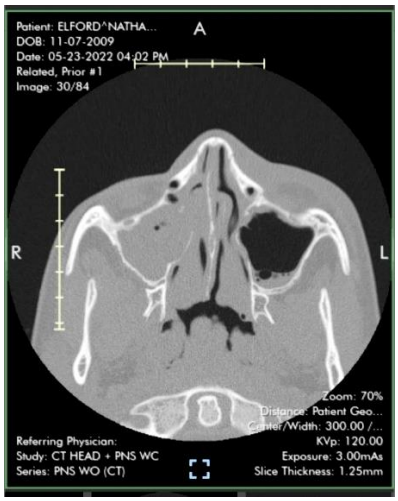

FIG. 2. **Axial CT scan, showing right side pansinusitis.**

A diagnosis of PNC as an intra cranial complication of sinusitis was made and a medicinal treatment started but as there was no significant clinical improvement seen within 48 hours, so a surgical intervention by FESS was done. There was a collection of pus and unhealthy mucosa in right Fronto- Ethmoido-Maxillary and Sphenoidal sinuses which was cleaned, and the pus was sent for culture and sensitivity, but it did not reveal growth of any pathogen. Even after the FESS procedure and continued broad spectrum antibiotics his clinical condition continued worsening (high grade fever, headache, vomiting and an attack of generalized seizures) and on third day he started developing a progressive diffuse swelling on his forehead. A repeated CT scan revealed comparatively clear sinuses (FIG. 3) but the size of pneumocephalus had increased (FIG. 4 a) and a subdural emphysema was seen in the left fronto parietal region (FIG. 4 b).

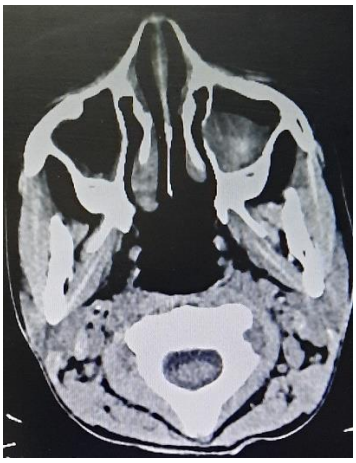

FIG. 3. **Axial CT scan.**

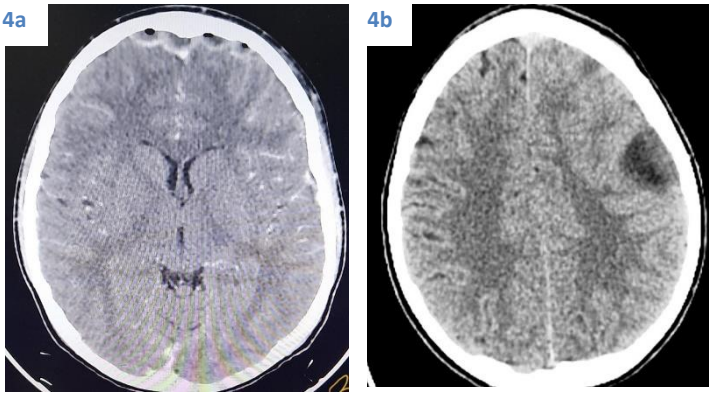

FIG. 4. **(a) pneumocephalus (b) subdural empyema.**

FIG. 5.

A neurosurgical intervention was requested, and a surgical drainage (by left Fronto-Parietal craniotomy) was done to evacuate subdural empyema (FIG. 5). Post op the patient started improving significantly and no more seizure was noted. The medical treatment was continued and seven days later he was found fit to be discharged with oral antibiotics, antiepileptics, nasal saline spray and nasal decongestants. He was followed after two, four and six weeks and was found to have improved significantly. Histopathological report of frontal sinus mucosa revealed chronic inflammatory changes. He was reviewed again in 4 months when he had only mild intermittent frontal headache. He was followed after 6 months and then after 1 year, without any complaints and was advised to continue in a Neurosurgery clinic.

3. Discussion

The case presented is in pediatric age group (12 years) and presented as a case of acute URTI with history of recurrent upper respiratory tract infections and as per literature [2] the age and history are similar to it except that the ICC of sinusitis are not common with Acute sinusitis but with chronic sinusitis. It may be a variable (Atypical) clinical presentation or the history of recurrent URTI might have been actually a chronic sinusitis. Since there were some suspicions of intra cranial infection [high fever, headache and projectile vomitings with rhinitis so URTI with intracranial complication was suspected and some basic investigations were advised like CBC and a CT scan of brain. The scan revealed small PNC in frontal region along with right side pansinusitis hence a diagnosis of pneumocephalus as ICC of sinusitis was made, this is as per literature review which emphasized the significance of CT scan of brain and PNS in patients with high fever, severe headache with recurrent URTI [3,4]. In the emergency department this probability of ICC of sinusitis should be kept in mind despite a lack of typical chronic sinus or chronic upper respiratory tract infection (a variable clinical picture).

In the presented case the pneumocephalus was seen in close proximity (as seen in MRI) to Frontal sinuses confirming the ICC of Frontal sinusitis and this is per literature which tells PNC is more common from Frontal sinusitis [5,6]. Clinically and radiologically, there may be no bone erosion or fungal infection necessary to produce pneumocephalus but once recognized then it may be the first sign of intracranial complication in the setting of bacterial sinusitis. PNC. As per prognosis if recognized in early stages then its treatable with appropriate antibiotic therapy so in the presented case also a conservative treatment was started with broad spectrum antibiotics but it was found to be not so effective and the condition started worsening so a decision was made for removing the pathology from the sinuses by FESS and the drained pus was sent for culture and sensitivity and the mucosa for histology test. Post FESS procedure in spite of adding more antibiotics (as per clinical experiences) the resolution was not satisfactory and in 3 days' time the signs and symptoms worsen clinically presenting such as high fever, severe headache, increase in size in the forehead swelling, vomitings and an attack of generalized seizures. A repeat CT scan of PNS and Brain reported that though the sinuses were comparatively clear but an increase in the size of the pneumocephalus and a subdural empyema in left fronto parietal region of brain [7].

This finding goes along with the literature [8] which tells that in spite of suitable and modern antibiotics the morbidity and mortality of ICC of frontal sinusitis is quite higher. The neurosurgeon had to remove the SDE by performing craniotomy and then the patient clinically improved within two days and was discharged after a week with oral antibiotics for 2 weeks and advice for reviews regularly in ENT and Neurosurgery clinics. A timely diagnosis and management by FESS and antibiotics could not control the intra cranial infection due to ineffective antibiotics. The pus, drained by FESS, was sent for culture and

sensitivity was found negative so no specific antibiotics could be selected, and the used antibiotics could not control the ICC turning into an SDE. The case needed two separate surgical interventions, first by ENT and later second by a Neurosurgeon as both pathologies were not found at one time. Otherwise, if found together then both surgeons can operate at one time under same one-time anesthesia [9].

4. Conclusion

As per literature review and the experience in this presented case, doctors in the emergency department or ENT must emphasize the significance of CT scan of brain and PNS in patients with persistent high fever and severe headache with recurrent URTI as this may be a subclinical or a variable presentation of chronic sinusitis, quite common in pediatric age group, with intracranial complications. A small PNC may be difficult to identify and may be initially overlooked but it is the first sign of intracranial complication in the setting of bacterial sinusitis. So, once it is detected then along with the treatment a strict vigil on progress of patient has to be kept until PNC disappears (to be confirmed by a repeat CT scan) otherwise ICC of sinusitis may progress to SDE with increased morbidity and mortality which needs to be surgically removed by a neurosurgeon. If sinusitis and its ICC are diagnosed in its early stages then it's treatable with appropriate parenteral antibiotic therapy and when it does not resolve then surgical interventions, FESS for sinusitis. A strict vigil on progress has to be there (clinically and radiologically) to deal with any remnant and developing complication like SDE. The result of conservative management depends upon the selection of specific antibiotics and should be as per culture and sensitivity report of the pus.

5. Disclaimer

There is no financial burden or obligation on any one or any conflict of interest regarding the publication of this case report.

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