Case report

Tension pneumocephalus: an unusual complication after lung resection

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Abstract

On day 5, after right upper lobectomy, the patient developed headache, confusion and right hemiparesis and there was clear fluid drainage from the chest tube. Computed tomography (CT) scan of the head showed gas in the ventricles and subarachnoid space. The fluid from the drain was positive for Beta-2 transferrin signifying cerebrospinal fluid (CSF) fistula. Patient recovered completely with conservative management.

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1. Case report

A 65-year-old man was operated for non-small cell lung cancer (NSCLC) of right upper lobe of the lung with attachment to the parietal pleura. Surgery involved right upper lobectomy with extrapleural dissection on the posteromedial aspect of the chest. There were no problems or difficulties encountered during surgery and in specific, there was no cerebrospinal fluid (CSF) leak noted. Chest was closed with two pleural drains. Postoperative recovery was uncomplicated except for continuing air leak till day 4, when the drains stopped leaking and the last drain was removed next day. After drain removal on day 5, patient developed severe headache, confusion, lethargy and right hemiparesis. At this stage, patient was being nursed in upright sitting position in the bed. Chest X-ray revealed unexpected fluid level in the right thorax and a drain was inserted. There was clear serous fluid drainage from the chest tube and also there was air leak. Incidentally, there was dramatic improvement in the mental status when the patient was placed in supine position and hence, was placed in head low position. Computed tomography (CT) scan of the head revealed gaseous distension of ventricles (third ventricle and both lateral ventricles) of the brain, and air also in the subarachnoid space around the cortex (Fig. 1). The fluid from the chest drain was analysed biochemically.

It was reported to contain high chloride (135 meqiv) and was positive for Beta-2 transferrin protein. Detection of Beta-2 transferrin in body fluid is said to be highly suggestive of CSF fistula as this protein is found only in CSF, aqueous humour and perilymph fluids. Indeed, this technique is being increasingly used for detection of CSF rhinorrhea or CSF otorrhea.

After a brief period of improvement, there was continuing deterioration in the mental status, despite being placed in head low position. Also, this was associated with serous fluid drainage from the chest drain of about 450 ml. Second chest drain was inserted and both drains were placed on low suction. Subsequently, there was marked improvement in the mental status within 72 h and gradually recovered completely from the right hemiparesis. CT scan of the head, done on 11th postoperative day, showed resolution of the large amount of air in the ventricles and subarachnoid space (Fig. 2). The chest drains were removed on postoperative day 15 when the drainage was minimal and air leak has stopped. Patient made full recovery from the event and was asymptomatic without pneumocephalus or pneumothorax in the follow-up.

2. Discussion

Pneumocephalus implies communication between the intracranial vault and air containing cavity. Most commonly, it is sequel of trauma or surgery on the cranium or
spine. In cardiothoracic surgery, this complication is encountered rarely after surgery involving dissection close to neurovascular bundle emerging from the spine. In the uncommon situation where excision of vertebra or part of it is contemplated, one would anticipate the possible communication to the subarachnoid space and steps will be taken to avoid CSF leak. Hence, it may be expected after surgery for Pancoast tumour or posterior mediastinal tumour excision [1–3]. However, it has also been reported as complication of routine thoracotomy [4], epidural anaesthesia [5] but is often seen after penetrating injury [6]. Generally, this happens on postoperative day 4–6, however, it has been reported on postoperative day 1 and up to 2 months [2,6–8].

Most commonly accepted explanation of this complication, especially when encountered later in the postoperative period, is the traction and avulsion of dorsal nerve root as it emerges from the spinal canal [4,7–9]. In the present case, it was most likely that the dural reflection along thoracic second or third nerve root was avulsed in relation to the site of extrapleural dissection where the tumour was adherent. It is unlikely to be due to epidural puncture as the presentation was on day 5 and it was felt that the large amount of air in the ventricles and subarachnoid space could not have entered from the epidural puncture site.

Many authors in the past have advocated immediate surgical repair as the main stay of treatment for this complication. The success with conservative management with head low position and discontinuation of suction on the chest drain has been stressed in the recent report [7]. In contrary to this, our patient recovered only after applying suction on the chest drains. In the head low position, the air is likely to shift towards the defect and applying low suction on chest drains may help prevent air being forced in to subarachnoid space during expiration. Also helps in resolution of pneumothorax. However, the concern about the CSF extravasation is also there and hence, high suction should be avoided. Pneumothorax being the primary aetiology, we feel that resolution of pneumothorax is most important.

Surgical repair should probably be contemplated in the event of continuing fistula beyond 1 or 2 weeks or being symptomatic despite conservative management. There is no such definite period specified in the literature. However, we feel this may be appropriate as improvement with conservative management has been reported within 1 week and generally within 48–72 h of conservative management. Although head low position seems to be useful, there is unlikely to be any consensus on the different aspects of conservative management. It is important to identify the site of CSF leak before surgical repair. Among the various methods described to identify the leak radioisotope cisternogram or cisternomyelogram and CT myelogram have been commonly used [9,10]. We have not done any imaging to confirm the site of CSF leak as it was considered not to be essential for the conservative management. Surgical intervention should preferably be undertaken along with neurosurgeons. There are various surgical methods described such as laminectomy and repair of the fistula or suture ligating the avulsed nerve root and/or covering with intercostal muscle and pleural based flap [6–9]. Also available are various fibrin glues or bioglues. Da Silva et al. in their review of literature (n = 6 cases) on iatrogenic subarachnoid–pleural fistula noted one death in the conservative group because of the infection in the cachectic patient [9]. Bilsky et al. have reported good recovery from conservative management in two patients [7]. We feel that a trial of conservative management is essential in patients presenting with pneumocephalus in the postoperative period.

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[Fig. 1. Axial CT scan of the brain on fifth postoperative day showing large amounts of air in the third ventricle, lateral ventricles and the subarachnoid space.]

[Fig. 2. Axial CT scan of the brain on 11th postoperative day showing near total resolution of air in the ventricles and subarachnoid space.]
References


