

**Case Report****Iatrogenic Pneumothorax Causes, Prevention and Management**

Authors

**Dr Mohammed Hidayath Hussain<sup>1</sup>, Dr Hina Afreen<sup>2</sup>, Dr Rj Bhavna Srivastav<sup>3\*</sup>**<sup>1</sup>Professor and Head of Department - Pulmonology, Dr VRK Women's Medical College, Teaching Hospital & Research, Hyderabad, Telangana, India<sup>2</sup>Senior Resident, Department of Pulmonology, Dr VRK Women's Medical College, Teaching Hospital & Research, Hyderabad, Telangana, India<sup>3\*</sup>First Year Postgraduate, Department of Pulmonology, Dr VRK Women's Medical College, Teaching Hospital & Research, Hyderabad, Telangana, India

\*Corresponding Author

**Dr RJ Bhavna Srivastav****Abstract**

*Iatrogenic pneumothorax refers to a pneumothorax that has developed due to an invasive procedure, secondary to diagnostic or therapeutic procedures related to lung, like thoracocentesis, pleural biopsies, etc. It can also occur during central vein cannulations or in mechanically ventilated patients. Iatrogenic pneumothorax can occur in any individual irrespective of gender or health condition and immediate management is the key step. The management depends solely on the symptoms and level of cardiorespiratory discomfort along with the size of pneumothorax. Patients with small pneumothoraces are usually treated with oxygen therapy. However, there is evidence that oxygen therapy increases resolution rate. Hereby, We report a case of iatrogenic pneumothorax in which we avoided placing a chest tube and treated the patient by continuous high flow oxygenation and monitoring. In this case, iatrogenic pneumothorax is a complication of thoracocentesis done for moderate pleural effusion.*

**Keywords:** *Iatrogenic Pneumothorax, Central Venous Cathetrization, High flow oxygen therapy.*

**Introduction**

Pneumothorax is defined as air/gas occupying between the parietal and visceral pleurae, as a result of injury to the chest wall and is termed traumatic pneumothorax.

This condition can present in the following ways:

- a) Primary/Spontaneous pneumothorax
  - b) Secondary pneumothorax
  - c) Traumatic pneumothorax
- Iatrogenic pneumothorax is a subclassification of traumatic, and will be further classified as accidental & artificial.

Iatrogenic pneumothorax refers to a pneumothorax that has developed secondary to an invasive procedure (diagnostic/therapeutic) such as pulmonary needle biopsy (transthoracic and transbronchial), placement of a central venous line or positive pressure ventilation. This procedure has become an increasingly recognised complication due to its routine procedure done on OP basis. Iatrogenic pneumothorax acts as a patient safety indicator condition of the above procedures <sup>(1)</sup>

### Case Report

A 85 year old female patient k/c/o Ca Breast presented to the ER,

Complaining of fever and cough not associated with breathlessness and chest pain for the last 7 days. On examination, her vitals were PR: 95bpm, BP: 100/60 mmHg, SPO2: 93% in RA, Tem: 100° F with reduced breath sounds in the left interscapular and infrascapular areas.

On investigations, her x-ray showed moderate pleural effusion and a management thoracentesis was performed. Patient had coughed while aspirating. Post procedure X-ray showed left sided pneumothorax. Patient coughing during the procedure could have led to development of iatrogenic pneumothorax.

In transthoracic ultrasonography, absent lung sliding (ie, respiratory movement at the pleural line) was noted which is a positive sign of pneumothorax. She was managed by administering high flow oxygen, IV fluids as per her output, appropriate antibiotics, anti-pyretics, nebulization and mainly high flow oxygenation, while making sure her saturation does not fall below 95% and was put under observation in ICU. We designated an absence of the lung sliding sign at the midclavicular line of the second intercostal space as an indicator of pneumothorax progression.

After a few days, complete resolution occurred only through non-invasive procedure i.e High flow oxygen administration. Chest X-ray 2 days postoperatively revealed that the pneumothorax had healed, and the patient was discharged eventually

### Discussion

Iatrogenic pneumothorax is a complication of invasive pulmonary procedures, such as Paracentesis thoracis, Pleural biopsy, transbronchial biopsy, Percutaneous lung biopsy/aspiration, Central venous cannulation, Barotrauma, Artificial pneumothorax, Pulmonary needle biopsy (transbronchial and transthoracic)<sup>(2)</sup>.

Few reported cases also show bilateral simultaneous iatrogenic pneumothorax due to wrong placement of nebulization kit, in spontaneously breathing intubated patients,<sup>(3)</sup> after insertion of hypoglossal nerve stimulator<sup>(4)</sup>, after acupuncture<sup>(5)</sup>

In one series of 112 pneumothoraces seen on supine radiographs, the most common location of air was anteromedial in 38%, followed by subpulmonic in 26%, apicolateral in 22%, and posteromedial in 11%.

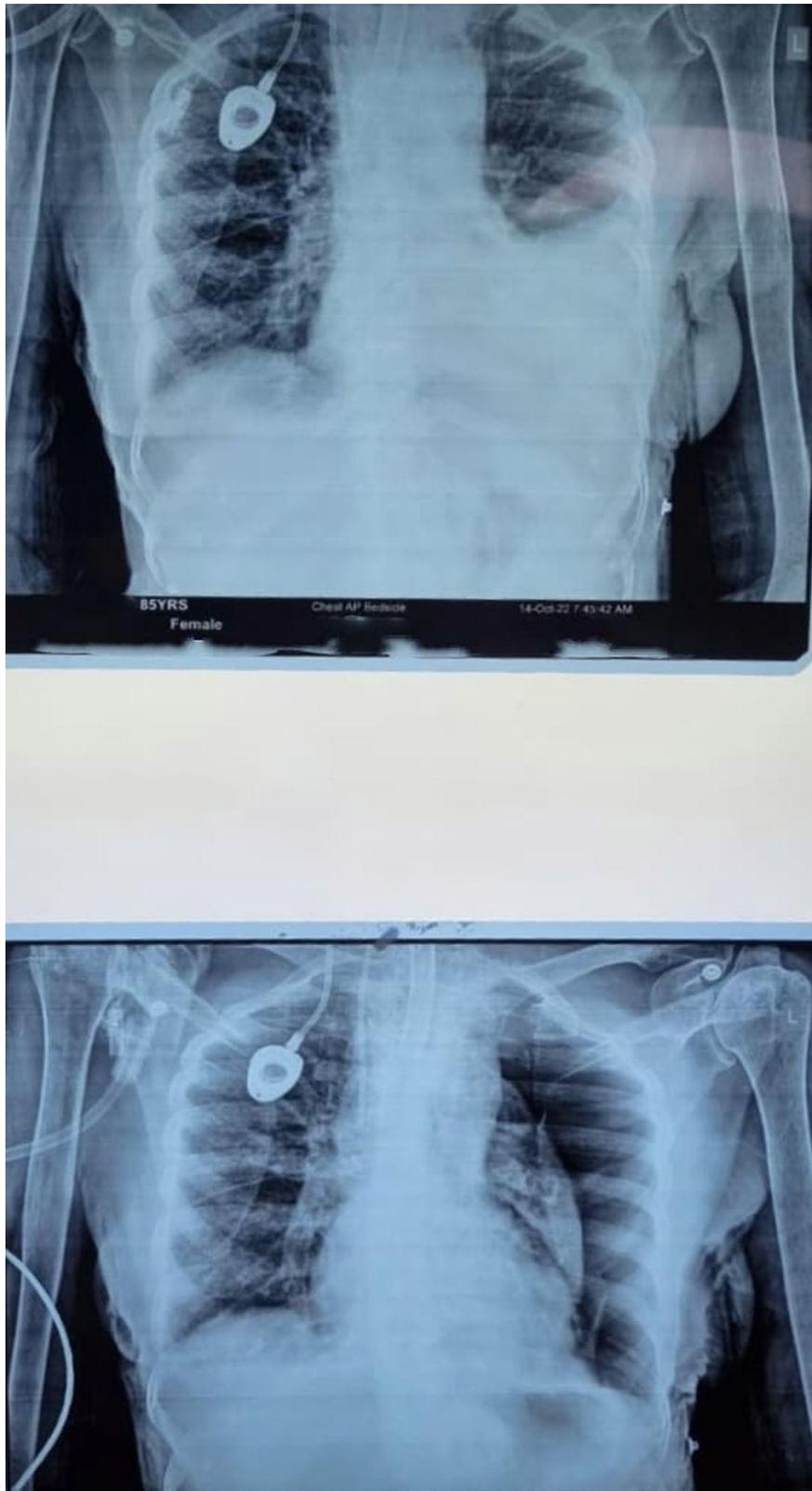
High flow oxygen (>28%) should usually be given to individuals with a pneumothorax in order to maintain adequate oxygenation (saturation >92%) to vital organs. This also lowers the partial pressure of nitrogen, which may in turn accelerate the rate of absorption of air from the pleural cavity and hasten lung re- expansion. However, care should be taken in individuals with chronic obstructive pulmonary disease who may retain carbon dioxide.<sup>(7)</sup>

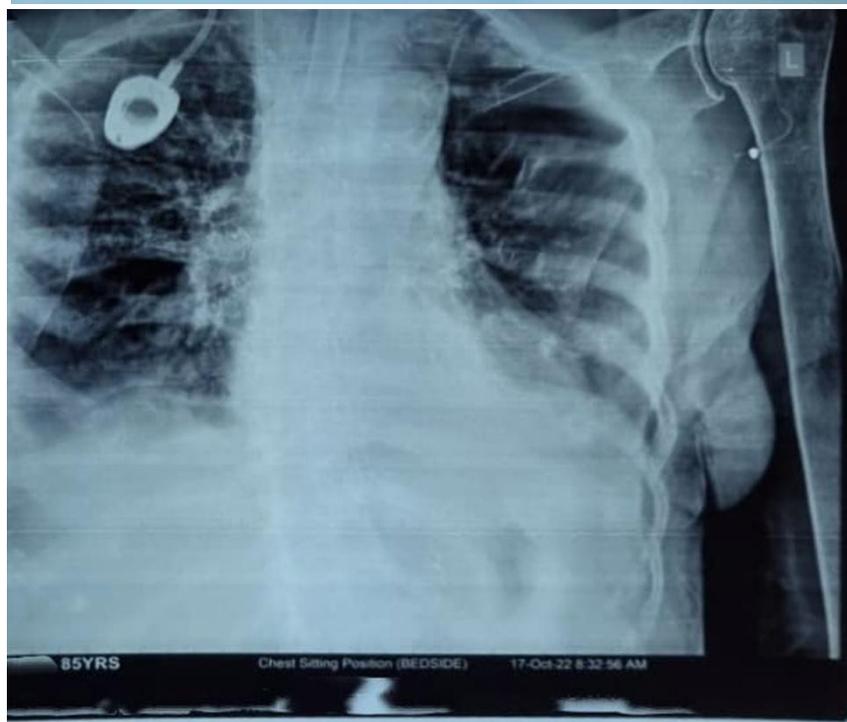
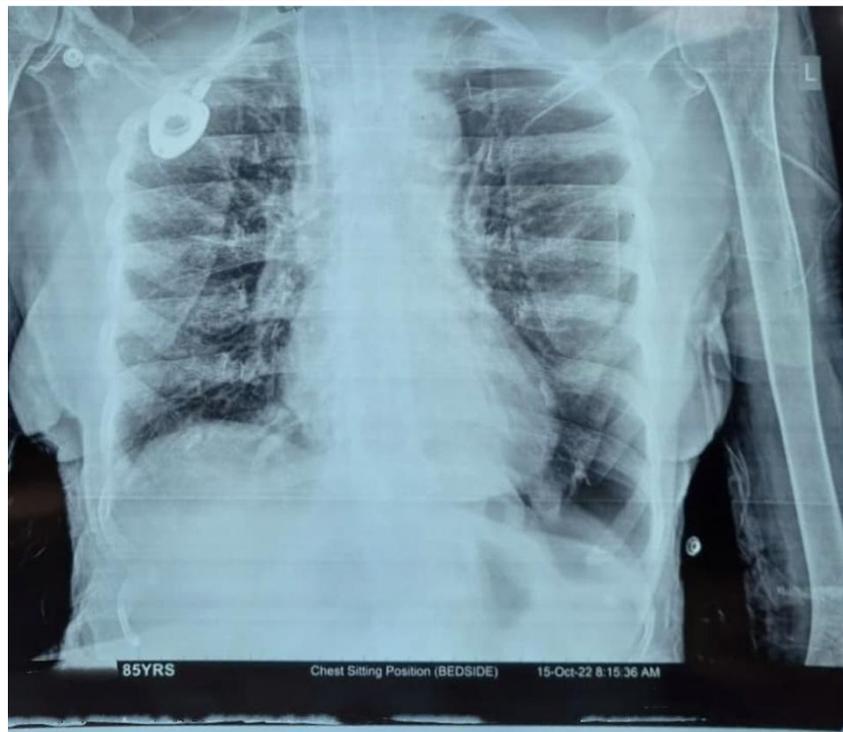
The progression of the pneumothorax could be successfully evaluated using ultrasonography because the collapsed area was very small and a functional indicator, the lung sliding sign at the midclavicular line of the second intercostal space, could be visualized. A "point sign" (sliding pleural next to non-sliding pleura) is diagnostic.<sup>(10)</sup> Although the sensitivity ranges widely, several studies demonstrated that ultrasonography was more sensitive than supine X-ray.<sup>(8)</sup> When the patient is in supine or semi supine position, the most superior part of the chest (where the air accumulates) is the anterior costophrenic sulcus.

A traumatic pneumothorax can progress to tension pneumothorax, and tension pneumothorax is a condition that can quickly cause death from respiratory and circulatory failure and must therefore be diagnosed immediately. According to the British Thoracic Society guideline, a chest tube is not required if the distance from the apex to the cupola is less than 2 cm.<sup>(9)</sup> In the current case, the distance from the apex to the cupola was only 5 mm, and therefore we decided not to insert a chest tube to avoid the associated complications.

We could manage the minimal pneumothorax diagnosed by the chest X-ray safely without placing a chest tube by monitoring the progression of the pneumothorax using thoracic ultrasonography.

In other words, ultrasonography can be an effective tool for evaluating the progression of a pneumothorax, facilitating the decision about whether chest tube placement is necessary for traumatic or iatrogenic pneumothorax with positive pressure ventilation.





**Management**

**Comparison of Management Techniques by Society Guidelines<sup>(6)</sup>**

Society	Management Technique	Indication
ACCP	Catheter drainage	>3 cm interpleural distance at apex
BSP	Aspiration or catheter drainage	Pleural gap along entire lateral chest wall
BTS	Simple aspiration	>2cm interpleural distance anywhere
SEPAR	Aspiration or catheter drainage	Pleural gap along entire lateral chest wall

In general, if the patient has no symptoms or just mild symptoms and the pneumo-thorax occupies less than 40% of the hemithorax,

- The patient can be managed with observation. The administration of supplemental oxygen will increase the rate at which air is absorbed from the pleural space.
- If the patient is more than mildly symptomatic, if the pneumothorax occupies more than 40% of the hemithorax, or if the pneumothorax continues to enlarge, however, one should consider removing the intrapleural air.

In general, most iatrogenic pneumothoraces should first be treated with aspiration. If the initial aspiration is unsuccessful, then a Heimlich valve should be attached to the catheter. Only when the lung does not expand and remains expanded with the Heimlich valve is a larger chest tube inserted.

### Conclusion

The resolution rate of iatrogenic pneumothorax was increased with oxygen supplementation. However, taking into consideration current concerns about adverse outcomes of hyperoxia, the routine use of oxygen therapy in patients with small pneumothoraces should be considered carefully.

The estimated risk of pneumothorax recurrence is 23% to 50% over a 1- to 5-year follow-up period, with the highest risk during the first month. However, there is no data for recurrence or incidence changes specific to iatrogenic pneumothoraces.<sup>(12)</sup>

In order to prevent pneumothorax, it is advisable to use ultrasound guidance whenever possible. If pneumothorax occurs, it is important to recognize its signs and symptoms. To exclude the presence of asymptomatic pneumothorax, in the normal clinical routine a chest X-ray should be obtained within 4 hours from the procedure of thoracocentesis, central vein cannulation of subclavian and internal jugular veins. If promptly

recognized, pneumothorax can be managed quickly and in a relatively easy way. Depending on its size and symptoms, and in particular when a tension pneumothorax is suspected, treatment can vary from simple observation to a chest tube insertion or, in the latter case, to an emergency thoracentesis needle insertion in the pleural space.<sup>(11)</sup>

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