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# A CASE REPORT ON HYDROPNEUMOTHORAX

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## ABSTRACT

An abnormal presence of air and fluid in the pleural cavity is known as hydropneumothorax. It is caused by a blunt or a penetrating chest injury certain medical procedures or damage due to underlying lung disease or it may occur for no obvious reason. It is characterized by shortness of breath and sudden chest pain. A male patient, 67 years old who is IDV positive presented with a complaint of breathlessness which was suddenly in onset and progressive and cough along with expectoration with chest pain which was right sided pleuritic. Patient didn't have any history of fever and the patient was labourer and reported to be consuming alcohol regularly past 30 years. His past medical history conveys that he had hypertension in the last 20 years and was on regular medication and was smoker for 30 years. Medical history was significant for HIV infection and Tb infection. So, the physician advised to take a report of CBC, LFT, Electrolytes, Chest Xray, ECG, HRCT thorax, Pleural fluid analysis these all parameters are showing an abnormal impression which confirms the diagnosis of hydropneumothorax. The management of hydropneumothorax mainly includes ICD insertion (intercoastal drain) to relive pressure on lung and antimicrobial therapy Analgesics were prescribed to treat chest pain. Proton pump inhibitors to prevent GI irritation, Nebulization to treat breathlessness. First criteria to confirm hydropneumothorax is significant change in chest Xray showing gross right hydropneumothorax with collapsed lung with symptoms of infective aetiology. Elevated WBC indicates the presence infection. HRTC thorax report revealed presence of hydropneumothorax.

**KEYWORDS:** Hydropneumothorax, Blebs, Bullae, Pleurodesis, Thoracostomy tubes.

## INTRODUCTION[1]

PNEUMOTHORAX is the medical term for air in the pleural cavity. Air does not enter the pleural space even though intrapleural pressures are negative during most of the respiratory cycle because the average of all partial pressures of gases in capillary blood is only 93.9 kPa (706 mm Hg). Therefore, for there to be a net migration of gases from capillary blood into the pleural space, pleural pressures lower than -54 mm Hg (or lower than -36 cm H2O) are needed, which are extremely rare under normal conditions. Therefore, if air is found in the pleural space, one of three things must have happened: either communication between the pleura and alveolar spaces, direct or indirect connectivity between the pleural space and the atmosphere, or the existence of organisms that produce gas in the pleural space.

## TYPES OF PNEUMOTHORAXES[1][3]

**1)Primary Spontaneous Pneumothorax[1]:** Incidence rates of PSP are 7.4–18 cases per 100,000 males and 1.2–6 cases per 100,000 females annually. PSP generally affects tall, skinny individuals. Smoking and being a man are further risk factors. PSP frequently happens while at rest. Changes in air pressure and exposure to loud music may act as precipitating factors.

**2)Secondary Spontaneous Pneumothorax[3]**: Multiple of respiratory disorders have been described as a cause of spontaneous pneumothorax. The most frequent underlying disorders are COPD (chronic obstructive pulmonary disease) with emphysema, cystic fibrosis, tuberculosis, lung cancer, Pneumocystis *carinii* caused by HIV infection, followed by more rare but 'typical' disorders such as lymphangioleiomyomatosis and histiocytosis.

**3)Catamenial Pneumothorax [3]:** Usually, catamenial pneumothorax develops 24 to 72 hours following the start of menstruation. It is frequently repeated and might be more typical than previously believed. Catamenial pneumothorax frequently results from pelvic or thoracic endometriosis. Because catamenial pneumothorax recurrences are common, recurrence prevention therapy is recommended after a first occurrence. Treatment for hormonal suppression is frequently supplemented.

**4)Traumatic Non-Iatrogenic Pneumothorax[3]:** With up to 50% of chest trauma sufferers experiencing it, pneumothorax is the second-most typical symptom after rib fracture. A CT of the chest should always be done on chest trauma patients who need mechanical breathing because pneumothorax may be occult in 50% of these instances. Traumatic Iatrogenic Pneumothorax.

**5)Iatrogenic pneumothorax**[3]: **This** pneumothorax most frequently occurs after positive pressure ventilation (7%), transthoracic needle biopsy (24%), subclavian vein catheterization (22%), thoracentesis (20%), transbronchial lung biopsy (10%), and pleural biopsy. Iatrogenic pneumothorax diagnosis is frequently delayed; thus, doctors should be on the lookout.

## HYDROPNEUMOTHORAX[2]

It is defined as the presence of both air and fluid within pleural space. An upright chest X ray will show air fluid levels.

## EPIDEMOLOGY[4]

Non-traumatic pneumothorax occurs in 7.4 to 18 per 100,000 people each year. Smokers have a substantially higher risk (12% vs. 0.1% lifetime risk).

Young men with slim, tall builds and primary spontaneous pneumothorax are frequently smokers. In the first three years following the initial episode, the incidence of recurrence ranges from 20 to 60%.

Patients with underlying pulmonary conditions can potentially develop secondary spontaneous pneumothorax; as a result, epidemiology varies widely.

Young women of childbearing age are affected by catamenial pneumothorax.

## ETIOLOGY[4]

1. Traumatic – caused by piercing or blunt injuries to the chest wall.

2. Spontaneous - primary spontaneous pneumothorax happens to persons who have no underlying lung illness or initiating event, whereas secondary spontaneous pneumothorax happens to those who have severe underlying parenchymal lung disease and is brought on by an initiating incidence, like a bleb rupture.

3. Iatrogenic pneumothorax is a subtype of traumatic pneumothorax in which a medical procedure, such as the insertion of a central line, results in an injury. Iatrogenic pneumothorax causes include: pleural biopsy, transbronchial lung biopsy, transthoracic pulmonary nodule biopsy, and central venous catheterization.

4. Catamenial is a pneumothorax that does not involve trauma and affects women during their menstrual cycle. The aetiology, though not fully known, is thought to be pleural endometriosis.

## CLINICAL MANIFESTATION[4]

Depending on the cause and extent of the pneumothorax, the clinical presentation varies.

Chest discomfort, difficulty in breathing are the most typical presenting symptoms (64 to 85%). Chest discomfort typically radiates to the ipsilateral shoulder or arm and is acute, stabbing, and pleuritic. After 24 hours, symptoms in primary spontaneous pneumothorax may lessen, probably as a result of the pneumothorax's slow spontaneous cure. Patients may also exhibit anxiousness or a cough, but these conditions are less observed.

An early diagnosis and course of treatment are essential for the patient's survival because the signs and symptoms of tension pneumothorax are more severe. Along with chest discomfort and breathlessness, tension pneumothorax also exhibits hemodynamic impairment. There may be severe hypoxia and hypotension in the patient.

**RISK FACTORS**[4]

Risk factors contributing primary spontaneous pneumothorax.

- Smoking
- Marfan syndrome.
- Pneumothorax in family
- Tall slender body, otherwise healthy person
- Being pregnant

Diseases associated with secondary spontaneous pneumothorax.

- COPD (chronic obstructive pulmonary disease)
- Cystic fibrosis
- Tuberculosis
- HIV with pneumocystis pneumonia
- Necrotizing pneumonia
- Sarcoidosis
- Bronchogenic carcinoma
- Idiopathic pulmonary fibrosis
- Thoracic endometriosis
- Inhalational drug use like cocaine or marijuana
- Lymphangioleiomyomatosis
- Collagen vascular disease
- Collagen vascular disease
- Severe ARDS (acute respiratory distress syndrome)
- Langerhans cell histiocytosis

## PATHOGENESIS[6]

PSP's precise pathophysiology is uncertain. The primary problem is the occurrence of a communication between the pleura and the alveolar spaces on its own. Although most of the authors agree that PSP is occurred by the spontaneous rupture of a subpleural bleb or bulla. It is not known that how frequently these lesions are the source of air leakage, even though most PSP patients, including youngsters, exhibit blebs or bullae (typically near the apices of the lungs).

A small percentage of blebs rupture during thoracoscopy or surgery, while other lesions, commonly referred to as "pleural porosity" areas of disrupted mesothelial cells at the visceral pleura, are present in the most of the cases. These areas have increased porosity and an inflammatory elastofibrotic layer, which allows air to leak into the pleural cavity. This latter characteristic may suspect for the high recurrence rates of bullectomy alone (without accompanied pleurodesis) as therapy, which can reach 20%. Several factors, such as distal airway inflammation, hereditary predisposition, anatomical abnormalities of the bronchial tree, ectomorphic physiognomy with more negative intrapleural pressures and apical ischemia at the apices, low body mass index, and caloric restriction, may contribute to the formation of blebs, bullae, and areas of pleural porosity.

## GENETIC PATHOGENESIS[6]

Familial primary spontaneous pneumothorax and genetics.

1)A FLCN (Folliculin) gene mutation can cause primary spontaneous pneumothorax.

2)This gene encodes a protein called folliculin, which is made by the lung's alveolar cells and is involved in healing damaged lung tissue.

3)Folliculin is present in the connective tissue cells that allow the lungs to contract and expand during breathing.

4)Isolated familial spontaneous primary pneumothorax is caused by a nonsense mutation in the folliculin gene.

5)Modified folliculin protein can cause the inflammatory process to start in the lung tissue, which can change and harm the tissue and lead to the formation of blebs.

## GROSS PATHOLOGY[6]

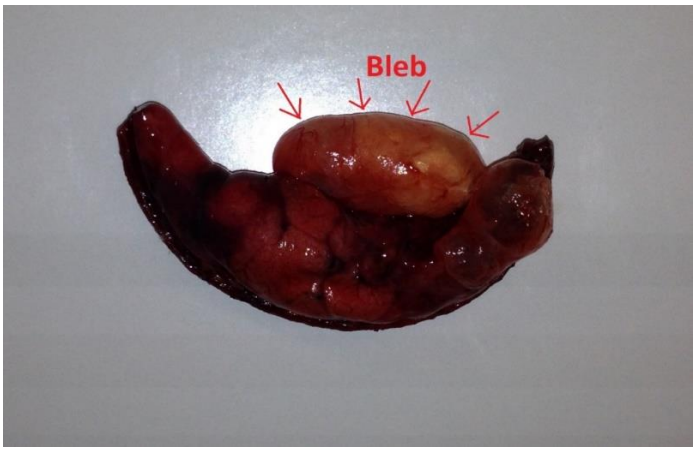
The pneumothorax has the following gross pathological findings.

1)Bullae or blebs on the surface of the pleura.

2)Plaque fibrosis.

3)Adhesions between the lungs.

4)Inflammation of airways.




## MICROSCOPIC PATHOLOGY[6]

The following microscopic findings are connected to pneumothorax:

1)Pleural fibrosis with thickening and hyperplasia of the mesothelium.

2) Proliferation of the pleura, eosinophils, thickening of the mesothelium, and lymphocytes.

## DIAGNOSIS[4][6]

1)Any blunt or piercing chest trauma is a suspected diagnosis of traumatic pneumothorax. The cornerstones of the diagnosis are an adequate history, physical examination, and chest X-rays. The chest X-ray and physical examination frequently miss minor pneumothoraxes, but a CT chest scan taken as part of a diagnostic workup for another injury may reveal them.

2)Spontaneous pneumothorax should always be considered in the differential diagnosis list for individuals who come with abrupt onset of acute pleuritic chest discomfort and shortness of breath.

3)Except for tension pneumothorax, which is diagnosed clinically, the diagnosis is frequently made by an upright chest radiograph.

4)Point-of-care ultrasonography is frequently used to assess patients who have pneumothoraxes. In fact, ultrasound can diagnose pneumothoraxes more quickly and accurately than a chest X-ray while exposing the patient to less radiation.

5)It is believed that the chest radiograph understates the magnitude of the pneumothorax.

## COMPLICATIONS[4]

A common pneumothorax consequence is misdiagnosis. Misdiagnosis can be caused by several things, including an incomplete or insufficient history or physical exam, a low index

of clinical suspicion, omitting a chest radiograph, or failing to spot a pneumothorax on one. Misdiagnosis results in failure to treat the pneumothorax, which can, in some situations, have disastrous effects including.

1)Conversion to tension pneumothorax.

2)Hypoxemic respiratory failure

3)Shock.

4)A respiratory arrest.

5)Cardiac arrest.

6) Empyema.

7) Respiratory oedema with re-expansion.

8)Chest tube induced arrythmia.

9)Iatrogenic complications include failure of the lung to re-expand, lung laceration, infection of the insertion site and pleural space, laceration of the internal mammary artery or intercostal vessels, haemothorax, persistent air leak, damage to the intercostal neurovascular bundle, etc. Caused by needle decompression or thoracostomy procedure.

10) Pneumomediastinum: The mediastinum can get infiltrated with pneumothorax-derived air. This appears as air launch around the heart on a chest X-ray. Additionally, during the heart examination, a crunching sound could be audible. The left lateral decubitus posture is the ideal place to hear this sound, known as Hamman's crunch.

**MANAGEMENT/TREATMENT[4]**

The aetiology, clinical presentation, and risk stratification all influence the management.

TARGETS FOR TREATMENT

The basics of pneumothorax treatment include.

1)Air removal.

2)Reducing air leakage.

3)Repairing pleural fistulas.

4)Encouraging lung re-expansion.

5)Preventing subsequent occurrences.

**Aspiration[3]**

According to recommendations, aspirating the PSP to reduce its size is just as effective as inserting a chest tube in cases where the PSP is large (>50%) or when the PSP is linked to dyspnoea. The provision of local anaesthesia is required for this surgery, as well as the

insertion of a needle with a three-way tap and up to 2.5 litres of air (in adults). If a further X-ray shows a significant reduction in the extent of the pneumothorax, the remaining course of treatment might be cautious.

**Chest tube**[3]

The most effective therapy for a pneumothorax is a chest tube, often known as an intercostal drain. The "safe triangle" under the axilla (armpit) is where a chest tube is normally put to prevent internal organ damage. Applying local anaesthetic. Two different types of tubes are typically employed. Small-bore (less than 14 F, 4.7 mm diameter) tubes may be placed using the Selinger procedure in spontaneous pneumothorax. Larger tubes are not advantageous. It has been noted that bigger tubes (28 F, 9.3 mm) are used for traumatic pneumothorax. Chest tubes is necessary for tension pneumothorax, significant SSPS (>50%), and PSPs that have not responded to needle aspiration. They are connected to a system, according to the manner.

**Pleurodesis and surgery**[3]

Pleurodesis is regarded as the ideal treatment. The pleural gap is permanently eliminated during this treatment, which also connects the lung to the chest wall. The most successful procedure is regarded to be a surgical thoracotomy that includes identifying any sources of air leakage, stapling of blebs, pleurectomy of the outer pleural layer, and pleural abrasion of the interior layer.

**PHARMACOTHERAPY**[4]

Pharmacotherapy for pneumothorax is primarily concerned with providing enough pain relief from the pneumothorax itself as well as from operations (such as thoracostomy or needle aspiration) that restore lung volumes and air-free pleural space. Pain can be controlled by injecting an anaesthetic locally at the site of the thoracostomy, as well as by giving patients either intravenous or oral pain medicine, or a combination of the two. A thoracostomy typically requires the use of intravenous opiates or procedural sedative analgesia to place the tube and treat any discomfort brought on by the indwelling thoracostomy catheter. For these individuals, some experts recommend localized anaesthetic, such as intercostal nerve blocks. To prevent infection at the site of insertion and subsequent problems, such as pneumonia, prophylactic antibiotics should be considered in patients during the chest tube implantation.

## CASE REPORT

A 67-year-old male with a history of IDV and HIV positivity was admitted in Vijayanagar Institute of Medical Science, Bellary, Karnataka. He presented complaints of breathlessness which was sudden in onset and progressive and cough associated with expectoration for the past 3 days and chest pain which was right sided pleuritic.

The patient was labourer He reported a history of smoking for 30 years. The patient denied any fever, night sweats, weight loss, or haemoptysis. His medical history was significant for HIV infection. His past medical history conveys that he had hypertension for 20 years and was on regular medication (Amlodipine 5mg OD), and was newly diagnosed for TB before 2 months back and was on ATT.

On objective examination, the patient was found to have a lower respiratory rate, oxygen saturation of 94% on room air. Patient was found to have BP rate of 170/100 mmHg and pulse rate was 130bpm.

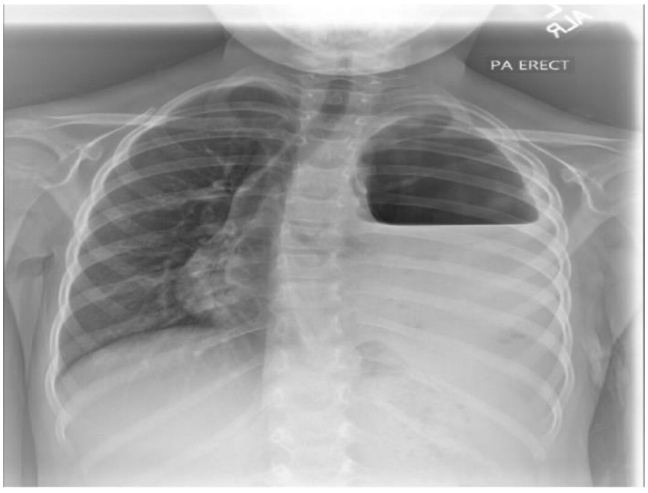
On systemic examination respiratory system showed decreased breathing sounds on ride side and dull note on right side, and CNS examination showed that the patient was conscious++s and oriented and per abdomen examination showed soft and non-tender.

## LABORATORY FINDINGS

| **DAY 1** | **DAY 2** |
|---|---|
| Haemoglobin, Lymphocytes, Red blood cells, PCV, MCV, MCH are found to be decreased.<br>White blood cells, Neutrophils, MPV, RDW-CV, PDW-CV were found to be increased.<br>On examination of liver function testy Albumin, A/g ratio, were found to be decreased.<br>Globulin Conjugates bilirubin, ALT, ALP, Serum creatinine, Blood urea and electrolytes like potassium, chloride are found to be increased<br>**HRTC THORAX:**<br>Loculated Hydropneumothorax noted on right upper and mid zone causing moderate compression of upper, middle and lower lobes, with underlying atelectatic changes.<br>Diffuse subcutaneous emphysema seen along the right chest wall. | Haemoglobin, Lymphocytes, PCV were found to be decreased.<br>WBC, Neutrophils, MPV, RDW-CV, ESR were found to be increased.<br>**DAY 3**<br>Urine protein creatinine ratio is increased and LDH was found to be increased.<br>**FLUID ANALYSIS REPORT**<br>Quantity; 1ml<br>Colour: straw yellow<br>Cell count: 2500 cells / cmm<br>Cell type: Neutrophils 85%<br>Lymphocytes: 10%,<br>Reactive mesothelial cells: 5%,<br>No malignant cells. |

**X RAY REPORT**

Gross right HYDROPNEUMOTHORAX WITH COLLAPSED LUNG ( Infective etiology).




**TREATMENT GIVEN**

Initially the treatment was started by temporary clamping of an intercoastal chest drain (ICD) to drain out the pleural fluid and to restore negative intrapleural pressure and respiratory function. On confirmation, physician started the treatment by giving antibiotic such as Tablet Ceftriaxone 1g two times a day for 7 days to prevent Nosocomial infection. Injection Pantoprazole 40 mg BID for 7 days which is a proton pump inhibitor was given to prevent Gl irritation. Then nebulization of combination of salbutamol + ipratropium bromide every 8thourly for 7 days as the patient had complained about breathlessness. Next tablet Tramadol was given 50 mg BID for 7 days to relieve chest pain suffering by the patient. Tablet Paracetamol 500mg was given TID for 7days which is an analgesic and antipyretic used for fever associated with pain. Injection Metronidazole 100ml TID was started from day 2 to day 7 to treat infection. IVF, one pint NS + Multivitamin injection OD, one ampule MVI+ 500 ml NS was started from day 3 to day 7. The patient was on medication category 1 ATT which includes the combination of Isoniazid 300mg, Rifampicin 400mg, Ethambutol 500mg, Pyrazinamide 400mg was started from day 4 to day 7 as the patient had the history of Tuberculosis. Tablet Pyridoxine was started OD 40 mg from day 4 to 7 to prevent vitamin B6 deficiency resulting from certain medications and some medical conditions.

**DISCHARGE MEDICATIONS.**

| Sl no | Name of medication | Dose | Route | Frequency |
|---|---|---|---|---|
| 1 | CEFTRIAXONE | 1g | PO | 1-0-1 |
| 2 | PANTOPRAZOLE | 40mg | PO | 1-0-1 |
| 3 | TRAMADOL | 50mg | PO | SOS |

| | | | | |
|---|---|---|---|---|
| 4 | PARACETAMOL | 500mg | PO | 1-1-1 |
| 5 | ATT (Anti tubercular Therapy) | 300mg,400mg, 500mg,400mg | PO | Modified dose |
| 6 | PYRIDOXINE | 40mg | PO | 1-0-0 |

## RESULTS AND DISCUSSION

HYDROPNEUMOTHORAX: - A abnormal presence of air and fluid in the pleural cavity is known as hydropneumothorax. It is caused by a blunt or a penetrating chest injury certain medical procedures or damage due to underlying lung disease or it may occur for no obvious reason. It is characterized by shortness of breath and sudden chest pain. A male patient ,67 years old who is IDV positive presented with a complaint of breathlessness which was suddenly in onset and progressive and cough along with expectoration with chest pain which was right sided pleuritic. Patient didn't have any history of fever and the patient was labourer and reported to be consuming alcohol regularly past 30 years. His past medical history conveys that he had hypertension in the last 20 years and was on regular medication and was smoker for 30 years. Medical history was significant for HIV infection and Tb infection. So, the physician advised to take a report of CBC, LFT, Electrolytes, Chest Xray, ECG, HRCT thorax, Pleural fluid analysis these all parameters are showing an abnormal impression which confirms the diagnosis of HYDROPNEUMOTHORAX. The management of HYDROPNEUMOTHORAX mainly includes ICD insertion (intercoastal drain) to relive pressure on lung and antimicrobial therapy Analgesics were prescribed to treat chest pain. Proton pump inhibitors to prevent GI irritation, Nebulization to treat breathlessness. First criteria to confirm HYDROPNEUMOTHORAX is significant change in chest Xray showing gross right HYDROPNEUMOTHORAX with collapsed lung with symptoms of infective aetiology. Elevated WBC indicates the presence infection. HRTC thorax report revealed presence of HYDROPNEUMOTHORAX.

## CONCLUSION[2]

Medical practitioners have followed the rational medication. Hydropneumothorax requires thorough pleural fluid sample and investigations, including a microbiological and biochemical work-up, in order to establish an etiological diagnosis. TB is still the most typical cause of hydropneumothorax. ICD tube insertion and antibacterial chemotherapy are still part of the treatment. But for extended periods of time, ICD is required. There is a lack of information in the literature about hydropneumothorax, which makes further research necessary to aid in the effective management of the condition.

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