

Hemithorax Opacification (Hemithorax White-Out) — Radiology

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Sometimes, in surgical wards and at the emergency department, the radiologist might see a chest x-ray with a complete white-out of a hemithorax. The number of causes that can cause a complete white-out of a hemithorax on a chest plain radiography is limited. To better understand such causes, we chose to classify them according to the position of the trachea.



A Hemithorax White-Out with the Trachea Pulled Towards the White-Out

Several conditions can **cause a complete white-out of half of the chest cavity on the chest x-ray** which all share one feature, i.e. the loss of lung volume on the affected side. These conditions include pneumonectomy, total lung atelectasis in the postoperative period, pulmonary agenesis and pulmonary aplasia.

Pneumonectomy

Pneumonectomy is a surgical procedure that can be defined as the **total removal of the lung on one side**. The main indication of such a procedure is the removal of the ipsilateral lung tissue adjacent to a malignant lung tumor. A complete pneumonectomy is usually performed if the contralateral lung is considered as adequate in terms of function.

The complete removal of one lung causes a complete white-out of that hemithorax on plain radiography imaging. The trachea will be pulled to the side of the removed lung. If surgical clips were used at the time of surgery, they might be visualized at the lung hilum on the x-ray.

If a computed tomography scan of the chest is performed, one would notice the complete absence of the lung on that side. **High-resolution computed tomography scanning of the contralateral lung will reveal hyperaeration** which is thought to be a compensatory reaction.

Complete Unilateral Lung Atelectasis

The term, collapsed lung, is preferred when the total lung has been collapsed.

Atelectasis can be defined as the collapse of the alveoli and the airway passages which can be due to obstruction of the main airway. The obstruction of the right or left main bronchus can collapse the lung distal to the obstructed bronchus.

A chest radiograph will reveal a complete white-out of the hemithorax of the collapsed lung with the **trachea and mediastinum shifted towards the collapsed lung**. The other lung might show compensatory overinflation.

A computed tomography scan of the chest can reveal the extent of the collapsed lung parenchyma and might also reveal the obstructing lesion, i.e. tumor versus foreign body for instance.

Pulmonary Agenesis

Bilateral pulmonary aplasia is incompatible with life. Unilateral pulmonary aplasia, or agenesis depending on the presence of the main bronchus, might go unnoticed until adolescence. The condition is **commonly associated with other congenital anomalies such as cardiovascular malformations**.

Chest plain radiography

A chest plain radiography will reveal a **complete hemithorax white-out on the ipsilateral side of pulmonary agenesis**. The mediastinal structures, including the trachea, are expected to be pulled towards the affected side. The contralateral side will usually show signs of hyperinflation.

Computed tomography

A computed tomography scan is useful in the confirmation of the diagnosis and it shows the absence of normal lung parenchyma on the affected side. **Most patients do not have a main bronchus on the affected side or might have a rudimentary bronchus** which can be easily identified on the computed tomography scan.

A Hemithorax White-Out with the Trachea Pulled Far from the White-Out

Causes of a complete white-out of a hemithorax that will result in a shift of the mediastinum to the contralateral side are expected to include an increased volume of the thoracic cavity of the affected side. Therefore, the most **common causes of such an occurrence are massive pleural effusions, a huge pulmonary mass, and a large diaphragmatic hernia.**

Pleural Effusions

A pleural effusion is defined as the **accumulation of fluid in the pleural space**. The accumulation of fluid can be a transudate, an empyema, a chylothorax, or a hemothorax. The symptoms of large pleural effusions are usually attributed to the collapse of the ipsilateral lung and the underlying etiology of the effusion.

Plain radiographic imaging

Plain radiographic imaging of the chest in the erect position will reveal a complete white-out of a hemithorax if the pleural effusion is massive. Patients with massive pleural effusions are expected to have a **mediastinal shift away from the effusion**. Patients who have a large effusion that resulted in a complete collapse of the ipsilateral lung might have the trachea and mediastinum pulled towards the affected side.

Computed tomography

A computed tomography scan is helpful in the **identification of some causes of massive pleural effusions**, such as malignant disease. The differentiation between a massive pleural effusion and other causes of a complete white-out of a hemithorax is made easier with computed tomography imaging.

Huge Lung Masses

Huge tumors of the lung might cause a complete white-out of a hemithorax, especially if they compress the main bronchus and cause a complete collapse of the ipsilateral lung. Such tumors are usually cancerous.

Diaphragmatic Hernia

Diaphragmatic hernias can be congenital or acquired. They are characterized by a **defect in the diaphragm which results in the herniation of intra-abdominal organs** such as the liver and the stomach into the thoracic cavity. When the hernia is huge, it can cause complete opacification of the ipsilateral hemithorax. History and physical examination and the presence of intestine in the chest cavity on the x-ray are usually sufficient to make the diagnosis. Huge diaphragmatic hernias are usually congenital, rather than acquired.

A Hemithorax White-Out with the Trachea Position Unchanged

Conditions that do not result in a significant decrease or increase in the volume of occupying tissue of a hemithorax might cause a complete white-out if severe enough of the affected side, but without any effect on the position of the trachea. In other words, **the trachea and the other mediastinal structures will remain central in position.** Consolidation due to pneumonia, pulmonary edema, chest wall masses, and pleural tumors are the most common examples of a complete white-out of a hemithorax with the trachea remaining central in position.

Pneumonia and Consolidation

The filling of the alveoli with fluid causes opacification on the chest x-ray. This fluid can be pus from pneumonia, a transudate because of heart failure, cells from a bronchoalveolar carcinoma, or blood from a pulmonary hemorrhage or hematoma. **Lobar pneumonia might cause significant consolidation and opacification** of more than one lobe of the affected lung. If this is accompanied by a large pleural effusion, the whole hemithorax might appear white on the x-ray.

Chest Wall Tumors

Very large chest wall tumors, known as Askin tumors, are part of the Ewing sarcoma family of tumors. These tumors might be massive enough to cause a complete opacification of the hemithorax on the affected side.

Pleural Tumors

Mesothelioma can be large enough to obscure the lung tissue behind it. A chest x-ray can show an almost complete, or a complete white-out, of the affected side. **Sometimes, the compressing tumor reduces the volume of the lung tissue.** If this happens, the mediastinal structures, including the trachea, might be pulled towards the lesion.

Pulmonary Edema and Acute Respiratory Distress Syndrome

Severe pulmonary edema due to congestive heart failure or acute respiratory distress syndrome due to any severe illness can cause a bilateral white-out of both sides of the thorax on the x-ray.

References

[Hemithorax white-out \(differential\)](#) via radiopaedia.org

[Pneumonectomy](https://radiopaedia.org/articles/pneumonectomy) via <https://radiopaedia.org/articles/pneumonectomy>

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