*PNEUMOMEDIASTINUM**

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ABSTRACT

Mediastinum is defined as the area demarcated by the thoracic inlet superiorly, the diphragm inferiorly, and the pleural cavities laterally. The mediastinum is a division of the thoracic cavity that contains thymus gland, the heart, trachea and portions of the seophagus, and other structures. Mediastinum divided into 3 region, anterior, posterior, superior, and middle regions.

Pneumomediastinum or emphysematous mediastinum is existence of free air in the mediastinum due to spontaneous or secondary reasons. That can be confirmed with thorax X-Ray or CT- Scan thorax. The symptomps are severe central chest pain, shortness of breath, subcutaneous emphysema, laboured breathing and voice distortion. In physical diagnosis, especially on auscultation, there is spesific sign called "Hamman's Crunch" (crunching sound corresponding with the cardiac cycle (Hamman's Crunch).

Pneumomediastinum can leadto pneumopericardium, pneumotoraks, penumoretroperitonium or penumoperitonium. Air in the mediastinal cavity can be absorbed by itself slowly, so penumomediastinum can treated non-operatively.

Keywords : *Mediastinum, Pneumomediastinum, Treated Conservatively*

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INTRODUCTION

Pneumomediastinum or emphysematous mediastinum is existence of free air in the mediastinum due to spontaneous or secondary reasons.[3,5,11] Pneumomediastinum diagnosed in 1/100.000 of natural births, more frequnet inchildren (1/800-1/15.500) or 1/44.500 of accident. Incidence in ages between 5-34 years is 1/25.000 ang 76% of cases are males.[2]

Pneumomediastinum can caused spontaneously or traumatically. Spontaneous pneumomediastinum is the

presence of air into the mediastinum without an obvious causative factor like an operation, presence of infection, trauma, or air following a viscous perforation. When a causative factore is identified, this condition known as secondary pneumomediastinum.[1,11,12]

Usual including factor include asthma, Chronic Obstructive Pulmonary Disease(COPD), interstitial lung disease, bronchiectasis, lung cysts or lung malignancy, trauma, and excessive vomiting. The use of recreational drugs, like cocaine, marijuana, methamphetamine can cause penumomediastinum.[10,15]

CAUSE OF PNEUMOMEDIASTINUM

Pneumomediastinum can be caused due to an abnormal increase in pressure in the pneumomediastinum. Pressure on pleural cavity becomes low and negative, so the air is trapped in mediastinal structure.[4]

Gas can enter to mediastinal cavity from rupture of alveoli, from rupture of the gastrointestinal tract or the tracheobronchial tree, or from extraluminal gasinto the toraks from the chest wall, neck, or retroperitoneum.[3,5,6]

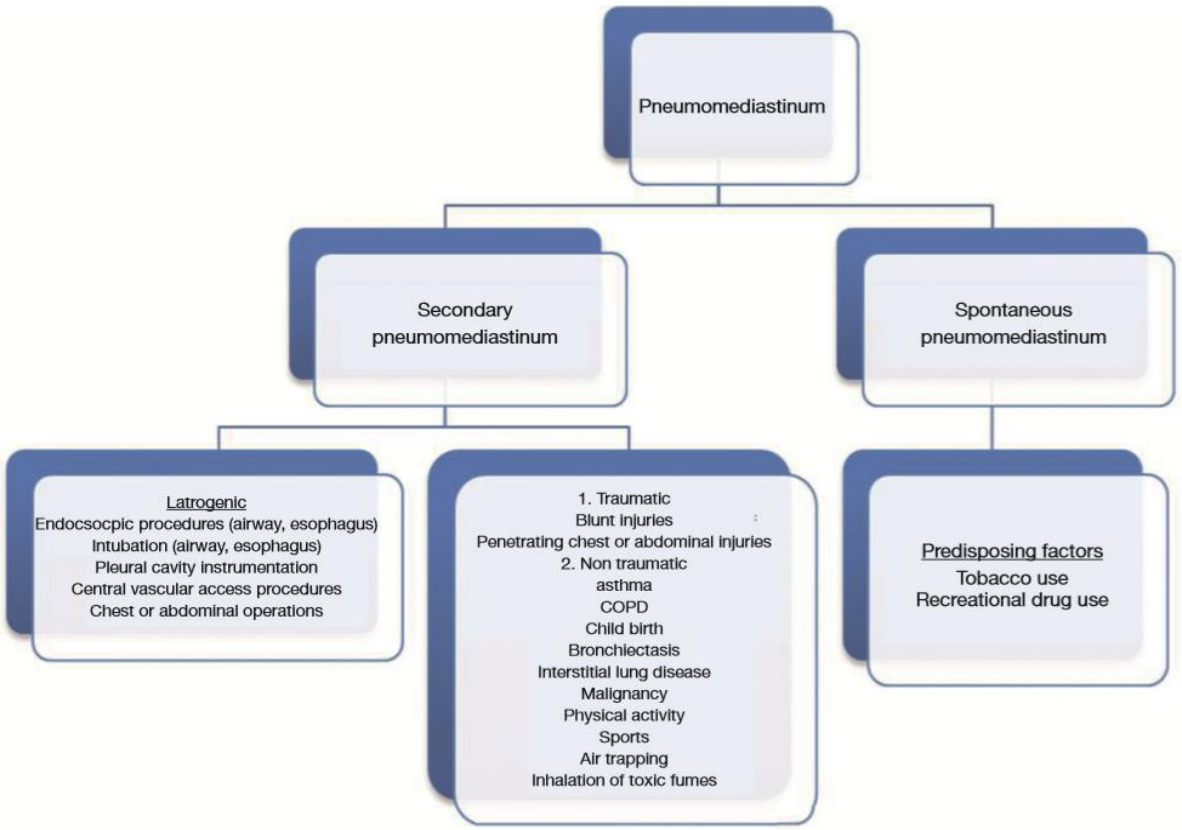


Figure1. Pneumomediastinum Etiology (Adopted From Koaritas VK)[1]

Table 1. Cause of Pneumomediastinum (Adopted From Bejvan SM)

Cause	Underlying Condition	Source of Underlying Condition
Alveolar rupture associated with elevated alveolar pressure	Airway obstruction	Asthma; foreign body; acute obstructive laryngitis; congenital stenosis
	Mechanical ventilation	General anesthesia; positive end-expiration pressure
	Thoracic trauma	Blunt trauma; penetrating trauma (e.g., from rib fracture with pulmonary laceration or from lung biopsy)
	Deep respiratory maneuvers	Strenuous activity; vital-capacity maneuvers; acidosis (Kussmaul respiration)
	Valsalva maneuver	Weight lifting; Heimlich maneuver; defecation; parturition; inhalation of nitrous oxide, marijuana, or cocaine
	Vomiting	Diabetic ketoacidosis; anorexia nervosa
	Change in atmospheric pressure	Caisson disease; rapid change in altitude
Alveolar rupture associated with alveolar disease	Infection	Bacteria; viruses (measles, influenza, smallpox, chickenpox); mycobacteria (tuberculosis); lung abscess
	Aspiration	
	Adult respiratory distress syndrome	
	Emphysema	
	Interstitial lung disease	Sarcoidosis; silicosis
Tracheobronchial injury	Trauma	
	Instrumentation	Bronchoscopic biopsy
	Tracheal or bronchial neoplasm	
Esophageal perforation	Vomiting	
	Iatrogenic injury	
	Trauma (penetrating)	
	Neoplasm	
Head and neck injury or surgery	Perforation of nasopharynx	Traumatic intubation
	Facial fractures or surgey	
	Dental procedures	
	Neck surgery	Thyroid surgery; tonsil surgery; tracheostomy
Abdominal or retroperitoneal injury or surgery	Bowel perforation	
	Diverticulitis	
	Hernia	
	Ulcer	
	Trauma	
	Rectosigmoid surgery	

CLINICAL PRESENTATION

The main symptom of penumomediastinum is chest pain, spread into the neck or the back. Other symptoms are coughing spells, dyspnea, neck pain, dysphagia or emesis. Subcutaneous emphysema can be detected in 70% cases. Other sign are rhinolalia (nasally sounding voice), neck swelling and hoarseness.[11,20]

Clinical evaluation may identufy tachycardia, tachypnea or anxiety. Spesific sign can be found in physical examination, there was click present or mediastinal crunch in left sternal border and apex same with heart beat on auscultation, known as the Hamman's Sign.[7, 11, 19]

DIAGNOSIS

Chest X-Ray can showing lucent streaks, visible mediastinal pleura, and bubbles of air outlining mediastinal structure. Chest CT Scan can be used for confirm the chest X-ray, and it is important to differentiate between pneumopericardium and pneumomediastinum. Bronchoscopy or esophagoscopy are not routinely required. Ultrasound of the mediastinum can be done in emergency room to identify pneumomedistinum.[6,8,11]

There are the other sign (on X-ray or CT-Scan), such as ring sign (air sorrunding the pulmonary artery), thymic

sail (because of air, the thymus elevated), continous diaphragm sign, double bronchial wall, or air adjacent to spine or hemidiaphragm.[16,17] In laboratory there was leukocytosis or elevated C-Reactive protein. Sometimes, an abnormal ECG can be found.[11,17]

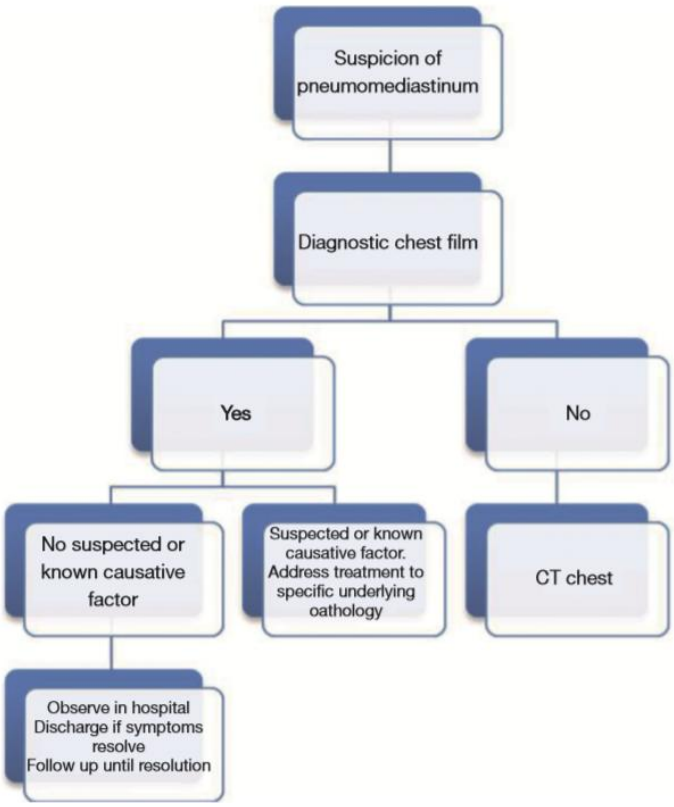


Figure 2. Diagnosis for Pneumomediastinum(Adopted From Koaritas VK)[11]

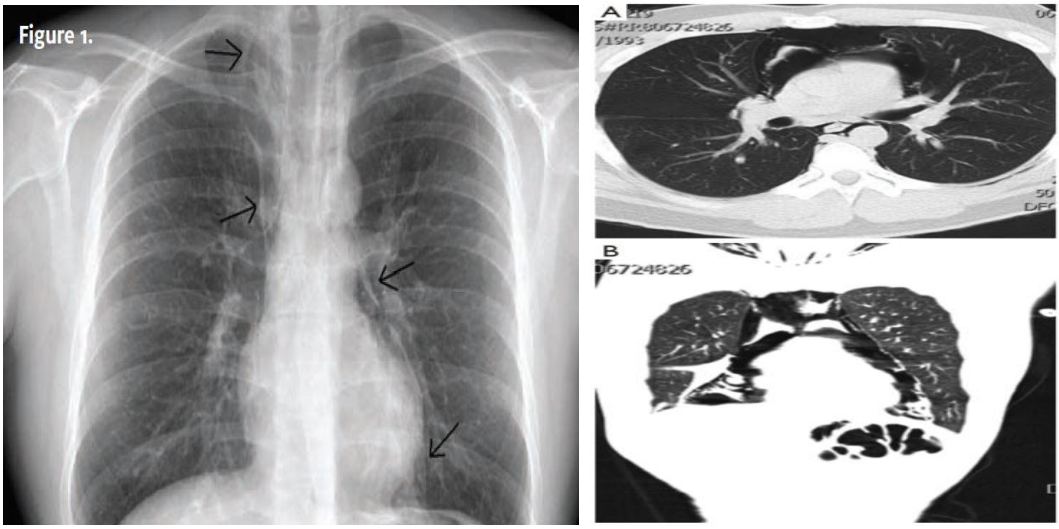


Figure 3. Pneumomediastinum: Mediastinal air throughout the medial border of the descending aorta (Adopted From Koaritas VK)[11]

MANAGEMENT

Air in the mediastinal cavity can be absorbed by itself slowly, so penumomediastinum can treated non-operatively. Patient must be hospitalized for a minimum of 24 hours observation. Pain can controlled with analgesics. Anti anxiety drug can also be administered. Antitussives for cough and administration od oxygen can increase gas absorpsion. In some other cases that require decompression, VATS or thoracotomy can be done.[11,13,18]

COMPLICATION

The complication of pneumomediastinum are pneumothorax (air pass the pleura or peritoneum resulting pneumoperitoneum), subcutaneous emphysema (the air penetrate to the skin, neck, or upper abdomen via the loose alveolar fat tissue), This condition usually require minor intervention, like chest tube drainage and skin incision.[2,9,14]

Table 2. Pneumomediastinum versus Pneumotoraks (Adopted From Bejvan SM)[3]

Feature	Characteristic	
	Pneumomediastinum	Pneumothorax
Configuration of gas	Multiple thin, lucent streaks; can be confused with pneumothorax when streaks extend along diaphragm, over lung apex, or behind sternum	Apical lucency (upright); medial basal lucency (supine); deep-sulcus sign (supine)
Distribution	Outlines mediastinal structures (pulmonary artery, aorta, esophagus, and airway)	Never outlines mediastinal structures; anteromedial (supine); apical (upright)
Change in distribution with change in patient position?	No	Yes

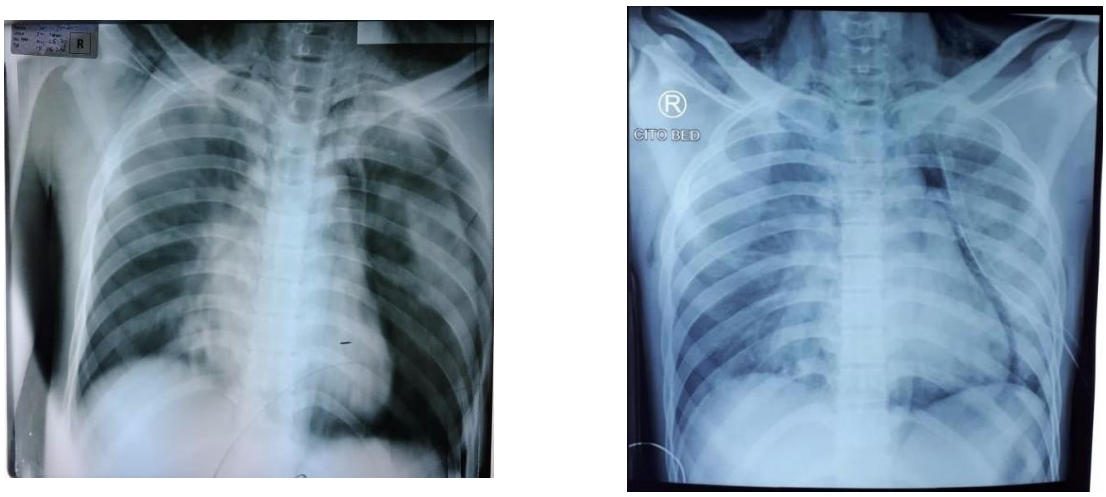
Table 3. Pneumomediastinum versus Pneumopericardium (Adopted From Bejvan SM)[3]

Feature	Characteristic	
	Pneumomediastinum	Pneumopericardium
Configuration of gas	Multiple thin, lucent streaks	Broad band; halo sign (gas surrounding heart)
Distribution[a]	Outlines mediastinal structures, including aortic arch, trachea, and bronchi; commonly extends into neck	Because limited to pericardium, outlines ascending aorta and main pulmonary artery but does not extend to aortic arch, along trachea or bronchi, or into neck
Change in distribution with change in patient position?	No	Yes
Associated findings	See text	Visible thickening of pericardium; hydropneumopericardium

CASE REPORT OF PNEUMOMEDIASTINUM CASES IN DR. SOETOMO GENERAL HOSPITAL

CASE 1

Figure 4. Man, 21 years old, post traffic accident. Patient from Mojokerto General Hospital to Emergency Room DR. Soetomo General Hospital with shortness of breath, decreased awareness and stable hemodynamics (Pulse 102x/minute, Blood Pressure 115/70 mmHg, RR 30x/minute, and Saturation 99%), resuscitation and chest x ray examination were performed. The patient was diagnosed with pneumomediastinum and left pneumothorax



(a) **(b)**

Figure 5. Thorax X-Ray (a) Before Chest Tube insertion, visible air in the mediastinal region, pulmonary collapse 40%, (b) after Chest Tube insertion, lung expand almost 100%, air lines appear on the left mediastinal edge

CASE 2

Figure 6. 35-year-old male with pain in the lower right tooth for 3 weeks and swelling in the lower jaw for about 1 week, the patient has been treated at the Mojokerto hospital by a general surgeon, the right neck has been pricked and pus is removed, then the patient was referred to the Dr. Soetomo Hospital. Diagnosis for this patient are mouth floor phlegmon + mediastinitis + pneumomediastinum

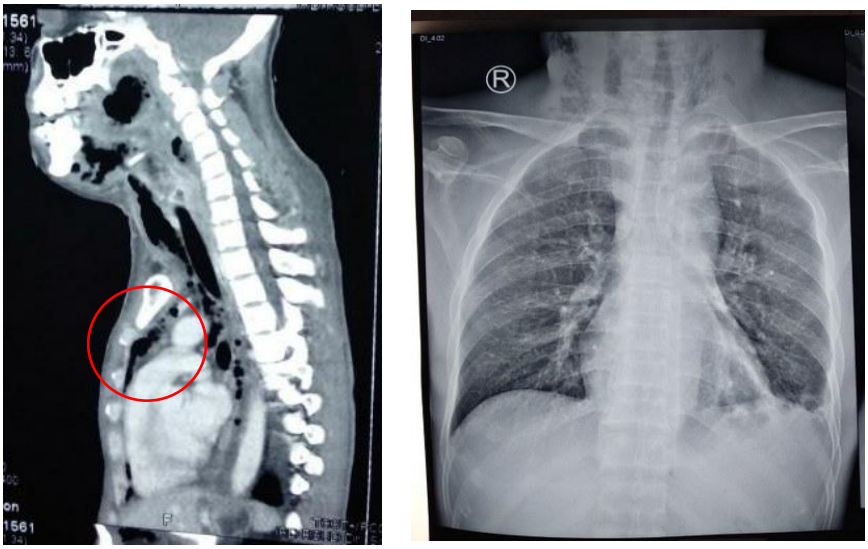


Figure 7.

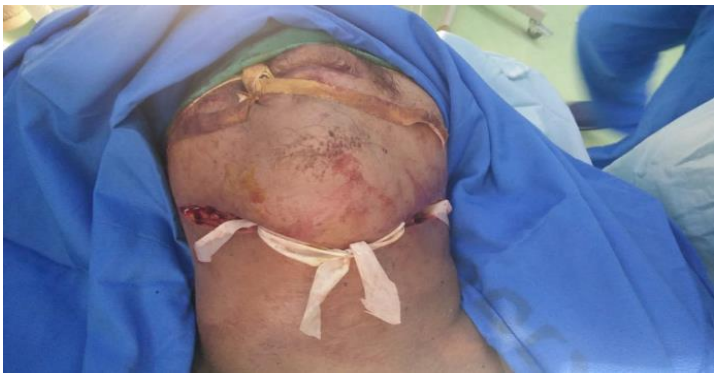


Figure 8. Operation site

Figure 9. Chest X-Ray 4 days after mediastinal drain insertion

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