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SPONTANEUS PNEUMOMEDIASTINUM

Wojciech Rokicki The Department and Clinic of Thoracic Surgery in Zabrze, Medical University of Silesia in Katowice - Corresponding Author

Marek Rokicki The Department and Clinic of Thoracic Surgery in Zabrze, Medical University of Silesia in Katowice

Mateusz Rydel The Department and Clinic of Thoracic Surgery in Zabrze, Medical University of Silesia in Katowice

ABSTRACT

Spontaneous pneumomediastinum

Spontaneous pneumomediastinum is a rare condition, more common in male patients, and the average age is between 5 and 34 years. Symptoms are unspecific, thus while differential diagnosis, other life threatening conditions should be considered. Despite the many proposed conditions that may predispose to the development of spontaneous pneumomediastinum, about 30-56% of patients failed to establish the cause of its state. The spontaneous pneumomediastinum most often resolves spontaneously during diagnostics.

Pneumomediastinum sometimes called mediastinal emphysema is characterized by the presence of air and/or gas in mediastinum. However, it seems that term "emphysema" concerns rather tissues, whereas pneumomediastinum is a more precise term indicating the presence of air in the body cavity (Mason, 2005; Kobashi, Okimoto, Matsushima, Soejima, 2002).

Anatomically mediastinum communicates with many areas of the body such as spaces: retropharyngeal, submandibular, retroperitoneal and pelvic, so that the air from mediastinum can travel to the distant body areas as well as from the spaces descibed above can move to the mediastinum (Zylak, Standen, Barnes, Zylak, 2000; Kleinman, Grill, Whalen, 1978). Air from the mediastinum can also get to the pleural cavity where along the large vessels can move into the peritoneal cavity causing peritoneal emphysema (Pooyan, Puruckheer, Summers, McGregor, 2004). We distinguish two main types of pneumomediastinum (Figure 1) (Kouritas et al, 2015).

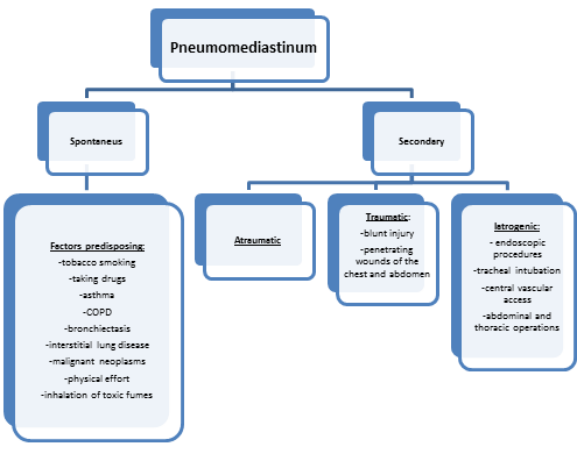

Figure 1. Classification of pneumomediastinum

In 1939, Macklin proposed sequence of events that resulted in spontaneous pneumomediastinum (SP). As a result of increased airway pressure (caused by the Valsalva maneuver), there is a breakdown of the small alveoli and the passage of air into the lung parenchyma, from which further released air along the loose peribronchial and perivascular spaces penetrates towards the mediastinum, causing pneumomediastinum. This phenomenon is currently known as Macklin effect (Sahni et al, 2013).

The first case of spontaneous pneumomediastinum was described by L.V. Hamman from the J. Hopkins Hospital in Baltimore, who observed in patient after natural labour the appearance of subcutaneous emphysema on the neck and chest with accompanying pneumomediastinum. In addition, during the auscultation he noted at the apex of the heart crunching, rasping sound synchronous with the heartbeat, especially in the patient's left-hand position (Hamman's symptom) (Kobashi, Okimoto, Matsushima, Soejima, 2002).

Spontaneous pneumomediastinum is a rare condition and its incidence ranges from 1: 25000 to 1: 44000 inhabitants. Male patients are predominant (76% of all cases) and the mean age is between 5 and 34 years. It is believed that the cause of the prevalence of SP among young people is the high level of fibrous tissue of their mediastinum compared to the elderly in which they are rigid, fibrotic by which more "tight" (Mason, 2005; Jougon et al, 2003; Kara et al, 2015; Caceres et al, 2008).

Among the big number of spontaneous pneumo medias tinum clinical symptoms, should be mentioned:

- Chest pain radiating to the neck and/or back
- Subcutaneous emphysema of the chest and/or neck
- Dyspnoea
- Persistent cough
- Swallowing difficulties
- Febrile states
- The appearance of hoarseness with nasal speech
- Stomach pain
- Vomiting and nausea
- Tachycardia
- Dizziness
- Swelling of the face
- General weakness (Park S, Park J, Jung, Park, 2016)

The most common symptoms observed in patients with SP were: sudden chest pain (60-100%), persistent cough (80%), dyspnoea (75%), subcutaneous emphysema (70%), Hamman's symptom (45%) of patients (Sahni et al, 2013; Dajer-Fadel, Arguero-Sanchez, Ibarra-Perez , Navarro-Reynoso, 2014). The diagnosis of spontaneous pneumomediastinum, which starts with chest pain and subcutaneous emphysema, includes elimination the cardiopulmonary disorders (acute coronary disease, pericarditis, pulmonary embolism, pneumonia, pneumothorax). Differential diagnosis should also exclude perforation of the esophagus, gastroesophageal reflux and gastric cardia spasm. Only after the elimination of these conditions spontaneous pneumome diastinum could be diagnosed (Caceres et al, 2008).

The most common cause of spontaneous pneumomediastinum is the the Valsalva maneuver in the form of coughing, hard physical work, sports, vomiting, defecation, wind instruments. Sponta

neous pneumomediastinum is more commonly observed in patients with: bronchial asthma, COPD, ketoacidosis in diabetes, diffuse interstitial lung fibrosis, after tonsillectomy, tobacco smoking history, after natural labour, afer intense scream (Kara et al, 2015; Caceres et al, 2015; Tran, Littlefield, 2015). The appearance of SP has also been reported after ecstasy use, marijuana smoking, cocaine inhalation, and after injection of drugs into the jugular vein (Janes, Ind, Jackson, 2004; Mazur, Hitchcock, 2001; Mengiardi, Studler, 2001). It should be emphasized that in about 30-56% of patients with SP, despite accurate diagnosis, it was not possible to determine the main cause of this disease (Caceres et a;, 2008; Dajer-Fadel et al, 2014). Diagnosis of spontaneus pneumomediastinum, like other medical conditions, includes: medical history, physical examination, imaging and laboratory examination. Approximately 90% of patients with SP were diagnosed with X-rays in the lateral position. Transparent streaks, gas bubbles, and air separating the mediastinal structures showing medistinal pleura are visible in the X-ray. However, in about 30% of patients the chest X-ray may be correct, thus it is recommended to perform computer tomography with almost 100% sensitivity in detecting spontaneous pneumomedistinum (Kara et al, 2015; Caceres et al, 2008; Iyer, Joshi, Ryu, 2009) (Figure 2, 3).

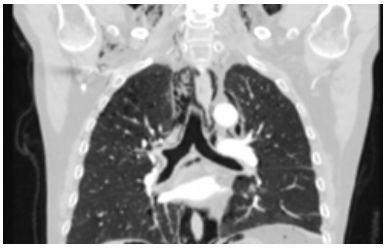

Figure 2. CT scan of pneumomediastinum preceded by sudden pain and subcutaneous emphysema within the chest.

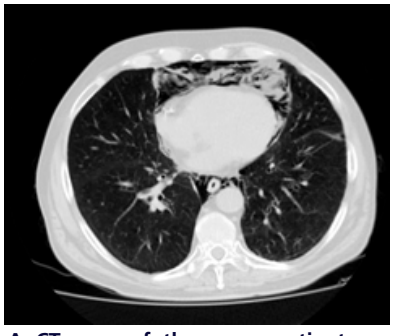

Figure 3. A CT scan of the same patient revealed the presence of air "separating" the mediastinal organs.

Recently, especially in the ICU and the ER, it is noted increased value of ultrasound diagnostics of SP because of its speed, minimal invasiveness and repeatability. Diagnosis of leucocytosis and serum CRP level, which are elevated in 39% of patients, may be helpful in diagnosis (Caceres et al, 2008; Takada et al, 2008). Occasionally, patients with spontaneous pneumomedistinum in ECG studies reported tachycardia, low echocardiogram, and deviation of the cardiac axis as a symptom of myocardial hypoxia (Tytherleigh, Connolly, Handa, 1997; Panacek, Singer, Sherman, Prescott, Rutherford, 1992).

In spontaneous pneumomedistinum, after exclusion its reasons listed in Figure 1, the standard is conservative treatment consisting in: the horizontal position and rest in bed, the prophylactic antibiotic therapy (most commonly the first generation of cephalosporins), anti-cough medications, painkillers and oxygen therapy which facilitate the air removal from mediastinum, known as a "nitrogen purge" (Kouritas et al, 2015; Dajer-Fadel et al, 2014; Takada et al, 2008; Koullias, Korkolis, Wang, Hammond, 2004). In most cases, after the aforementioned therapeutic treatment, SP quickly resolves spontaneously. There is a view that conservative treatment should be continued for 1-5 days. However, spontaneous pneumomedistinum persisting for more than 2 months has been described (Pooyan et al, 2004; Freixinet et al, 2005). It is believed that spontaneous pneumomedistinum has good clinical prognosis. Rarely, only about 2.2% of patients are diagnosed with recurrences, which were first described by Yellin in 1983. Most often appear 6-9 months after the first SP incident (Macia et al, 2007; Yellin, Gapany-Gapanavicius, Lieberman, 1983). Other authors estimate the amount of SP recurrences on 0-1.5% (Pooyan et al, 2004; Dajer-Fadel Dajer-Fadel et al, 2014; Iyer et al, 2009). Most patients were discharged when full diagnostic was performed and after complete resolution of clinical symptoms, sometimes even with persistent radiological signs of SP (Park et al, 2016). Bronchofiberoscopy, esophagoscopy, X-ray of the upper gastrointestinal tract with contrast were not routine procedures in spontaneous pneumomedistinum, unless there were objective premises for this (Kouritas et al, 2015). Figure 4.

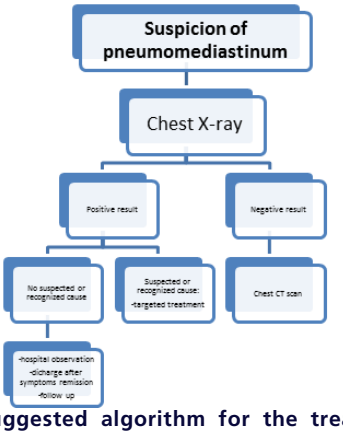

Figure 4. Suggested algorithm for the treatment of spontaneous pneumomediastinum.

In conclusion, spontaneous pneumomedistinum is considered to be a rare disease observed especially in young men and usually resolves spontaneously during diagnosis. It is not a difficult medical problem, but the presence of SP should always raise suspicion and prompt the clinician to look for the cause (Caceres et al, 2008; Esayag, Furer, Izbicki, 2008). It seems that recommending treatment in the diagnosis of spontaneous pneumomedistinum is an algorithm proposed by Kouritas et al., from the Thessaloniki University Hospital (Greece).

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