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Case Report

A Rare Presentation of Hemothorax due to Left Hemithorax Penetrative Wound: An Operative Approach Requiring Segmentectomy

Studi Kasus Langka Hemothorax Akibat Luka Penetrasi Hemithorax Kiri: Pendekatan Operatif yang Memerlukan Segmentektomi

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Abstract

Hemothorax is a medical emergency as blood accumulates inside the pleural space due to spontaneous, iatrogenic, or traumatic etiology. In general, hemothorax has a good prognosis. But severe hemothorax, especially those in vital areas, can lead to more invasive management. This case report aims to explore the presentation of massive hemothorax due to penetrative trauma and discuss suitable management approaches. A 16-year-old patient came due to spear wound through the left shoulder without exit wound. From primary assessment we found subcutaneous emphysema in the left lung, without compensation in airway and circulation system. A thoracocentesis intervention promptly performed as initial treatment. Secondary management proceeded with surgical thoracotomy which resulted in segmentectomy. Around 2-6% of patients of hemothorax patients need surgical intervention, and less than 2% will need segmentectomy intervention due to bleeding that cannot be corrected with surgical ligation. This case is one of the rare cases of hemothorax with segmentectomy. Although this patient did not have any respiratory nor circulatory complication, laceration in proximal hilum area leads to massive bleeding that damaged the lung parenchyma. Vigilant assessment in patients with penetrative trauma, especially in the left hemithorax, is essential to diagnose possible complication and execute evidence-based management plan.

Keywords: *hemothorax, preventable death; penetrating wound; thoracotomy; traumatology*

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Abstrak

Hemothorax adalah salah satu kegawatdaruratan medis yang didefinisikan sebagai darah pada rongga pleura akibat spontan, iatrogenik, atau traumatik. Pada umumnya, hemothorax memiliki prognosis yang baik. Kasus hemothorax, khususnya pada area vital, menyebabkan kebutuhan tatalaksana yang lebih invasif. Laporan kasus ini bertujuan untuk memaparkan temuan hemothorax masif akibat trauma penetratif, dan pendekatan tatalaksananya. Seorang pasien laki-laki berusia 16 tahun datang dengan trauma tusuk tombak pada bahu kiri tanpa luka keluar. Pada asesmen primer ditemukan emfisema subkutan pada paru kiri, tanpa gangguan jalan nafas dan sirkulasi. Tindakan thorakosentesis segera dilakukan sebagai tatalaksana awal. Tatalaksana sekunder dilanjutkan dengan torakotomi emergensi yang dilanjutkan dengan segmentektomi. Torakosentesis dapat dilakukan pada hemothorax untuk mengevakuasi penumpukan darah, dengan pembuluh darah yang umumnya bisa regenerasi dan menutup. Sebanyak 2-6% pasien membutuhkan intervensi operatif, dan kurang dari 2% membutuhkan segmentektomi akibat perdarahan yang tidak dapat dikoreksi dengan ligasi operatif. Kasus ini adalah salah satu kasus hemothorax yang membutuhkan intervensi segmentektomi. Pasien sebenarnya tidak memiliki komplikasi respirasi dan sirkulasi, namun laserasi pada hilar menyebabkan perdarahan hebat yang merusak parenkim paru. Asesmen ketat pada pasien dengan trauma penetratif, khususnya pada hemithorax kiri, sangat penting untuk mendiagnosis komplikasi dan menentukan tatalaksana yang berbasis bukti.

Kata kunci: hemothorax, kematian yang dapat dicegah, trauma penetrasi, torakotomi, traumatologi

Introduction

Hemothorax is defined as accumulation of blood in the pleural space, with volume <1500 mL. Blood can enter the pleural space due to spontaneous causes, or from trauma in the head and neck. This condition can occur due to direct laceration in large mediastinal vessels, or laceration due to structural anomaly of the ribs. From the prognostic value, hemothorax can be classified into minimal hemothorax (blood estimation volume <400 mL), moderate hemothorax (estimation volume 400 – 1000 mL), and severe hemothorax (estimation volume >1000 mL). Hemothorax has a relatively high prevalence, with 73.3% of them being caused by traumatic etiology. Nevertheless, it usually has a good prognosis. Around 15-30% are self-limiting without need of surgical intervention. However, lacerations in vascular-rich structures, such as perihilar areas of the left hemithorax pose bigger risk of severe bleeding. On some very rare cases, surgical approach is needed, demanding quick judgment and comprehensive clinical skills. Due to its

rarity, hemothorax requiring surgical removal of anatomic structures is rarely reported. This case report aims to explore the presentation of massive hemothorax due to penetrative trauma in the left hemithorax and discuss suitable management approaches.

Case Report

We received a 16-year-old male patient in the Arifin Achmad General Hospital Emergency unit presenting with a spear stabbed into his left shoulder, without a visible exit wound. We conducted a primary survey and found a clear airway. On breathing assessment, we suspected hemothorax in the left lung. We found no sign of hemorrhagic shock; however, this patient presented with labored breathing. Thoracocentesis was performed as primary management, and we evacuated 300 mL of fresh blood. The management then continued with placing the Water Sealed Drainage (WSD) and evacuated another 200 mL of fresh blood.

On circulation assessment, we found blood pressure of 80/50 mmHg and a heart rate of 120 bpm. We performed a fluid resuscitation protocol with normal saline. After giving 1 liter of fluid, we found the blood pressure elevated to 90/60 mmHg with a heart rate of 105 bpm. The patient was declared stable, and we sent the patient for a chest x-ray.

On chest x-ray, we found the appearance of foreign bodies in the left lung parenchyma that causing fluid buildup and dullness in the left costophrenic angle, as presented in Figure 1. The laceration was seen positioned near the left atrium. No sign of either pneumothorax or rib fracture was seen. After one hour in the unit, this patient was stable, and we performed a secondary assessment.

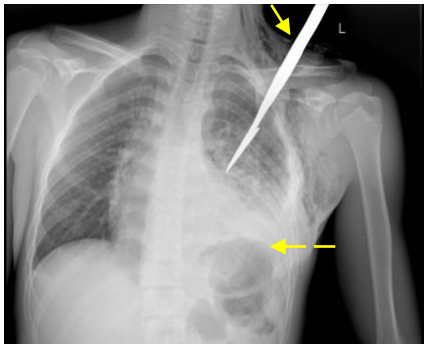

Figure 1 Chest X-Ray

Annotation:
On Antero-posterior chest x-ray, we visualize the spear pierce from the left shoulder through the left lungs (yellow arrow) but narrowly misses the heart. The left costophrenic angle was unable to be found and instead filled with opaque matter, suggesting hemothorax (dotted yellow arrow). The right lung was instead within normal limits. We do not visualize any fractures in the shoulder, ribs, and vertebrae structures.

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From allo-anamnesis, the patient's family explained that the patient was stabbed when he went for boar hunting. Around 6 hours before being admitted to the hospital, the patient was hunting but accidentally slipped and had his spear fall and stab him in his shoulder. Immediately, the patient was coughing and apneustic, however, without seizures or impairment of consciousness. His family later took him to the nearest clinic, was then given oxygen and debridement before being referred to Arifin Achmad General Hospital.

On secondary survey, we found asymmetrical chest movement, dullness of percussion, and vocal fremitus in the left hemithorax. The clinical appearance of this patient is presented in Figure 2. The patient's hemodynamics were stable. We give pharmacological management of tetanus prophylaxis (tetagram), prophylaxis antibiotic (ceftriaxone), and analgesic (ketorolac). This patient was planned for emergency thoracotomy with the indication of severe hemothorax due to a penetrative wound in the left lung with stable hemodynamics.

Figure 2 Clinical Presentation

Annotation:
Spear was visibly stabbed from the left chest into the chest cavity. The entry wound has been treated by the referring clinic, and no active bleeding was found otherwise.

During exploration thoracotomy, we found penetrative wounds in the Colli II area, with the spear head stab penetrated 10 cm into the pleural space into the inferior lingular segment of the superior left lung. Segmentectomy on the superior lobe of the left lung was performed, followed with debridement and bleeding control. A total intraoperative bleeding volume of 50 mL was acquired. Intra-operative visualization is presented in Figure 3.

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Figure 3 Penetrative wound in the Left Lingua Region

Annotation:
Visualization of the left lingua region, showing bleeding and ruptured structures

This patient was later hospitalized for the next 5 days for stabilization, along with adjuvants of fentanyl and midazolam. On the first Post-Operative Day (POD), we performed serial chest x-ray and did not find any indication of atelectasis. The WSD was preserved for further fluid extraction. On the third POD, we found fluid production on the WSD drastically reduced to 40 mL in 24 hours, with a serous appearance and no fresh blood. Afterwards we found no signs of bubble, pus, of food inside the WSD. Therefore, we detached the instrument. After two more days of observation, we dismissed the patient for outpatient care on the 5th POD.

Discussion

Hemothorax can be defined as blood accumulation inside the pleural cavity due to spontaneous, iatrogenic, or traumatic aetiology.[1–4] Hemothorax can occur due to laceration in the major vessels, such as intercostal arteries or mammary arteries, due to blunt or sharp trauma. [1,2,5] In this case we found a rare presentation of hemothorax, where we found a lacerative wound in the left hemithorax. This area housed a major vascular system that poses a high risk for massive bleeding, especially with the presence of the aorta and heart. On physical examination, we found asymmetrical chest movement in the impacted area, followed by dullness of sound transmission due to fluid accumulation. However, we found neither signs of shock nor disturbance of consciousness in this patient. Therefore, we conclude that although the laceration most likely impacted the major arteries in the left hemithorax, it spares the heart and the aorta.

Hemothorax is usually self-limiting without indication of operative management. Thoracocentesis followed by WSD attachment can be performed as an emergency intervention to evacuate blood, thus relieving breathing, reducing the risk of blood coagulation, and monitoring

bleeding. However, several exceptions were spared for operative surgery indications. Severe bleeding can be defined as bleeding volume >1500 mL or finding of fluid drainage of >200 mL per hour in the first 24 hours of bleeding.[1,2,6,7] Although we assessed no hemodynamic alteration, we found a long aspirate of 300 mL immediately after WSD attachment. In this case, thoracocentesis management is still a justified resuscitative management plan to reduce intrapleural pressure and pleural invasion due to blood accumulation. However, this intervention can only reduce fluid accumulation without reducing the bleeding process, especially in massive hemothorax.[3,8–10]

Thoracotomy is performed in 2.6% - 6% of all hemothorax cases. There are two main purposes of thoracotomy in patients with penetrating lung laceration: to stop bleeding and to prevent air leak in the lung parenchyma.[2,3,11,12] Although not all chest trauma is indicative of surgical management, this patient fulfills several indications, including: massive hemothorax, penetrative trauma with involvement of the Colli II area, and penetration to the left lingular region.[12–14] The main intervention in thoracotomy includes vascular ligation through sutures or stapling. However, these interventions could not be performed if massive bleeding was found, especially with involvement of the proximal hilar structure.[2,3,11,12,15]

Segmentectomy is rarely performed due to the rarity of case finding (less than 2%) and high interventional risk. In this patient, we found massive parenchymal damage that involves damage in the proximal vascular hilar structure that could not be corrected using ligation and stapling. Therefore, in this patient, we perform segmentectomy management. For this intervention, we detached each lung lobes based on the hilus and fissures. Bronchial and bronchiolar structures were ligated with a thoraco-abdominal stapler and bonded with uninterrupted sutures. Resection was performed with linear stapling, and a ventilation test was performed to ensure no air leak in the alveolar structure.[13,16] Post-operative care was performed to ensure healing and stabilization, along with adjuvants of fentanyl and midazolam. Clinical signs, including dyspnea and fever, should be monitored. Afterwards, we found no signs of bubbles, pus, or food inside the WSD. This finding shows that there are no air leaks in the alveolar structure, which can be shown with the bubble sign.[14,17]

In this case, we found a patient presenting with an uncomplicated hemothorax due to left lung laceration. Quick and accurate diagnosis from the primary survey is critical to ensure a relevant management plan. After a proper primary survey, we diagnosed the patient with hemothorax and promptly performed thoracocentesis intervention. Although we do not perform any imaging study (eFAST, CT SCAN) apart from x-ray, we are confident that an adequate primary survey is sufficient to ensure no cardiovascular emergency. After stabilization, we

perform surgical management using thoracotomy to stop the source of bleeding and to take the spearhead out of the mediastinal space. However, additional segmentectomy was performed due to major bleeding in the hilar area. After surgery, the patient was still attached to WSD for the next five days of inpatient care. Attachment of WSD can improve clinical presentation and can be maintained until bleeding evacuation is less than 100 mL in 24 hours, without bubble sign or any other debris. After five days of care, the patient was stabilized and dismissed without any additional bleeding or complications.[18–20]

Conclusion

Penetrative trauma in the neck and chest is an emergency that can quickly decompensate the breathing and circulatory system. A competent primary survey is essential to discover relevant clinical presentations and support a better outcome. Emergency correction and indicated intervention are essential as a life-saving approach and prevent further complications. Although rarely performed, localization of trauma and prediction of involved structures are essential to measure the indication of segmentectomy. Post-segmentectomy patients can fully heal without any meaningful disability.

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