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Technology CT Scan 128 Slices in Emergency Pneumotorax and Pneumomediastinum Cases

Lilik Lestari[1*], Muhammad Harris Sis Sultansyah[2]
[1] *Department of Radiology, Pulmonary Hospital dr. Ario Wirawan, Salatiga, Indonesia*
[2] *Public Health Center Tambakaji, Semarang, Indonesia*

ABSTRACT. Pneumothorax and pneumomediastinum are complications of mechanical ventilation of the pleural and mediastina cavities. This study aims to report the findings of a 128-slice 3D chest scan with an axial coronal view for a case of pneumothorax and pneumomediastinum. Research conducted at dr. Ario Wirawan, Salatiga. The study used a CT scan 128-slice type Ingenuity CT 120 kV, series 502 idose 4, slice thickness 0.64 mm, zoom 1.0 and used contrast. The CT scan imaging results were qualitatively analyzed by experts. The results showed four cases with pneumothorax and pneumomediastinum, and only pneumothorax was found in seven cases.

Keywords: CT Scan 128 Slice, Pneumothorax, Pneumomediastinum

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1. INTRODUCTION

Pneumothorax is a medical condition that happens when air enters the pleural space (the thin layer of tissue that lines the lungs and chest wall) [1]. This can occur due to an injury to the chest, such as a broken rib, or due to a lung disease such as emphysema or pneumonia. Air that enters the pleural cavity prevents the lungs from fully expanding, which can cause difficulty breathing, chest pain, and low blood pressure. Pneumothorax often requires immediate medical treatment to prevent more serious complications [2].

Trauma to the chest is one of the common causes of pneumomediastinum [3]. In cases of chest trauma, air can leak into the mediastinum (the area between the lungs in the chest) through an opening or tear in the airways or other tissue in the chest. This can occur as a result of a broken rib, injury to the soft tissue in the chest, or a serious car accident. Pneumomediastinum caused by trauma usually occurs suddenly and can cause symptoms such as chest pain, shortness of breath, or cough [4].

CT (computed tomography) scan 128 slice has a role to diagnose emergency cases of pneumothorax [5, 6] and pneumomediastinum [7]. In cases of pneumomediastinum, a CT scan can show an image of air collecting in the mediastinal cavity. In addition, a CT scan can also help identify the cause of the pneumomediastinum, such as a chest injury or lung disorder. Detections that can be carried out include detecting trauma to the chest, detecting blood clots, and detecting cancer.

High-resolution CT imaging for pulmonary embolism is a potential technique for evaluating cardiac and coronary artery motion [8]. For emergency cases, fast, accurate and precise diagnosis is very important to determine the right course of action [9]. Positron Emission Tomography (PET) or CT scanners have quickly become established and powerful imaging techniques that are largely complementary in the information they provide [10]. A 128 slice CT scan can provide a clear and detailed picture of the condition being faced, so that doctors can immediately evaluate and plan the actions needed. On the other hand, CT scans can safer exposure to radiation doses [11]. A 128-slice chest CT scan can be performed using 3D Dimensions with axial, coronal, and sagittal views [12]. In an axial view, the image is projected from top to bottom, in a coronal view, it is projected from front to back, and in a sagittal view, it is projected from left to right[13].

2. MATERIALS AND METHODS

This research was conducted using secondary data from lung hospital dr. Ario Wirawan, Salatiga, Indonesia. In this case the emergency patient with pneumothorax and pneumomediastinum caused by trauma. Emergency cases of pneumothorax and pneumomediastinum were diagnosed using Philips brand 128 slice CT scan, type Ingenuity CT 120 kV, series 502 idose 4, slice thickness 0.64 mm, zoom 1.0, and use contrast. A 128-slice chest scan can be performed using the 3D Dimension with axial, coronal, and sagittal views. CT scanning with 128 slices is a type of medical imaging technology commonly used to produce detailed images of the thorax (chest) area in emergency cases.

During a CT scan, several X-ray images are taken from different angles around the body and then joined using computer processing to create a cross-sectional image of the

body. The 128 slices in this type of CT scan refer to the number of images taken during one cycle of the X-ray machine.

In emergency cases, a CT scan with 128 slices can be used to quickly and accurately diagnose various conditions affecting the thorax , such as injuries lungs , pulmonary embolism , and pneumothorax (collapsed lung). The high resolution and speed of this type of scan can help doctors make more informed decisions about treatment and can potentially help save lives.

The collected data were then analyzed using qualitative methods. CT scan images result is interpreted by a radiologist to determine the presence of a pneumothorax, pneumomediastinum, or both.

3. Result and Discussion

CT Scan results in emergency cases of the chest are described in Figures 1 through Figure 12.

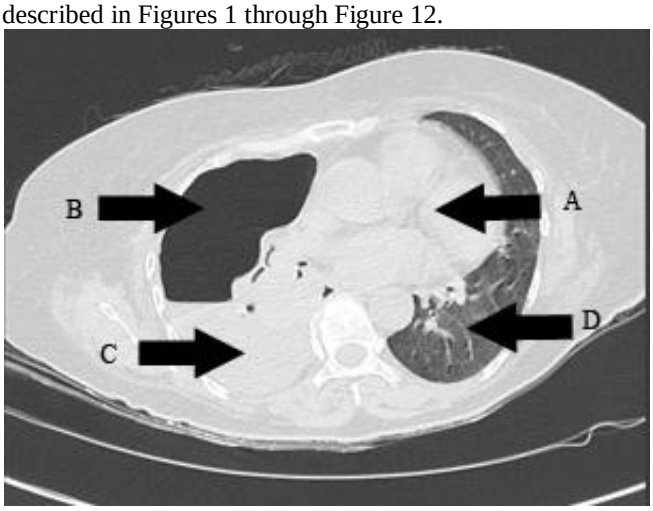

Fig.1. The results of a thoracic CT scan, it is known that the cardiac shape and size appear normal (A), there is a right pneumothorax (B), a mass in the lung dextra (C), left lung known normal shape and size.

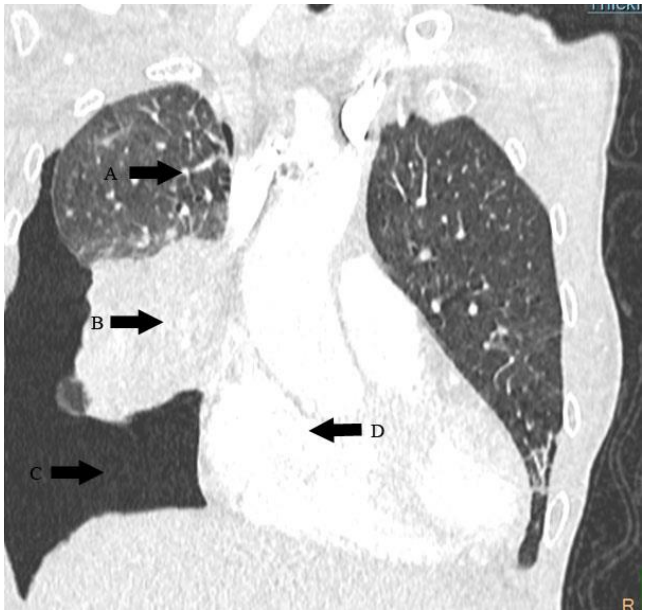

Fig. 2. Pneumothorax CT Scan Imaging Results. In the lungs found pneumonia (A), there is a mass or tumor in the lung dextra (B), cardiac cardiomegali (C), and pneumothorax dextra (D).

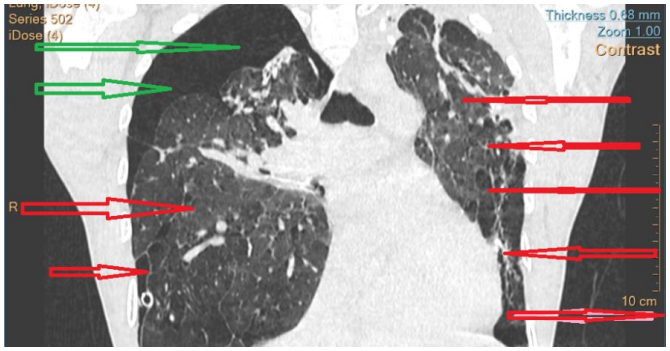

Fig. 3. CT Scan imaging, it is known that there is a pneumothorax dextra (green arrow) and in the lungs there is a paraseptal centrilobular lung emphysema type and line fibrosis (red arrow)

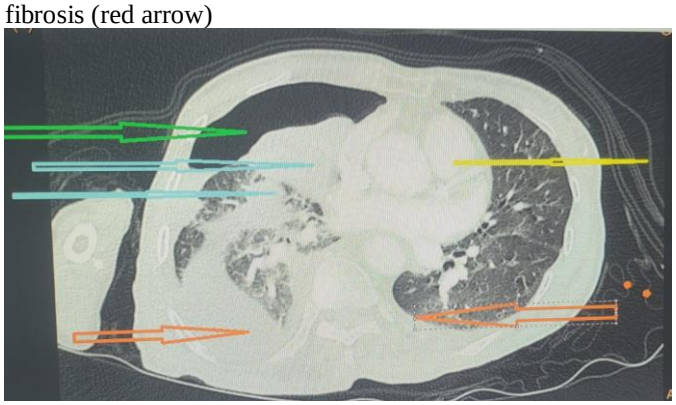

Fig. 4. Thorax CT Scan imaging, obtained pneumothorax (green arrow), mass in the lung right (light blue arrow), bilateral pleural effusion (orange arrow), and cardiac are normal (yellow arrow).

Fig. 5. Axial CT scan of the thorax, found right lung pneumothorax (green arrow), lung emphysematous centrilobular type, paraseptal with lung fibrosis (red arrow), normal cardiac (orange arrow).

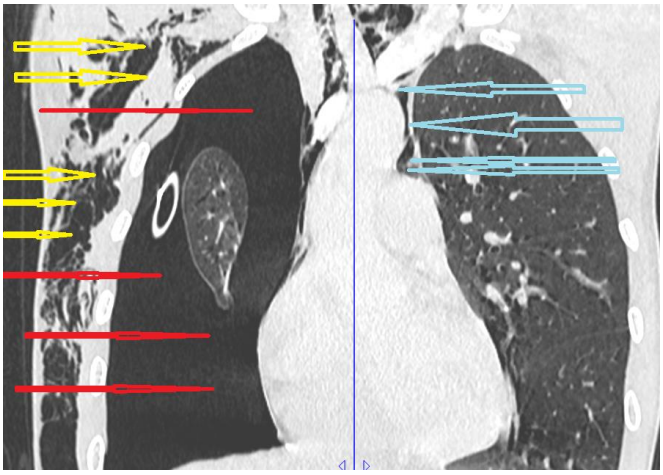

Fig. 6. CT scan axial finding pneumomediastinum (blue arrow), pneumothorax (red), and emphysema subcutis (yellow).

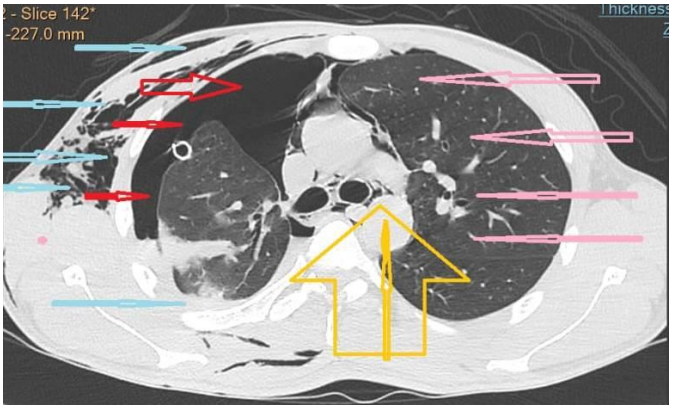

Fig. 7. Axial CT scan of the chest, found emphysema subcutis (blue arrow), pneumothorax right lung (red arrow), lung left lung (pink arrow), cardiac with pneumomediastinum (yellow arrow).

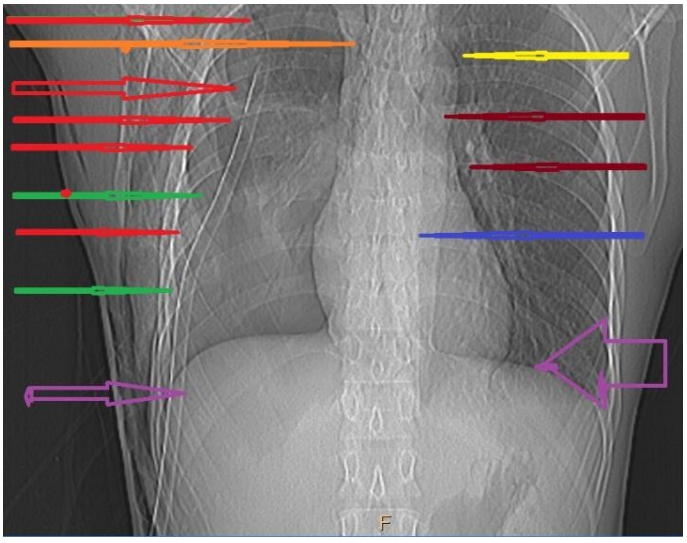

Fig. 8. Scannogram CT scan technology 128 slices, it is known that there is a Water sealed drainage (WSD) tube that is installed in the lung dextra. The end of the tube is at the level of the intercostals 2-3 dextra. In the picture, you can find a WSD tube that was installed to treat a pneumothorax dextra (red arrow). Pneumothorax dextra (green arrow), pneumomediastinum (orange arrow), and thoracic aortic arch (yellow arrow).

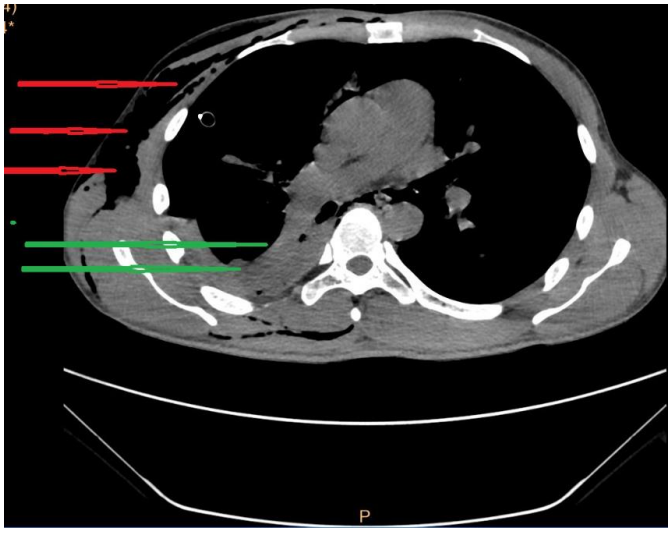

Fig 9. CT scan of the chest performed with an axial section without the use of contrast drugs, found emphysema subcutis of the thoracic wall dextra (red arrow), and right pleural effusion (green arrow).

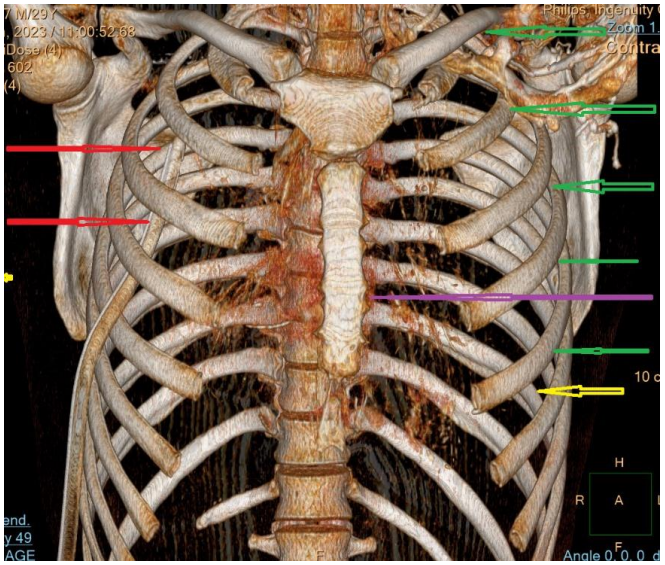

Fig.10. Results of a thoracic CT scan using 128 slices technology . In the image, a WSD tube is found attached with the end of the tube 2-3 to the right, which is installed to treat a pneumothorax dextra (red arrow), left anterior rib (green arrow), left rear rib (yellow arrow), and sternum (purple arrow).

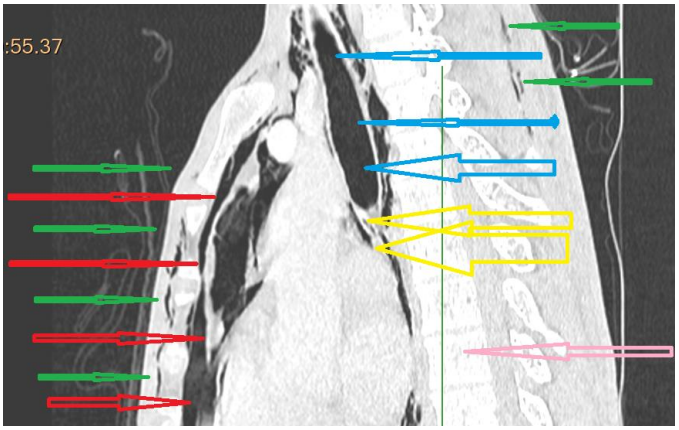

Fig. 11. Chest CT scan results in patients with pneumothorax , pneumomediastinum , emphysema subcutis chest by using a thoracic CT scan of 128 slices, emphysema was found subcutis on front and back thoracic wall (green arrows), pneumothorax dextra (red arrow), pneumomediastinum (yellow arrow), trachea (blue arrow), and vertebral body (yellow arrow).

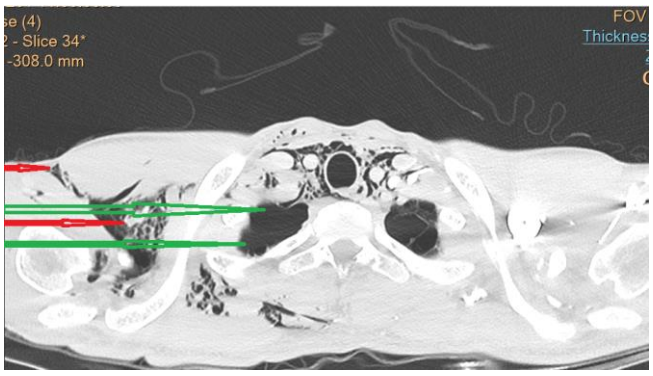

Fig. 12. The results of an axial CT scan of the chest , in the image obtained information on emphysema subcutis chest wall (red arrow), and pneumothorax dextra (green arrow).

In this case report, CT scan imaging with 128-slice technology has been used to diagnose pneumothorax and pneumomediastinum. As described by Fujiwara, using a computed tomographic (CT) scan of the chest, a pneumomediastinum with pulmonary fibrosis and pneumothorax can be found. Pneumomediastinum is characterized by the rupture of alveoli or honeycomb cysts in the retrosternal space, preaortic space, perivertebral space, subcarinal space, at the hilus, and perivertebral space[14].

The CT scan results in these cases could be categorized into two criteria, namely *first* were only pneumonia cases found, and *second* pneumonia with mediastinal (pneumomediastinum) cases was found in one patient. First category as shown in Figure 1, the results of the CT scan explain that there is a pneumothorax in the right lung caused by a mass in the right lung, which is recurring. Figure 2, Figure 3, Figure 4, Figure 5, Figure 9, Figure 10, and Figure 11 show a lung mass with a right pneumothorax. In the right lung, it is known that a pneumothorax is almost of the right lung field. As stated by Nagarsheth and Kurek, a chest CT scan can be more accurate than a chest X-ray in identifying the cause of pneumothorax[15].

Pneumomediastinum occurs when there is air or gas in the mediastinum [16]. The most common cause of pneumomediastinum is the spontaneous rupture of the alveoli in the lung, which allows air to leak into the mediastinum [7]. In Figure 6, Figure 7, Figure 8, and Figure 11, CT scan can describes an axial pneumomediastinum. According to Zylak et al., digital computed tomographic (CT) radiography can assist in establishing or confirming the diagnosis of pneumomediastinum [17].

4. CONCLUSION

Pneumothorax and pneumomediastinum are two emergency cases in the thorax, and emergency cases require immediate treatment. The pneumothorax was caused by lung cancer, tuberculosis, trauma, and therapeutic action. Based on the result and discussion, it can be concluded that the 128-slices CT scan can diagnose emergency cases and provide accurate imaging for both cases. A contrast chest CT scan showed a right pneumothorax caused by a mass in the right lung. There are four rare cases, where pneumothorax and pneumomediastinum found in one patient, whereas a pneumothorax was found alone in seven cases.

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