

An unexpected complication of robotic cardiac surgery: Pneumomediastinum



Gökhan Erol^a, Emre Kubat^{a,*}, Hüseyin Sicim^a, Murat Kadan^a, Cengiz Bolcal^a

^aDepartment of Cardiovascular Surgery, Health Sciences University, Gülhane Training and Research Hospital, Ankara

^aTurkey

Pneumomediastinum is a rare entity that is defined as free air in the mediastinal space. A 26-year-old male patient was admitted with pneumomediastinum as an unexpected complication of robotic surgery. Diffuse subcutaneous emphysema was observed suddenly on Postoperative Day 3 without respiratory distress. Air trapping into the mediastinum was seen on chest X-ray and computed tomography. The patient was followed in the intensive care unit for 7 days and managed conservatively. Subcutaneous emphysema reduced gradually. In conclusion, although it is a rare condition, pneumomediastinum should be kept in mind as a complication of robotic cardiac surgery.

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1. Introduction

Pneumomediastinum is a rare entity that is defined as free air in the mediastinal space. Chest pain is the most common symptom of pneumomediastinum, followed by dyspnea, cough, and neck pain. The etiology is multifactorial, originating from alveolar or esophageal rupture with release of air into the mediastinum or from trauma or surgery [1]. Over the past two decades, atrial septal defect (ASD) closure using the DaVinci robotic system has been adopted as a minimally invasive surgical technique with high

success and low complication rates [2]. Here, we present a case of pneumomediastinum as an unexpected complication of robotic surgery.

2. Case report

A 26-year-old male patient presented with complaints of exertional dyspnea for 1 year. On physical examination, normal lung sounds and wide splitting of S2 with systolic murmur along the left sternal border were found. Spirometry results were normal. Transthoracic echocardiography revealed a dilated right atrium (48.2 mm), dilated right ventricle (mid-cavity end-diastolic diameter

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* Corresponding author at: Department of Cardiovascular Surgery, Health Sciences University, Gülhane Training and Research Hospital, General Dr. Tefvik Sağlam Cd. No: 1, 06010 Ethik, Ankara, Turkey.
E-mail address: ekubat@gmail.com (E. Kubat).



P.O. Box 2925 Riyadh – 11461KSA
Tel: +966 1 2520088 ext 40151
Fax: +966 1 2520718
Email: sha@sha.org.sa
URL: www.sha.org.sa



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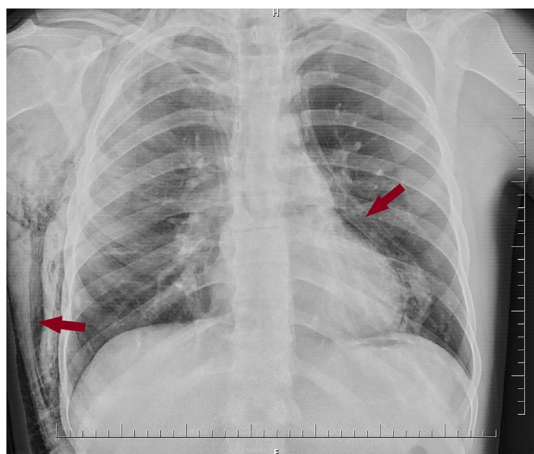


Figure 1. Pneumomediastinum and air in soft tissue seen on chest X-ray.

39 mm), and increased systolic pulmonary artery pressure (47 mmHg). Qp: Qs ratio was 2.1. Transesophageal echocardiography confirmed the diagnosis of a large secundum ASD (38 mm × 15 mm) with inadequate aortic and inferior rims with left-to-right shunt. Following the initial evaluation, ASD closure was planned using the DaVinci robotic system. Written informed consent was obtained from the patient. A 37F double-lumen endotracheal tube was inserted easily for unilateral mechanical ventilation during

surgery. Standard surgical procedure was performed for robotic surgery [3]. There was no pathology in the right lung on direct vision of the surgical field. ASD was closed with primary suturing. Total cross-clamp time and total perfusion time were 96 minutes and 164 minutes, respectively. A 36F chest tube was inserted carefully into the right thoracic space from the right arm port incision, and the operation was terminated without any lung injury. Early postoperative period was uneventful. There was no air leakage or abnormal oscillation problems on Postoperative Day 1. The chest tube was removed after 36 hours of intensive care, as in our routine clinical practice. Control X-ray findings were normal. Three hours after chest tube removal, mild subcutaneous emphysema developed, initiated from the neck and jugular region. No respiratory distress or saturation abnormality was observed. There was no pneumothorax on the chest X-ray and respiratory examination was normal. Emphysema did not increase until the Postoperative Day 3. However, subcutaneous emphysema spread over the right side of the thorax without respiratory distress on Postoperative Day 3. Pneumomediastinum and subcutaneous emphysema were seen on the chest X-ray (Fig. 1). Computed tomography examination revealed subcutaneous emphysema and pneumomediastinum starting from the jaw and neck,

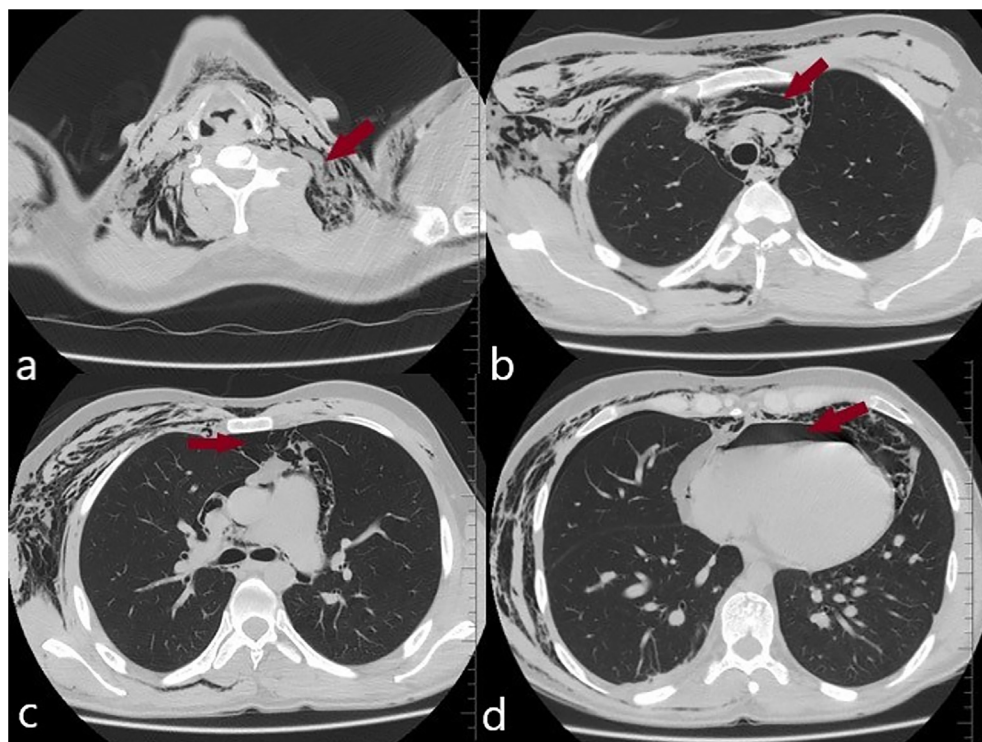


Figure 2. Computed tomography imaging of pneumomediastinum and subcutaneous emphysema. Air trapping within the upper anterior chest wall and soft tissue (A, B). Pneumomediastinum and pneumopericardium seen on axial computed tomography scans (C, D).

extending from the trachea to the pericardium (Fig. 2). The patient was treated with antibiotics, analgesics, and oxygen. The margin of emphysema was marked on the skin and followed on a daily basis, if it increased. In addition, chest X-ray examination was performed daily. Emphysema decreased during follow-up and resolved completely on Postoperative Day 7. On Postoperative Day 12, the patient was uneventfully discharged. Physical examination and chest X-ray findings were normal at 1 month follow-up.

3. Discussion

The first robotic mitral repair was performed by Carpentier et al. [4] in 1998 using an early prototype of the da Vinci surgical system. Since then, the use of robotic systems for minimally invasive surgery has become increasingly popular in Europe [2]. Currently, robotic ASD closure is a feasible and safe technique with a high success and low complication rate [2,3]. Robotic cardiac surgery-related complications include cardiac arrest, atrial fibrillation, bleeding, renal failure, and vascular complications [5]. However, pneumomediastinum has not been previously reported as a complication of robotic surgery. To the best of our knowledge, this is the first case in the literature.

Increased intra-alveolar pressure may cause alveolar rupture, releasing air which migrates through the peribronchial and perivascular sheaths to the mediastinum, with resulting pneumomediastinum [1]. It is benign in nature when there is a low amount of air [1]. The air often migrates to the skin of the chest wall from the mediastinum, resulting in subcutaneous emphysema. In the majority of cases, this complication is idiopathic without any reasonable etiology, as in our case. In the present case, the respiratory system examination was normal with normal respiratory functions and spirometry findings. No early postoperative surgery-related respiratory complications such as iatrogenic surgical injury or complications related to chest-tube removal were seen. In such cases, treatment should be mostly conservative, comprising antibiotics, pain control, and oxygen therapy [1,6,7]. High-concentration oxygen therapy enhances absorption of free air in the mediastinum due to increased nitrogen diffusion rates in the interstitium [6]. In the presence of excess air in the mediastinal space, an increased level of free air pressure prevents venous return and direct

cardiac compression, leading to tension pneumomediastinum [8]. In the case of cardiorespiratory collapse, urgent thoracic decompression is recommended [8]. Rapid and effective tube drainage of the air for thoracic decompression can be achieved via open or percutaneous techniques, such as the subxiphoid approach [8,9]. In our case, the course of this complication and the presenting symptoms of the patient were benign; therefore, the patient was managed conservatively. The patient was followed in the intensive care unit for 7 days and subcutaneous emphysema resolved gradually.

In conclusion, although it is a rare condition, pneumomediastinum should be kept in mind as a complication of robotic cardiac surgery. Although pneumomediastinum is usually a self-limiting entity, patients should be closely followed for potentially life-threatening complications including tension pneumomediastinum and cardiac arrest.

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