

## Aortic perforation following chest tube insertion: an unusual complication

*Göğüs tüpü yerleştirilmesini takiben gelişen aort perforasyonu: Nadir bir komplikasyon*

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Tube thoracostomy is a routine intervention which is used in cardiovascular surgery clinics. Although it is a life-saving intervention in most cases, it has serious complications leading to mortality. We encountered an ascending aortic perforation, an unusual complication following apical chest tube insertion, in a 71-year-old male patient who underwent coronary artery bypass graft (CABG) surgery in our clinic. This complication was managed successfully and the patient was discharged with a complete recovery. This rare but fatal complication should be considered for the patients undergoing tube thoracostomy, particularly with a trocar. It should also be noticed whether the patients have mediastinal shift in postoperative period.

**Key words:** Aortic rupture; chest tube; thoracostomy.

A tube thoracostomy is not commonly performed in the postoperative period of cardiovascular interventions. In fact, it is an intervention itself that can have various complications,<sup>[1-3]</sup> with the most important being an organ injury in the thoracic cavity.<sup>[3]</sup> However, ascending aorta injuries due to tube thoracostomies are extremely rare.

### CASE REPORT

A 71-year-old male patient with a three-year history of medical treatment due to coronary artery disease (CAD) and chronic obstructive lung disease (COLD) underwent percutaneous transluminal coronary angioplasty (PTCA) and coronary stent implantation at our facility. In addition, a triple coronary artery bypass grafting (CABG) procedure was performed due to coronary restenosis. Although no problems occurred during the early postoperative period, the patient

Tüp torakostomisi, kardiyovasküler cerrahi kliniklerinde rutin olarak kullanılan bir girişimdir. Tüp torakostomisi birçok durumda hayat kurtarıcı bir işlem olmakla birlikte, mortaliteye neden olabilecek ciddi komplikasyonları vardır. Kliniğimizde koroner arter baypas greft (KABG) ameliyatı yapılmış 71 yaşında erkek bir hastada, ameliyat sonrası apikal göğüs tüpü yerleştirilmesinin alışılmadık bir komplikasyonu olarak çıkan aort perforasyonu gelişti. Bu komplikasyon başarılı bir şekilde tedavi edilerek, hasta tam şifa ile taburcu edildi. Özellikle torakarlı tüp torakostomisi uygulanan hastalarda bu nadir ancak ölümcül komplikasyonun gelişebileceği akılda tutulmalıdır. Keza, ameliyat sonrası dönemde bu hastalarda mediastinal yer değişikliği olup olmadığına dikkat edilmelidir.

**Anahtar sözcükler:** Aort rüptürü; göğüs tüpü; torakostomi.

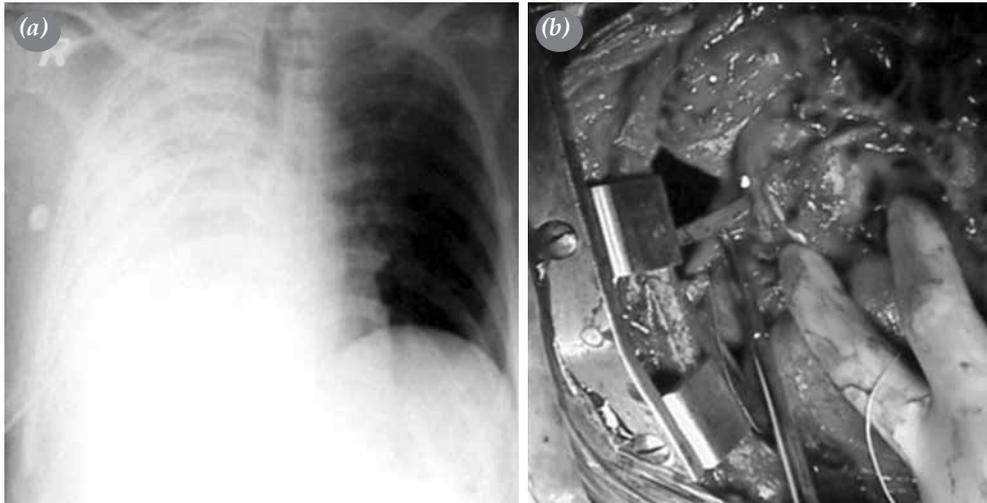
suddenly showed dyspnea, tachypnea, and cyanosis on the third postoperative day along with diminished breathing sounds in the right hemithorax. An arterial blood gas analysis revealed acidosis and hypoxia, and a chest X-ray showed a wide spread opacity in the right lung field (Figure 1a), suggesting fluid accumulation and/or atelectasis. A 28 French (F) chest tube was then inserted at the sixth intercostal space on the midaxillary line, and a total of 150 ml of serosanguinous fluid was drained over the following couple of hours. A control chest X-ray was then performed which revealed a misplaced tube with kinking. Therefore, a 24 F chest tube with a trocar was inserted at the fourth intercostal space on the midaxillary line. After insertion, 4 liters of blood was drained. An accompanying drop in blood pressure led to a diagnosis of a major vessel injury, and the tube was then clamped. The patient returned to the operating room, and the median sternotomy



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**Figure 1.** (a) Chest X-ray showing a wide spread opacity in the right lung field, suggesting fluid accumulation and/or atelectasis. (b) View of the tube perforating into the ascending aorta in the right anterolateral region.

incision was reopened. On exploration, we observed that the tube was perforating into the ascending aorta in the right anterolateral region (Figure 1b). When we entered the right pleural cavity, total atelectasis of the right lung and the misplaced chest tube were revealed in the diaphragmatic recess. The aorta was primarily repaired with two purse string stitches. However, due to an increase in blood pressure, a tear in the aortic wall occurred, necessitating patch plasty repair of the wall using a Dacron patch. A simultaneous bronchoscopy revealed an obliterating mass in the right main stem bronchus that was responsible for the atelectasis. In addition, a pathological examination revealed well-differentiated squamous cell carcinoma. The patient was discharged on the 11<sup>th</sup> postoperative day with no cardiovascular problems and was referred to a local oncology clinic for further treatment. We

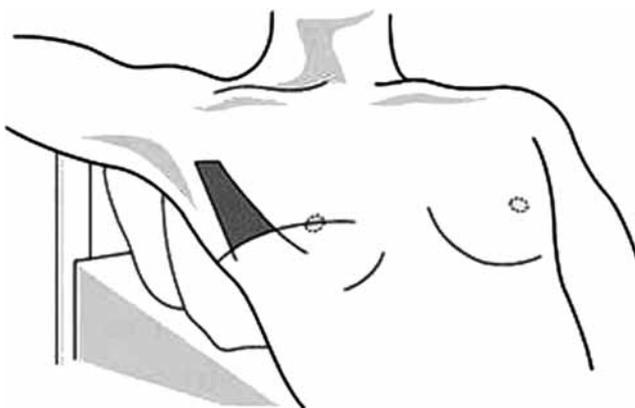
followed up the patient for approximately two years, and no complications were reported due to either the cardiac surgery or the aortic perforation caused by the tube thoracostomy.

## DISCUSSION

A tube thoracostomy is frequently used to remove fluid or air from the pleural cavity.<sup>[1]</sup> British Thoracic Society (BTS) guidelines suggest that a chest drain should be inserted in cases of malignant pleural effusion, empyema, traumatic hemothorax, and some types of pneumothorax. In addition, it may be required in some cases postoperatively, such as after cardiac surgery.<sup>[2]</sup> The drain should be inserted within the ‘safe triangle’ (Figure 2), which is defined as the area bordered by the anterior edge of the latissimus dorsi, the lateral edge of pectoralis major, and a line superior to the horizontal level of the nipple with the apex below the axilla.<sup>[2]</sup>

Although it is a relatively safe surgical procedure, sometimes complications may appear in the period between its insertion and removal. Major complications, including laceration or perforation of major organs, are usually related to the use of a trocar or a failure to use landmarks for insertion.<sup>[3-7]</sup>

Complications associated with a tube thoracostomy have traditionally been classified as insertional, positional, or infective,<sup>[3-7]</sup> and these are depicted in Table 1. Cardiovascular injury as a result of a tube thoracostomy has been very rarely reported in the literature, with most of the few available case reports being connected with aortic injuries. In two



**Figure 2.** The ‘safe triangle’ of the chest as recommended for tube thoracostomies by the British Thoracic Society guidelines.

**Table 1. Complications associated with a tube thoracostomy**

Insertional
<ul style="list-style-type: none"> <li>• Intrathoracic organ injury: lung, heart, mediastinum, or vessels</li> <li>• Chest wall: intercostal vessel injury</li> <li>• Intra-abdominal injury: liver, spleen, stomach, diaphragm, or colon</li> </ul>
Positional
<ul style="list-style-type: none"> <li>• Extrathoracic (above the ribs)</li> <li>• In the fissure</li> <li>• Kinking</li> <li>• Last hole outside the chest</li> </ul>
Infective
<ul style="list-style-type: none"> <li>• Cellulitis</li> <li>• Empyema</li> </ul>

cases published by Yen et al.,<sup>[4]</sup> and Nachiappan et al.,<sup>[5]</sup> an aortic perforation was thought to have occurred due to the friction placed peroperatively on the mediastinal tube in the aorta. Another case involving friction was also reported by Yuncu et al.<sup>[6]</sup> in which a pulmonary artery injury caused by a thoracic tube was successfully repaired. Some authors have suggested the use of chest tubes with a trocar instead of thoracic tubes because nearly 30% of thoracic tubes may need to be misplaced.<sup>[7]</sup> However, using chest tubes in conjunction with a trocar is very dangerous and should be done with extreme caution. In 1990, Meisel et al.<sup>[8]</sup> were inserting a chest tube with a trocar in a kyphoscoliotic patient when the right atrium was injured. The outcome was fatal. Shih et al.<sup>[9]</sup> reported a case in which the right atrium was perforated with a thoracic tube. This caused postoperative pleural effusion in the patient who then underwent mitral valve replacement surgery and tricuspid annuloplasty. Domínguez Fernández et al.<sup>[10]</sup> inserted a tube in the left hemithorax of a patient with blunt chest trauma, which caused a perforated right ventricle. The patient had previously undergone a left lobectomy, and despite surgical intervention, the patient died. Furthermore, Haron et al.,<sup>[3]</sup> reported the case of a patient in which the left ventricle was punctured due to a left thoracostomy performed using a chest tube with a trocar, but it was successfully repaired with surgery. In our case as well as with most of the reported cases, the cardiovascular injury occurred due to a tube thoracostomy, and mediastinal shift was found to be an important predisposing factor. Therefore, maximum care should be used in these cases. In our patient, the use of a trocar drain and its late withdrawal following the insertion in the pleural

space might have been responsible for the ensuing complication.

In the literature, primary suture repair is usually reported to be sufficient for large arterial injuries due to tube thoracostomies. In our case, the perforation in the aorta was initially repaired by primary purse string sutures. Unfortunately, due to the size of the defect and an increase in blood pressure, the aortic tension increased, leading to the failure of the primary repair. The tear was then repaired using a Dacron patch. We believe that in cases like ours with a large aortic injury, it may be more appropriate to repair the defect with patch plasty rather than primary repair.

In conclusion, although some surgeons prefer to use chest tubes with a trocar due to ease of placement and low rate of misplacement, we believe this is not a safe option in postoperative patients with mediastinal shift and/or chronic lung disease because of the risk of complications. However, if a chest tube with a trocar is used, we suggest doing so with extreme caution.

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