Case Report
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Embolism of a Piece of Iron after Penetrating Neck Injury: From Right Internal Jugular Vein to Left Lower Lobe of the Lung

Ekin İlkeli[1, a], Cenk Aslan[2, b]

[1]Department of Cardiovascular Surgery, Duzce State Hospital, Düzce, Turkey, [2]Department of Cardiovascular Surgery, İlhan Varank Education and Research Hospital, Istanbul, Turkey

Correspondence: *ekinilkeli@hotmail.com*; Tel.: + 90 380 529 13 00; Fax.: + 90 380 549 70 60

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Abstract

Objective. This case report of a 40-year-old male patient describes the embolization of a piece of iron trapped in the jugular vein following an industrial injury. **Case report.** The 40-year-old male patient was admitted to the emergency service for bleeding from the neck. In contrast to the first X-ray image, no foreign body was observed at the injury site or aspiration of fluid during emergency surgery. Following x-ray radiography, an opacity was observed in the left lower lobe of the lung, consistent with a foreign body. Echocardiography demonstrated no pathological manifestation in the atria, ventricles, or major pulmonary artery. There was no need to intervene because the patient was asymptomatic and had no noticeable symptoms of hemoptysis. The outpatient clinic's radiological and clinical control examinations were normal at the end of six months. **Conclusion.** The movement of the foreign body to the lung within one or two hours may have resulted from our manipulation or may have occurred spontaneously. As a result, any foreign bodies that have invaded the vascular system should be removed as soon as possible.

Key Words: Foreign Bodies ▪ Emergency Service ▪ Pulmonary Arteries ▪ Jugular Veins.

Introductıon

The most fatal complication related to a foreign body penetrating the lung parenchyma via the heart is estimated to be 0.01% (1). When the heart is penetrated by a foreign body, it leads to a life-threatening situation. In the literature, endocarditis, valvular insufficiency or mural thrombus are reported (2, 3). Foreign bodies removed via open heart surgery have been reported (4). There is no standard approach in this regard, since the penetration of foreign substances is a very varied situation. The vascular route is used by 88% of foreign bodies that reach the heart. For 54% of these patients, surgical intervention was performed; in 29% of them, the foreign body was removed percutaneously, and 14% were monitored conservatively (5, 6).

[a]ORCID ID: 0000-0003-0302-4721
[b]ORCID ID: 0000-0001-9217-1314

This report is about the route taken by a piece of iron, trapped in the jugular vein after an industrial injury, in a 40-year-old male patient.

Case Presentation

A 40-year-old male patient was admitted to the emergency service with neck bleeding. Once his case history had been investigated, it was found that a fragment of metal had become caught in his neck by accident while he was cutting iron. He had no history of injury or surgery. During the initial examination, a minor hematoma on the right side of his neck was observed. His vitals were stable. No significant pathology was found in his laboratory values, and chest radiography was normal. CT angiography of the neck was performed to rule out vascular injury. It was detected that a piece of iron sized 1.31×0.6 cm was stuck in the right internal

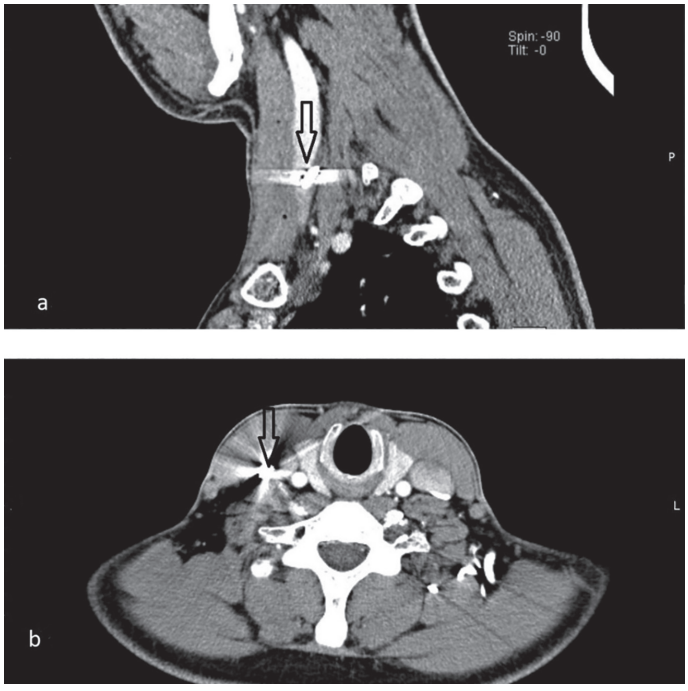

Figure 1. View of the foreign body in the neck: a- Foreign body in the right internal jugular vein on sagittal CT angiography (black arrow); b- Radial image of the metallic foreign body on axial CT angiography of the neck (black arrow).

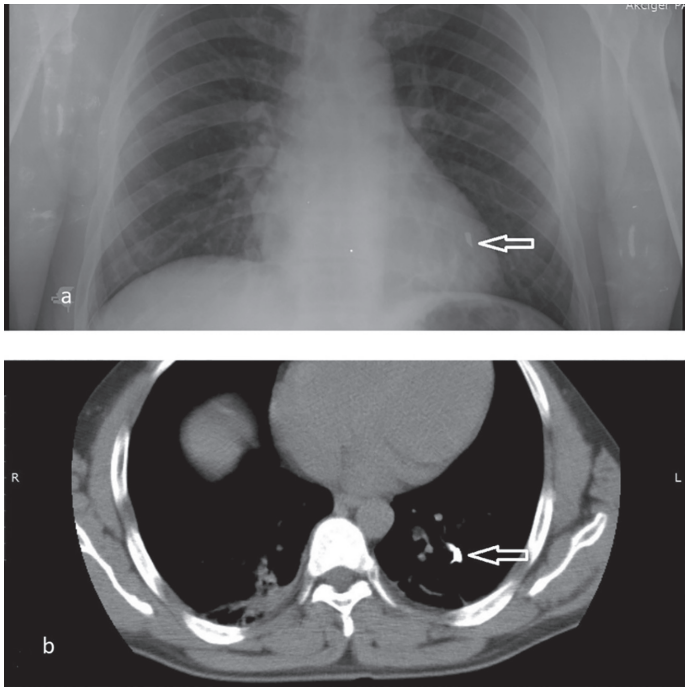

Figure 2. View of the foreign body in the chest: a- Metallic foreign body with smooth, sharp edges on chest radiography of the left lower lobe (white arrow). b- Foreign body in the subsegmental branch of the pulmonary artery on axial CT (white arrow).

jugular vein (Figure 1-a, b). The patient was taken to surgery immediately, and the internal jugular vein was repaired, however, the foreign body was not found. An X-ray image of the neck and aspiration fluid was taken and no foreign body was detected. The patient was transferred for inpatient treatment and echocardiography was performed. No pathological signs were observed in the atria, ventricles or main pulmonary artery. A second radiography examination of the chest was performed immediately thereafter. An opacity consistent with the foreign body was observed in the left lower lobe of the lung (Figure 2-a). On the contrast CT angiography of the thorax, the foreign body was seen in the left lower lobe (Figure 2-b). It was understood that the penetrating foreign body had progressed from the jugular vein to the vena cava superior, the right atrium, the right ventricle, the pulmonary artery and finally, to the left subsegmental branch of the lung. No intervention was undertaken since the patient was stable and there was no sign of hemoptysis. He was discharged on the third day. Radiological and clinical control in the outpatient clinic were normal after 6 months.

Discussion

Treatment for foreign bodies that have reached the subsegmental branches of the pulmonary artery varies according to the case. Although follow-up is recommended for patients with limited life expectancy in most cases, early intervention is recommended for foreign bodies that have reached the heart and main pulmonary artery. Successful results have been achieved with endovascular intervention (7). To the best of our knowledge, this is the first case where a piece of iron travelled from the jugular vein to the pulmonary arterial tree. Similarly, stents that have reached the

segmental branches of the pulmonary artery, and thoracoabdominal injuries due to medical devices and high-energy weapons have been previously reported (8).

The approach to be adopted for small pieces of iron embedded in the pulmonary segmental branches is arguable. Conservative treatment and observation was performed for the vascular migration of a piece of iron that reached the pulmonary artery through the popliteal vein. Venous system-related aneurysms can cause pulmonary embolism (9, 10). However, follow-up is recommended for asymptomatic patients. An operation may be required for symptomatic patients with pulmonary infarction, pulmonary abscess and erosion. If the foreign body is located in the periphery, a wedge resection may be performed (11, 12).

The patient's history of trauma and surgery should certainly be taken and considered. If and when any vascular or thoracic injury is possible due to penetrating foreign bodies, X-ray radiography should be performed first. This will provide significant information about the location of the foreign body before and after migration. Opacities observed on X-rays can suggest the presence of a piece of iron or metal. Computed tomography angiography can provide the best image for vascular injuries. Metallic foreign bodies give a radial image on CT angiography, and extravasation of the opaque substance is always a guiding factor for vascular injury. There is always the possibility that magnetic resonance angiography may trigger migration of metallic foreign bodies and therefore, magnetic resonance angiography should be avoided. Metallic foreign bodies within the human body may be affected by the strong magnetic field, and thereby it may trigger travel to the vascular system and lead to injuries. Our example supports the use of a "wait-and-see" approach in the treatment of such individuals (13-15). Non-iatrogenic pulmonary embolism is characterized as embolisation to the pulmonary circulation of different foreign bodies (Table 1).

Complications can be prevented if early diagnosis and treatment are performed in cases in which a foreign body has penetrated the vascular system (16-18). Early removal of a foreign body prevents fatal consequences, such as serious cardiac injury or pulmonary embolism. Rigid manipulation for exposure should be avoided during surgery and/or

Table 1. Recent Research on Non-thrombotic Pulmonary Embolism Including Examples of Multiple Foreign Agents Affecting the Pulmonary Circulation Intravenously

Study	Age (year)	Sex	Type of foreign body	Entry Site	Final Destination	Management
Fernandez-Ranvie GG et al. 2013 (9)	20	Male	Bullet	Left femoral vein	Right pulmonary artery	Observation alone
Ciarrocchi AP et al. 2021 (14)	46	Male	Wooden	No apparent	The artery of the lateral basal segment of the right lower lobe	Thoracotomy Removal foreign body
Lebon M et al. 2018 (21)	41	Male	Sewing needle	Superficial femoral artery and the femoral vein	Embolism of pulmonary lobar arteries	Sewing needle removal with surgıcally
Gschwind CR et al. 2002 (22)	29	Male	Piece of metal	Subcutaneous veins	Right lung	Followed wıth medıcıne
Desai M et al 2020 (15)	22	Male	Glass fragment	Right internal jugular vein	Left lower lobe pulmonary artery	Endovascular Retrieval
Sakai T et al. 2018 (19)	19	Male	Iron hammer fragment	Femoral vein	Pulmonary artery	Removal with video-assisted thoracoscopy
Nally L et al. 2012 (20)	21	Male	Bullet	Left arm	Right lower pulmonary lobe	Removed (no specific description how)

preparation of patients for surgery. Such forceful manipulations can push the foreign body into the circulatory system. The foreign body should be removed without damaging the surrounding tissues by very gentle exposure and dissection. Foreign bodies can move within an hour or a few days, or even years.

Conclusion

Movement of foreign bodies in the vascular system can occur easily and early. In our case, the arrival of the foreign body in a lung within one or two hours may have resulted from our manipulation or may have occurred spontaneously. Therefore, it is important that patients not be moved or that they are carried to the operating room with minimal movement.

What Is Already Known on This Topic:

Studies on foreign body migration into the pulmonary circulation loop are rare and essentially generally iatrogenic. An earlier case had advanced through the popliteal vein, across the vena cava, into the right atrium and right ventricle, and into the pulmonary artery. The authors describe an unusual instance in which a metal particle moved to the left pulmonary artery after an industrial accident caused penetrating jugular vein damage. The unique feature of this case is that it is both asymptomatic and a rare case with good prognosis.

What This Case Adds:

The authors conclude that metal objects entering the body should be continuously observed and intervention should be avoided in asymptomatic individuals, as a supplementary to the existing research.

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