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# A rare case of penetrating lung and cardiac injury due to late migration of multiple Kirschner-wire after shoulder fracture fixation



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## ABSTRACT

**Introduction:** Penetrating foreign body through lung and cardiac is very uncommon case and may lead to life-threatening complication.

**Case:** We reported an unusual case of penetrating lung and cardiac injury as a complication of open reduction and internal fixation combined with transfixing wire of right glenohumeral procedure.

**Conclusion:** The Kirschner wires were successfully extracted by using heart-lung machine (HLM) through thoracotomy and sternotomy approach, consecutively.

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## INTRODUCTION

Pins and wires are widely used material in orthopaedic practice for fixation of fractures and dislocations around the shoulder.<sup>1,2,3</sup> Report of the migration of these material into the thoracic cavity as a complication is very rare.<sup>1,2</sup> Migration of kirschner wire (K-wire) into the chest cavity could penetrate into the lung, great vessel and heart. This complication could result pneumothorax, hemothorax, cardiac tamponade, and arrhythmia which may lead to life-threatening condition. Therefore early diagnosis and urgent removal are mandatory. Video-assisted thoracoscopy, thoracotomy, and sternotomy are safe and could be used to remove migrated wires.<sup>3,4</sup> In this report, we described a case of penetrating lung and cardiac injury as a late complication of transfixing right glenohumeral procedures by using multiple K-wires, which was successfully removed with HLM through thoracotomy and sternotomy approach.

## CASE REPORT

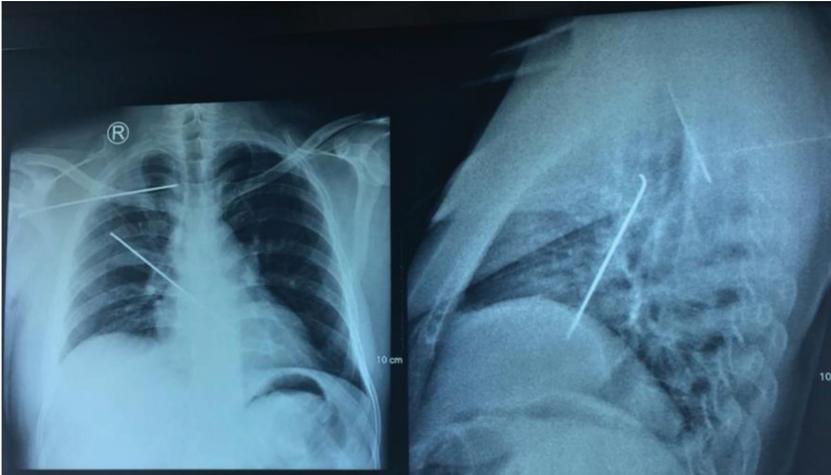
A 37-year-old man, was referred from the orthopaedic with a previous history of open reposition and fixation of humeral head by using locking plate, combined with transfixing wire glenohumeral by using two K-wires a month before admission. During a month after the procedure, the patient complained hemoptysis and felt chest discomfort at the back, but his hemodynamic status was stable, and no clinical sign of pneumothorax, hemothorax or cardiac tamponade. The chest x-ray 4 weeks postoperatively showed that both wires were broken

and displaced into the chest cavity, but there were no pneumothorax and hemothorax (Figure 1). A Chest CT scan was performed and revealed that the two K-wires penetrated through the lung and heart. The first wire was located in the superior segment of the right upper lobe at third level of right intercostal spaces (ICS), and second wire penetrated through heart, one end of the K-wire was located in right side and the other end was inside the heart (Figure 2).

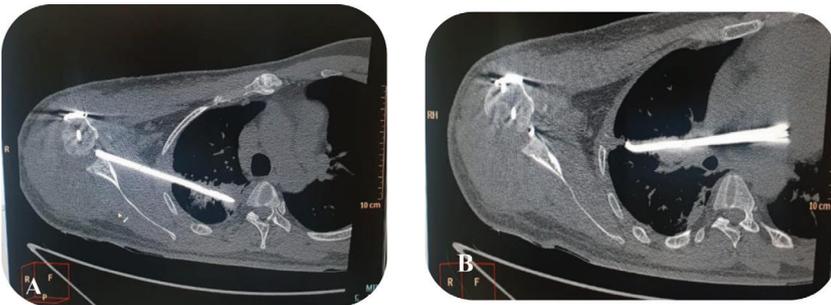
Furthermore, based on the Chest x-ray and CT scan, we decided to remove the K-wires through right thoracotomy posterolateral approach. During the procedure, we found that first K-wire was located in right superior lobe of the lung, at third level of intercostalis space and the injured lung was tailored with corolene 4.0 and bubble test was negative. Otherwise, we can't clearly seen the end of second K-wires at the right side, so we decided to convert the procedure into the sternotomy way to explore the second k-wires location.

We found that the second K-wires was displaced furthermore into the left heart, one end of the wire entered in right superior pulmonary vein and the tip of the wire exited at the posterior wall of the left ventricle. The wire is successfully extracted from the left atrium by using heart lung machine with beating heart condition with cardiopulmonary bypass time was 61 minutes. The entry and exit wound was closed by using corolene 4.0 with pledget (figure 3). a 28-F chest tube was placed in sub-sternal and 12-f drain in intra cardiac. Post operatively, the patient had a satisfactory clinical condition, and evaluation of echocardiography showed that there were no valves abnormality or

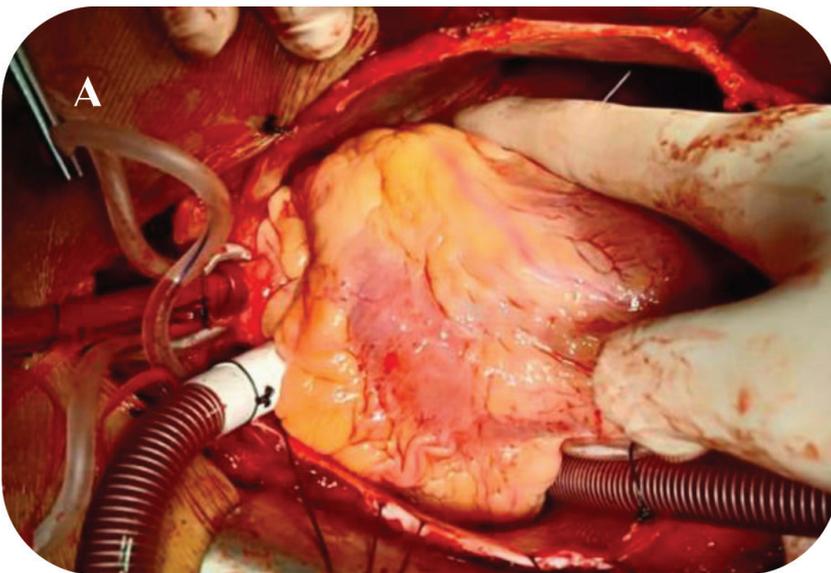
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**Figure 1** Chest X-ray 4 weeks postoperatively showed that The migration of two K-wires into right chest cavity (A) from posteroanterior view, (B) lateral view.



**Figure 2** Chest CT scan, 4 weeks postoperatively depicted that the migration of multiple K-wires into right chest cavity (A) first wire penetrated through the lung, (B) second wires penetrated throughout the heart



**Figure 3** A. The second wire was extracted via sternotomy approach by using HLM machine with beating heart procedure; B.the wires after extraction

any septal defect. On the fifth day postoperatively, the patient was discharged from hospital with good condition without any complication

## DISCUSSION

The complication of orthopaedic procedures such as penetration of pins and k-wires into the thoracic cavity is very rare, but it is a well-known complication since it was first described in 1943.<sup>1</sup> There were 47 cases related to this complication already reported by Lyons and Rockwood in 1990.<sup>4</sup> This complication could manifest with no symptoms, but it also could cause catastrophic clinical manifestation such as massive hemothorax and cardiac tamponade.<sup>2,3</sup> Therefore, immediate removal of this material is recommended. In our case we decided to removed the K-wires immediately to prevent sudden death due to massive hemothorax or cardiac tamponade.

The location of the migrated pins varied, and it included the heart, aorta, pulmonary artery, brachiocephalic artery, oesophagus, trachea, thoracic duct, lungs, spleen and the spinal canal.<sup>2,3,5-8</sup> Although the migration of shoulder pin or K-wire into the thoracic cavity has already reported previously, migration of multiple K-wire, with penetration into the lung and heart has not been reported yet.

Lyons et al.<sup>4</sup> and Nayakama et al.<sup>7</sup> suggested some precautions should be taken if K-wires are to be used as a material for internal fixation of shoulder girdle fractures and dislocation. First, to prevent potential migration, it is highly recommended to bend the subcutaneous end of each pin into the shape of a walking stick, use restraining devices; Second, patient must be monitored closely both clinical sign and radiographic follow-up, and third is withdraw the wires at the end of treatment. In our case, we analyzed the reasons of the K-wires migration are (a) the length of K-wires is too long; (b) the subcutaneous end of K-wire didn't bend properly; and (c) disobedience of the patient to followed the instruction not to move his arm freely during four weeks after operation.

Initially, in this case, we planned to perform the procedure via right thoracotomy based on the result of chest x-ray and chest CT scan preoperatively which showed that both wires were still located in right thoracic cavity (Figure 1 & 2). But during the procedure, the position of second wire was not similar to what was depicted in the chest x-ray or CT scan, so we had a difficulty to find it clearly from right thoracotomy. Based on that condition, we converted the approach into sternotomy, and used the cardiopulmonary bypass machine to remove the second wire because its location which lying from right superior pulmonary vein into the posterior wall of left ventricle. The changing position of second wire might be caused due to (a).postural position change, (b).the great freedom of shoulder

movement, (c).negative intrathoracic pressures associated with respiration, and (d).gravitational force. We suggested, in this case it would be better to performed chest x-ray with c-arm just before the procedure to avoid this pitfall.

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