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# Migration of K-wire into the cavum pleura after the reduction of acromioclavicular dislocation, a case report and review of literature

Panji Sananta\*, Respati Suryanto Dradjat, Rizky Julana, Ray Asaf Hexa Pandiangan, William Putera Sukmajaya, Muhammad Abduh

Orthopaedic and Traumatology Department, Saiful Anwar Hospital, Jalan Jaksa Agung Suprpto No. 2, Klojen, Kota Malang, Jawa Timur, 65112, Indonesia

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## ABSTRACT

**INTRODUCTION:** The use of K-wire (Kirschner wire) in acromioclavicular dislocation was the first trans-articular fixation technique to be described.

**PRESENTATION OF CASE:** A 40-years-old man was presented to the emergency room (ER) with shortness of breath. He had a history of acromioclavicular dislocation two years ago, which had been treated using two K-wires and tension band wiring. The plain x-ray revealed left side pneumothorax with K-wire migrated into the left hemithorax. CT scan showed that K-wire migrated into the posterior cavum pleura. A chest tube was then inserted, and the removal of K-wire was performed using thoracoscopic assisted surgery followed by the removal of the remaining K-wire in the left shoulder. Three days post-surgery, the chest tube was removed, and the patient was discharged from the hospital.

**DISCUSSION:** This technique is easy and cheap, but it can cause lethal complications. K-wire can migrate into the area of vital organs, including the liver, heart, neck lung subclavian artery, and aorta.

**CONCLUSION:** K-Wire should be used cautiously for treating upper extremity injury, especially acromioclavicular dislocation, due to its lethal complications. This method is outdated and should be restricted as much as possible.

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## 1. Introduction

The use of metal pins and wires, presently known as the Kirschner wire (K-wire), in acromioclavicular dislocation, was introduced in 1909 and developed by Martin Kirschner. The transarticular fixation of the acute complete acromioclavicular (AC) joint dislocation using pins or wires was one of the first described techniques [1]. The fixation was meant to enhance temporary reduction allowing the native soft tissue to heal with the AC joint in a reduced position. Nevertheless, the K-wire that was used to stabilize the AC joint was reported migrating into remote, life-threatening locations such as lung, spinal cord, neck posterior to the carotid sheath, and pleura [2–5]. The authors reported a case of K-wire migration presented as pneumothorax in a 40-years-old man. This work is reported in line with SCARE 2018 criteria [6].

## 2. Case presentation

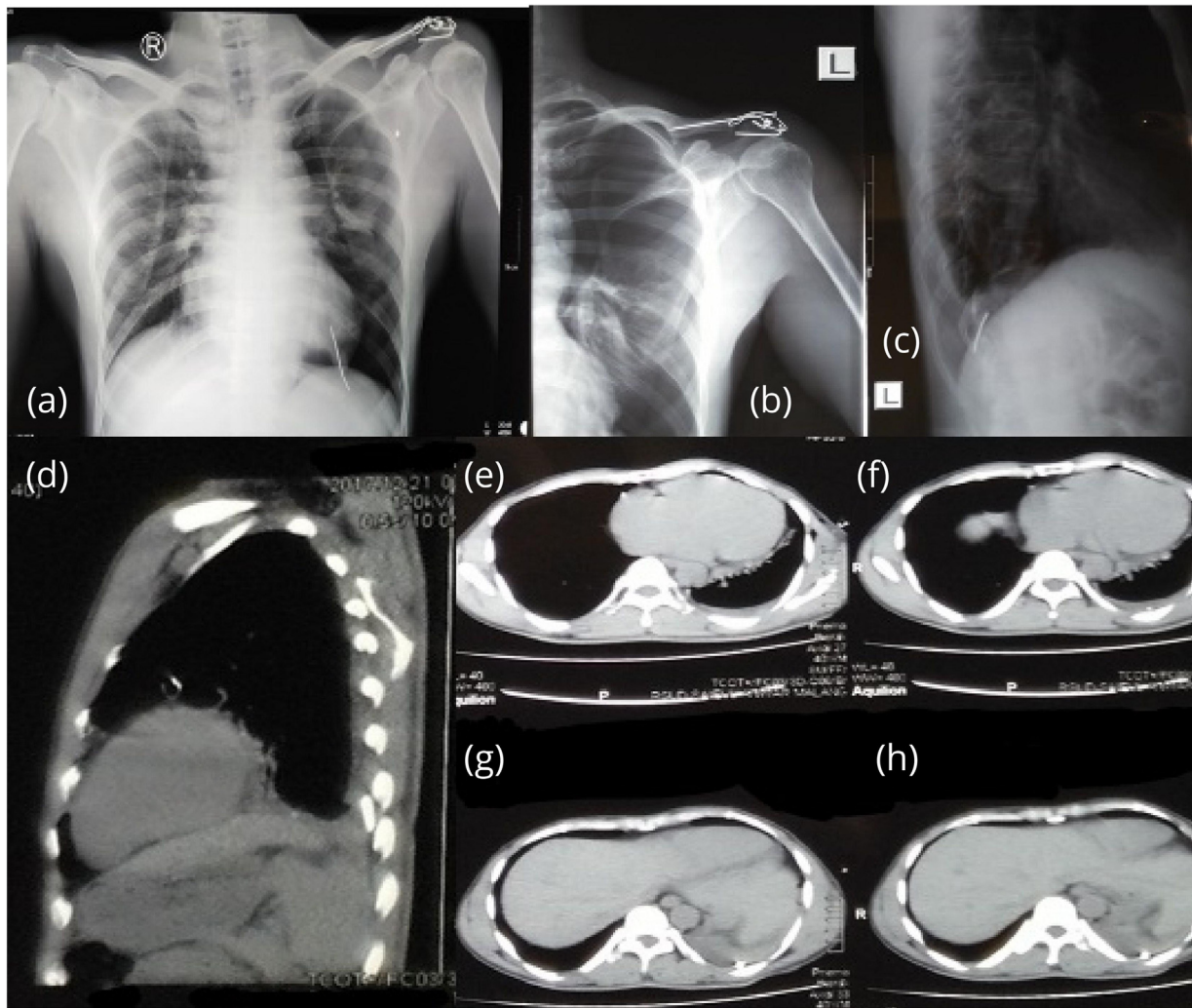
A 40-years-old man admitted to our emergency department due to shortness of breath two days earlier and pain in his left-back seven days earlier. The patient had a history of acromioclavicular dislocation two years ago that had been treated using two K-wires and tension band wiring. The physical assessment showed blood pressure of 135/80 mm Hg, pulse rate of 110 min<sup>-1</sup>, respiratory rate of 25 min<sup>-1</sup>. The radiographic examination revealed left side pneumothorax with a piece of K-wire migrated into the left hemithorax. Computed Tomographic (CT) scan was performed, which showed that K-wire was partially inside the posterior cavum pleura (Fig. 1).

The patient was immediately taken up for surgery for the removal of K-wire. A chest tube then inserted, and the removal of K-wire was performed using thoracoscopic assisted surgery followed by the removal of the remaining K-wire in the left shoulder (Fig. 2).

Three days after the surgery, the chest tube was removed, and the patient discharged from the hospital. Informed consent was obtained from the patient for the treatment of the injury and publication of radiographic images without any personal identification.

\* Corresponding author.

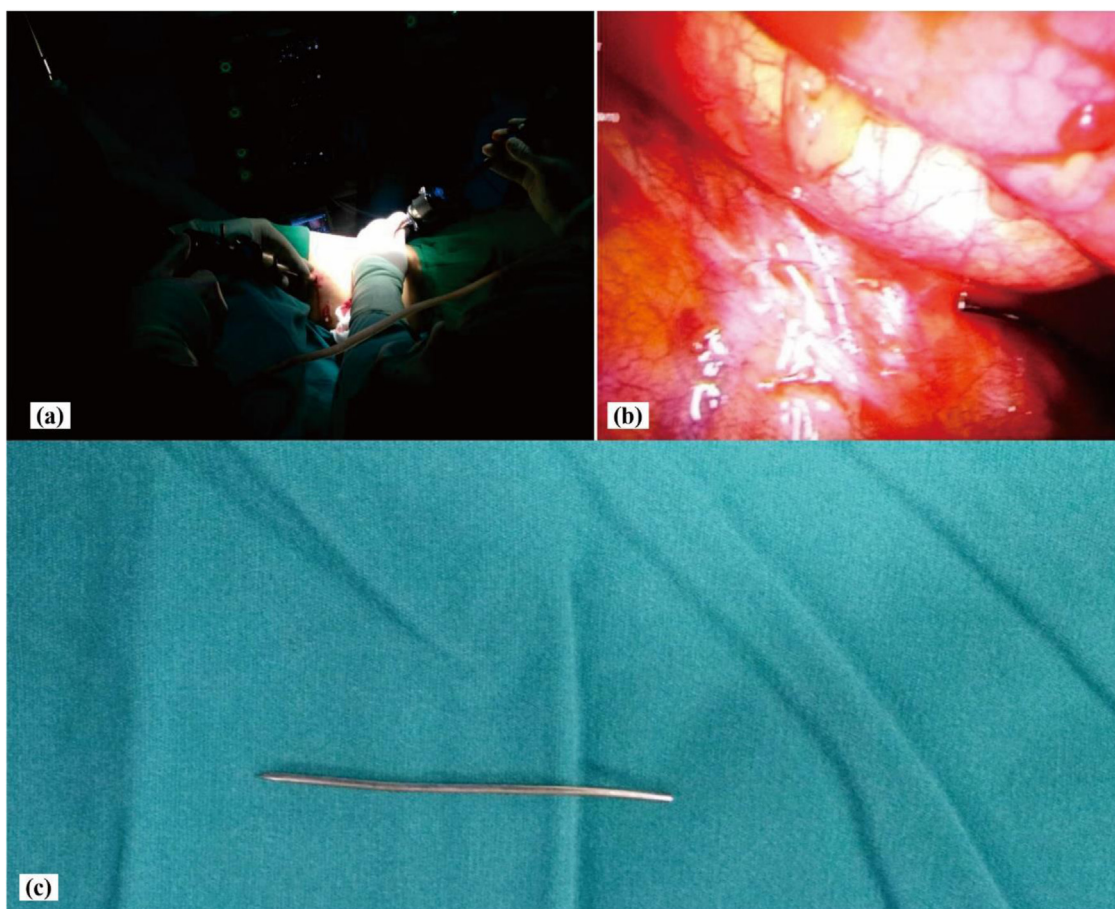
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**Fig. 1.** Transthoracic migration of K-Wire. (a) Plain thorax x-ray shows pneumothorax in left lung with migration of k-wire. (b) The remnant of K-wire and tension band wiring (c) lateral x-ray reveal the k-wire in the posterior aspect of left hemithorax (d-h) CT scan confirm the k-wire inside the cavum pleura.

**Table 1**  
Complications of the K-Wires migration: Review of the Literature.

Case	Authors	Age/Sex	Indication for Using K-wire	Interval from Placement to Migration	End Site	Symptoms and Complications
1	Rhegine et al. [2]	65/F	Left clavicle fracture	20 years	The left pulmonary apex	Light intensity pain in the upper left chest area
2	Nakayama et al. [3]	70/M	Right clavicle fracture	8 months	The lung and intrathoracic trachea	Cough and hemoptum
3	Irianto et al. [8]	34/F	Left clavicle fracture	3 years	The right lung	Chronic cough, chest pain during deep inspiration, and bloody sputum
4	Tan et al. [4]	5/M	Right midshaft clavicle fracture	7 days	The ascending aorta	Syncope, chest pain, and shortness of breath, hemopericardium and cardiac tamponade
5	Palauro et al. [5]	48/M	Right acromioclavicular dislocation	9 months	The left shoulder	Pain on the left shoulder (contralateral side), difficulty to mobilize the shoulder, ecchymosis and protrusion
6	Ballas et al. [9]	56/M	Sternoclavicular dislocation	2 years	The endopelvic	Chest pain
7	Kumar et al. [10]	36/M	Right clavicle dislocation	Within 4 weeks after surgery	The anterior mediastinum	No symptom
8	Batin et al. [11]	52/M	Right Acromioclavicular dislocation	5 years	The back of the neck	Swelling at the back of the neck
9	Leppilahti et al. [12]	56/M	Right clavicle fracture	11 days	Anterior of the cervical spine	No symptom (The migration discovered within post operative follow up)
10	Julia et al. [13]	83/F	Left proximal humerus fracture	1 month	Abdomen	Left upper abdominal quadrant pain. A mild left haemothorax and atelectasis and a minimum amount of perisplenic fluid



**Fig. 2.** (a) Thoracoscopic assisted surgery was performed to remove the K wire. (b) The K-wire inside the cavum pleura. (c) The k-wire after removal.

### 3. Discussion

There are several techniques for the management of AC joint dislocations. One of those is using the K-wire. There were different opinions of K-wire. For the pros, K-wire provides a safe and easy fixation with low morbidity. On the other hand, the cons have numerous reports represented the migration of K-wire into the area of vital organs, including liver, heart, neck lung subclavian artery, and aorta (Table 1) [1–4]. The risk of severe complications has led certain authors to abandon K-wire osteosynthesis as a treatment option in such cases [3–5].

The recommendations from authors and certain studies to prevent migration of K-wire are the following: ensure the patient to comply with follow-up visits radiologically and clinically in order to evaluate the progress of the treatment until the removal of the K-wire; ensure the internal tip of the K-wire within the marrow cavity of the clavicle completely, whereas the external tip of the K-wire, must be folded in an angle of approximately 90°; intraoperatively or immediately postoperatively, radiographs must be taken to analyze the position of the K-wire; and lastly, K-wire must be removed at the end of the treatment or if their migration is detected, regardless of the lack of clinical symptoms [7]. The surgeon decides the timing of K-wire removal, based on the age of the patient, the pattern of the injury, and additional injuries [2,8].

The present case was not following recommendations for using K-wire completely. The distal end of the K-wire was folded but did not reach the necessary angulation to prevent migration, hence allowing migration to occur. This patient was also not followed-up with serial radiographs. Moreover, the patient was not adequately informed when to remove the K-wire. It is very important for sur-

geons to follow the recommendations completely or abandon this treatment due to its lethal complications.

The exact cause and mechanism of K-wire migration are uncertain. Various causative mechanisms have been proposed, including muscular activity, movement of the shoulder, negative intrathoracic pressure during the respiratory excursion, regional resorption of the bone, gravitational force, and even capillary action [2,7].

### 4. Conclusion

This case and certain studies show that K-wire's use is outdated and should be restricted as much as possible due to the risk of lethal complications. If there is no alternative treatment to be chosen, the surgeon should be careful and follow the recommendations thoroughly.

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### Ethical approval

This study has been reviewed by the authors' Institutional Review Board, and the patient had given a written consent.

### Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images.



## Registration of research studies

This case report is not registered.

## Guarantor

Panji Sananta, MD.

## CRedit authorship contribution statement

**Panji Sananta:** Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Supervision, Validation, Writing - original draft, Writing - review & editing. **Respati Suryanto Dradjat:** Conceptualization, Data curation, Formal analysis, Project administration, Resources. **Rizky Julana:** Project administration, Conceptualization, Formal analysis, Investigation, Methodology, Writing - original draft, Writing - review & editing. **Ray Asaf Hexa Pandiangan:** Conceptualization, Formal analysis, Investigation, Methodology, Software, Writing - original draft, Writing - review & editing. **William Putera Sukmajaya:** Writing - review & editing. **Muhammad Abduh:** Writing - review & editing.

## Declaration of Competing Interest

The authors report no declarations of interest.

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