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(CASE REPORT)

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Kirchner wire migration: A case report of migration from left hip to the right pleural space

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Abstract

A 7-year-old female sustained a high-energy trauma following a truck-pedestrian accident, resulting in a displaced intertrochanteric femoral neck fracture (Delbet Type IV). She also suffered a mild traumatic brain injury, from which she recovered fully. Capsular decompression was not performed. Open reduction and internal fixation (ORIF) were carried out using smooth Kirschner wires. The patient was maintained on strict bed rest postoperatively.

Radiographic union was achieved at six weeks, at which point she commenced partial weight-bearing with a walker (Zimmer frame). She was lost to follow up at six months post-injury; there were no clinical or radiological signs of avascular necrosis, and she was ambulating with full weight-bearing without pain.

Keywords: K-wire migration; Paediatric orthopaedic trauma; Femoral neck fracture; Open reduction and internal fixation (ORIF); Intrathoracic foreign body

1. Introduction

Kirschner Wires (K-Wires) are commonly used in orthopaedic surgery for fracture fixation, bone reconstruction, and as guide pins for implant placement for patients undergoing surgery following road traffic crash, workplace injury, congenital malformation corrections and other aetiologies.{1,44}. The appropriate wire size depends on the specific case, requiring the surgeon's judgment.(1,2,3,4,20) They provide temporary fixation during surgery and are usually removed after four to five weeks. In some cases, they are used for definitive fixation, particularly in small fracture fragments or intramedullary stabilization, such as in the ulna. Tension band wiring, often used for fractures of the patella and olecranon, relies on K-Wires to secure bone fragments while a flexible wire loop applies compression. (7,8,9,26). In skeletal traction, they pass through the bone to maintain direct traction, commonly with a frame and pulley system, as seen in femoral traction. They also serve as guides for cannulated screws, ensuring accurate screw placement during fixation. (19,32,33,35)

Pin-related complications associated with K-wire fixation include haemorrhage following vascular injury, wound issues such as over-granulation, pin-tract infections, and hypersensitive scars. Pin loosening without infection is also observed. Prolonged K-wire placement increases the risk of these complications, particularly when left for more than four weeks. (8,9,10,11,13,17, 43)

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Metal-related complications include pin migration, which can lead to severe outcomes if the wires migrate to vital structures. Retrograde migration is noted in some cases, though no fatal or near-fatal complications occur. Wire loosening is common but does not always compromise fixation. (23,27, 29,30,32)

Neurological complications involve nerve injuries such as neurapraxia and axonotmesis, with most cases recovering fully. However, persistent nerve palsy requiring surgical intervention is reported. Proper assessment and documentation of neurovascular status before and after surgery are essential. (8,9,36,45)

Tendon-related complications include flexor and extensor tendon impalement, which generally resolve after pin removal. Osteomyelitis, though rare, occurs in some cases and responds well to conservative management. (16,17,32)

Fracture-fixation complications include loss of reduction, necessitating revision procedures in some cases. The duration of K-wire placement directly correlates with complication rates, with longer retention increasing the risk of infection, loosening, and migration (1,20,21,22).

2. Case history

B.A was a 7-year-old girl who was a victim of pedestrian motor vehicle crash. She sustained right sided facial abrasions, left hip injury with inability to bear weight on the left lower limb. She had a transient loss of consciousness which was recovered immediately. There were no abdominal swelling or difficulty in breathing, cough haemoptysis or haematemesis. She was rescued from the scene of the crash to our facility.

Examination showed a young child, conscious and alert, in pains, pale, anicteric, acyanosed and mildly dehydrated. There was an extensive abrasion on the right side of the face, congealed blood on the nostril. There was deformity of the left thigh with the left lower limb externally rotated and shortened. Investigations done revealed packed cell volume of 19% with with other investigations largely normal.

She was resuscitated and transfused with units of blood. She subsequently had open reduction and internal fixation with K-wires. The choice of K wire was due to open growth plate that needed minimal disruption to present growth arrest.

She did well and discharged on the 23rd day of admission.

She was followed up to 6weeks with radiological union noted. Partial weight bearing was commenced at this time. The patient presented again on the 16th week with fully united fracture (Fig 3). The patient was scheduled for implant removal during her next visit. However, she began full weight-bearing activities contrary to medical instructions. On 24weeks presentation, she presented with xray should a broken part of one of the three K wires already migrated to the pelvic region (Fig. 4). She was immediately booked for implant removal. However, patient was lost to follow up until 40weeks of surgery when she presented. She presented without symptoms. The Xray at 40weeks showed the broken K wire in the posterior lateral aspect of the right pleural space (Fig 5).

She underwent a right posterior-lateral thoracotomy, retrieval of the broken K-wire and passage of right closed thoracostomy tube drain. The post-operative period was uneventful. The tube was removed on the 4th day after surgery and the patient got discharged on the 7th day following surgery.

Figure 1 Left Pertrochanteric Fracture

Figure 2 2weeks After fixation

Figure 3 Broken and migrated wire at 24week

Figure 4 K wire in the chest at 40weeks

Figure 5 Lateral view shows wire in the pleural space

3. Discussion

This is a case of a 13-year-old whose K-wire migrated following surgery to the right hip. Her follow-up period was irregular, with evidence of poor compliance with instructions. These are often noted in resource-poor environments where patients pay out of pocket to sustain their treatment. Patients sometimes exit orthodox medicine and use alternative medicine to pursue their speedy recovery until it fails them, before they revert to their clinicians. [1,2,3,4,6].

Kirschner wires (K-wires) are widely used in orthopaedic surgery for temporary or definitive fixation of fractures, particularly in paediatric patients where growth plate preservation is crucial. However, despite their advantages, K-wires are associated with several complications, including migration, infection, wire loosening, and neurovascular injury. Migration of K-wires to distant anatomical locations is a rare but potentially life-threatening complication, as seen in the case of a 7-year-old with an intrathoracic migrated K-wire. Wire injury to the surgeon could lead to transmission of infections like felon, hepatitis or HIV. (12,14,18). This will lead to antibiotics therapy and abscess drainage, viral hepatitis therapy or lifelong antiretroviral therapy with all their complications.[7,8,9,10,12,38,40) .

K-wire migration occurs due to several biomechanical factors, including limb movement, muscle contractions, gravitational forces, and cyclical loading (2,11,13,14). Migration is more common in freely inserted K-wires without proper fixation or those left for an extended period (1,14,) and K-wires inserted around joints(1,16,17,26, 30,32). The direction of migration depends on the initial insertion angle and the anatomic structures surrounding the wire. Retrograde migration has been reported in various case studies, with K-wires reaching vital organs such as the lungs, heart, spinal canal, bladder, and gastrointestinal tract (3,13,17,36).

In this case, improper adherence to weight-bearing restrictions likely exacerbated wire movement, leading to its breakage and migration to the pleural cavity. Cases of similar migration have been reported, where K-wires travelled into the thoracic cavity, mediastinum, and even the spinal cord (7,16,).

Several risk factors contribute to K-wire migration. The risk increases when K-wires remain in place beyond four to six weeks, as loosening occurs over time (2,16,26,). Wires that are not bent at the end or securely fixed are more prone to migration (9). Premature loading can cause wire fatigue and breakage, as noted in this case and others (10,26). K-wires in joints or near muscle insertions tend to migrate due to continuous movement (17,32,). Rapid healing in children may contribute to K-wire entrapment, increasing migration risk after breakage (27,32).

Wires should be bent at the exposed end or buried beneath the skin to prevent external displacement (5).

Radiological monitoring at four-week intervals is crucial to detect early signs of migration (21). Removal should be planned at the earliest possible time, particularly in paediatric patients (32). Education regarding weight-bearing restrictions is vital to prevent excessive mechanical stress (1,29).

Retrieval of migrated K-wires depends on their location and associated complications. In cases of intrathoracic migration, a minimally invasive thoracoscopic approach is preferred, though open thoracotomy may be required for deeply embedded wires (5,23). In this case, the patient underwent a posterior-lateral thoracotomy with successful retrieval of the K-wire and pleural drainage. Similar retrievals have been reported for intrapelvic, mediastinal, and urinary bladder migrations, using laparoscopic, endoscopic, or open surgical techniques (26,35).

Most patients recover well after wire removal, provided there are no associated infections or organ injuries. In this case, the patient had an uneventful recovery and was discharged on the seventh postoperative day. (1)

4. Conclusion

K-wire migration is a rare but serious complication of orthopaedic fixation, necessitating vigilance in placement, meticulous monitoring, and timely removal. Pediatric patients are particularly vulnerable due to rapid bone healing and high activity levels. This case highlights the importance of adhering to post-surgical instructions, maintaining close radiological follow-up, and promptly intervening upon the detection of complications. Awareness of migration risks and adherence to preventive measures can significantly reduce morbidity associated with K-wire fixation in pediatric fractures.

Compliance with ethical standards

Disclosure of conflict of interest

There is no conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from the parents of the child for the use of their radiographs and relevant information in this research.

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