

Unusual migration of a Kirschner wire in a patient with Osteogenesis Imperfecta

A case report

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Abstract

Rationale: Kirschner wires (K-wires) are the most commonly used implants in orthopedic surgery. Although complications are not uncommon, they are mostly benign in nature and easily managed. While migration of K-wires is a rare complication, fatal outcomes have been reported. A review of the literature showed that only 7 cases of wire migration in the hip and pelvic region have been reported. Only 2 occurred in the pediatric population. Although K-wires are routinely used in osteogenesis imperfecta (OI) patients, there has been no report of complications in this vulnerable patient population.

Patient concerns: A 10-year-old girl with OI, presenting with gastrointestinal symptoms 1 year after operative fixation of a subtrochanteric femoral fracture. Pelvic x-ray showed a missing K-wire.

Diagnosis: The patient was diagnosed with migration of a K-wire from the left femoral neck to the right retroperitoneal space.

Interventions: The patient underwent surgery. During the operation, the migrated K-wire was extracted from just below the 12th rib on the right side.

Outcomes: The patient had an uneventful rehabilitation, recovered completely, and was asymptomatic at 2-year follow-up.

Lessons: There has been no prior report of migrated K-wires in the OI population. This is also the first report of a K-wire migrating from the femoral neck to the contralateral retroperitoneal region. Proper intraoperative bending of K-wires, timely removal of temporary K-wires, and considering K-wire migration in patients with retained hardware complaining of respiratory or gastrointestinal symptoms will prevent potentially life-threatening complications.

Abbreviations: K-wire = Kirschner wire, OI = osteogenesis imperfecta.

Keywords: Kirschner wires, osteogenesis imperfecta, pin migration

1. Introduction

Kirschner popularized the use of smooth wires (K-wires) in orthopedic procedures. To this day, no other implant has exceeded the ubiquity of K-wires as the workhorse of orthopedic surgery. Complications are not uncommon, but are usually benign in nature and treated easily. Wound-related complications are the most common.^[1] K-wire migration is, on the contrary, a serious complication. The first such report was published in 1943, presenting 2 cases of K-wire migration to the lung.^[2] A review of the following reports clearly indicates that the highest risk of K-wire migration is in the shoulder region. There are few reports of K-wire migration in the pediatric population. No

reports were found of K-wire migration in the osteogenesis imperfecta (OI) patients.

We hereby present the case of a 10-year-old girl with OI, complaining of gastrointestinal symptoms 1 year after fixation of a femoral neck fracture with K-wires. A migrated K-wire was found to be the source and was subsequently removed. A brief review of the literature regarding K-wire migration in the lower limbs then follows.

2. Case report

A 10-year-old girl with a history of multiple fractures due to OI sustained a displaced subtrochanteric fracture of the left femur. She underwent surgical reduction and fixation of the fracture utilizing 3 K-wires, supplemented by cerclage wires, as previously described by Fassier et al^[3] (Fig. 1). The fracture healed uneventfully, and the patient was able to walk independently at 4 months postoperatively.

The patient began experiencing abdominal discomfort, chest pain, and occasional back pain 1 year after the index procedure. She was visited by 3 gastroenterologists, had a normal abdominopelvic sonography, and was prescribed antacid medication to reduce symptoms, without success. After visiting our clinic, x-rays were obtained, demonstrating a missing K-wire, which was subsequently found in the right abdominal region (Fig. 2). She was immediately admitted for surgery and was placed in a prone position. Intraoperative fluoroscopy was utilized, and the migrated pin was removed with an oblique

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Figure 1. Post-operative left hip X-ray after the index procedure, showing 3 bent K-wires held by a cerclage wire, as described by Fassier et al.^[9]

incision just below the 12th rib and was extracted from the retroperitoneal space (Fig. 3). She reported complete resolution of her symptoms the day after surgery and was symptom-free at 2-year follow-up.

Written informed consent was obtained from the patient's guardian.

3. Discussion

Since Kirschner (1909) used a double-ended pin for skeletal traction, K-wires have been the most widely used devices in

orthopedic surgery, owing to their high versatility, low cost, and availability.^[1] Due to their smooth nature, K-wires are prone to migration, as was first described in 1943.^[2] Numerous reports describing incidents of K-wire migration have been published. Considering the ubiquity of K-wire use, the incidence of symptomatic K-wire migration is rare.

Surgeries around the shoulder including acromioclavicular joint dislocations, clavicular fractures, and sternoclavicular joint dislocations constitute most of the literature on K-wire migration. Lyons and Rockwood reviewed 37 reports of pin migration in the shoulder region, and found 17 major vascular injuries resulting in 8 deaths.^[4] In a review of K-wire-related complications after pediatric upper-extremity fracture fixation, Sharma et al^[11] found 4 cases of retrograde wire migration, with no fatal or near fatal incidents. We failed to find a review article regarding K-wire migration in the lower extremities.

A thorough review of literature suggests that symptomatic pin migration often occurs in the upper extremities. This further consolidates Lyons and Rockwood's theory, which states that pin migration in the shoulder region might be the result of the shoulder's wide range of motion.^[4]

As of April 2018, 7 reports have been published reporting cases of late complications of pin migration in the hip and pelvis region. Fong et al reported a case of asymptomatic pin migration, found only on a routine pelvic x-ray. The patient had a history of a pelvic fracture 10 years before pin migration. The pin was successfully removed.^[5]

Tamura et al^[6] report a curious case of a migrant pin causing an inflammatory polyp in the colon 25 years after surgery for a pelvic fracture.

In a similar case reported by Matsumoto et al,^[7] 26 years after a pelvic fracture surgery, K-wire migration caused a perforation in the sigmoid colon, and was successfully treated.

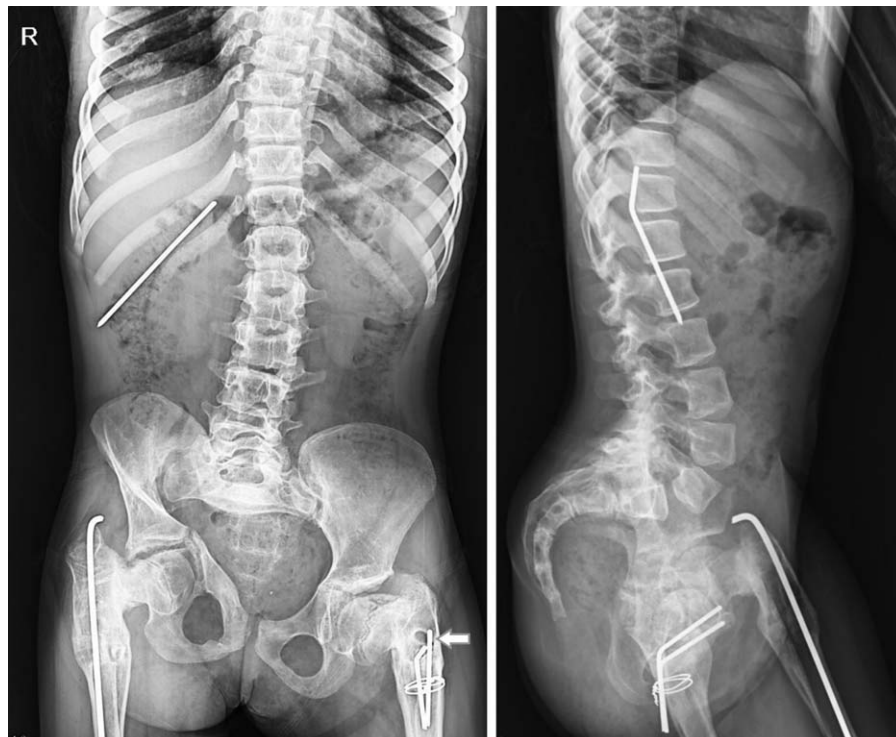


Figure 2. Anteroposterior and lateral x-rays clearly depicting a K-wire in the right hypochondrial region. A lucent area (arrow) suggests loosening of the wire before migration.



Figure 3. Intraoperative photograph: with the patient in prone position (patient's buttock on the lower part of the image) shows the migrated K-wire being extracted from just below the 12th rib.

These reports underscore the potentially dangerous nature of retained smooth K-wires, particularly in the pelvic region.

Late migration of pelvic K-wires in children are extremely rare, and only 2 published reports were found regarding the matter. Interestingly, both cases include transarticular K-wires supporting the reduction in developmental dysplasia of the hip. Yurtçu et al^[8] report a case of transvesical pin migration after surgery for developmental dysplasia of the hip. Marya et al report a 5-year-old child, in which a transarticular K-wire, placed out of the skin during surgery, could not be found upon cast removal. The pin was surgically removed from the hypochondrial region without complications.^[9] Authors of both reports stress that K-wires cut outside of the skin should be bent to prevent pin migration. Firoozabadi et al^[10] proposed a useful technique for proper bending of K-wires that consists of 3 bends and ensures a 180 degree bent K-wire, which is thought to significantly reduce the risk of pin migration.

The important lesson in all reports is the temporary nature of K-wires. K-wires are to be removed upon achieving their goal. Retained K-wires may migrate in the early postoperative period, or several years later. We believe that the routine practice of K-wire removal in the pediatric population has led to the scarcity of K-wire migration reports in this age group.

Plate and screw constructs are contraindicated in patients with OI. Intramedullary nails and K-wires are a surgeon's only options in treating these patients.^[11] OI patients, many of whom would be wheelchair bound without surgical interventions, are being more active in the community. Activity not only increases the risk of sustaining fractures, but also provokes migration of K-wires.

To the authors' knowledge, there has been no prior report of migrated K-wires in the OI population. This is also the first report of a K-wire migrating from the femoral neck to the contralateral retroperitoneal region. We do not yet have a theory of the path the K-wire took, but superior migration through the iliopsoas sheath possibly led the K-wire to the retroperitoneal region.

The authors of this report suggest proper bending of all K-wires, according to the technique described by Firoozabadi et al.^[10] Furthermore, it is strongly recommended to remove the K-wires which have served their purpose. Also, evidence of pin loosening in the follow-up x-rays is an indicator of a high risk of pin migration (Fig. 2). Finally, in surgically treated OI patients, as with any patient with a retained K-wire, any abdominal or respiratory symptom prompts a thorough diagnostic evaluation, including radiographs and ultrasounds. We believe that adherence to these recommendations will virtually eliminate the risk of K-wire migration related morbidity and mortality.

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