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Case report

A case report: Perforation of the small intestine and sigmoid colon due to Kirschner wire migration

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ABSTRACT

Introduction: Kirschner wires (K-wires) are extensively utilized in orthopedic and trauma procedures. Several risks associated with K-wires have been documented, including a rare case of intestinal perforation caused by wire migration into the pelvis. **Case Report**: In this report, we present the case of an 84-year-old woman with a history of left femoral neck fracture fixation surgery using a K-wire. She was hospitalized in the emergency room due to persistent dull pain in the left iliac fossa for 7 days. A contrast-enhanced computed tomography scan revealed an abscess in the left iliac fossa and a K-wire located in the abdominal cavity adjacent to the abscess. An emergency laparotomy was performed, and three perforations were identified. The surgery involved removal of the K-wire, closure of the small bowel perforation, and exteriorizing a segment of the damaged sigmoid colon to form a stoma. With timely diagnosis and treatment, the patient experienced significant recovery within 13 days postoperatively. **Conclusion**: Perforation of the small intestine and sigmoid colon due to Kirschner wire migration is a rare complication. However, it should be considered in patients with a history of orthopedic surgery involving K-wires.

Key words: case report, perforation, small intestine, sigmoid colon, Kirschner wire, migration

INTRODUCTION

The Kirschner wire was first used for skeletal traction in 1909[1]. Nowadays, K-wires are extensively utilized for bone fixation, particularly in cases of clavicle fractures, as well as small bones in the hands, feet, and even long bones. In surgical cases involving K-wires, the incidence of complications is 18%, including infections, loss of fixation, broken nails, and pin migration; among these, pin migration accounts for only 1%[2]. Migration of K-wires from the insertion site to the spinal cord, the heart, and organs in the abdomen has been documented. Additionally, K-wire fixation is frequently utilized for the treatment of hip fractures, and migration into the pelvis leading to colon damage is an exceedingly rare complication[3,4]. We report a clinical case of perforation of the small intestine and sigmoid colon due to K-wire migration, as well as a literature review on the diagnosis and treatment.

CASE REPRESENTATION

An 84-year-old woman with a body mass index (BMI) of 18.3 had a complicated medical history of cerebral hemorrhage with left hemiplegia and a surgery for left femoral neck fracture fixation with a K-wire 15 years ago. The patient reported persistent dull pain in the left iliac fossa at home for 7 days, with no fever and normal bowel movements. The pain gradually became more severe, prompting the patient to visit the emergency room. On physical examination, signs of peritonitis were noted, including abdominal distension, guarding, rebound tenderness in the left iliac fossa, and generalized abdominal tenderness. Blood tests revealed an elevated white blood cell count of 17×10^9/L with 90% neutrophils, an increased C-reactive protein level (12.3 mg/dL), and a low potassium level (2.7 mmol/L). Abdominal radiography did not show signs of pneumoperitoneum, but it revealed that the left hip fixation material (K-wire) had migrated (**Figure 1**). A contrast-enhanced computed tomography (CT) scan of the abdomen showed free air in the abdomen, an abscess in the left iliac fossa, and the left hip fixation material penetrating into the pelvis adjacent to the abscess. Additionally, thickening of the small bowel loops in the left iliac fossa and diffuse infiltration of the mesentery were evident on the CT scan (**Figure 2**).

The patient underwent emergency laparotomy immediately after the diagnosis was confirmed. The patient was placed in a supine position under general anesthesia, and a midline incision was made. Upon opening the abdominal cavity, pseudomembranes and a large amount of cloudy fluid were observed throughout the abdomen, predominantly in the left iliac fossa,

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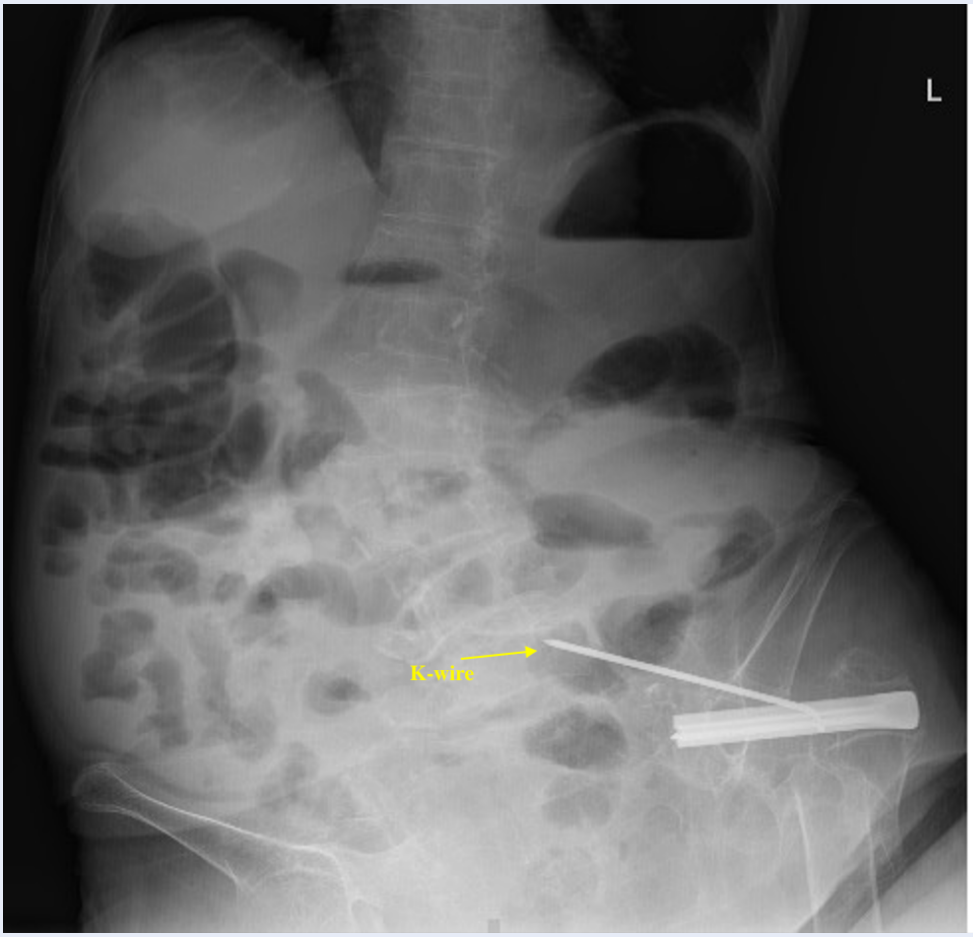

Figure 1: **Abdominal radiography shows that the K-wire has shifted from its original position (yellow arrow).**

Figure 2: **Abdominal computed tomography scan shows free air in the abdomen (red arrow), an abscess in the left iliac fossa (green arrow), and the K-wire penetrating into the pelvic adjacent to the abscess (yellow arrow).**

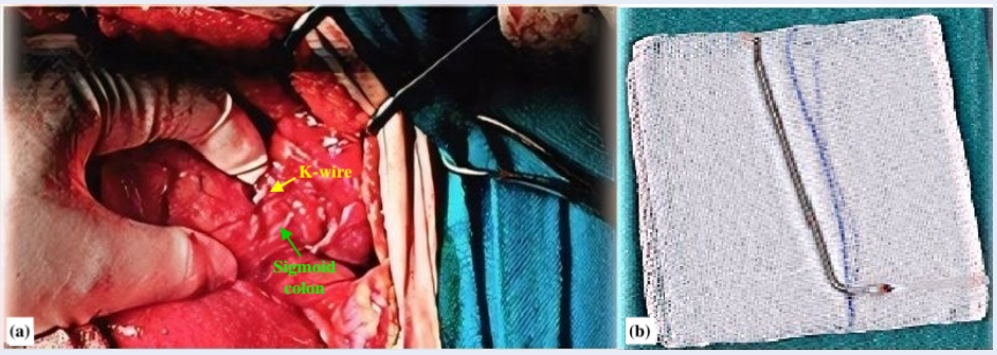

Figure 3: **Intraoperative photo and Kirschner wire**. (**a**) Intraoperative image shows one end of the K-wire (yellow arrow) penetrating the sigmoid colon (green arrow). (**b**) The K-wire after removal.

where an abscess had formed, covered by loops of the small intestine and colon. Three 1-cm-diameter perforations caused by K-wire migration were identified at different locations: on the antimesenteric border of the small intestine 1 meter proximal to the ileocecal junction, on the mesenteric border, and on the colonic wall of the mid-sigmoid colon (**Figure 3**). Surgical procedures included irrigation of the peritoneal cavity, removal of the K-wire, suturing of the small bowel perforation, and exteriorization of the damaged sigmoid colon segment to create a stoma.

Following surgery, the patient was admitted to the intensive care unit (ICU) for 6 days to manage septic shock. Once her condition stabilized, she was transferred to the surgical department. The patient's recovery was uneventful, with a soft abdomen, absence of pain and fever, and a well-functioning stoma. She was discharged from the hospital 13 days postoperatively. Currently, the patient is stable and is considering surgery to close the stoma.

DISCUSSION

K-wires were first utilized for skeletal traction in 1909 by Martin Kirschner[1,5]. Today, K-wires are among the most frequently used devices in orthopedic trauma surgery due to their cost-effectiveness, efficacy, ease of insertion into bones and joints, and flexibility[6–8]. The use of K-wires has expanded from treating clavicle fractures to addressing fractures in small bones of the hands and feet, as well as femoral neck fractures. Despite their advantages, complications associated with K-wires have been extensively documented[2,7,9].

In 1992, Botte *et al.* reported on a cohort of 137 patients with wrist fractures fixed using K-wires, noting that 18% experienced complications, including infection, loss of fixation, nail loosening, broken nail, tendon damage, vascular injury, nerve damage, and pin migration, which accounted for 1% of cases[2]. Similarly, Stahl *et al.* studied 238 patients undergoing wrist surgery with K-wires, finding complications in 15% of cases (36 patients), with only one instance of K-wire migration[7]. The issue of K-wire migration was noted as early as 1939, and by 1943, two cases of K-wire migration from the clavicle into the lung were documented[9,10]. Subsequent reports have highlighted that K-wires can migrate to various locations, such as the lung, heart, liver, spinal cord, bladder, colon, and rectum, potentially causing severe and even life-threatening complications[6,11–17].

A review by Sadat-Ali et al. compiled over 30 years of medical literature, documenting more than 60 cases of K-wire migration, including 11 fatalities and numerous severe complications[18]. Although the precise mechanisms behind K-wire migration remain unclear, possible contributing factors include prolonged joint movement, muscle contractions, gravity, local bone resorption, and inadequate bone healing[4–6,12].

Our report describes a case of perforation of the small intestine and sigmoid colon due to K-wire migration—a rare complication that has been reported in a small number of studies[1,16,19]. Migration of K-wires has been documented to occur from days to years after the time of surgery[6,16]. The intervals between the initial hip surgery and the onset of colon perforation varied: 12 years in McGiffin's study, 25 years in Tamura's, and 32 years in Matsumoto's, whereas the interval in our case was 15 years[1,16,19]. These cases illustrate that K-wires can remain in the body for extended periods without close follow-up, leading to significant complications. Meanwhile, K-wires are essentially temporary fixation devices and need to be removed afterward[16].

Clinical manifestations of K-wire migration vary widely and can be non-specific. In McGiffin's study,

abdominal pain and diarrhea were present for 3 years before an abdominal radiograph revealed the K-wire migration into the pelvis [19]. Tamura's patient experienced constipation, and the migration was diagnosed through a colonoscopy and CT scan [1]. Matsumoto reported a case in which, 26 years post-pelvic fracture surgery, perforation of the sigmoid colon caused by K-wire migration was successfully treated [16].

The differing clinical presentations may be attributed to various responses to the foreign body: sterile fibrosis leading to adhesion and lesion localization; pus-filled reactions forming abscesses; or chronic irritation causing inflammation, polyps, and digestive disorders [1,3,16]. Our patient presented with severe peritonitis and infection due to the K-wire, which caused extensive damage, including perforations of the sigmoid colon and small intestine.

Treatment approaches for sigmoid colon perforation, as illustrated by the four cases (including ours), varied. McGiffin's case involved an exploratory laparotomy; the sigmoid colon perforation was sutured in two layers, and the K-wire was removed through a hip incision [19]. Tamura's case required K-wire removal through an iliac fossa incision, and simultaneous endoscopic clipping was also carried out to close the colonic wound [1]. Matsumoto's case necessitated resection of the damaged sigmoid colon and K-wire removal through abdominal surgery [16]. In our case, due to the patient's advanced age, severe infection, and complicated abdominal damage, we opted for peritoneal lavage, suturing of the small intestine perforation, and exteriorization of the segment of the damaged sigmoid colon to create a stoma.

To mitigate complications from K-wire migration, it is crucial to remove the K-wires once bone healing is complete and function is restored. Additionally, K-wires should be curved or used with assistive devices to minimize movement, and regular follow-up and assessment of K-wire positioning are essential. Prompt removal is necessary if migration is detected [4,5] .

CONCLUSIONS

Perforation of the small intestine and sigmoid colon due to K-wire migration is an exceptionally rare complication. The symptoms associated with this condition can be diverse and occasionally nonspecific; in some cases, they may be life-threatening. Consequently, it is crucial to consider this potential complication when evaluating patients with a history of trauma surgery involving K-wires. A thorough understanding of the pathogenesis, along with a precise assessment of the patient's overall condition and injuries during exploration, is essential for informed treatment decisions.

ABBREVIATIONS

BMI - Body Mass Index, **cm** - Centimeter, **CT** - Computed Tomography, **ICU** - Intensive Care Unit, **K-wires** - Kirschner wires, **L** - Liter, **mg/dL** - Milligrams per deciliter, **mmol/L** - Millimoles per liter

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AUTHOR'S CONTRIBUTIONS

DNT: conception and design and performing the main steps of essay and writing the manuscript.. TTP: analysis and interpretation of the data. DQL, PDN: revising the manuscript critically for intellectual content. QAN, HNH: acquisition and analysis of data. All authors read and approved the final manuscript.

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AVAILABILITY OF DATA AND MATERIALS

Data and materials used and/or analyzed during the current study are available from the corresponding author on reasonable request.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

CONSENT FOR PUBLICATION

Written informed consent was obtained from patient and patient's son for publication of this Case Report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

COMPETING INTERESTS

The authors declare that they have no competing interests.

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