Allergic Reaction to Percutaneous K-Wires after Osteosynthesis

Krielen P1*, Bakia JM1, and Frolke JPM1

Department of Surgery, Radboudumc, Nijmegen, The Netherlands

Abstract

A 34-year-old patient visited the emergency room of our center with a painful fourth digit of the left hand. X-ray imaging of this finger showed a fracture of the proximal falanx. The treating surgeon opted to treat this fracture with ‘buddy wiring’ using Kirschner wires, also known as K-wires. Following this procedure, the patient developed progressive swelling of the third and fourth digit. In retrospect, the patient was known to be allergic to nickel. The diagnosis was an allergic reaction to nickel with a secondary infection. This case serves to illustrate a potentially underreported complication: an allergic reaction to percutaneous K-wires.

Keywords: Kirschner wire; Falanx fracture; Nickel allergy

Introduction

A nickel allergy is a type IV contact allergy with a prevalence of 13.1% [1]. Despite the frequent use of osteosynthesis materials, little has been documented about allergic reactions to these different compounds. The Kirschner wire (K-wire) which is made of stainless steel, is frequently used for osteosynthesis. What was previously unknown to the authors is that stainless steel contains 15% nickel. In this manuscript we describe a patient with an allergic reaction to K-wires used in the treatment of a fracture of the fourth digit of the hand.

Case Report

The patient, a 34-year-old woman, visited the Emergency Room following an injury of the fourth digit of the left hand when her dog unexpectedly yanked on its leash. Her medical history revealed no previous illnesses or surgeries, except a confirmed nickel allergy. We observed a swollen, painful fourth digit with rotational malalignment. Vascular and neurological assessments were normal. The X-ray showed an intra-articular, comminuted fracture of the proximal phalanx of the fourth digit of the left hand (Figure 1).

Because of a persistent rotational malalignment after the initial cast, the shared decision was made to treat this fracture with a surgical intervention. The treating physician opted for ‘buddy wiring’. In this technique a horizontal K-wire is placed between the proximal falanx of the third and fourth digit after closed reduction; analogue to the treatment of metacarpal fractures [2]. Adequate alignment of the fracture was achieved with this procedure (Figure 2). A sterile bandage was applied to the wound.

Only several days later the patient attended the outpatient clinic because of progressive swelling and pain of the third and fourth digit of the hand. Upon further inspection cutaneous necrosis was observed at the insert of the K-wires (Figure 3). These symptoms were not accompanied by a fever, nor did the patient feel ill. The rapid onset of symptoms made a primary infection unlikely. The diagnosis was an allergic reaction to the K-wires with a secondary infection. The patient received oral amoxicillin/clavulanic acid. The K-wire was removed, with subsequent splinting of the fourth digit.

Discussion

A nickel allergy is a cell-mediated allergic response, the allergic reaction occurs after several days. Infectious complications after K-wire fixation of the hand are diagnosed at an average of 18 days postoperative [3]. In this timeframe the first symptoms of a (wound) infection can arise. The onset of symptoms, only several days after the initial operation, made an allergic reaction more likely. The timeframe in which the symptoms of an infectious complication and allergic reactions can occur overlaps, this leads us to believe that there might be a relative underreporting of the cases of allergic reactions after percutaneous K-wiring.

Because a nickel allergy is relatively common (13.1%), it is important to know what the clinical implications are for the use of (percutaneous) osteosynthesis materials. The first articles on allergic reactions to osteosynthesis materials were published over five decades ago. Over the years several case reports and expert
opinions have been published [4–6]. However, to date there are no uniform guidelines. Moreover, the majority of these reports describe allergic reactions following joint replacing surgery. This is the first manuscript to explicitly create awareness of the potential sequelae of K-wiring in patients with a nickel allergy.

An expert opinion review from 2014 states that a skin test should be performed in patients with a history of hypersensitive responses to metal to ensure they are not allergic to metal [4]. It is important to emphasize the relevance of this cutaneous response. Theoretically speaking, if the osteosynthesis material was to stay out of contact with the skin, the patient would not develop an allergic response. An example is a recent report on a patient known to be allergic to chrome, cobalt and nickel, who received a total knee replacement without developing an allergic response [5]. We hypothesize that the transcutaneous position of the K-wire in our patient was an important factor in the later symptoms. Admittedly, the negative wound cultures in our patient do not exclude the possibility that there was indeed an infection. However, previous strong hypersensitive responses to nickel increase the likelihood of the K-wires being a contributing (if not causal) factor in developing these symptoms.

**Conclusion**

With an incidence of 13%, a nickel allergy is relatively common. It is important to be mindful of the fact that a frequently used metallic compound, stainless steel, contains nickel. When using percutaneous K-wiring, this can lead to an allergic response in patients with a known nickel allergy. If a patient has symptoms of swelling and erythema following osteosynthesis with percutaneous K-wires, it is important to assess whether there is a (superficial or deeper) infection or migration of the K-wire. However, simultaneously one must be aware of the possibility of a hypersensitivity response. Given the potential (local) sequelae, the author’s advice against the use of percutaneous K-wires in patients with a known nickel allergy.

**Conflict of Interest**

The authors declare that they have no conflict of interest.

**References**


**Corresponding author:** Pepijn Krielen, Department of Surgery, Radboudumc, 6500 HB Nijmegen, The Netherlands, Tel: +31-613-218-398; Fax: +31-243-540-501; E-mail: pepijn.krielen@radboudumc.nl.

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