Late Migration of Threaded Wire (Schanz Screw) from Right Distal Clavicle to the Cervical Spine

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We report a 49-year-old man who had undergone osteosynthesis to treat right distal clavicular fracture with a threaded wire (Schanz screw). The wire could not be removed due to its firm fixation within the bone. Eight years later, migration of the broken wire to the right 7th cervical vertebra punctured the lamina, with no spinal cord injury noted. The threaded wire was extracted from the C7 lamina emergently. No complication occurred after pin removal or during the 1-year postoperative follow-up. [J Chin Med Assoc 2009;72(1):48–51]

Key Words: cervical spine, clavicular fracture, complication, Kirschner wire, migration, Schanz screw

Introduction

Kirschner wires (K-wires) and pins are simple tools to manage some fractures and dislocations. A notable concern is the potential for these devices to migrate to distant anatomic sites. The migration of K-wires applied for fixation of the shoulder into the thoracic cavity is a rare but serious complication.¹⁻¹⁸ Migration of smooth K-wires into the cervical spine can occur.¹²,¹⁹⁻²¹ To minimize the chance of migration, the use of threaded wire is suggested; the threaded portion increases the holding power of the wire to the bone. However, as the present case report highlights, migration of a threaded wire (Schanz screw) can occur after metal failure of the threaded wire.

Case Report

A 49-year-old man who worked as a laborer experienced right upper chest pain that became progressively worse for 1 month prior to his visit to our emergency department for help in July 2005. Review of his medical history revealed a complex shoulder injury with displaced right distal clavicular fracture (Robinson type 3B.2) and anterior fracture–dislocation of the right shoulder with greater tuberosity fracture in September 1997. He had received open reduction and internal fixation with 2 threaded wires for his clavicle fracture at a local clinic. Three months after the operation, a broken wire was noted (Figure 1). The implants were removed at the local clinic 4 months after the 1st operation. The broken wire could not be removed as the threaded wire had firmly fixed to the clavicle. Despite this, the patient did not complain of any discomfort and no further imaging of the involved region was performed.

On physical examination, tenderness over the right upper area of the chest region was evident, which was exacerbated during deep inspiration. No weakness or paresthesia of any limbs was noted. Posteroanterior chest radiography showed that 1 wire fragment had migrated to the right C7 vertebra (Figure 2). Computed tomography of the cervical spine demonstrated a wire fragment about 39 mm in length penetrating the lamina of the right C7 without entering the spinal canal (Figure 3).

Three-dimensional reconstruction of computed tomography images was performed to more accurately assess the position of the wire in the C7 vertebra (Figure 4). Open surgical removal of the wire was performed in an emergency operation. The extracted broken Schanz screw is shown in Figure 5. At the 1-year postoperative follow-up examination, the patient had no symptoms in the right clavicle region or right upper limbs.

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The migration of K-wires has been a well-known complication since the first report in 1943.\textsuperscript{1} Distant migrations of K-wires have been reported, for example, from the finger to the heart,\textsuperscript{22} pelvis to the abdomen,\textsuperscript{23} pelvis to the heart,\textsuperscript{24} and hip to the liver.\textsuperscript{25} Most of the migration originates from the region of the shoulder girdle including the proximal humerus, clavicle, the acromioclavicular joints, and sternoclavicular joints.

When they migrate from the shoulder region, wires most commonly traverse the chest wall and invade the thorax, ending up in the pleural space,\textsuperscript{10,11} pulmonary parenchyma,\textsuperscript{1,12,13} mediastinum,\textsuperscript{8} esophagus,\textsuperscript{3} cardiac cavities,\textsuperscript{14-17} pericardial space,\textsuperscript{14} subclavian artery,\textsuperscript{5}
ascending aortic wall,\textsuperscript{18} or pulmonary artery.\textsuperscript{4–7} Such migration can produce serious complications, including lethal cardiovascular events. K-wire migration from the shoulder into the abdomen can compromise the spleen,\textsuperscript{17} abdominal aortic lumen,\textsuperscript{26} the neck,\textsuperscript{8} and spine.\textsuperscript{12,19–22}

The mechanism of postoperative implant migration remains obscure. The possible reasons include muscular activity, movement of the shoulder, negative intrathoracic pressure with respiratory excursion, regional resorption of the bone, gravitational forces, and even capillary action.\textsuperscript{27} Migration of distant osteosynthetic materials with penetration into the spinal canal is rare. A few cases of migration of a wire into the spine with or without neurologic complications have been reported since 1986.\textsuperscript{19–21} It is evident from this brief discussion that clinicians need to be alert to the possibility of wire migration, especially in the shoulder region. Several methods to prevent or promptly detect such migration have been devised. Patients undergoing wire osteosynthesis should receive regular plain radiographic follow-up every 2–4 weeks. If a temporary fixation at the level of the acromioclavicular joint region is performed using wires, the pins should be removed after bone union or ligament healing, and arm movement should be restricted to elevation up to only 90°. In addition, the external tip of the implanted wire should be bent enough to prevent its migration.\textsuperscript{19,20} Threaded pins, such as the Schanz screw, have increased holding power in bone, and have been suggested for use in fixation instead of smooth wires to prevent migration.\textsuperscript{20,28} However, threaded wires cannot completely eliminate the possibility of migration,\textsuperscript{28} as this case has illustrated, even after years of being firmly in place.

Physicians should be aware of the possibility of late migration of threaded wires and carefully instruct patients about the importance of returning for follow-up evaluations, even years later. Other internal fixation devices should be considered for internal fixation around the shoulder to prevent the complication of pin migration.

References

Migration of threaded wire to cervical spine