

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

Chun-Hao Tsai<sup>1</sup>, Horng-Chaung Hsu<sup>1</sup>, Chun-Yin Huan<sup>2</sup>, Hsien-Te Chen<sup>1</sup>, Yi-Chin Fong<sup>1\*</sup>

<sup>1</sup>Department of Orthopedics, China Medical University Hospital, Taichung, and <sup>2</sup>China Medical University Pei Kang Hospital, Pei-Kang, Yun-Lin, Taiwan, R.O.C.

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 7<sup>th</sup> 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 post-operative 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.<sup>1–18</sup> Migration of smooth K-wires into the cervical spine can occur.<sup>12,19–21</sup> 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

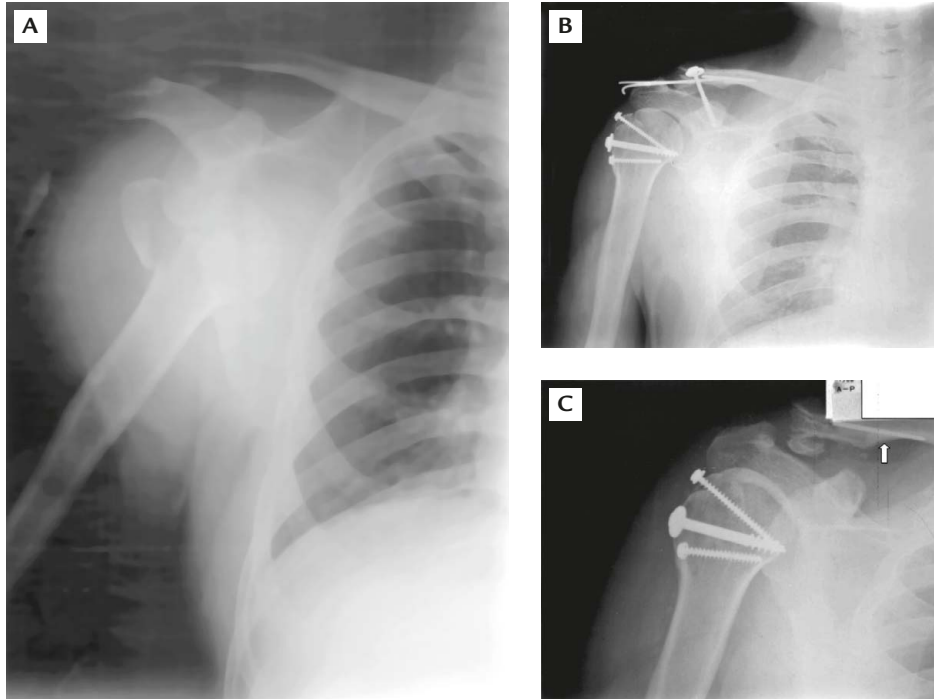
fixation with 2 threaded wires for his clavicle fracture at a local clinic. Three months after the operation, a broken wire was noted (Figure 1). The implants were removed at the local clinic 4 months after the 1<sup>st</sup> operation. The broken wire could not be removed as the threaded wire had firmly 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.



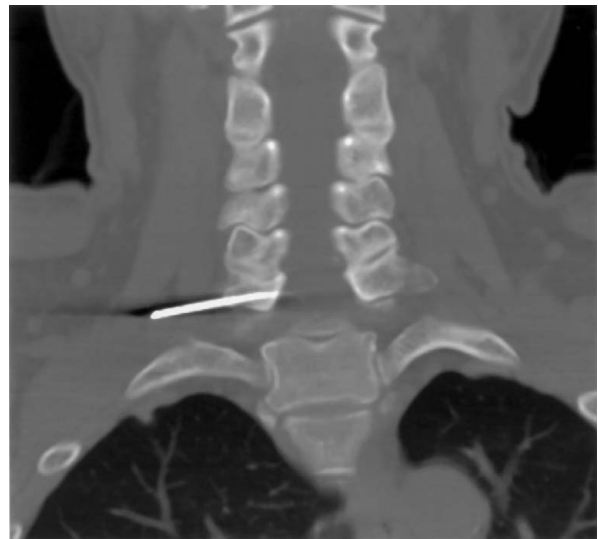
\*Correspondence to: Dr Yi-Chin Fong, Department of Orthopedics, China Medical University Hospital, 2, Yude Road, Taichung 404, Taiwan, R.O.C.  
E-mail: ritsai@giga.net.tw • Received: June 7, 2007 • Accepted: August 15, 2008



**Figure 1.** (A) Preoperative radiograph of the right shoulder shows displaced right distal clavicular fracture with fracture–dislocation of the right shoulder. (B) X-ray obtained 3 months after osteosynthesis reveals a broken wire at the distal clavicle area. (C) The internal fixators were removed except for the broken wire.



**Figure 2.** Chest X-ray shows the migrated wire at the C7 vertebra.



**Figure 3.** Computed tomography of the cervical spine shows that the wire has penetrated the right vertebral body without entering the epidural space.

## Discussion

The migration of K-wires has been a well-known complication since the first report in 1943.<sup>1</sup> Distant migrations of K-wires have been reported, for example, from the finger to the heart,<sup>22</sup> pelvis to the abdomen,<sup>23</sup> pelvis to the heart,<sup>24</sup> and hip to the liver.<sup>25</sup> 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,<sup>10,11</sup> pulmonary parenchyma,<sup>1,12,13</sup> mediastinum,<sup>8</sup> esophagus,<sup>3</sup> cardiac cavities,<sup>14–17</sup> pericardial space,<sup>14</sup> subclavian artery,<sup>3</sup>

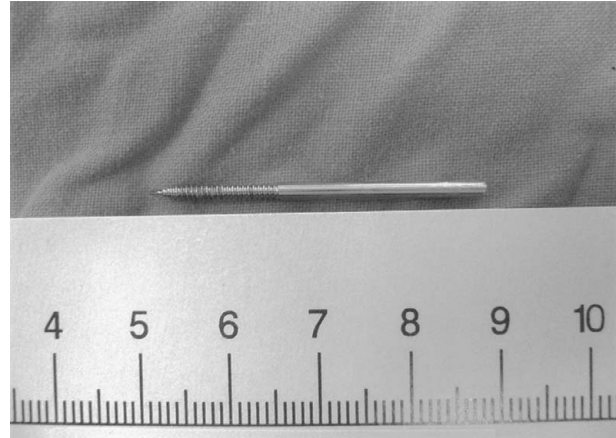


**Figure 4.** Three-dimensional reconstructed computed tomography scans of the cervical spine show the migrated wire over the right side of C7.

ascending aortic wall,<sup>18</sup> or pulmonary artery.<sup>4-7</sup> Such migration can produce serious complications, including lethal cardiovascular events. K-wire migration from the shoulder into the abdomen can compromise the spleen,<sup>17</sup> abdominal aortic lumen,<sup>26</sup> the neck,<sup>8</sup> and spine.<sup>12,19-22</sup>

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.<sup>27</sup> 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.<sup>19-21</sup> 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.<sup>19,20</sup> Threaded pins, such as the Schanz screw, have increased holding power in bone, and have been suggested for



**Figure 5.** The migrated wire was removed. It was threaded and about 39 mm in length.

use in fixation instead of smooth wires to prevent migration.<sup>20,28</sup> However, threaded wires cannot completely eliminate the possibility of migration,<sup>28</sup> 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

1. Mazet RJ. Migration of a Kirschner-wire from the shoulder region into the lung: report of two cases. *J Bone Joint Surg Am* 1943;25:477–83.
2. Medved I, Simic O, Bralic M, Stemberga V, Kovacevic M, Matana A, Bosnar A. Chronic heart perforation with 13.5 cm long Kirschner wire without pericardial tamponade: an unusual sequelae after shoulder fracture. *Ann Thorac Surg* 2006;81:1895–7.
3. Wada S, Noguchi T, Hashimoto T, Uchida Y, Kawahara K. Successful treatment of a patient with penetrating injury of the esophagus and brachiocephalic artery due to migration of Kirschner wires. *Ann Thorac Cardiovasc Surg* 2005;11:313–5.
4. Leonard JW, Gifford RW Jr. Migration of a Kirschner wire from the clavicle into the pulmonary artery. *Am J Cardiol* 1965;16:598–600.
5. Liu HP, Chang CH, Lin PJ, Chu JJ, Hsieh HC, Chang JP, Hsieh MC. Pulmonary artery perforation after Kirschner wire migration: case report and review of the literature. *J Trauma* 1993;34:154–6.
6. Combalia-Aleu A, Garcia S. Pulmonary artery perforation after Kirschner wire migration: case report and review of literature. *J Trauma* 1994;37:514–5.
7. Chou NS, Wu MH, Chan CS, Lai WW, Lin MY. Intrathoracic migration of Kirschner wires. *J Formos Med Assoc* 1994;93:974–6.

8. Leppilahti J, Jalovaara P. Migration of Kirschner wires following fixation of the clavicle: a report of 2 cases. *Acta Orthop Scand* 1999;70:517-9.
9. Hopkinson-Woolley JA, Constant CR. Fixation of fractures of the clavicle with Kirschner wires. *J Bone Joint Surg Br* 1998;80:746.
10. Aalders GJ, van Vroonhoven TJ, van der Werken C, Wijffels CC. An exceptional case of pneumothorax: a new adventure of the K wire. *Injury* 1985;16:564-5.
11. Ullmer E, Bolliger CT, Soler M. Pneumothorax or the end of a wire's journey. *Respiration* 1998;65:151.
12. Bedi GS, Gill SS, Singh M, Lone GN. Intrathoracic migration of a Kirschner wire: case report. *J Trauma* 1997;43:865-6.
13. Foster GT, Chetty KG, Mahutte K, Kim JB, Sasse SA. Hemoptysis due to migration of a fractured Kirschner wire. *Chest* 2001;119:1285-6.
14. Goodsett JR, Pahl AC, Glaspy JN, Schapira MM. Kirschner wire embolization to the heart: an unusual cause of pericardial tamponade. *Chest* 1999;115:291-3.
15. Anic D, Brida V, Jelic I, Orlic D. The cardiac migration of a Kirschner wire: a case report. *Tex Heart Inst J* 1997;24:359-61.
16. Daus GP, Drez D Jr, Newton BB Jr, Kober R. Migration of a Kirschner wire from the sternum to the right ventricle: a case report. *Am J Sports Med* 1993;21:321-2.
17. Potter FA, Fiorini AJ, Knox J, Rajesh PB. The migration of a Kirschner wire from shoulder to spleen: brief report. *J Bone Joint Surg Br* 1988;70:326-7.
18. Demaria R, Picard E, Bodino M, Aymard T, Albat B, Frapier JM, Chaptal PA. Migration of a clavicular bone wire acutely perforating the ascending aorta. *Presse Med* 1998;27:1013.
19. Mellado JM, Calmet J, Garcia Forcada IL, Sauri A, Gine J. Early intrathoracic migration of Kirschner wires used for percutaneous osteosynthesis of a two-part humeral neck fracture: a case report. *Emerg Radiol* 2004;11:49-52.
20. Loncan LI, Sempere DF, Ajuria JE. Brown-Sequard syndrome caused by a Kirschner wire as a complication of clavicular osteosynthesis. *Spinal Cord* 1998;36:797-9.
21. Priban V, Toufar P. A spinal cord injury caused by a migrating Kirschner wire following osteosynthesis of the clavicle: a case review. *Rozhl Chir* 2005;84:373-5.
22. Haapaniemi TA, Hermansson US. Cardiac arrhythmia caused by a Kirschner wire inside the heart: an unusual complication of finger osteosynthesis. *J Hand Surg Br* 1997;22:402-4.
23. Fong YC, Lin WC, Hsu HC. Intrapelvic migration of a Kirschner wire. *J Chin Med Assoc* 2005;68:96-8.
24. McCardel BR, Dahners LE, Renner JB. Kirschner wire migration from the pelvis to the heart and a new method of fixation of articular fracture fragments, acetabular reconstruction. *J Orthop Trauma* 1989;3:257-9.
25. Marya KM, Yadav V, Rattan KN, Kundu ZS, Sangwan SS. Unusual K-wire migration. *Indian J Pediatr* 2006;73:1107-8.
26. Naidoo P. Migration of a Kirschner wire from the clavicle into the abdominal aorta. *Arch Emerg Med* 1991;8:292-5.
27. Lyons FA, Rockwood CA Jr. Migration of pins used in operations on the shoulder. *J Bone Joint Surg Am* 1990;72:1262-7.
28. Kocalkowski A, Wallace WA. Closed percutaneous K-wire stabilization for displaced fractures of the surgical neck of the humerus. *Injury* 1990;21:209-12.