



Available online at
SciVerse ScienceDirect
www.sciencedirect.com

Elsevier Masson France
EM|consulte
www.em-consulte.com/en



CASE REPORTS

Endopelvic migration of a sternoclavicular K-wire. Case report and review of literature

R. Ballas*, F. Bonnel¹

Beau-Soleil Private Hospital, Orthopedics Department, 119, avenue de Lodève, 34070 Montpellier, France

Accepted: 8 September 2011

KEYWORDS

Bone wires;
Foreign-body migration;
Postoperative complication;
Shoulder;
Pelvis

Summary We report a unique case, never before published, of sternoclavicular joint fixation K-wire migration to the pelvic region, in a 56 year-old man. Two years previously, sternoclavicular dislocation had been fixed by three wires. A transitory episode of precordial thoracic pain followed by iterative abdominal pain accompanied the migration. Extraction was performed five years later. Scapular K-wire migration is frequent. The proximity of cardiovascular structures may have fatal consequences. This type of internal fixation raises questions, and migration prevention needs to be taken into account. Medical complications and the legal context are major factors leading us to abandon this type of osteosynthesis. Once migration has been diagnosed, the wire should be removed without delay.

© 2011 Elsevier Masson SAS. All rights reserved.

Introduction

K-wire migration from the scapular girdle is frequent. Lyons and Rockwood [1], in 1990, found 49 migrations in 47 patients in 37 reports. Our own exhaustive literature search found no comparable cases of K-wire migration from the sternoclavicular joint to the pelvic cavity.

Clinical case

A 56 year-old man suffered posterior dislocation of the left sternoclavicular joint. He was operated on in emergency

by open reduction and fixation using three K-wires. Early postoperative course was favourable. After rehabilitation, he was able to go back to his work as a heavy plant driver. A wire that was jutting out under the skin had to be removed early on. Two years after the osteosynthesis, the patient complained of chest pain. Myocardial infarction (MI) was suspected, but clinical assessment and complementary specialized cardiological examinations failed to confirm this diagnosis. AP chest X-ray found a K-wire projecting vertically in front of the sternum (Fig. 1). The link was not made between this migrated wire and the precordial pain, which spontaneously improved; diagnostic investigation was therefore stopped. This second wire was removed, and the patient resumed his activities. Four years after the original osteosynthesis, radiographic assessment for abdominal pain found a K-wire projecting in the pelvic cavity on AP view (Fig. 2). Laparoscopic removal failed. As there was no aggravation of symptoms, laparotomy was not undertaken. Five years after the osteosynthesis, recurrence of

* Corresponding author. Tel.: +33 6 88 28 07 59.

E-mail addresses: richardballas@yahoo.fr (R. Ballas), profbonnel@free.fr (F. Bonnel).

¹ Tel.: +33 6 19 61 17 15.



Figure 1 Chest X-ray, after admission to cardiology for suspected but non-confirmed myocardial infarction, showing a retrosternal K-wire.

abdominal pain led to a renewed attempt to extract the wire, located on CT between the internal iliac vessels and right colon (Fig. 3). Attempted laparoscopic extraction having again failed, a venous haemorrhage led to conversion to sub-umbilical laparotomy. The wire was located under per-operative fluoroscopy and extracted. At last follow-up, the patient was under occupational disability following total hip replacement.

Discussion

We were able to retrieve 78 articles with 88 separate cases of K-wire migration, following clavicular fracture (27 cases), sternoclavicular joint dislocation (18 cases), acromioclavicular joint dislocation (12 cases), fracture of the proximal extremity of the humerus (nine cases) or surgery for shoulder

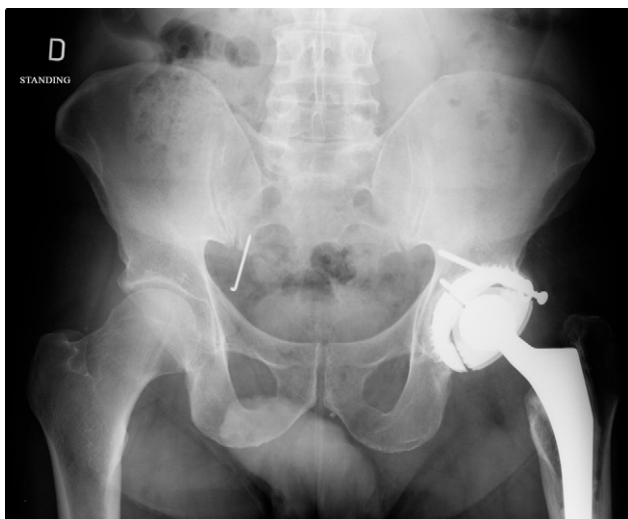


Figure 2 Pelvic X-ray during follow-up of total hip replacement. A K-wire, which had initially been curved, was found in the right pelvic cavity. A. AP pelvic view. B. Strict lateral view. C. Three quarter axillary view.



Figure 3 Horizontal CT slice: right pelvic K-wire location on the anterior side of the piriform muscle.

instability (five cases). Descriptions were in some cases incomplete. Migration was most often pleuropulmonary (17 cases) [2–16], cervical or thoracic tracheobronchial (four cases) [17–20], vascular (ascending aorta (eight cases) [21–26], pulmonary artery (five cases) [21,27–31], or sub-clavian artery (two cases) [32,33]), to the heart cavities (12 cases) [10,22,27,28,34–41], or esophageal (one case) [16]. There was migration towards the spinal nerves and lower cervical or upper thoracic intervertebral foramens (from C5-C6 to T8-T9) (12 cases) [15,42–51] and to the cervical region (three cases) [20,52,53]. Exceptionally, K-wire migration was found in the abdominal cavity: spleen (one case) [54,55] or intrahepatic (two cases) [52,56]. Origins were right-side in 19 cases and left-side in 20.

The present case features six years' radiological tracking of the K-wire's gradual migration from thorax to pelvic cavity. The episode of chest pain led to admission in cardiology for non-confirmed suspicion of myocardial infarction. A control pulmonary X-ray showing sternal projection of the wire failed to attract attention at the time. The migration route was probably via the anterior mediastinum in a retrosternal position simulating MI without vascular or cardiac perforation, passing posteriorly to the xiphoid process and then into the abdominal cavity without visceral lesion. Intra-abdominal migration followed the gravitational axis in the peritoneal cavity forward of the stomach and then of colon. The wire came to fix in the right retroperitoneal space on the anterior side of the piriform muscle. The outcome in this case was fortunate.

The evolution of this kind of migration, however, can sometimes be tragic [10,18,23,42,43,54,57,58], leading us to reconsider indications and osteosynthesis material in functional lesions of the scapular belt. A case was reported of cardiac tamponade on postoperative day 6 [27]. Rajesh [55] reported K-wire migration on day 5 in the right atrium and 12 hours later in the abdominal cavity in contact with the spleen. Another case of migration was reported at a 20-year interval [34] with a cerclage performed to stabilize the sternoclavicular joint and removed from the right ventricular wall by thoracotomy. In unstable osteosynthesis, the large ranges of motion in the shoulder induce K-wire migration, exacerbated by respiratory motion, intrathoracic depression and gravity. The proximity of vessels in contact with the sternoclavicular joint leads to anterograde or

retrograde intravascular migration to the cardiac cavities during the first weeks. Longer term migration seems to be due to muscle movement, inducing migration along the arteriovenous circuit in contact with the muscles and under the effect of gravity, accounting for migration from the muscle compartment into other anatomic regions. Lyons and Rockwood [1] reported eight deaths, out of 47 patients, due to migration from the sternoclavicular joint: six cardiovascular complications with tamponade and two cases in the early course following wire removal; one of the latter involved irreversible ventricular fibrillation following repair of a pseudoaneurysm of the ascending aorta, and the other irreversible cardiovascular collapse. Our literature search found two deaths from K-wire migration with associated cardiovascular lesions, 1 following humeral fracture osteosynthesis [24] and the other following stabilization of chronic shoulder instability [35,38]. K-wires should be extracted as soon as signs of migration appear, to avoid sudden and sometimes fatal acute complications [1,48]. Endoscopic extraction may be recommended if the migration area is accessible and risk-free; otherwise, open surgery should be performed [13,14]. This attitude was formulated for pleuropulmonary migration and applies also in the present case, where laparoscopic extraction failed twice due to the deep location of the wire, finally requiring conversion to sub-umbilical laparotomy for pelvic vein hemostasis.

The risk of migration increases in both frequency and severity after sternoclavicular stabilization, so that certain authors [1] consider K-wire osteosynthesis as contraindicated. Patients managed by scapular belt K-wire should be informed of this risk and followed up regularly before removal. The use and number of K-wires should be specified in the surgical report. These authors [1,48] recommend curving the wire at its extremity and planning for removal as soon as the treatment period is over [1]. Curving the wire tip does not guarantee long-term stability, as the present case shows, nor does using a threaded pin. The legal aspect of the issue is worth mentioning. Should a patient who had not been informed of the question or given an appointment for material ablation after consolidation develop this complication, he or she can demand compensation. The risk should be clearly stated in postoperative, discharge and consolidation reports.

Conclusion

K-wires are still a common means of fixation in orthopedic reduction stabilization. They can be mandatory when fragments are small and unamenable to other methods. The significant risk of migration has to be taken into account, as do the means of minimizing it in the scapular belt and in the sternoclavicular joint in particular. The risk of severe complications has led certain teams to abandon K-wire osteosynthesis as a treatment option in such cases.

Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.

References

- [1] Lyons FA, Rockwood CA. Migration of pins used in operations on the shoulder. *J Bone Joint Surg Am* 1990;72:1262–7.
- [2] Abbas A, Richmond N, McCormack DJ, Thava B, Reddy S, Davies CWH, et al. A 27-year-old man presenting with acute chest pain and dyspnea. *Chest* 2009;135:1684–7.
- [3] Bezer M, Aydin N, Erol B, Laçın T, Güven O. Unusual migration of K-wire following fixation of clavicle fracture: a case report. *Ulus Travma Acil Cerrahi Derg* 2009;15:298–300.
- [4] Calkins CM, Moore EE, Johnson JL, Smith WR. Removal of an intrathoracic migrated fixation pin by thoracoscopy. *Ann Thorac Surg* 2001;71:368–70.
- [5] Chou NS, Wu MH, Chan CS, Lai WW, Lin MY. Intrathoracic migration of Kirschner wires. *J Formos Med Assoc* 1994;93:974–6.
- [6] Durpekt R, Vojáček J, Lischke R, Burkert J, Spatenka J. Kirschner wire migration from the right sternoclavicular joint to the heart: a case report. *Heart Surg Forum* 2006;9:E840–2.
- [7] Ferrández L, Usabiaga J, Ramos L, Yubero J, No L. Migration of Kirschner wires into the mediastinum after stabilization of sterno-clavicular lesions. A report of two cases. *Chir Organi Mov* 1991;76:301–4.
- [8] González Rivas D, De La Torre Bravos M, Borro Maté JM. Iatrogenic pneumothorax caused by migration of a Kirschner needle. *Arch Bronconeumol* 2002;38:341–2.
- [9] Hegemann S, Kleining R, Schindler HG, Holthusen H. Kirschner wire migration in the contralateral lung after osteosynthesis of a clavicular fracture. *Unfallchirurg* 2005;108:991–3.
- [10] Hüttel T, Kassai I, Hartvánszky I, Daróczy L, Friedrich O, Szépehlyi K, et al. Successful cardiac surgical removal of migrated Kirschner wires used for fixation of the surgical neck of the humerus. *Magy Seb* 2007;60:267–9.
- [11] Khan AA, Khan SU, Hossain Z. Intrathoracic migration of a humeral orthopedic pin. *J Cardiovasc Surg [Torino]* 2003;44:275–7.
- [12] Kim JH, Kwon JH, Hwang ED, Yu JH. Intrathoracic migration of Steinmann pins. *J Thorac Imaging* 2000;15:301–3.
- [13] Marchi E, Reis MP, Carvalho MV. Transmediastinal migration of Kirschner wire. *Interact Cardiovasc Thorac Surg* 2008;7:869–70.
- [14] Sergides NN, Nikolopoulos DD, Yfadopoulos DK, Novi EA, Kanata MP. Intrathoracic migration of a Steinman wire: a case report. Review of the literature. *Cases J* 2009;2:8321.
- [15] Veres L, Kiss R, Boros M, Enyedi A, Takács I, Kollár S, et al. Intrathoracic migration of Kirschner wires. *Magy Seb* 2009;62:353–6.
- [16] 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.
- [17] Nakayama M, Gika M, Fukuda H, Yamahata T, Aoki K, Shiba S, et al. Migration of a Kirschner wire from the clavicle into the intrathoracic trachea. *Ann Thorac Surg* 2009;88:653–4.
- [18] Glauser F, Kremens V. Unusual sequela following pinning of medial clavicular fracture. *Am J Roentgenol Radium Ther Nucl Med* 1956;76:1066–9.
- [19] Wu YH, Lai CH, Luo CY, Tseng YL. Tracheoinnominate artery fistula caused by migration of a Kirschner wire. *Eur J Cardiothorac Surg* 2009;36:214–6.
- [20] Foster GT, Chetty KG, Mahutte K, Kim JB, Sasse SA. Hemoptysis due to migration of a fractured Kirschner wire. *Chest* 2001;119:1285–6.
- [21] Gerlach D, Wemhöner SR, Ogbuihi S. 2 cases of pericardial tamponade caused by migration of fracture wires from the sternoclavicular joint. *Z Rechtsmed* 1984;93:53–60.
- [22] Fueter-Töndury M. Migration of the wire after osteosynthesis. *Schweiz Med Wochenschr* 1976;106:1890–6.

- [23] Nordback I, Markkula H. Migration of Kirschner pin from clavicle into ascending aorta. *Acta Chir Scand* 1985;151:177–9.
- [24] Freund E, Nachman R, Gips H, Hiss J. Migration of a Kirschner wire used in the fixation of a subcapital humeral fracture, causing cardiac tamponade: case report and review of literature. *Am J Forensic Med Pathol* 2007;28:155–6.
- [25] Demaria R, Picard E, Bodino M, Aymard T, Albat B, Frapier JM, et al. Migration of a clavicular bone wire acutely perforating the ascending aorta. *Press Med* 1998;27:1013.
- [26] Subbotin VM, Sukhanov SG. Migration of a foreign body into the aorta following osteosynthesis of the clavicle. *Grud Serdechnosudistaia Khir* 1991;2:56.
- [27] Baquero L, Fragata J. Cardiac tamponade due to intrathoracic migration of a Kirschner wire. *Rev Port Cir Cardiorac Vasc* 2009;16:199–202.
- [28] Janssens de Varebeke B, Van Osselaer G. Migration of Kirschner's pin from the right sternoclavicular joint resulting in perforation of the pulmonary artery main trunk. *Acta Chir Belg* 1993;93:287–91.
- [29] Liu HP, Chang CH, Lin PJ, Chu JJ, Hsieh HC, Chang JP, et al. Pulmonary artery perforation after Kirschner wire migration: case report and review of the literature. *J Trauma* 1993;34:154–6.
- [30] Liu HP, Chang CH, Lin PJ, Chu JJ, Hsieh HC, Chang JP, et al. Migration of Kirschner wire from the right sternoclavicular joint into the main pulmonary artery. A case report. *Changcheng Yi Xue Za Zhi* 1992;15:49–53.
- [31] Tubbax H, Hendzel P, Sergeant P. Cardiac perforation after Kirschner wire migration. *Acta Chir Belg* 1989;89:309–11.
- [32] Sethi GK, Scott SM. Subclavian artery laceration due to migration of a Hagie pin. *Surgery* 1976;80:644–6.
- [33] Gauthoff H, Klammer HL. Complications due to migration of a Kirschner wire from the clavicle [author's transl]. *Rofo* 1978;128:591–4.
- [34] Wirth MA, Lakoski SG, Rockwood CA. Migration of broken cerclage wire from the shoulder girdle into the heart: a case report. *J Shoulder Elbow Surg* 2000;9:543–4.
- [35] Stemberga V, Bosnar A, Bralic M, Medved I, Simic O, Pocekaj L. Heart embolization with the Kirschner wire without cardiac tamponade. *Forensic Sci Int* 2006;163:138–40.
- [36] Serdiuk AA. Injury of the pericardium following metallic osteosynthesis of a fracture of the clavicle. *Vestn Khir Im I I Grek* 1974;112:110–1.
- [37] Nishizaki K, Seki T. Intracardiac migration of a Kirschner wire from the right clavicle. *Asian Cardiovasc Thorac Ann* 2007;15:272–3.
- [38] Medved I, Simic O, Bralic M, Stemberga V, Kovacevic M, Matana A, et al. 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.
- [39] Lenard L, Aradi D, Donauer E. Migrating Kirschner wire in the heart mimics acute coronary syndrome. *Heart F Eur J* 2009;30:754.
- [40] Gulcan O, Sezgin AT, Bolat B, Turkoz R. Right ventricular penetration and cardiac tamponade as a late complication of Kirschner wire placement in the sternoclavicular joint. *Interact Cardiovasc Thorac Surg* 2005;4:295–6.
- [41] Fowler AW. Migration of a wire from the sternoclavicular joint to the pericardial cavity. *Injury* 1981;13:261–2.
- [42] Was MT, Kurowski K, Francuz I. Migration of Kirschner wire into the spinal canal as complication of inveterate shoulder luxation treatment - case study. *Ortop Traumatol Rehabil* 2010;12:370–5.
- [43] Mellado JM, Calmet J, García Forcada IL, Saurí A, Giné 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.
- [44] Bennis S, Scarone P, Lepeintre J-F, Puyo P, Aldea S, Gaillard S. Asymptomatic spinal canal migration of clavicular K-wire at the cervicothoracic junction. *Orthopedics* 2008;31.
- [45] Conzen M, Sollmann H. Displacement of materials in the cervical spinal canal following clavicular fixation as a late complication. *Unfallchirurg* 1986;89:47–8.
- [46] Fransén P, Bourgeois S, Rommens J. Kirschner wire migration causing spinal cord injury one year after internal fixation of a clavicle fracture. *Acta Orthop Belg* 2007;73:390–2.
- [47] Loncán 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.
- [48] Mamane W, Breitel D, Lenoir T, Guigui P. Spinal migration of a Kirschner wire after surgery for clavicular nonunion. A case report and review of the literature. *Chir Main* 2009;28:367–9.
- [49] Regel JP, Pospiech J, Aalders TA, Ruchholtz S. Intraspinous migration of a Kirschner wire 3 months after clavicular fracture fixation. *Neurosurg Rev* 2002;25:110–2.
- [50] Tsai C-H, Hsu H-C, Huan C-Y, Chen H-T, Fong Y-C. Late migration of threaded wire [schanz screw] from right distal clavicle to the cervical spine. *J Chin Med Assoc* 2009;72:48–51.
- [51] Pribán 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.
- [52] Starke W, Schilling H. Migration of Kirschner's wire after osteosyntheses [author's transl]. *Aktuelle Traumatol* 1981;11:126–9.
- [53] Yadav V, Marya KM. Unusual migration of a wire from shoulder to neck. *Indian J Med Sci* 2003;57:111–2.
- [54] 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.
- [55] Rajesh PB, Nair KK. Unusual migration of a Kirschner wire. *Eur J Cardiothorac Surg* 1991;5:164.
- [56] Vashchenko AE, Tutchenko NI, Moldovan PP. Migration of a metal bone pin from the left clavicle into the liver. *Klin Khir* 1983;9:63.
- [57] Kumar P, Godbole R, Rees GM, Sarkar P. Intrathoracic migration of a Kirschner wire. *J R Soc Med* 2002;95:198–9.
- [58] Venissac N, Alifano M, Dahan M, Mouroux J. Intrathoracic migration of Kirschner pins. *Ann Thorac Surg* 2000;69:1953–5.