



## Case Report

# Spinal kirschner wire migration after surgical treatment of clavicular fracture or acromioclavicular joint dislocation: Report of a case and meta-analysis

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## ABSTRACT

Kirschner wire is the most used device for clavicular and acromioclavicular joint dislocation fixation. Although wire migrations have been extensively reported, spinal migrations remain rare. Moreover, the mechanism of migration is still elusive. The aim of the present paper is to describe a single case of cervical spine migration of a K-wire followed by meta-analysis. Twelve cases of spinal K-wire have been reported in the last 20 years, with less than 2 cases per year. Clavicular fixation was the main initial procedure with 66.67% of cases. The average time between surgery and migration was 25.5 months. C7-T1 and T2-T3 were the prominent level of migration with each 33.33% of cases, where the migration was transversal in 72.73% of cases. The neural foramen was the most penetrating site of the K-wire in the spine (75% of cases). In all cases the wire was removed via direct access surgery by gentle pulling out along its axis under view control. The greater range of motion in the shoulder seems to be the main mechanism of all kinds of migrations.

## 1. Introduction

Kirschner wire (K-wire) and Steinmann pin are metal rods commonly used by orthopedic surgeons in internal fixation of bones fractures [1]. K-wire fixation is the most used treatment for clavicular fracture and acromioclavicular joint repair [2]. Despite good outcome, several complications are associated with the use of K-wire such as wire loosening, wire ruptures, nerve damages, osteomyelitis, and pin tract infection [3].

Among those complications, the migration is one the most frequent complication [1,3]. Several authors reported serious complications due to K-wire migrations. Thus, Matsumoto et al. [4] reported a K-wire passing across the sigmoid colon; Tan et al. [5] a case of death due to intra-aortic migration of K-wire from the clavicle, Ono et al. [6], a migration of K-wire from the femur in the right ventricle and at last Cortes-Julian et al. [7] in the right pulmonary hilum. Strikingly, spinal migration of K-wire is rare despite its proximity with the clavicular bone and the acromioclavicular joint [8]. The mechanism of spinal migration is not well explained.

The goal of this study is to describe a single case of spinal migration of K-wire after acromioclavicular disjunction surgery and conduct a meta-analysis of the documented cases of spinal migration of K-wire.

Additionally, we discussed the suggested mechanisms underlying the spinal migration and summarized the management of this rare complication.

## 2. Patients and method:

This paper is about a documented case of cervical spine K-wire migration after acromioclavicular joint dislocation surgery. The case presentation is followed by a meta-analysis. For this purpose, a review of literature was performed using Pubmed, Scholar google, Embase, Cochrane library, sciences direct. This review of literature encompassed articles from the last 20 years.

Keywords used was: Kirschner wire; Kirschner wire migration; spinal migration of Kirschner wire; clavicular fracture, acromioclavicular joint dislocation

The retained cases were those of patients who had spinal migration of K-wire after clavicular fracture or acromioclavicular joint dislocation surgery. One case of Steinmann pin migration was also retained because it raised the same problem. We excluded 3 articles. A cases of paraspinal muscle migration reported by Batin et al. [3] was excluded. We also excluded a case reported by Kedra et al. [9] because it was a short case report and lot of data missed. Lastly Priban et al. [10] reported in

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**Table 1**  
The review of literature.

Number	Reference	Sex/age	Delay	Level/localisation	Initial operation	B-wire	E migration	Pseudarthrosis	Direction	Treatment
1	Carcarvilla et al. (1998)	22/M	2	T2-T3/NF	Fracture of clavicle	No	Yes	No	transversal	Direct access and pulling along the horizontal plane No exposure of dura
2	Regel et al. (2001)	50/M	3	C5-C6/NF	Fracture of clavicle	No	Yes	Yes	Ascendant	Direct access and gentle pulling No exposure of dura
3	Fransen et al. (2007)	30/M	12	T1-T2/NF	Fracture of clavicle	Yes	Yes	No	Transversal	T1,T2 laminectomy for direct Access, gentle traction on wire Dura exposure
4	Tsai et al. (2008)	49/M	96	C7/lamina	complex shoulder Injury	No	No (broken wire)	No	Transversal	open surgical removal (direct access)
5	Bennis et al. (2008)	57/M	4	C7-T1/NF	Fracture of clavicle	No	yes	No	Transversal	Direct access and gentle And gentle pulling wire Out along its axis, no No exposure of dura
6	Mamane et al. (2009)	34/M	2	T2-T3/NF	Fracture of clavicle	No	Yes	Yes	Transversal	Sus clavicular direct access Axial traction for removal No exposure of dura
7	Was et al. (2010)	66/M	1	T8-T9/NF	Humeroscapular fixation	No	Yes	No	Transversal	Direct access via thoracotomy Pullig out along its axis No exposure of dura
8	Mian et al. (2011)	41/M	24	C7-T1/NF(C8)	Fracture of clavicle	No	No (broken pin)	No	–	C7 hemilaminectomy for Direct access, Identification of pin both laterally and medially remove from medial to lateral dura exposure
9	Li et al. (2013)	35/M	2	T2-T3/NF	Dislocation of left clavicle Acromioclavicular joint	No	Yes	No	transversal	Direct access via thoracoscopy no dura exposure
10	Minic et al. (2016)	35/M	4	T2/NF	Fracture of clavicle	Yes	Yes	No	descendant	direct access and gentle Traction along its axis No dura exposure
11	Mankowski et al. (2016)	34/M	84	C6/TF	Fracture of clavicle	Yes	No (Broken wire)	Yes	ascendant	Direct access, no Dura exposure
12	N'da et al. 2017)	34/M	72	C7/body	acromioclavicular joint Disjunction	Yes	Yes	Yes	transversal	direct access via cervical anterolateral route. Removal by traction along wire axis

B = Bent; NF = Neural Foramen, E = Entire; TF = Transversary foramen.

2016 a typical case of spinal migration of K-wire. This case only reported in Czech was not included due to difficulties of translation. The review of literature is shown by the [Table 1](#)

### 3. Results

#### 3.1. Case report

A 34 years old man was admitted in the orthopedic department of our institution for a car traffic accident. He dropped off a motorcycle on his right shoulder. X-ray showed a right acromioclavicular disjunction. A purely orthopedic treatment was tried in first intention by the reduction and immobilization of disjunction. Three months later, a persistent right shoulder pain due to non-fusion of the disjunction was diagnosed. Subsequently, the acromioclavicular joint was fixed by surgery using 2 transacromial K-wires associated with a ligamentoplasty followed by 6 weeks immobilization (Dujarier cast) of the shoulder. The K-wires were not removed because of the lost sight of the patient.

Six years later, the patient came back to the hospital complaining of lower cervical spine pain worsened by the right shoulder movement. Physical examination of the shoulder was insignificant and neurological status was normal. Cervical spine X-ray revealed a migration of entire K-wire into cervical spine ([Fig. 1](#)). Computed tomography angiography was performed to see the position of K-wire with regard to the major vessels ([Fig. 2](#)). The wire on the CT scan measured 8 cm.

The wire was removed by a classic anterolateral surgery of the cervical spine. The wire was found in front of C7 ([Fig. 3](#)) body with a transversal direction. The device was removed by a gentle traction along its axis after complete dissection of the soft tissues ([Fig. 4](#)) The post-surgical evaluation was uneventful and the patient was discharged from hospitalization 3 days later.

#### 3.2. Analyze of literature

Since the past 20 years, only 12 cases of spinal migration of K-wire have been reported. The frequency of the published cases in the world is of less than a case a year. There were 12 men and no woman. The mean age at the moment of K-wire migration was 40.58 years. The initial operation for K-wire using was clavicular fixation in 66.67% of cases, humero-clavicular fixation in 8.33% of cases and acromioclavicular fixation in 25% of cases. The average time between surgery and migration was 25.5 months (ranged from 22 days to 96 months). They were multiple level of migration. C7-T1 and T2-T3 level was the most frequent level of migration with each 33.33% of cases followed by the C5-C6 level (16.66%). The T1-T2 and the T8-T9 level was less touched with each 8.33%. High cervical spine and lumbar spine were free from migration. The neural foramen was the most penetrating site of the K-wire in the spine, 75% of cases. The other sites were the lamina, the transversary foramen and the anterior body part with one case each. According to the projection of the wire compared to spine, we defined 3 routes of migration. A transversal route when the wire projection is

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