

Broken Kirschner Wires Can Migrate: A Case Report and Review of Literature

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Learning Point of the Article:

Wires do break due to metal fatigue and technical difficulty. Broken wires do migrate and should be removed to avoid serious complications. Unbroken wires should also be removed once their purpose is achieved.

Abstract

Introduction: Kirschner wires are in use in orthopedic and trauma surgery since the past 80 years. These wires can break due to metal fatigue and migrate which can cause lethal complications.

Case Report: A 27-year-old female sickle cell patient with avascular necrosis of the head of femur, drilling, and injection of the osteoblasts in the head of femur was being performed. A 2 cm of 2.0 mm proximal tip of the guide wire broke. Discussion started whether to leave the wire and the young decided to leave the broken wire, but the wisdom directed us to remove it.

Conclusion: Migration of wires does occur, we believe not only broken wires should be removed but also even the unbroken wire to be removed once the purpose of use is achieved.

Keywords: K-Wires, Migration, Complications, Death

Introduction

Kirschner wires (K-wires) which were developed and popularized its use since 1932 are widely used in orthopedic and trauma surgeries [1], even though 18% end up in complications related to the K-wires which include infection, loss of fixation, loosening breakage, and migration [2, 3]. Migration of the K-wires away from the site of the insertion to lungs, spinal cord, heart, and abdominal organs has been reported. The question arises if during the insertion if the wire breaks what should be done? We report a case where the proximal wire broke in the neck of femur and decision was taken to remove, which was done successfully. Later, a review of literature revealed devastating results of migration of the broken K-wires (Table 1).

Case Report

A 27-year-old female patients with Grade II avascular necrosis

of the head of femur secondary to sickle cell disease were taken to operating room for drilling and injection of autologous bone marrow derived osteoblasts and are recommended to use a smaller diameter K-wire for instillation of the cells. During the procedure, two guidewires were passed to centralize the area of injection. A 3.2 mm cannulated drill was used to drill on top of the guidewires. During drilling, 2 cm of the proximal guide wire broke (Fig. 1) and we believe that this happened due to metal fatigue as the wire was used before couple of time. A discussion arose whether to leave the broken wire in situ. The risk of migration was always on the cards, hence, the guidewire was pushed back to the edge of the broken part. A 4.0 mm cannulated drill was used to drill over the broken wire (Fig. 2). The drill was pushed till the subchondral bone and slowly the cannulated drill was withdrawn and with it the broken part came out (Fig. 3). The rest of the procedure was carried out as per our protocol. Figure 4 shows the X-ray the right hip after 16 months of the surgery.

Author's Photo Gallery



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Discussion

Table 1: Review of literature with complications of broken K-wires

	Authors	Site of surgery	Migration to site	Years after surgery
1	Furuhata et al. (2020) [10]	Left clavicle	Right lung	30 months
2	Palauro et al. (2019) [11]	Right AC joint	Left shoulder	9 months
3	Boasquevisque (2019) [9]	Right clavicle	Left lobe of lung	34 years
4	Irianto et al. (2018) [8]	Right clavicle	C6-7	4 days
5	Baghdadiet al. (2018) [6]	Left femur neck	Right retroperitoneal space	12 months
6	Suzukiet al. (2017) [12]	Dislocated shoulder RT	Right lung	14 days
9	Douglas et al. (2017) [13]	Left clavicle	Spinal cord T2-T3	3 months
10	Bang et al. (2017) [14]	Fracture dislocation right shoulder	Right lung	6 weeks
11	Matsumoto et al. (2017) [15]	Pelvis	Sigmoid colon	23 years
12	Aydinet al. (2016) [16]	Right patella	Right foot	2 years
13	Batinet et al. (2016) [17]	AC joint	Back of neck	5 years
14	Kumar et al. (2016) [18]	Patella	Knee ACL	15 months
15	Tan et al. (2016) [7]	Clavicle	Aorta	7 days
16	Kong et al. (2016) [19]	2 nd toe	Calcaneum	6 months
17	Hafezet al. (2016) [20]	C1	Vertebral artery	3 years
18	Leonardi and Rivera (2016) [21]	Left hip, arthroplasty	Heart	24 years
19	Tamura et al. (2014) [22]	62	Bowel perforation	25 years
20	Alihanoglu et al. (2013) [23]	Sternum	Chest wall	10 years
21	Lee et al. (2013) [24]	Sternum	Heart	3 months
22	Meena et al. (2013) [25]	Patella	Popliteal fossa	5 years
23	Ballas and Bonnel (2012) [26]	Sternoclavicular	Pelvis	2 years
24	Konda et al. (2012) [27]	Patella right	tibia	9 years
25	Türker et al. (2011) [28]	Medial malleolus R	Achilles tendon	4 years
26	Makki et al. (2011) [29]	Trochanter; THR	Popliteal fossa	13 years
27	Daud et al. (2011) [30]	Right clavicle	Ascending aorta	10 years
28	Sharma and Tam (2011) [31]	Right AC joint	Inno. vein	6 years
29	Yurtcu et al. (2010) [32]	DDH	Pelvis	4 years
30	Botha et al. (2009) [33]	Radius	Cubital fossa	1 year
31	Dhillon et al. (2009) [34]	R carpal	Ulnar nerve	10 weeks
32	Choi et al. (2008) [35]	Patella	Popliteal fossa	4 years
33	Tan and Ibrahim (2007) [36]	Right clavicle	C6 soft tissue	9 months
35	Biddaue et al. (2006) [37]	Patella	Heart	13 years
36	Stemberga et al. (2006) [38]	Shoulder	Heart	2 years
37	Durpekt et al. (2006) [39]	Right sternoclavicular	Heart	6 months
38	Maryae et al. (2006) [40]	Left DDH	Liver	6 weeks
39	Kumar et al. (2002) [41]	Shoulder	Ant. mediastinum	4 weeks
40	Seipel et al. (2001) [42]	Distal radius	Heart	3 years
41	Wirth et al. (2000) [43]	Right shoulder	Heart	20 years
42	Hazlerigg and Staller (1994) [44]	Sternal wire	Ascending aorta	9 years
43	Chous et al. (1994) [45]	Clavicle	Mediastinum	6 years
44	Limet et al. (1993) [46]	THR/trochanter	Hip joint	10 years
45	Varebeke and Osselaer (1993) [47]	Sternoclavicular	Perforation pulmonary artery	3 years
46	Davantas et al. (1991) [48]	THR	Femoral artery	7 years

Migration of the broken K-wires and other devices is known to occur without any indication and can cause from death to grievous injuries to the various organs of the body. No doubt this complication is rare but does happen and surgeons should be ready to recognize it and remove the broken implant. We reviewed the literature and in the past 30 years and over 60 cases of migration of the broken K-wires have been described in the English language literature causing 11 deaths and serious injuries with extended morbidity in otherwise healthy patients (Table 1). Among different areas of surgery vulnerable to migration of the K-wires if used during the procedure was the shoulder region. Acromioclavicular joint dislocations, clavicular fractures, and sternoclavicular joint dislocations constitute the majority of reported cases. Most of the literature on K-wire migration. Lyons

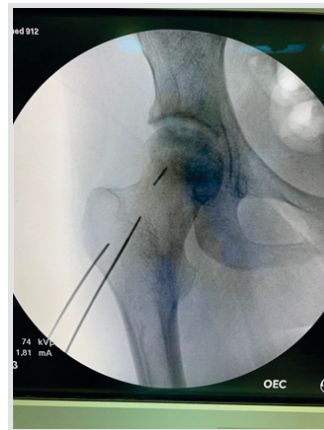


Figure 1: Radiographs at presentation broken K-wire in the neck of femur.



Figure 2: Broken guide wire was over drilled with 4.0 mm cannulated drill.



Figure 3: Broken guide wire was successfully removed.

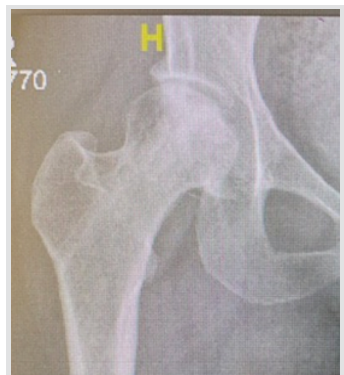


Figure 4: X-ray after 16 months of surgery.

and Rockwood reviewed 37 reports of pin migration from the shoulder region and found that in 17 patients caused serious vascular injuries causing 8 deaths [4].

There is no age is bar for migration as K wires from pediatric to adults cases haven reported. Over the years, 10 cases of migration of K-wires have been reported in pediatric age group [5, 6, 7] and in one child ended in the demise of the child in which the wire migrated after 7 days of insertion [7]. The second important aspect to ponder is that the wires have migrated from 4 days to 34 years [8, 9].

Based on our review of literature, it is wise to state that K-wires, broken or unbroken, have a tendency to migrate. Once it is on path to move it can cause significant damage to organs and even death. We believe that every attempt should be made to remove the broken wires which happen during surgery and those wires in place should be bent appropriately, monitored and removed once the purpose of insertion is achieved. This will avoid potential complications and morbidity.

Conclusion

Breakage of the K-wires can occur during surgery either due to metal fatigue or due poor technique. In our case, we believe it happened due to metal fatigue as the wire was used before couple of time. Migration of K-wires occur, more so the broken



ones, we believe that K-wires should be removed either broken or unbroken once the purpose of use is achieved, second, it is advisable to limit the reuse of K-wire or guide wires.

Clinical Message

K-wires are prone to migrate, more so when they get broken inside the bone due to any cause. Attempts should be made to remove them, if the wire is broken during a procedure, which could be much easier.

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