

# Is Kirschner Wire (K-wire) Infection Risk Higher when Operated by Junior Surgeons?–Infection Rates of K-wire Fixation in a UK Plastic Surgery Hand Trauma Unit

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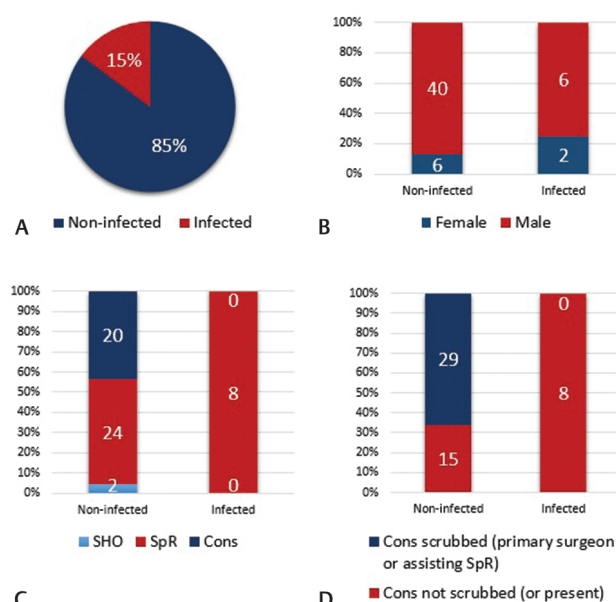
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Hand injuries such as fractures and dislocations are commonly managed with K-wires. Studies assessing K-wire complications suggest an infection rate between 6.6% to 33%.<sup>1–5</sup> Our local hand trauma unit perceived an increase in frequency in K-wire infections. Therefore, we assessed our local hand injury K-wire infection rate and its associated factors.

The primary outcome was to identify the infection rate while the secondary outcome was to compare injury, surgical and postoperative factors of cases which developed infections compared with those which did not. This retrospective analysis included all cases (adult and pediatric) requiring at least one K-wire fixation in the plastic surgery trauma theater lists between August and December 2019. Data collected included the following: patient demographics, injury characteristics, surgery characteristics, timing of appointments, and follow-up.

We identified 54 cases: 46 noninfected and 8 infected, leading to an infection rate of 15% (►Fig. 1 a). Differences between demographics (►Fig. 1 b), injury characteristics and surgical characteristics such as K-wire number, antibiotic prophylaxis and follow-up were not statistically significant. Interestingly, 59% of noninfected cases and 100% of infected cases were operated by junior surgeons (registrars), and this difference was statistically significant ( $p = 0.015$ , ►Fig. 1 c); however, the registrar grade (junior vs. senior registrar) difference was not ( $p = 1$ ). Additionally, we noted that differences in the degree of involvement of the senior supervisor (consultant) was statistically significant ( $p = 0.0007$ , ►Fig. 1 d). For a summary of the results and their statistical analyses, please see ►Table 1.



**Fig. 1** (a) Graph showing the infection rate. (b) Graph showing patient demographics ( $p = 0.38$ , difference is nonstatistically significant, Fisher's exact test). (c) Graph showing the difference in frequency of surgeon level per group ( $p = 0.015$ , difference is statistically significant, Fisher's exact test). (d) Graph showing the differences in level of consultant involvement per group ( $p = 0.0007$ , difference is statistically significant, Fisher's exact test). (Statistical analyses performed through JASP Version 0.13.1 Computer Software). Key: Cons: Consultant, SpR: registrar, SHO: senior house officer.

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**Table 1** Summary of results and factors analyzed while assessing differences between the noninfected and infected hand injury K-wire cases. (Statistical analyses performed through JASP Version 0.13.1 Computer Software)

	Noninfected (n = 46)	Infected (n = 8)	p-value (95% CI)
<b>Demographics</b>			
Age per patient group (years)	34	37	0.672
Female	6/46	2/8	0.38
<b>Injury factors</b>			
Cases across the months (Aug–Dec 2019)	–		0.26
Injury anatomical location (specific digit)	–		0.402
Injuries per hand (1 vs. 2+)	–		0.474
Open injuries (vs. closed injuries)	6/46	0/8	0.279
<b>Surgery factors</b>			
Days between 1st assessment and surgery	1.1	2.2	0.241
SpR as primary surgeon (vs. consultant)	24/44 <sup>a</sup>	8/8	0.015 <sup>a</sup>
Junior SpR (vs Senior SpR, if SpR primary surgeon)	13/24	5/8	0.681
Consultant absent (vs. present scrubbed/unscrubbed, if SpR primary surgeon)	12/24	7/8	0.061
Consultant not scrubbed (vs. scrubbed, if SpR primary surgeon and consultant in theater)	3/12	1/1	0.118
Consultant not scrubbed/absent (vs. consultant scrubbed as primary surgeon or supervising)	15/44 <sup>a</sup>	8/8	<0.001 <sup>a</sup>
Skin preparation chlorhexidine (vs. Povidone iodine based or NS)	22/46	6/8	0.279
1 K-wire (vs 2 or more)	15/46	3/8	0.786
<b>Antibiotic prophylaxis (n = 54)</b>			
Prophylactic given on induction (vs. not given/NS)	24/46	6/8	0.125
Prophylactic on discharge (vs. not given/NS)	11/46	0/8	0.121
<b>Follow-up</b>			
1st pin site check (days postop) (n = 54)	10.8	8.7	0.761
Time K-wires in situ (days) (n = 53) <sup>b</sup>	27.7	20.8	0.0083 <sup>a</sup>

Abbreviations: CI, confidence interval; NS, not specified; SpR, registrar.  
<sup>a</sup>2 cases excluded as they were operated by senior house officers and supervised by registrars. <sup>b</sup> 1 case excluded as followed-up in a different city.

Although no studies comparing skills or outcomes of junior versus senior surgeons have been identified, surgical technique has been highlighted as an important factor in determining pin site infection in orthopedic limb surgery.<sup>6</sup> For example, infection risk reducing technique skills (such as nontouch handling of wires and minimizing hematoma on the surgical site) are likely to improve with experience and practice. These may not have been developed by the registrars in this study, which could have led to an increased infection rate.

In conclusion, we report an infection rate of 15% and note that most surgical and injury factors' differences between infected and noninfected groups were nonsignificant. We note a significance in the level of primary surgeon and consultants' involvement with the case. We recommend that further consultant supervision is implemented when registrars are performing the operations as well as further training and education. A larger study to assess these measures' effectiveness in the reduction of infection rates is required.

#### Conflicts of Interest

None declared.

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