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A Single Surgeon's Experience of Infection Rates in K-Wires in Hand Surgery: Buried *vs.* Exposed

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1. Abstract

There is anecdotal evidence suggesting buried K-wires are superior to unburied or exposed K-wires due to lower pin track infection rates, although the evidence remains unclear. We present a closed loop audit looking at a single surgeon's experience of 111 consecutive cases requiring K-wires in hand surgery. Our pin track infection rates differed between a series of 3 consecutive cohorts. Pin track infection rates were 2% in an initial cohort of buried K-wires, 14.3% in a second cohort of exposed K-wires and 0% in a third cohort when practice was changed back to burying the K-wires. Our experience demonstrates there was a measurable difference in post-procedure infection rates between burying and exposing K-wire ends.

2. Keywords: K-wire; Complications; Buried; Exposed; Infection; Pin-track

3. Introduction

Kirschner wires (K-wires) can be used in the fixation of fractures in the hand (phalanges and metacarpals) and for fusion of joints in the hand [1-4]. The ends of the K-wires can typically either be left exposed or buried. The decision as to whether to leave them buried or not is naturally multi-factorial and will depend largely on surgical preference and patient concerns.

The main advantage of leaving the k-wire exposed is ease of removal. The pin can usually be removed at an appropriate time in an outpatient setting with no further admission or trip to the operating theatre required. Buried K-wires often need removal in theatre and subsequent admission, the burden of which was identified in a recent study examining infection and re-operation rates in K-wire fixation of metacarpal and phalangeal fractures [5].

However, there are some disadvantages of this common practice. As unburied k-wires protrude from the skin surface, there is a chance of the pin catching which can cause pain or even dislodgement of the k-wire, leading to loss of fracture reduction or bone position. Unburied k-wires are known to increase the risk of infection, which usually gains entry through the puncture site. Pin track infection appears to be a very common complication of exposed k-wires, with a rate of 13.5% reported in a recent systematic review, compared to 6.1% of buried k-wires [6].

These disadvantages can largely be avoided by cutting the end of the k-wire short to 'bury' the end under the skin. The supposed advantages include lower rate of

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infection and risk of accidental injury or dislodgement. This method also allows for the pin to be safely kept in situ for as long as is deemed necessary. However, the disadvantage as mentioned, where local anaesthesia would be needed to allow a small skin incision before the wire is located and pulled out.

A recent trainee-led collaborative study [7] aimed to delineate the factors guiding the decision-making process between 'exposed' and 'buried' k-wires and noted that amongst many other reason's infection was a considerable concern for both surgeon and patient. Anecdotal evidence exists to suggest that buried k-wires are superior to unburied k-wires in preventing infection however this evidence has not been deemed strong enough to date to formalize a guideline. Whilst it remains that there is uncertainty in the decision-making process, it is clear there is still lacking evidence [6,8,9] to support either burying k-wires or leaving a portion exposed with reference to the rate of post-operative infection.

We present data from a single surgeon's experience of using both buried and unburied k-wires. We describe a chronological series of cases which demonstrate changes in practice and corresponding changes in adverse outcomes.

4. Our Practice

Initially, the surgeon (AL) buried the end of the K-wires in all cases for the reasons mentioned above (supposed lower rate of infection and risk of accidental dislodgement/injury) (Cohort 1). However, for logistical reasons (namely a long waiting list which made timely removal of wires difficult), practice was changed so that the ends of the k-wires were kept exposed to allow removal of the K-wires in the outpatient clinic (Cohort 2). Despite all precautions and satisfactory patient education (about keeping the puncture sites clean), we noticed pin track infections on a more regular basis. After auditing the results, the surgeon moved back to the previous practice of burying k-wires (Cohort 3). A further audit of the outcome was undertaken to close the audit loop.

In cohort 1 and 3, once satisfactory placement of the k-wire(s) is achieved, the exposed end of the wire is cut short so that the end remained just under the surface of the skin, but 3 to 4 mm of the wire remains outside the cortex. The puncture wound in the skin is then closed with Histoacryl glue. Once union of the fracture or fusion of the joint is confirmed clinically and/or radiologically, the patient is booked for a minor procedure where, under local anaesthesia, a small (typically 4 mm to 5 mm) incision is made over the palpable end of the K-wire. The end of the wire is grabbed, taking care that it is not pushed further into the bone, and removed. Healing, fracture or fusion of the joint is checked clinically. The incision is then closed with Histoacryl glue and the hand mobilized.

In cohort 2, after satisfactory positioning, the end of the k-wire is kept exposed a short distance. The end of the wire is then bent on itself to avoid any injury from the sharp end. The patient is taught appropriate care of the pin site in the form of regular cleaning with alcohol wipes. Once union of the fracture or fusion of the joint is confirmed clinically and/or radiologically, the wire is removed in the outpatient clinic.

5. Methods

All consecutive patients who required insertion of K-wires over a three-year period operated on by the same surgeon were included and were classified as cohort 1,2 or 3. The dataset included patients who required fracture fixation (metacarpal and phalangeal fractures only), joint fusions (interphalangeal joints of fingers) and joint stabilization (after release of joint contracture). Patients with incomplete records were excluded from the analysis. Data was collected retrospectively from hospital records including operation notes and clinical letters. These were interrogated to establish rate of infection post-procedure.

Cases in cohort 1 were those initially treated with buried K-wires. Practice then changed and cohort 2

was collected with patients treated with exposed K-wires. Practice was reverted for cohort 3 and patients were again treated with buried K-wires. Rates of pin track infection were compared between the 3 cohorts and between overall buried and exposed cases.

Statistical analysis was performed using Chi-Square analysis with a $p<0.05$ deemed to be indicative of statistical significance.

6. Results

111 cases were included in the final analysis. 13 cases were excluded due to incomplete records.

Overall, 83 cases (75%) had buried K-wires and 28 cases (25%) had exposed K-wires. There were 50 cases in cohort 1, 28 in cohort 2 and 33 in cohort 3.

Table 1: Summary of results.

	Total number of patients	Pin track infection	Infection rate (%)
Cohort 1 (Buried)	50	1	2
Cohort 2 (Exposed)	28	4	14.3
Cohort 3 (Buried)	33	0	0
Overall buried K-wires	83	1	1.2
Overall exposed K-wires	28	4	14.3

In cohort 1 (initial burying of the K-wires), 1 case was found to have post-procedure pin track infection (2%). 4 cases were identified as having post-procedure pin track infection in cohort 2 (14.3%) and no cases were found to have pin track infection in cohort 3.

Overall, of the 83 buried K-wire cases, 1 was identified as having pin track infection (1.2%) compared to 4 out of 28 exposed K-wire cases (14.3%) ($p<0.05$). Table 1 summarizes our findings.

7. Discussion

Though it seems common sense that the pin track infection rate will be lower when the K-wires are kept buried, there is yet any strong and convincing evidence, so that, at least in our experience, most surgeons still seem to leave wires exposed. There is an argument that it may be cheaper and more convenient to leave the wires exposed [7,10] so that they can be removed in the clinic, avoiding another trip to operating theatre and expenses involved therein. However, in our experience, patients who have had wires both left buried and exposed at different times, always prefer the occasions when the wires were left buried. A pin track infection may not only require treatment with antibiotics, occasionally it can lead to early removal of the K-wire before the fracture or joint fusion has healed, thus complicating the treatment and leading to further and potentially more complicated surgery [11].

Our relatively short series has a number of limitations including retrospective data collection and no formal randomization as well fairly low numbers of cases. However, it has the strength of including consecutive patients (thus minimizing any selection bias) who were all operated on by the same surgeon, ensuring uniformity of clinical practice.

The cohorts demonstrate uniquely a change in practice followed by a corresponding change in outcome.

Based on our experience and the lack of convincing evidence to date, we set out to answer a simple question: is post-procedure infection rate higher with exposed K-wires in this patient cohort? We believe our simple study with a closed loop audit cycle demonstrated clearly that the practice of burying K-wires enjoys a much lower infection rate compared to leaving K-wires exposed.

References

1. Dickson DR, Mehta SS, Nuttall DNCY. A systematic review of distal interphalangeal joint

arthrodesis. Journal of hand and microsurgery. 2014; 6: 74-84.

2. Kelsch G UC. Intramedullary k-wire fixation of metacarpal fractures. Archives of orthopaedic and trauma surgery. 2004; 124: 523-526.

3. Diaz-Garcia R WJF. Current management of metacarpal fractures. Hand Clin. 2013; 29: 507-518.

4. Kozin SH, Thoder JJ LG. Operative treatment of metacarpal and phalangeal shaft fractures. JAAOS-Journal of the American Academy of Orthopaedic Surgeons. 2000; 8: 111-121.

5. Terndrup M, Jensen T, Kring S, MartinLindberg-Larsen. Should we bury K-wires after metacarpal and phalangeal fracture osteosynthesis? Injury. 2018; 49: 1126-1130.

6. Wormald JC, Jain A, Lloyd-Hughes H, Gardiner S, Gardiner MD. A systematic review of the influence of burying or not burying Kirschner wires on infection rates following fixation of upper extremity fractures. J Plast Reconstr Aesthet Surg. 2017; 70: 1298-1301.

7. Collaborative WR. Buried versus exposed kirschner wires following fixation of hand fractures: l clinician and patient surveys. Plast Reconstr Surg Glob Open. 2018; 6: 1747.

8. KoçT AJ, Jamil Ahmed, Aleksyeyenko S. Buried Kirschner wires in hand trauma: do they reduce infection rates and is it worth the extra cost. Eur J Plast Surg. 2012; 35: 803-807.

9. Hargreaves DG, Drew SJ, Eckersley R. Kirschner wire pin tract infection rates: a randomized controlled trial between percutaneous and buried wires. J Hand Surg. 2004; 29: 374-376.

10. Soumen das De, Bae DS, Peter M Waters. Displaced humeral lateral condyle fractures in children: should we bury the pins? J Pediatr Orthop. 2012; 32: 573-578.

11. WF van Leeuwen, BTJA van Hoorn, Chen N, D Ring. Kirschner wire pin site infection in hand and wrist fractures: incidence rate and risk factors. J Hand Surg Eur. 2016; 41: 990-994.

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