



## The removal of percutaneous Kirschner wires used in the stabilisation of fractures in children

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Kirschner wires are commonly used to stabilise fractures in children. There is a wide range of practice across the United Kingdom with regard to their removal, with some units routinely readmitting children for removal of wires under a general anaesthetic and others leaving the wires long and extracting them in the outpatient clinic. In a prospective study performed at The Barts and Royal London National Health Service Trust between November 1997 and December 1999, the acceptability and problems associated with the latter approach were assessed.

A total of 203 percutaneous Kirschner wires were used to stabilise 119 fractures following closed reduction in 113 children. The majority of the fractures were in the upper limb and the children ranged in age from five months to fifteen years and five months. The Kirschner wires were subsequently removed in clinic without anaesthetic. Details of wire placement and complications associated with wire use and their removal were recorded. The most common complication seen was overgranulation at the entry point of the wire (5.4%). In two cases, wires had migrated below the skin surface, requiring local anaesthetic infiltration to enable retrieval. Using a visual analogue pain score, the mean pain score immediately after wire removal was 2.8 out of a maximum of 10, reducing to 0.9 after one minute. It is concluded that K-wires can be removed safely without anaesthetic in the outpatient clinic and that this is tolerated well by children.

### INTRODUCTION

Percutaneous Kirschner wires (K-wires) are commonly used to stabilise fractures in children. There is a wide range of practice across the United Kingdom with regard to their removal, with some units routinely readmitting children for removal of wires under a general anaesthetic and others leaving the wires long and extracting them in the outpatient clinic. The acceptability and problems associated with the removal of percutaneous K-wires in the outpatient clinic were assessed in a prospective study performed at Barts and The London National Health Service Trust between November 1997 and December 1999.

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## MATERIALS AND METHODS

One hundred and thirteen children between the ages of 5 months and 15 years and five months were admitted to The Royal London Hospital between November 1997 and December 1999 with 119 closed fractures which were treated by primary manipulation under anaesthetic (MUA) and percutaneous K-wire stabilisation. There were 85 boys and 28 girls.

The majority of the fractures stabilised using this technique were in the upper limb. All open fractures or fractures requiring open reduction were excluded from this study. The number of wires used per single fracture was dependent upon the fracture site and configuration and ranged from one to three. The total number of wires removed in the study was two hundred and three.

The children were reviewed weekly in the Fracture Clinic both clinically and radiographically. When the fracture had healed sufficiently the senior orthopaedic technician removed the K-wires.

The smiling faces scale was used as a visual analogue pain score system (2, 3, 6, 7). The level of pain and distress experienced by the child was assessed immediately the wire was removed and one minute later. The scale was from zero (no pain) to five (unbearable pain).

## RESULTS

The results are shown in table I.

The mean pain score during the removal of the wire was 1.4 (range 0-5) and 0.5 (range 0-3) 1 minute after removal. No discomfort was felt during the removal of 48 of the 203 K-wires (23.6%). One minute after wire removal there was no discomfort in 162 cases (79.8%) (table I).

There was no benefit in the use of entonox during the removal of the K-wires. No difference in pain scores could be found for K-wires of different gauges or for the duration of K-wire stabilisation, nor for different anatomical sites.

Following closed reduction and percutaneous K-wire stabilisation, 104 out of 119 fractures (88.4%) proceeded to union without complication. Complications were encountered with 20 wires (9.9%), involving 15 fractures (12.6%).

Two children experienced severe distress on wire removal (score of 5), which required admission for wire removal under a general anaesthetic. One child suffered a transient ulnar nerve neurapraxia

Table I. — A Comparison of Pain Scores with Age & Sex

This table shows the pain scores experienced by the children at the time of the K-wire removal and one minute after removal. It compares the scores between the sexes and ages of the children.

Age	Average Pain Score			
	Female		Male	
	During	1 minute later	During	1 minute later
0-2	1.4	0.5	1.4	0.4
2-4	0	0	1.2	0.6
4-6	1.2	0.5	1.7	0.2
6-8	1.9	0.3	1.6	0.2
8-10	1.7	0.2	1.7	0.3
10-12	0.7	0	1.4	0.2
12-14	1.0	0	1.0	0
14-16	2.5	0	0.6	0

after removal of a single K-wire used for the stabilisation of a mid-shaft ulnar fracture. There were four superficial wound infections in three children. The most common complication was overgranulation of the wound (eleven K-wires in seven children). Ten wounds were successfully treated with application of silver nitrate ; one overgranulated scar was excised.

Two wires were buried beneath the skin at the time of removal : these were located and removed under aseptic conditions following infiltration of local anaesthetic in the fracture clinic.

## DISCUSSION

There are numerous references in the orthopaedic literature to the use of percutaneous K-wires in children's fractures, but these have concentrated on the indications for such stabilisation (1, 4) or on details of the technique itself (5, 8). The removal of K-wires has not been the subject of a detailed study.

One reason for admitting children for K-wire removal under general anaesthetic is a belief that this procedure is too traumatic to be performed on the conscious child in the outpatient clinic, but this study has shown that this is not the case.

By removing the K-wires in the outpatient clinic, we avoid the distress to the child and their family caused by the admission to hospital and the risk of a general anaesthetic. There are financial benefits from avoiding an unnecessary inpatient day-stay on a paediatric ward and an unnecessary minor operating procedure. Finally, there are waiting-list benefits by avoiding unnecessary use of the operating theatres. We recommend leaving percutaneous K-wires long and removing them in the outpatient clinic.

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