CASE REPORT

Catastrophic osteomyelitis following percutaneous wire fixation of a distal radial fracture: a cautionary tale of poor patient selection followed by surgical mishap

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SUMMARY

We present a case of distal radius fracture. Several sequential unfortunate events resulted in a poor outcome. The patient was poorly selected because the degree of early dementia was not fully appreciated, due to intermittent periods of lucidity. Having elected to treat this distal radius fracture with Kirschner wires, a wire snapped during the procedure and was deemed safe to leave within the medullary cavity. Subsequently, the patient was left in a cast for 4 weeks without regular pin site inspection. When the cast was removed a gross osteomyelitis had developed. This series of events, led to unnecessary morbidity and extended the immobilisation time with reduced wrist function. This case highlights the importance of careful patient selection, surgical tactics and continuity of care.

BACKGROUND

The importance of this case is a lesson in poor patient selection. The decision to admit and intervene on this lady was made by a senior clinician, who assessed the patient as cognitively intact. The operation was performed by a trainee, under supervision of a different consultant. When a technical complication occurred it was elected to leave a broken wire in the bone—a situation which is rare, and it is debatable whether retrieval is beneficial. The demented patient later pulled off the cast and removed one of the percutaneous wires. The pin sites were not regularly inspected, due to the period of cast immobilisation. This sequence of events resulted in significant osteomyelitis requiring two additional procedures, a prolonged course of antibiotics, increased length of stay and poor wrist function (probably worse than with non-operative treatment). We anticipate that subscribers, who read this article, will learn from this series of events and be reminded to consider patient and surgical factors when deciding how to manage these injuries.

CASE PRESENTATION

An 83-year-old woman was knocked over by a cyclist. She fell with her left arm outstretched onto a concrete surface. Outpatient evaluation of the patient the following afternoon revealed a left hand dominant, independent living, knitting enthusiast. Although physically very well for her age, she had been recently diagnosed with mild Alzheimer's disease, but did not volunteer this information on

first inquiry. Examination of the hand confirmed tenderness at the fracture site, no neurovascular deficit and intact extensor muscle function. Radiographs showed a comminuted, intra-articular, distal radial metaphyseal fracture, with an intact volar cortex. Initially assessed by a junior surgical trainee, she was transferred to the consultant for surgery, on the basis of her radiographs. A decision was made to admit this patient for application of bridging external fixation (figure 1).

The patient was discussed at the following morning's trauma meeting, where the overall opinion was that a patient with early cognitive impairment would not tolerate external fixation and that percutaneous Kirschner wires would be more appropriate.

During the procedure, an intrafocal wire was used to achieve reduction of the distal metaphyseal fragments. Attempts on the first pass, did not obtain an optimal position. On second pass, the 1.6 mm wire snapped as it was being levered into position leaving approximately half of the wire inside the radius. The consensus, among attending surgeons, was that retrieval of the wire would cause more damage. Thus the non-functioning

Figure 1 Posteroanterior and lateral radiographs of the patient's left wrist, shortly following injury.

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Figure 2 Postoperative posteroanterior and lateral radiographs of the patient's left wrist, following cast replacement.

intramedullary wire was accepted as 'lost' and three further supporting wires were introduced to stabilize the fracture (a radial styloid wire, and two dorsal radial wires). A back slab was applied in the theatre which was then converted to a full-below-elbow cast the following day in the plaster room.

The patient remained as an in patient while a package of care was established. A week after her surgery, in a moment of particular cognitive haziness, the patient removed her own below elbow cast, and then manually extracted one of the wires. Having seen the length of the wire she decided to leave the remaining two wires in situ. It was uncertain when the cast had been removed because she was discovered with her pin sites exposed on the morning ward round. She was hastily sent to the plaster room for redressing and further cast application, this time above her elbow to prevent removal (figure 2).

Once this cast was in place it was left on until follow up at 5 weeks. With the cast removed the pin sites were found to be grossly infected. She was taken to the theatre for wound exploration. The remaining wires were removed and the distal radius was found to be stable when stressed under fluoroscopy. The distal radius was then approached through the dorsal pin site wound and a small dorsal osteotomy facilitated retrieval of the snapped intramedullary wire, at the focus of osteomyelitic change. The wounds were then thoroughly irrigated and necrotic tissue excised with cavity packing.

At a further procedure, 48 h later, the packs were removed. The superficial branch of the radial nerve was intact but exposed passing through the radial styloid pin site wound. The angles of both wounds were opposed but left open centrally to prevent further abscess formation. Microbiological cultures grew staphylococcus aureus and 'faecal flora', and the patient was started on a 6-week course of appropriate antibiotics (figure 3).

OUTCOME AND FOLLOW-UP

Fourteen weeks following initial injury, the patient's wounds had healed and she was discharged from routine outpatient follow-up. At discharge, wrist range of movement was reduced but reasonable. Radiographs showed shortening of the radius, with no overall improvement in position from initial presentation and a loss of space of the wrist joint (figure 4).

Figure 3 Intraoperative photographs showing the extent of soft tissue damage originating from the deep, infected wire.

DISCUSSION

In the aviation industry, disasters are often attributed to the culmination of a series of small, individually insignificant errors.¹ A similar analogy is the chance alignment of holes in Swiss cheese allowing an 'accident trajectory'.² We present this case as an orthopaedic equivalent, where several adverse events occurred accumulating in catastrophic osteomyelitis.

In retrospect, the patient selection process was poor, largely due to the patient's early dementia. The patient attended fracture clinic independent of relatives who were aware of her cognitive limitations, and naturally the patient did not volunteer this information. This patient had all the social airs and graces to successfully mask the degree of her dementia and formal mental testing was not performed prior to the decision to intervene. When she was clerked into the ward her abbreviated mental test was 5/10 but this was not conveyed to the attending medical staff. Although highlighted in the trauma meeting her mental function was not seen as a reason to abandon the procedure, instead it was taken as a reason to change from external fixation (the admitting consultant's plan) to percutaneous wire fixation (the operating consultant's plan).

Figure 4 Posteroanterior and lateral radiographs at discharge showing bony deficits remaining.

Percutaneous pinning techniques are considered to be less invasive than internal fixation³ and less cumbersome than external fixation but there is a recognised pin site infection rate. Kapandji intrafocal wiring has been shown to be superior to crossed wire constructs⁴ because the intrafocal wires are levered down against smaller fragments of the bone to act with a buttress effect. However, use of this technique should be cautioned in high degrees of dorsal comminution because stability is lost in multifragmentary configurations and in osteoporotic bone the wires can cut through causing loss of position.⁵ Almost certainly the thin 1.6 mm wires broke due to bending fatigue during attempts to lever the wire into position.

Retained metal ware is usually asymptomatic but in the context of tracking infection microorganisms rapidly produce a glyocalyx biofilm⁶ which is resistant to antibiotics making the infection difficult to eradicate without first removing the metal foreign body. The decision not to retrieve the wire at the first procedure was fair because it was judged that retrieval would cause unnecessary damage. However, at a later stage when the patient removed her cast this should have served as an alarm bell to recognise that this patient was at a higher risk for infection. Regular pin site inspections could have been initiated rather than burying the wires in a cast. We now are much more stringent in monitoring pin sites, particularly for those with cognitive impairment, and all patients at risk of dementia have an abbreviated mental test score on admission clerking.

At several stages during case management, errors were made, which occurring in isolation, might have had clinically insignificant consequence isolation but occurring together culminated in this disastrous outcome.

Learning points

- ▶ Consider patient factors, as an essential part of the fracture personality,⁷ when considering the best management strategy.
- ▶ Close monitoring of pin sites is essential when using percutaneous wire techniques.
- ▶ Sequential errors can accumulate and lead to significant morbidity.

Competing interests None.

Patient consent Obtained.

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