CASE REPORT

AO 2 mm locking compression plate for arthrodesis of the proximal interphalangeal joint

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Introduction

Arthrodesis is a valuable reconstructive option in arthritic, unstable and infected joints. Various methods have been described for the arthrodesis of interphalangeal joints, including Kirschner wires, interosseous wiring, tension band wiring, bioabsorbable pins, compression screws, plate fixation and external fixation.1–4 Post-traumatic reconstruction requires a stable construct to achieve a solid arthrodesis. The 2 mm AO locking compression plate has been developed, based on the experiences gained with the PC-Fix and the LISS plate. These systems allow the screw heads to lock to the plate, thereby creating a fixed angle device, or mini internal fixator.5 The development of these locked internal fixation methods has been based on historical experience, scientific insights into bone biology, especially with reference to its blood supply, and failure of the screw/bone interface. Phalangeal intra-articular fractures, complicated by bone loss and osteomyelitis, provide a challenge for reconstruction. We describe the use of the AO 2 mm compact locking compression plate, for the salvage arthrodesis of the proximal interphalangeal joint, maintaining length and rotation.

Case report

An 18-year-old male factory worker, presented with multiple injuries following a road traffic accident. He sustained an open, intra-articular, oblique condylar fracture of proximal phalanx, right dominant index finger (Fig. 1a and b).

Initial wound debridement, washout and fracture fixation with two lag screws was carried out (Fig. 2). At 8 days post-operatively, he developed a wound infection associated with an abscess on the dorsum of the hand and returned to theatre for a wound washout. Microbiology samples were taken intra-operatively and intravenous antibiotic therapy was commenced. Cultures grew streptococcus milleri and mixed anaerobes. A further wound washout, exploration and debridement was undertaken 48 h later. The metalwork was washed out but not removed. Three weeks from the initial surgery, there was a recurrence of infection, leading to a further wound washout and debridement. The patient developed osteomyelitis of the proximal phalanx, requiring a radical bone resection, with skeletal stabilisation of the digit achieved using an external fixator.3 A gentamicin impregnated cement block spacer was used to fill the subsequent bone defect (Fig. 3).

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A 6-week course of intravenous antibiotics followed by 2 weeks of oral antibiotics and a further fortnight observation period for recurrence of infection. This therapy was successful and 4 months from the initial injury, reconstructive surgery was then undertaken. The reconstructive surgery involved the removal of the external fixator and cement spacer followed by a PIP joint fusion. A tricortical iliac crest bone graft was used with an AO 2 mm compact hand locking compression plate (LCP) to maintain length, rotation and provide stable fixation.

**Surgical technique**

A 2 mm AO compact hand set LCP, with screw to plate locking holes, was carefully shortened and contoured. Preliminary fixation was achieved using two oblique K wires to allow for final contouring of the plate. The desired length and rotation of the digit was determined. The plate was secured with a combination of standard screws and locking 2 mm screws. Three different thicknesses of the plate, in various lengths, are available. The proximal portion of the plate was secured initially with a locking
screw and followed by a lag screw into the graft, the graft to distal phalanx interface was secured using the same lag screw and locking technique.

The extensor tendon was closed with interrupted sutures and a continuous running suture for reinforcement. Prolonged post-operative antibiotics were used for 2 months.

Follow up at 3 months after the reconstruction showed good clinical and radiological evidence bony union across both bone/graft interfaces (Fig. 4a and b). Inflammatory markers and white cell count were normal at 3 months and he was discharged from the care of the Oxford bone infection unit at that stage. Latest follow up at 12 months showed solid painless fusion, with no signs of infection.

Discussion

LISS plate fixation was initially developed for acute fracture fixation in poor quality bone. Recent advances have suggested an extended role for the principle. Sommer and Gautier concluded that the LCP is useful for difficult situations, such as in
osteoporosis, complex joint fractures, juxta-articular fractures, corrective interventions and revision operations following the failure of other implants.

This case describes the use of the ‘mini’ AO LCP system in post-traumatic reconstruction of an interphalangeal joint. A 2.0 mm locking compression plate has been used in maxillofacial and oral surgery, but its use has previously not been described for PIP joint arthrodesis. Post-traumatic reconstruction with bone loss and infection represents a surgical challenge. The aim is to restore alignment, length and rotation and to maintain this until a solid arthrodesis is obtained. Functional outcome is improved by fusion of the joint in a ‘functional’ position of flexion. Plating and external fixation has been described in this setting previously with metalwork prominence and adhesions as complications.

The locking plate acts as a mini internal fixator, achieving stability by locking the screw head to the plate. Biomechanically, the LCP provides more stability across a fracture or osteotomy site. The low contour profile provides enough strength with reduced metalwork prominence, advocating its role in corrective hand surgery.

References


Figure 4 (a an b) AP and lateral radiographs showing solid arthrodesis after fixation with an AO 2 mm locking plate.