Non-Union Of Fractured Distal Radius Treated With A Volar Locking Plate: A Case Report

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Citation

Abstract
Non-union following volar plate fixation for distal radius fractures is a rare complication. Diabetes and obesity are known risk factors. We have described a case of non union of a distal radius following open reduction internal fixation and uniting after revision with a combination of non-autologous and autologous bone graft. In patients with known risk factors for non union of distal radius fractures we recommend considering the use of bone graft in the primary setting.

BACKGROUND
Volar locking plates have revolutionised the treatment of complex distal radius fractures. Benefits of volar locking plates include maintenance of fracture reduction and early mobilisation and physiotherapy 1 2. However, they are not without risks, including tendon rupture from prominent hardware on the volar or dorsal aspect of the distal radius, superficial and deep infection 3. Non-union is a rare complication, with few cases described in the literature 4 5 6 7. Because of its rarity, there is little consensus on the optimum method of operative treatment 8 9. We report a case of a non-union of a distal radius fracture treated with a volar locking plate, subsequently uniting post revision with bone grafting.

CASE REPORT
A 31 year-old female who suffered a fall onto an outstretched right hand while bush walking. She presented to the emergency department of a Sydney metropolitan hospital with right wrist pain and deformity. She had a background of polycystic ovarian syndrome, type 2 diabetes and obesity. She was a non-smoker. Examination findings included an obvious deformity to the right wrist, with no neurovascular compromise or open injury. X-Ray examination revealed dorsally displaced off-ended right distal radius fracture.

Figure 1
Figure 1 initial radiographs of the right wrist showing displaced off-ended distal radius fracture

A closed reduction in the emergency department was undertaken, with a satisfactory position on post-reduction x-rays. The patient underwent an open reduction and internal fixation 2 days later with a Synthes fixed-angle volar locking plate. The procedure and her recovery were uncomplicated.
After nine months the patient returned for unplanned follow-up, complaining of persisting pain. Examination revealed tenderness over the distal radius and x-rays revealed a non-union. At this point the plate was removed, the fracture site debrided and packed with autologous iliac crest bone graft and the original plate was re-inserted. The revision procedure was unsuccessful in promoting union of the fracture and a second revision procedure was undertaken 12 months later. This involved removal of the existing hardware, debridement of the fracture site, insertion of autologous iliac crest bone graft mixed with OP-1/BMP-7 (Olympus Biotech), and insertion of a Synthes variable-angle locked plate. The second attempt at revision was successful and the fracture went on to unite 5 months after the last procedure.

The patient was again followed up 10 months after the revision surgery. Examination revealed no further tenderness over the fracture site and 40 degrees of wrist flexion and 20 degrees of extension.

DISCUSSION
In general, union rates of distal radius fractures and time to healing have been satisfactory following open reduction internal fixation with a volar locking plate. Non-union is a
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Several cases of using iliac bone graft for non union have been described in the literature with excellent results 6 24 9. In our case however, following the failure of the iliac bone graft in promoting union, we chose to use an osteoinductive bone substitute mixed with iliac bone graft. We used osteogenic protein-1 (OP-1) also known as recombinant BMP-7. OP-1 is a bone morphogenetic protein (BMP) with osteoinductive properties. Use of OP-1 has been demonstrated in spinal fusion, tibial non-union, fibula defects and pelvic girdle non-union 24. Ekrol explored the use of OP-1in healing metaphyseal defects following corrective osteotomies for mal-union in distal radial fractures. They found slower and less complete bone healing with the use of OP-1 compared to iliac bone graft 24. They did note however that a reason for this was because the lack of structural support OP-1 paste offered compared with iliac bone graft. In our case, the use of OP-1 with the structural support offered by the iliac bone graft and volar locking plate was successful with the fracture uniting after 5 months.

CONCLUSION

Non-union following volar plate fixation for distal radius fractures is a rare complication, however obesity and diabetes are known risk factors. We have described a case of non union in such a situation and the use of a combination non-autologous and autologous bone graft in promoting union. In patients with known risk factors for non union of distal radius fractures we recommend considering the use of bone graft in the primary setting.

References

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