



Case Report

Distal Radius ORIF using a carbon-fiber reinforced PEEK volar plate for treatment of a left displaced intra-articular fracture with loss of height, radial inclination and volar tilt

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PATIENT HISTORY

Patient is an 82 year-old right hand dominant woman, presenting with left wrist pain and deformity. ER evaluation revealed a left distal radius fracture. Radiographic findings include a left intra-articular distal radius fracture with loss of radial height, radial inclinations, and volar tilt.

PMH: Hypertension, hypothyroidism, osteopenia and dyslipidemia

PSH: Appendectomy, hysterectomy, knee surgery

Medications: Metoprolol, Synthroid, aspirin, vitamins

Social History: 1-2 pack per day smoker

TREATMENT PLAN

It was recommended that she undergo ORIF of the left Distal Radius. Patient was advised that because she is a smoker, she has a much higher risk of nonunion or malunion, and was encouraged to quit smoking. Unfortunately, upon the date of proposed surgery, the patient presented with a severe urinary tract infection (UTI). Due to the UTI, surgery was cancelled and a closed reduction and casting under sedation was performed. Upon follow up of the closed reduction, it was determined that the acceptable reduction was lost. X-rays revealed loss of reduction with increase in dorsal tilt as well as loss of height and radial inclination. Surgery was again recommended once her UTI was resolved.

SURGICAL PROCEDURE

Under general anesthesia and sterile conditions, a standard FCR approach of the left distal radius was implemented. Standard reduction techniques and placement of hardware were also employed using the CarboFix CFRP Volar Plate.



Pre-operative radiographic findings

Immediate Post-operative

POST-OPERATIVE FOLLOW-UP

At **7 days post procedure**, the patient was doing well. She had been non weightbearing on her left upper extremity in a volar splint. She continued to smoke. Her incision was healing well and she was neurovascularly intact. She had full range of motion of her fingers. Range of motion of the wrist was not checked at this visit. She was transitioned into a removable Velcro wrist splint and started in hand therapy. Clear visibility of the reduction was well appreciated due to the radiolucency of the plate.

At **6 weeks post-surgery** the patient was doing very well and had no complaints, had minimal pain in her wrist, and had regained most of her wrist ROM in therapy. Radiographic findings showed maintained alignment of her fracture site easily visualized through the radiolucent hardware. There was no evidence of loosening or failure. The fracture appeared to be healing well.



7 days post-operative



6 weeks post-operative

Discussion

Anatomic volar plating is a well-accepted treatment modality for fractures of the distal radius. The rationale for the shift in material from metal to composites was attributed to radiolucency and a better suited modulus of elasticity. This potentially decreased the risk for complications arising from the mismatch of elasticity between bone and implant, especially in patients with predisposition to delayed union or nonunion.

Carbon fiber reinforced PEEK had been introduced as an alternative.

As with other plate fixation devices, the longitudinal structure provides stabilization and load bearing capabilities; the properties of the raw material as well and the design of the complete implant give these plates a unique combination of biomechanical characteristics with bone-like elastic modulus, high strength, and superior fatigue strength. This combination of biomechanical traits allows this implant to withstand ongoing cyclical loads, promoting its use with difficult to heal fractures, impending fractures, or overt pathological fractures which are slow to heal, if at all.

The CarboFix plating system holds additional substantial imaging benefits for pathological indications, over traditional, metallic devices. Since carbon-fibers-PEEK is, in-fact, radiolucent under X-ray, their "invisible" appearance under fluoroscopy and radiography allows for direct visualization of the fracture throughout the surgical procedure. Furthermore, this trait enables for an improved ongoing radiologic surveillance of both the healing process (i.e. callus formation and union).

As described, the CarboFix volar distal radius plate appears to be a valid treatment option, holding some substantial benefits over metallic implants, and holding their place in the armamentarium for the treatment of fractures.



CarboFix "Piccolo" Distal Radius Plates