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DVR plating of distal radius fractures

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ABSTRACT

Volar plating has become the standard of care for most distal radius fractures. When done for the right indication and with adequate mastering of the technique complication ratio is low. The concept of subchondral support is key in this technique. Osteoporotic patients will especially benefit from this type of fixation which allows early immobilization, quick return to activities of daily living and early good outcome.

Introduction

Distal radius fracture management continues to evolve and many treatment methods are available. Comparison of the different modalities has shown that palmar plating produces better early functional results than cast treatment or external fixation. However, complications of palmar plating may be as high as 16% [1].

Most complications can be avoided if palmar plating is correctly indicated and properly performed. The goal of operative distal radius fracture treatment is to obtain an anatomic reduction and a stable fixation to permit early mobilization of the wrist without loss of reduction. Cast free after-treatment following volar plating renders the patients independent for activities of daily living in the postoperative period.

Philosophy

Placing the volar locking plate on the palmar aspect of the radius has two mayor advantages:

1. It neutralizes the dorsally directed deforming forces. The plate with angular stable screws supports the distal fragment and transfers the load to the shaft of the radius (Fig. 1). The concept of subchondral support implies that the distal articular fragment is not only stabilized but also supported by the pegs/screws that are placed in a "fan shaped" spatial distribution that follows the anatomy of the subchondral bone of the articular surface. This construct provides increased stability that allows early mobilization for most distal radius fracture types.
2. Placing the hardware palmarly just below the watershed line produces less tendon irritation than dorsal plating [2], since there is more space available and therefore less direct contact of the tendons with the implant. Furthermore, most of the implant can be covered with the pronator quadratus muscle.

Indications

Operative treatment of an extra-articular distal radius fracture is indicated if fracture displacement persists after closed reduction, with more than 20° dorsal angulation, dorsal impaction of more than 5 mm, radius shortening of more than 3 mm and translation of the distal fragment of more than 2 mm.

For intra-articular fractures with a displacement between the fragments of more than 2 mm open reduction and internal fixation is also indicated [3]. Because low bone density is a predictor of secondary displacement, the indication for operative treatment is higher in the elderly than in younger patients [4–6].

The contra-indications for operative treatment may be general or fracture related: General contra-indications include those for the use of local anaesthesia, the presence of local or general infectious diseases and skin problems localized on the volar aspect of the wrist. The fracture related contra-indications depend on bone quality and fracture pattern. Dorsal fracture patterns as in dorsal Barton's fractures, radiocarpal fracture dislocations, isolated radial styloid fractures, small avulsion fractures of the volar rim and dorsal impacted articular fractures with intact or non-displaced volar cortex are contra-indications for palmar plating.

There is also a trend to avoid palmar plating in cases of high energy fractures with massive intra-articular comminution of the distal fragment and/or bone loss. These fractures have a higher risk of avascular necrosis of the distal fragments, and the chances of obtaining an anatomic reduction are highly diminished. Also in

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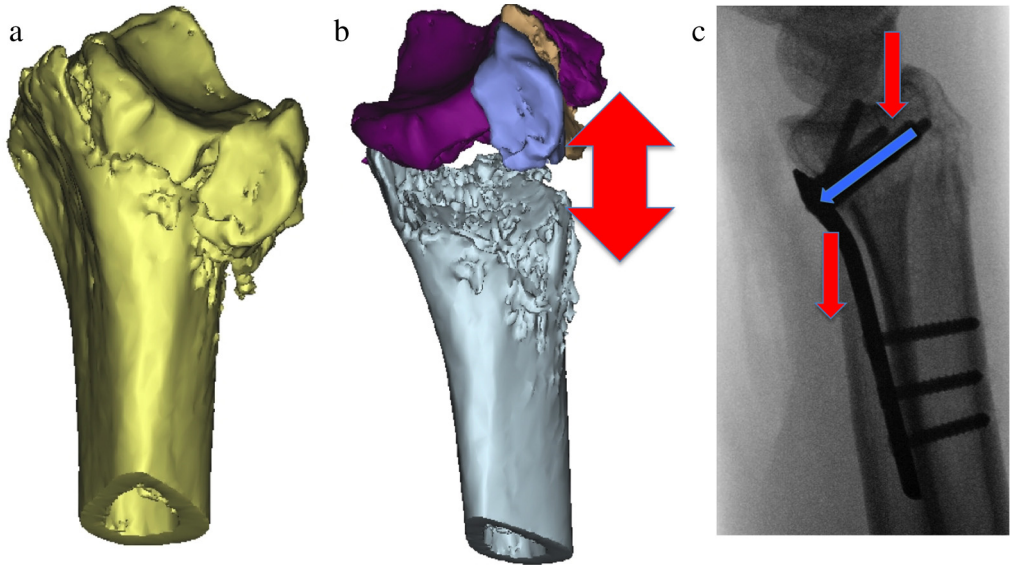

Fig. 1. (a) 3D reconstruction of a typical dorsal comminuted osteoporotic fracture. Note the high dorsal impaction. (b) 3D reconstruction after virtual reduction of the fracture. Note the defect that has to be supported by the plate. (c) Lateral view of a fracture with fixed DVR plate – arrows mark the load transfer.

extreme osteoporotic patients with highly displaced and multi-fragmented fractures, palmar plating may be difficult to perform. Subchondral support of the distal fragment may be problematic and lead to protrusion of the distal screws/pegs through the distal fragment into the joint space. However, these problems were not encountered in a recent study of 42 intra-articular volarly plated distal radius fractures. As stated in the article, this was probably related to the correct placement of the DVR plate in the distal fragment [7].

Technical hints

Most of the surgeons who deal with distal radius fractures are familiar with the technique of palmar plating. A flawless technique

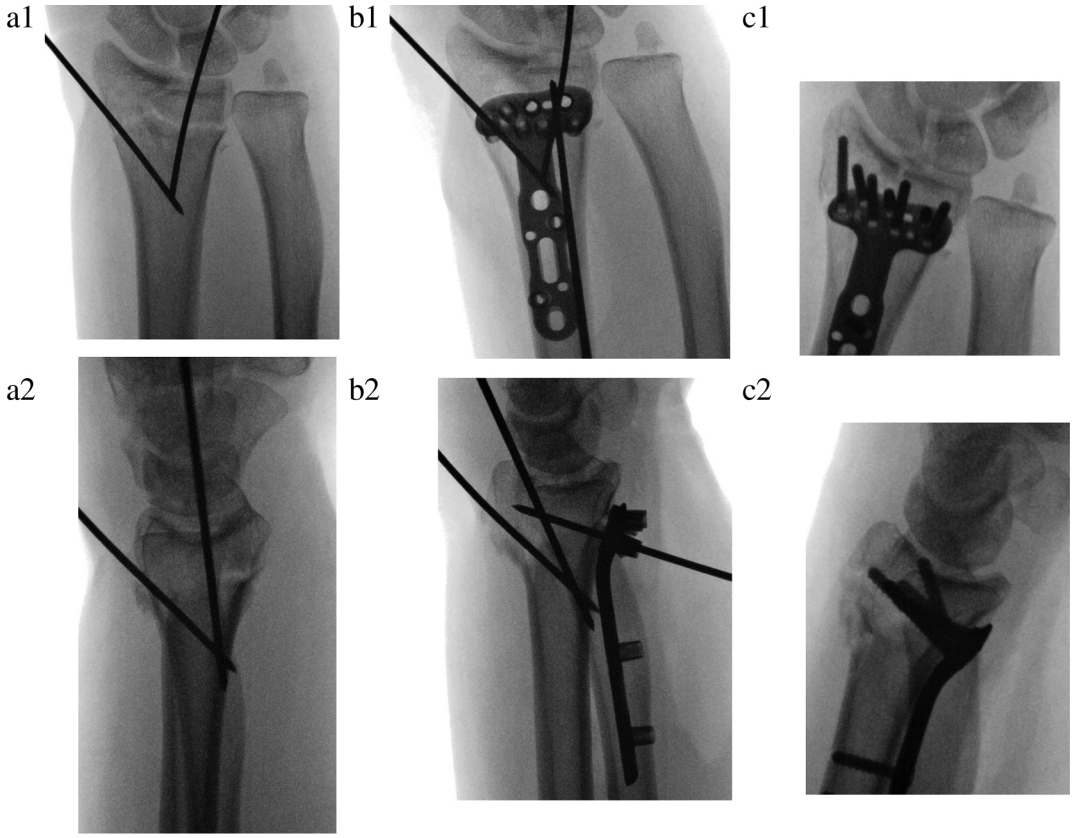

Fig. 2. (a) Fracture temporally fixed with two K-wires. Note insufficient restoration of the palmar tilt and a persistent intra-articular step-off. (b) Temporally fixation of the plate with the first K-wire. Note that the plate is fixed to the distal end of the radius (distal fragment first technique). The volar tilt is restored by reducing the proximal part of the plate to the radial shaft. (c) Final result after arthroscopic fine-tuning of the intra-articular step with insertion of the distal locking screws/pegs and finally reducing the proximal part of the plate against the radius.