High rate of complications following volar plating of distal radius fractures

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ABSTRACT

INTRODUCTION: Fracture of the distal radius (DRF) is one of the most common fractures treated by orthopaedic surgeons. The most common operative treatments of these fractures are open reduction and internal fixation. The incidents and types of complications associated with the use of these operations have not been studied in detail. **MATERIAL AND METHODS:** We performed a retrospective study documenting types of complications and their occurrence in a group of patients who received open reduction and internal fixation. Our definition of a complications which required an operation, or suffered from complex regional pain syndrome, or skin healing problems lasting more than four weeks from the operation.

RESULTS: A total of 165 patients were included. In all, 39 complications in 30 wrists were registered: i.e. 18% had a minimum of one complication.

CONCLUSION: Our finding that 18% suffer from a serious complication when treated using a volar locking plate must be taken into consideration when surgeons choose between conservative or operative treatment for DRF treatment. A few other studies have looked at the incidents of complications and have reported similar results. **FUNDING:** not relevant.

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Displaced/unstable distal radius fractures (DRFs) can be managed in many ways: plaster cast, closed reduction and plaster cast; and various methods of osteosynthesis are available: external fixation, percutaneous fixation using k-wires and internal fixation using screws with or without plating. Furthermore, many different kinds of plates are available. In Denmark, the plates most commonly used for treating these fractures are locking plates (**Figure 1**) [1].

Until recently, most displaced/unstable DRFs were treated by closed reduction, with or without percutaneous fixation, using k-wires. Open reduction and internal fixation (using first dorsal locking plating and later volar locking plates) have become the standard treatment within the past decade [2, 3]. Many studies have shown that volar plating allows for early mobilisation owing to stable fixation.

Volar plating has become the treatment of choice

despite the scarcity of studies documenting which complications the patient may experience when receiving this treatment and how often such complications occur [4, 5]. When a dorsal plating technique is used, tendinitis and rupture of extensor tendons are common and well documented [6].

The purpose of this study was to document complications associated with the use of a volar plating technique. **Figure 2** shows a correctly placed volar locking plate and an inserted plate, where at least one screw is too long.

MATERIAL AND METHODS

We included all adult patients who were operated on using an anatomic volar locking plate due to a displaced DRF between 1 January 2008 and 31 December 2009 at Kolding Hospital, Denmark.

A displaced DRF was defined as a DRF with or without a fracture of the ulnar styloid process, with: 1) dorsal tilt of the radius fragment > 12 degrees, > 2 mm loss of radial height, < 10 degree of radial inclination or > 2 mm intra-articular displacement.

A total of 16 patients were excluded due to incomplete follow up, central/peripheral neuropathy, open fractures, or additional fractures in the same arm. The minimum follow-up period was one year. After exclusion, 165 persons were included (132 women and 33 men. Their average age was 61 years).

Data were collected using the patients' files and X-rays. Our definition of a complication is presented in **Table 1**. We only accepted the first five complications as genuine complications if the symptoms were so severe that the patient underwent a re-operation because of these complications.

Insufficient osteosynthesis was only defined as a complication if the patient underwent a re-operation due to at least one of the following:

- The primary osteosynthesis was so unstable that the fracture collapsed into an unacceptable position and was re-operated.
- 2) A misplaced plate or screw, which resulted in a re-operation.
- Unacceptable position of fracture at the primary operation, which resulted in a re-operation.

ORIGINAL ARTICLE

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FIGURE 1



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A. A correctly placed volar locking plate. B. An inserted plate where at least one screw is too long.



Unacceptable position was defined as a dorsal tilt > 12 degrees, > 2mm loss of radial height, < 10 degree of radial inclination or > 2 mm intra-articular displacement which resulted in a re-operation.

Skin healing problems were only defined as a complication if there was a lack of healing four weeks after the primary operation.

Trial registration: not relevant.

RESULTS

We registered 39 complications. A total of 30 of the 165 patients experienced at least one complication: 30/165 = 18% (nine patients experienced two complications). Table 1 shows how many of the various complications occurred.

CONCLUSION

18% of the included patients experienced at least one serious complication. This is a higher incidence than expected. We have no reason to believe that this unexpectedly high incidence is due to a learning curve because these volar plates were introduced and used frequently at least two years before this study was performed. All operations were performed by a gualified orthopaedic surgeon or by a more junior colleague who was supervised by a qualified orthopaedic surgeon. Our results are similar to the results reported from other similar studies. We have been able to identify other studies [6-9], which also investigated the complication rate when performing this surgery using volar plating. They did not all include as many patients, their definition of complications was slightly different, and their reported complication rate was in the 8-27% range.

A recent systematic review concluded [10] that operation, whether performed using external fixation, percutaneous pining or volar plating, does not necessarily provide a better outcome than casting alone. A prospective randomised study compared non-operative treatment with volar locking plate in patients above the age of 60 years. They concluded that grip force and bone position were significantly better when operated on, but function and pain were the same after six months. There were significantly more complications when the treatment was operation [11].

There are not enough studies comparing conservative treatment with operative treatment in patients below the age of 65 years. Some of the complications are iatrogenic and can be avoided by improving the surgical technique. Awareness of the "typical" complications could yield a decrease in the number of complications if the surgeon is particularly careful to avoid these complications [2].

TABLE 1

Types and numbers of complications.

	n
Carpal tunnel syndrome	12
Tendon irritation or rupture	9
Insufficient osteosynthesis	12
Reduced range of motion	1
Infection	2
Complex regional pain syndrome	2
Skin healing problems	1
All complications	39

A recent meta-analysis studying complications following volar or dorsal plating concluded that there is no difference between the two groups with regard to the overall rate of complications. Compared with the dorsal approach, volar fixation was associated with a significant increase in carpal tunnel syndrome and neuropathy, and a reduction in tendon irritations [12].

As it is difficult to achieve a significantly better outcome in patients above 65 years of age through operative treatment [10, 11], and as a considerable number of patients experience serious complications, operative treatment has to be used scarcely in this group of patients [6-11].

Open reduction and internal fixation has become the "gold standard" when treating Colles' fractures in Denmark, but precise data regarding the frequency of complications are not available. The present study is the first of its kind in Denmark, and it is hoped that it will form part of the decision basis for prioritising among available treatment options. A workgroup is currently preparing a national guideline regarding the treatment of distal radius fractures to help ensure that patients will receive the best treatment across Denmark.

The primary sector should also be aware of the most common complications to ensure that these are diagnosed early and treated appropriately. Radiologists should be especially aware of insufficient osteosynthesis and too long/malplaced screws.

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LITERATURE

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