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Successful surgery to reduce and fixate with the plate of neglected, displaced fracture of the distal radius

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ABSTRACT

Treatment of neglected, displaced or united distal radial fractures (DRFs) is difficult, because it requires either wedging the almost consolidated fracture and reduction to the correct position, or cutting the united bone and putting it in the correct position (corrective osteotomy). Both treatments are associated with the risk of failure and complications. The paper presents a case of almost fully united DRF in a man, in whom 5 weeks after the injury, and after unsuccessful primary fixation with K-wires, the bone fragments were surgically wedged, aligned and fixed with a palmar plate. The result of treatment after 2 months was satisfactory. Early surgery allowed for a significant shortening of the recovery period and allowed the patient to return to work.
Keywords: distal radial fracture; failure of surgery; secondary displacement; corrective operation.

INTRODUCTION

Distal radial fractures (DRFs) are the second common type of fractures encountered in the emergency room, with an incidence of 16–32 fractures per 10,000 person/year [1]. Treatment options for DRFs vary from conservative treatment by close reduction and casting, to surgical methods such as close reduction and K-wire pinning, open reduction and internal fixation with locking plates and external fixation [2]. The effectiveness of these treatments (bony union in anatomical position) depends on various factors, including fracture configuration, age of the patient and quality of bone stock. The choice of treatment method should take into account several factors, of which fracture configuration is one of the most important. In general, simple fractures such as non- or slightly displaced and extraarticular are relatively easy to reduce and maintain correct position until the fracture will consolidate. In contrast, severely displaced, intra-articular and comminuted fractures tend to secondary displacement even after perfect reduction, and, therefore, they rather require surgery [2]. Surgical treatment also shows various effectiveness, depending on the fracture configuration: multi-fragmental, comminuted fractures and those with palmar displacement – need stable fixation with plates, whereas less displaced (more stable) ones can be addressed by K-wire fixation [2, 3]. In the surgical treatment of these fractures, the rule is to capture each fragment of the distal radius with a wire or plate. Missing this rule usually results in secondary displacement and malunion (union in non-anatomical position). Choosing the inadequate method of surgical treatment can also lead to secondary displacement of bone fragments and in malunion [2, 3, 4].

This report presents a case of a patient who sustained DRF with severe displacement. This patient was primary operated on by K-wire fixation of bone fragments, but an X-ray taken at 5 weeks showed secondary displacement and malunion of the fracture. The patient was given surgery and the operation allowed successful reposition of almost consolidated bone fragments, followed by fracture fixation with a palmar plate.

CASE REPORT

A 46-year-old male patient sustained comminuted, multifragmentary DRF of his left, non-dominated hand, following a fall down the stairs. He presented in authors' institution 2 days after the accident and was admitted to the hospital. An X-ray showed comminuted fracture of AO type C2, with concomitant distal radio-ulnar joint (DRUJ) dislocation (Fig. 1). The fracture was provisionally reduced under local anesthesia and immobilized in a plaster splint (Fig. 2). Next day the patient was given surgery. The operation was performed under brachial plexus block anesthesia and with a tourniquet. Dynamic assessment of the fracture under a fluoroscope raised hope for the possibility of a closed reduction of the fracture and fixation with K-wires. The reduction was achieved using Kapandji technique followed by fixation of bone fragments with K-wires. As there was a concomitant DRUJ dislocation, the joint congruity has been restored and the joint has been transfixed with single K-wire. Post-operative X-ray showed acceptable bone fragment's position in the distal radius (Fig. 3a), however on the lateral view, an incongruity of articular surface of the distal radius was seen and that palmar fragment of the bone was not fixed with K-wire (Fig. 3b). These findings were ignored, because the treating doctors hoped that the fracture would not be displaced in the course of healing. Unfortunately, at final radiological assessment at 5 weeks after surgery, it turned out that the fracture had been displaced and position of bone fragments was unacceptable (Fig. 4). The authors faced a dilemma, whether to leave the fracture until full

union and next corrective osteotomy, or to operate it immediately with the hope that reduction of the fracture will still be possible. The latter option was elected and the patient was given secondary surgery, 5 weeks after the first one.

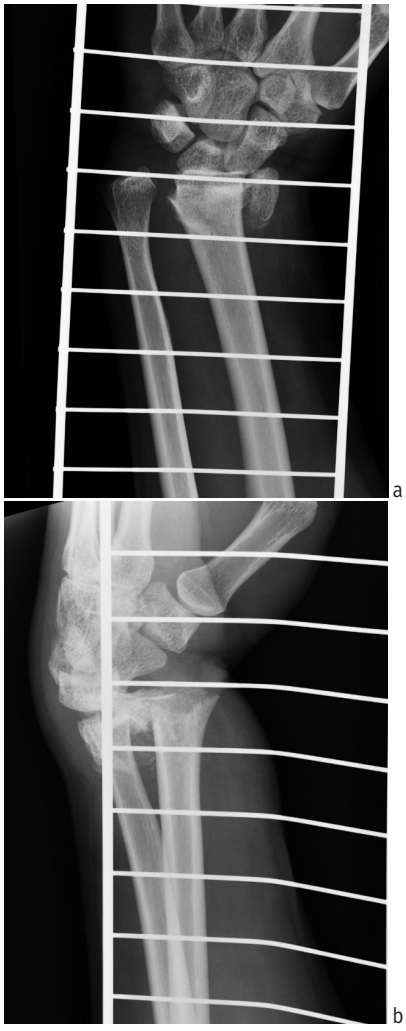
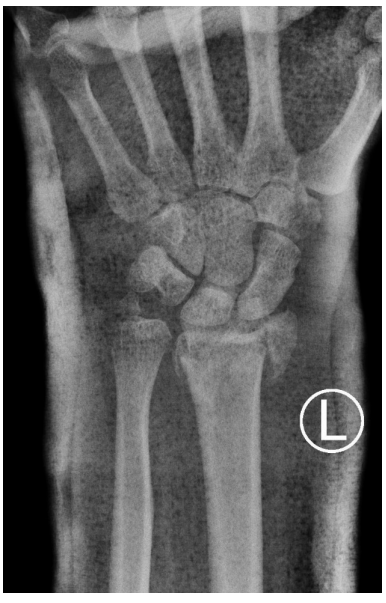


FIGURE 1. The fracture at presentation: a) p-a view; b) lateral view



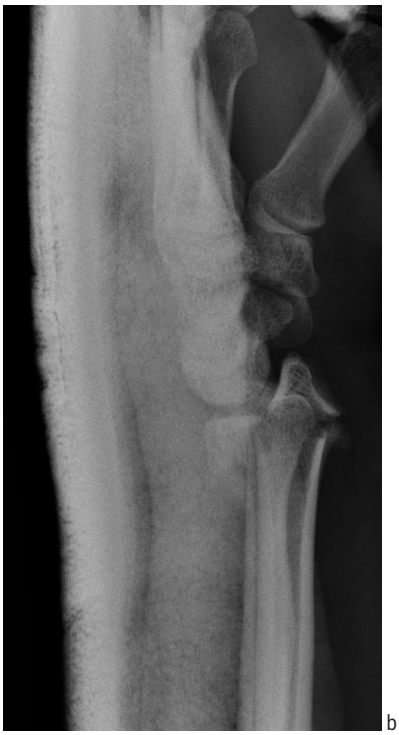


FIGURE 2. The fracture after initial reduction: a) p-a view; b) lateral view

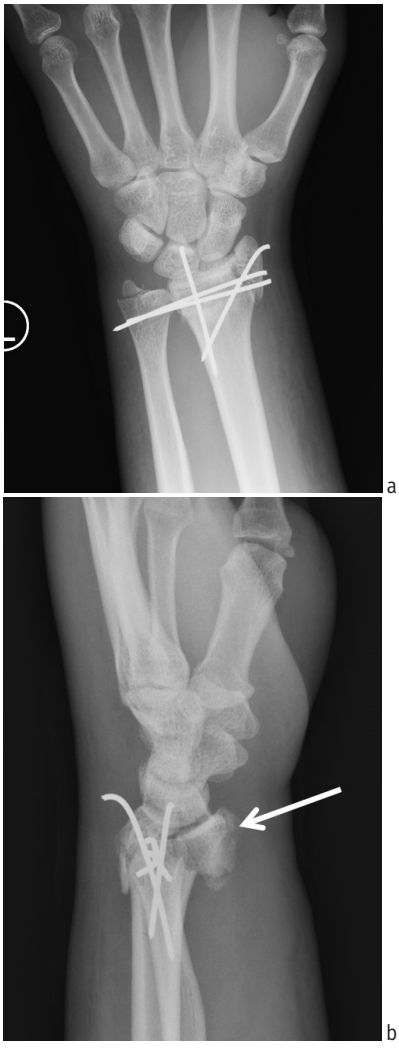


FIGURE 3. The fracture after first operation by K-wire fixation: a) p-a view; b) lateral view

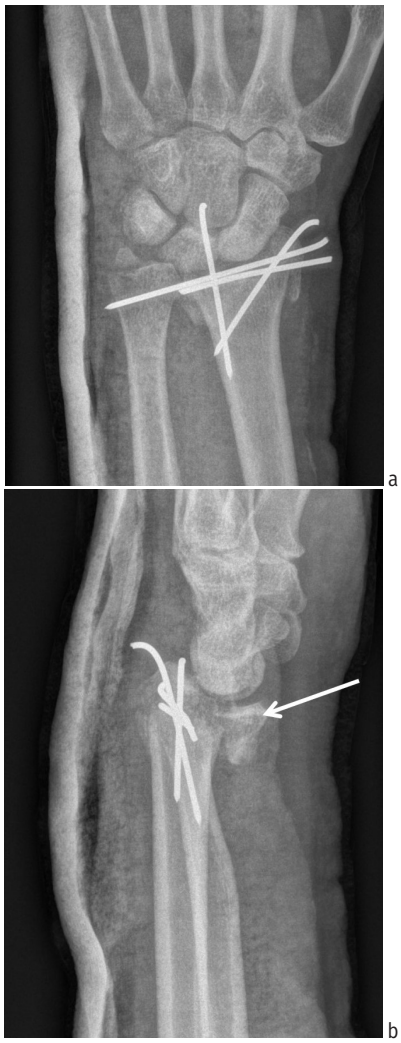


FIGURE 4. The fracture at 5 weeks: a) p-a view; b) note displacement of the palmar fragment (lateral view)

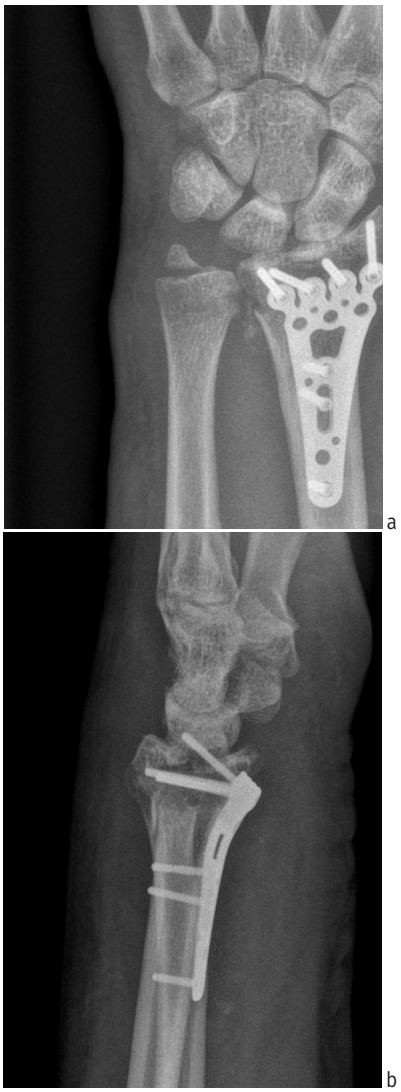


FIGURE 5. Post-operative X-ray after open reduction and internal fixation of the fracture: a) p–a view; b) lateral view

The operation was performed under brachial plexus block anaesthesia, with a tourniquet and under fluoroscopic control. The fracture of the distal radius was approached via palmar incision in the distal forearm. After exposition of the fracture, the palmar fragment was cut sharply using a chisel and separated form the rest of the bone. Then, the wrist was stretched using a manual traction to create space for the separated fragment. Next, the bone fragment managed to be pushed into place what was confirmed radiologically on fluoroscope display. After achieving reduction of the fracture, bone fragments were fixed with a locking palmar plate. The wrist was immobilized in a short plaster splint. Post-operative X-ray showed correct shape of the distal radius both in p–a and lateral views (Fig. 5). Then, the patient was followed-up in an out-patient clinic. Post-operative course was uneventful, the splint was removed at 2 weeks an he was referred to physiotherapy. One month after operation the patient presented with good hand function: he had full finger flexion and extension and grip strength of 20 kg (78% of the healthy hand). The patient was satisfied from the treatment outcome and he was ready to go back to work.

DISCUSSION

The case report presented in the paper is a rare example of delayed surgical correction of neglected DRF, which practically malunited. In such a situation, most surgeons choose awaiting until full bone union, and then perform corrective surgery. However, such a scenario is less beneficial for the patient than immediate surgery, because it prolongs the treatment period, and corrective osteotomy is more difficult and less predictable procedure than open reduction and internal fixation of the fracture. Therefore, it seems that the presented treatment option was optimal and allowed the patient to return to work relatively quickly. The second message of this case is a warning that the choice of the wrong method of treatment, such as K-wire fixation of severe, comminuted DRF, with palmar and dorsal displacement, usually ends in failure and the need for repeated surgery. Moreover, leaving the unstable palmar fragment of the fracture unfixed was inappropriate, because, according to the rule mentioned in the introduction, such a fragment is most likely to be displaced, which happened in the reported case.

LITERATURE REVIEW

There are not many studies and cases reports regarding delayed surgery for neglected DRFs. Some of them will be discussed below.

Weil et al. compared results of operative treatment with palmar plate fixation of DRF in 40 patients presenting more than 3 weeks after injury with 75 age-matched controls with acute fracture repair. The same surgical approach was used in both groups, and no osteotomy was required in patients with delayed fractures. Average age was 53 years in both groups and a mean follow-up was 3.4 years. At the final assessment, function of the hand measured with the quick The Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire was statistically significantly better in control group, comparing to delayed surgery group (6 vs 27 points), however, when controlling for 2 outlier cases with complications (hardware irritation and a sensory neuropathy) there was no significant difference. Radiological parameters (palmar tilt, radial inclination and radial length) were similar in both groups and were within normal anatomical values. The authors conclude that delayed operative fixation of displaced DRFs is a viable option for cases that were presented late, with predictable, favourable results. Neither extensile approaches nor formal osteotomies are required [5].

Howard et al. reported results of a retrospective cohort study aimed to assess whether there was any difference in outcome between patients receiving timely or delayed surgery for displaced, unstable DRFs. The Patient-Rated Wrist Evaluation score obtained at more than 1 year after injury was the primary outcome measure. Data from 380 patients treated at 2 district general hospitals over a 5-year period were obtained using electronic databases to capture the treatment details and postal questionnaires to assess current function. The study showed no statistical or clinical differences in outcome measures between the timely or delayed surgical treatments in the treatment groups [6].

Keçeci et al. reported results of retrospective study investigating the effectiveness of surgical treatment by palmar plate fixation in patients with distal radius fractures treated conservatively, in whom secondary displacement occurred during follow-ups. Specifically the study assessed the impact of early surgery (<3 weeks) vs delayed surgery (3–6 weeks). A total of 131 patients were recruited, of whom 42 patients (32%) had delayed surgery, whereas 89 (78%) received early surgical treatment. The mean follow-up was 1.5 years. The primary outcome measure was hand function in daily activities assessed with DASH questionnaires. Results showed similar DASH scores in both groups (8 vs 11 points, respectively) indicating normal hand function. Also assessment of quality of life with Short-Form 12 questionnaire showed similar results in both groups. Complications, including carpal tunnel syndrome, superficial radial nerve neuropraxia, and complex regional pain syndrome, occurred in 12 patients (13%) in early fixation group, and 9 (21%) of delayed fixation group (difference statistically significant). Radiological measurements were similar in the 2 groups. The authors conclude that although clinical and radiological results of early and delayed surgery after DRFs were similar, the latter option is associated with significantly higher complication risk [7].

In contrast, Nowak et al. reported different results of the study comparing reoperations following DRFs managed with early fixation versus delayed fixation following initial closed reduction. The authors used administrative databases in Ontario, Canada, to identify DRF patients aged 18 years or older 2003–2016 and used multivariable regression to compare the association between early vs delayed operation and reoperation for all patients. The analysed group included 14,960, of whom 8339 (56%) underwent early surgical fixation at a mean 3 days after injury. In contrast, 4042 patients (27%) underwent delayed fixation between 8–14 days (mean 10 days), 1892 (13%) between 14–21 days (mean 17 days) and 687 (5%) >21 days (mean 25 days) post-fracture. The results of this analysis showed that patients who underwent delayed fixation >21 days post-fracture had a higher odds of reoperation (OR = 1.33; 95%CI: 1.11–1.79) comparing to early fixation groups. This results were worse in patients aged over 60 years. No difference was found in the odds of reoperation for patients who underwent delayed fixation within 8–14 or 15–21 days post-fracture (vs. early fixation). The authors conclude that DRFs with unacceptable closes reduction should be managed within 3 weeks to avoid detrimental outcomes, as results of surgery delayed more than 3 weeks are unfavourable [8].

Julian et al. reported results of a systematic review of the literature investigating the impact of timing of surgical intervention for distal radius fractures and the impact of time to surgery on outcomes. A total of 15 studies were included in the analysis. Ten trials (67%) found no significant differences in time to surgery as defined by early or delayed surgical intervention. Outcome measures included clinical outcome significance (complication rates, reoperation rates, range of motion), patient reported outcomes measures (i.e. DASH or Patient Reported Wrist Evaluation questionnaires) and radiographic measurements (i.e. palmar tilt, radial inclination, and radial height). In contrast, 5 trials found significant differences in time to surgery, at a surgical delay of greater than one week or 2 weeks on clinical and/or radiological outcomes. The significant differences in PROMs were found at were utilized the DASH and the Michigan Hand Outcomes Questionnaire. Clinical outcomes included increased finger and thumb stiffness (>2 weeks delay), decreased functional outcomes in wrist flexion and ulnar deviation at a delay of surgery of greater than one week, and more than triple the odds of experiencing chronic pain with a 1-week delay to surgery. One study found that patients who had surgery within 7 days of injury had better short-term clinical outcomes, with the delayed group showing significantly worse DASH scores, grip strength, and wrist motion at 3 months. However, in a longer perspective (at 1 year assessment these differences disappeared). The authors conclude that the evidence available to date do not allow for an unequivocal statement whether the delay of surgery adversely affects the outcome of treatment [9]. Nevertheless, it must be stated that it certainly does not improve these results and therefore it is better to operate

on patients at the optimal time after the injury than with a significant delay. However, the presented case shows that even when the fracture is practically united, it can be corrected and a satisfying result can be obtained [9].

The author did not find similar case in Polish literature what prompted him to submit this report for publication.

REFERENCES

1. Rundgren J, Bojan A, Mellstrand Navarro C, Enocson A. Epidemiology, classification, treatment and mortality of distal radius fractures in adults: an observational study of 23,394 fractures from the national Swedish fracture register. BMC Musculoskelet Disord 2020;21(1):88. doi: 10.1186/s12891-020-3097-8.
2. Żyluk A, Janowski P, Szlosser Z, Puchalski P. Percutaneous K-wires vs palmar locking plate fixation for different types of distal radial fractures: a comparison of the outcomes of two methods to controll our guidelines. Handchir Mikrochir Plast Chir 2018;50(5):319-25. doi: 10.1055/a-0751-2886.
3. Bell JA, James NF, Mauck BM, Calandruccio JH, Weller WJ. The pitfalls of difficult distal radius fractures and provisional reduction. Orthop Clin North Am 2024;55(1):113-22. doi: 10.1016/j.ocl.2023.05.012.
4. Skała K, Żyluk A. Health-related quality of life after fractures of the distal radius: a review of literature. Pol Orthop Traumatol 2013;78:183-6.
5. Weil YA, Mosheiff R, Firman S, Liebergall M, Khoury A. Outcome of delayed primary internal fixation of distal radius fractures: a comparative study. Injury 2014;45(6):960-4. doi: 10.1016/j.injury.2014.02.011.
6. Howard M, Curtis A, Everett S, Harries L, Donaldson O, Sheridan B. Does a delay in surgery for distal radial fractures affect patient outcome? J Hand Surg Eur Vol 2021;46(1):69-74. doi: 10.1177/1753193420941319.
7. Keçeci T, Karagöz B, Ağır İ. Effectiveness of delayed surgical treatment for distal radius fractures with loss of reduction. J Hand Surg Am 2024:S0363-5023(24)00312-5. doi: 10.1016/j.jhsa.2024.07.006.
8. Nowak LL, Moktar J, Henry P, Dejong T, McKee MD, Schemitsch EH. Delayed fixation of distal radial fractures beyond three weeks after initial failed closed reduction increases the odds of reoperation. Bone Joint J 2024;106-B(11):1257-62. doi: 10.1302/0301-620X.106B11.BJJ-2023-1349.R1.
9. Julian KR, Truong NM, Leversedge C, Kwong JW, Rosinski A, Kamal RN, et al. Does time to surgery for distal radius fractures impact clinical and radiographic outcomes? A systematic literature review. Curr Orthop Pract 2023;34(5):229-35.