

PERCUTANEOUS REDUCTION TECHNIQUE OF DEPRESSED ARTICULAR FRAGMENT OF PHALANX AND METACARPAL BONE

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SUMMARY

Introduction: *Depressed fractures of the base articular surface are not unusual. With the percutaneous reduction via bone marrow method, depressed fragments are reduced without additional periarticular tissue damage.* **Materials and methods:** *Fifty five joints were treated with percutaneous reduction.* **Outcome:** *ROM of the injured joint was higher than 80% in comparison with the uninjured joint. Discussion: Pain increased in proportion to the greater step off suggesting the importance of reduction at the joint surface.* Riv Chir Mano 2006; 3: 294-297

KEY WORDS

Phalangeal fracture, metacarpal fracture, fracture-dislocation, depressed fragment, percutaneous reduction

INTRODUCTION

Since Wilson's report (1), it has been widely known that dorsal fracture-dislocations of the PIP joint sometimes involves depressed fragments, and there have been many discussions about the treatment method (2). Also, fracture-dislocations of the CM, MP and DIP joints often involve depressed fracture of the base articular surface of the metacarpal and the phalanges. The fact is that depressed fractures do exist even in a non-dislocated case. I have expanded the indication for the percutaneous reduction via bone marrow method proposed by Hintringer (3, 4). In this presentation, cases treated with this method during the past 20 years will be discussed.

MATERIALS AND METHODS

The actual steps of the percutaneous reduction via bone marrow method are: 1. drill into the distal

shaft of the depressed fragment, 2. place the tip of the K wire inserted from the hole, which was created in step 1, on the bone marrow side of the depressed fragment under C-arm control, 3. push out the depressed fragment from the bone marrow side, pushing against the corresponding convex side of the joint, and 4. finally achieving reduction of the joint with K wire extension-block method (3). This method described above has an indication for simple depressed articular surface fractures, and also those fractures associated with fracture-dislocations.

Since 1986 sixty-five cases have been treated. Fifty four cases on 55 bones were available for follow up until the postoperative ROM reached plateau, and were examined for pain, ROM and osteoarthritic change on the X-ray.

OUTCOMES

Of the 54 cases on 55 fractures, 43 cases were male and 11 were female. The age ranged from 16

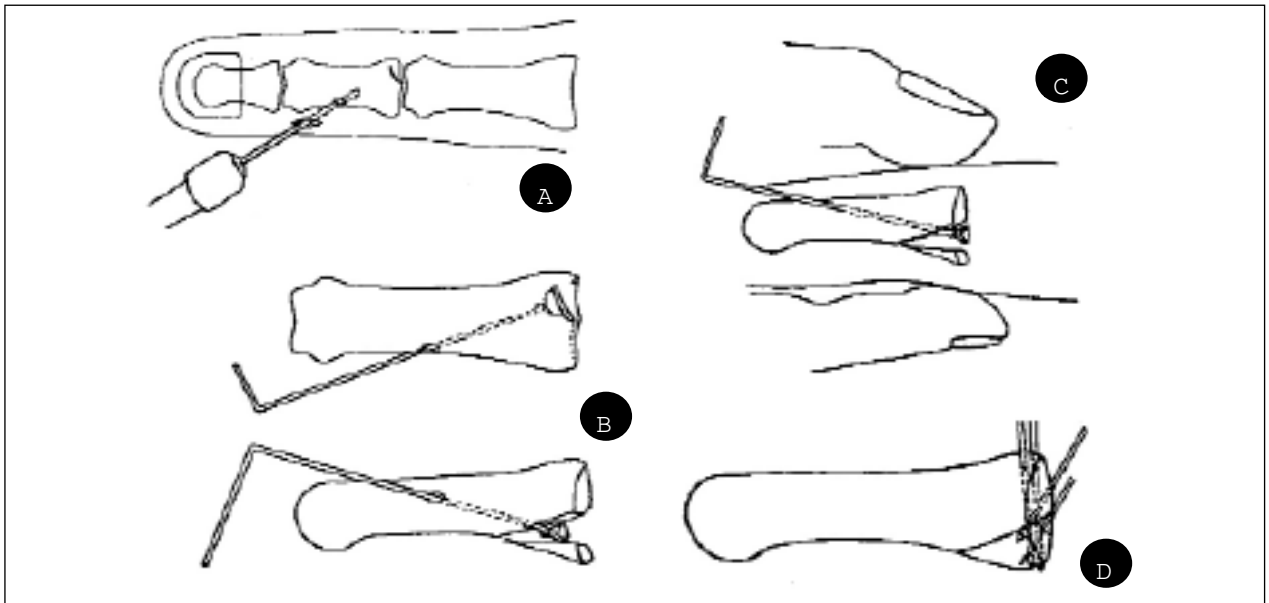


Figure 1. Method of reduction. A) Skin incision and drilling of the shaft (1.5mm K wire); B) Insertion of 1 mm K wire and reduction of depressed fragment; C) Manual reduction of split fragments; D) Pinning like lattice form.

to 75 years of age (avg. 30.6). Twenty eight fractures occurred on the right hand and 27 on the left. The injured sites are as follows: 3 cases in thumb ray, 11 in index ray, 11 in middle finger ray, 8 in ring finger ray and 22 in little finger ray. The injured joints are: 12 CM, 4 MP, 29 PIP, 8 DIP and 2 IP. Forty four fingers were dislocated on their ini-

tial visit. The follow up period was 52~1910 (avg. 255) days. At the time of final follow up, 33% (18 fractures) experienced pain, most of them had only minor tensile pain on maximum flexion, and 3 cases (6%) experienced difficulty performing their occupational functions. Fifty one percent showed no step off on the x-ray, and only one case had



Figure 2. Case 1, 22 year old male. He fell from a motorcycle and sustained a comminuted dorsal fracture-dislocation of the PIP joint of the right ring finger (A). The next day following the injury, percutaneous reduction via bone marrow method and K wire extension block*5 was performed (B). Four months later, ROM of the PIPj was 81° (uninjured side: 101°), TAM (total active range of motion) was 247° (uninjured side: 256°). Slight pain occurred only at maximum flexion, and the x-ray displayed slight evidence of osteophyte formation on the dorsal side of the articular surface (C).

Table 1. *Unreduced step off (mm) and pain (cases).*

step off	Pain	None	Tensile sensation	Rare	Intermittent	Moderate
0		22	1	1	2	
<0.5		9		1	3	
<1.0		5	2	1	4	
<2.0		1			1	
<3.0					2	

Table 2. *Unreduced step off (mm) and osteoarthritic (cases).*

Pain	OA	None	Torace Evidence	Light	Moderate	Severe
0		22	2	1		
<0.5		2	5	1	1	1
<1.0		2	2	5	1	
<2.0		1	2			
<3.0			1		1	1

3 mm step off. Forty nine cases, with more than 180 postoperative days, were examined for the osteoarthritic change, and 9% displayed the condition.

DISCUSSION/CONCLUSIONS

Until now, depressed fractures of the articular surface associated with dorsal fracture-dislocation of the PIP joint have been drawing attention, and numerous discussions have arisen concerning the necessity of reduction and the technique used for reduction. Precise reduction is preferable, but the open reduction causes additional trauma to the periarticular tissue. The percutaneous reduction via bone marrow method allows reduction of the depressed fragments with minimum influence to the periarticular tissue. Comparing the step off at the articular surface and the results, if the step off was bigger than 2 mm, pain occurred in all cases. Even if the step off was smaller than 2 mm, the tendency was that the bigger the step off, the greater the occurrence of pain (Tab. 1). It also had a tendency

that the frequency of osteoarthritic change occurrence became higher with the existence of the step off at the articular surface (Tab. 2). The final ROM depends on the severity of the original injury; however, joint surface reduction with less than 0.5 mm step off was achievable in 89% of the cases. None of the cases had strong enough pain to hinder patients from doing ADL. It is a natural result that the better the articular joint reduction achieved, the better the results are. But what about the possibility of negative influence to the ROM on the joint as a result of this technique? The injury on the DIP joint displayed limited ROM (66% of uninjured side). But as far as the injuries to other areas, an injured joint displayed 80% or more ROM of the uninjured side. Knowing that this technique was originally used for the treatment of joint injury cases, this is adequate enough ROM.

When treating an injured joint such as a depressed fracture of the articular surface no additional injury should be made to the already injured joint. In that respect, the technique presented here is almost an ideal treatment technique with the expectation that this technique will be widely accepted.

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