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## Rayhack

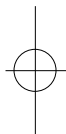
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= Abstract =

### Surgical Treatment for Unstable Intra-articular Fracture of the Distal Radius with Rayhack 's Transulnar Percutaneous Pinning Technique

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There has been many treatment modalities in the distal radius fracture. Although there is no doubt that external fixators have a role in the treatment of some highly displaced distal radius fractures, many unstable distal radius fractures may be treated adequately with far less complicated and intrusive percutaneous pinning technique.

The purpose of this study was to evaluate indication and effectiveness of Rayhack 's transulnar percutaneous pinning technique. Authors reviewed the unstable intra-articular fracture of the distal radius of 15 cases treated with Rayhack 's transulnar percutaneous pinning technique between March 1994 and February 1997. At the final follow-up examination, the mean loss of radial length, radial inclination and volar tilt was respectively 0.4mm (3.9%), 2.0 (10.6%), 2.1 (14.7%). Posttraumatic arthritis was occurred in 1 case (11.1%) of less than 1mm residual articular step-off, 2 cases (40%) of more than 1mm and less than 3mm residual articular step-off, 1 case (100%) of more than 3mm residual articular step-off. Distal radioulnar joint synostosis by percutaneous pinning was not found. According to Demerit point rating system,

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excellent to good results were obtained in 73.3%.

Authors suggest that Rayhack 's pinning technique can be applied in terms of simple procedure, cost-effectiveness and functional outcome.

**Key Words** : Distal radius, Unstable intra-articular fracture, Rayhack 's transulnar percutaneous pinning

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Frykman

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Rayhack

K-

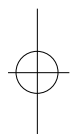
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**Table 1.** Rayhack classification of distal radius fractures

I. Non-articular	Non-displaced
II. Non-articular	Displaced
A. Reducible*	Stable
B. Reducible*	Unstable
C. Irreducible*	
III. Articular	Non-displaced
IV. Articular	Displaced
A. Reducible*	Stable
B. Reducible*	Unstable
C. Irreducible*	

\* By ligamentotaxis only

1994 3 1997 2 3 75 15 Rayhack K- 1. 50 60 , 20 30 8 (53.3%) 42 (20-77), 8



**Table 2.** Demerit point rating system

	Points
Residual deformity (range, 0 to 3 points)	
Prominent ulnar styloid	1
Residual dorsal tilt	2
Radial deviation of hand	2 or 3
Subjective evaluation (range, 0 to 6 points)	
Excellent-no pain, disability, or limitation of motion	0
Good-occasional pain, slight limitation of motion, and no disability	2
Fair-occasional pain, some limitation of motion, feeling of weakness in wrist no particular disability if careful, and activities slightly restricted	4
Poor-pain, limitation of motion, disability, and activities more or less markedly restricted	6
Objective evaluation (range, 0 to 5 points)	
Dorsiflexion < 45°	5
Ulnar deviation < 30°	3
Supination < 50°	2
Pronation < 50°	2
Palmar flexion < 30°	1
Radial deviation < 15°	1
Loss of circumduction	1
Pain in distal radio-ulnar joint	1
Grip strength < 60% of uninjured side	1
Complications (range, 0 to 5 points)	
Arthritic change	
Minimum	1
Minimum with pain	3
Moderate	2
Moderate with pain	4
Severe	3
Severe with pain	5
Nerve complications (median)	1 to 3
Poor finger function due to cast	1 to 2
Final results (range of points)	
Excellent	0 to 2
Good	3 to 8
Fair	9 to 20
Poor	21

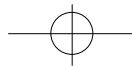
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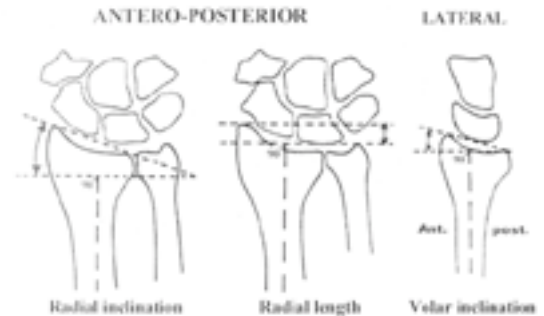
K-  
17,19)

Rayhack

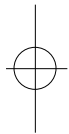
, X-

**Table 3.** Arthritis grading

Grade	Findings
0	None
1	Slight joint-space narrowing
2	Marked joint space narrowing, osteophyte formation
3	Bone-on-bone, osteophyte formation, cyst formation

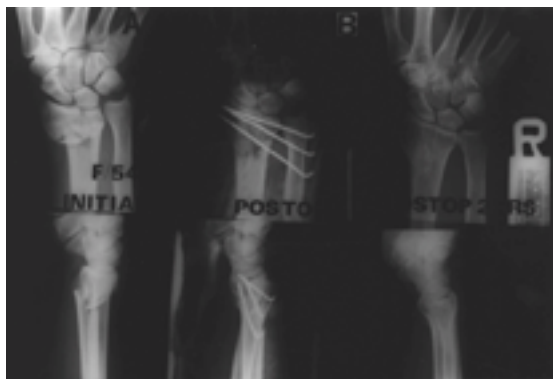
**Fig 1.** Radiologic measurement of volar inclination, radial inclination and radial length.**Table 4.** Result according to radiologic assessment

Radiologic assessment	Preop.	Postop.	Last F/U	Loss %
Radial length (mm)	5.4	9.9	9.4	5(5.1%)
Radial tilt (°)	11.8	22.1	20.2	1.9(8.6%)
Volar tilt (°)	3.6	6.4	5.3	6.1(7.1%)



가 K- (butress) 2-4 (Fig 2). K- X- , K- (Ligamentotaxis) 3 die punch fracture(radio-lunate fracture, Mayo type III) K- Rayhack . K- U 4-5 , U , 4-5 , 2 K- 6-7 K- .

1 가 15 point rating system<sup>20)</sup> 가, Sarmiento Demerit , 가 4 (Table 2). Demerit point rating system 5 , 6 , 4 , , 15 11 (73.3%) . (Fig 1), (residual articular step off) Knirk <sup>14)</sup> (Table 3). 0.4 mm (3.9%) 2.0 (10.6%), 2.1 (14.7%) (Table 4). 1mm 9 1 , 1mm 3mm 5 2 , 3mm 1 15 Grade 0 10 , Grade 1 3 , Grade 2 7 1 , Grade 3 0 .



**Fig 2.** A. 54 years-old woman with Frykman type III, A. initial radiograph, B. postoperative radiograph, C. postoperative 2 years radiograph of the complete union state.



**Fig 3.** This photograph shows full flexion, extension, pronation and supination at last follow up.

(synostosis),

, , K- (breakage)  
(migration)

Frykman

Rayhack

Frykman

7

8

60%

, Rayhack

가

(Ligamentotaxis)

12

3

1814

Colles<sup>8)</sup>가

가

. Gartland Werley<sup>12)</sup>

20 , 30

53.3%

3

, Frykman<sup>11)</sup>

가

가 20o

10 mm

8가

4

Melone<sup>16)</sup>

가

Weber

Szabo<sup>21)</sup>

. AO-ASIF

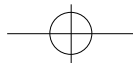
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90

가가

3

7). Rayhack<sup>18)</sup>



가 20),  
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 (synostosis),  
 ,  
 , 가 ,  
 . (Fig 3). Jenkins  
 13) 4 , Rayhack<sup>19)</sup> 6 , Cooney<sup>9,10)</sup> 10  
 (Ligamentotaxis) 6 8  
 2,3,11).  
 U 4-5  
 1,2,5). 2 ,  
 4-5 .  
 ,  
 triangular fibrocartilage 가 .  
 Lidstrom<sup>15)</sup> (volar tilt),  
 (radial length), Frykman<sup>11)</sup> 가  
 (radial inclination),  
 6). , Knirk  
 1989 Jupiter<sup>14)</sup> 2mm (step-off)  
 Rayhack 100% , 2/3가  
 K- (congruent)  
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 Rayhack . ,  
 가 가  
 , die punch fragment 4,14).  
 K- (incongruent)  
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 가 . Rayhack  
 Smith  
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 K-  
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 Rayhack





가가 15  
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가 Rayhack  
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