



❖ : 2003 4 18 ()
❖ :

❖ 2003 4 18 () ❖

❖ (,) ❖

❖ 8 : 50 ~ 9 : 00 ❖

❖ ❖

❖ 1 : 5 ❖

❖ : 3 ❖

❖ CD-ROM ❖

3. - - . _____ / ... (21)

4. . _____ . / ... (22)

5. - - _____ / ... (23)

❖ Discussion 15 ❖

Coffee Break (10:20 ~ 10:40)

3 10:40 ~ 11:20 : .

1. . . . _____ / ... (25)

2. _____ / ... (26)

3. - - . _____ . / ... (27)

4. . . _____ / ... (28)

5. . _____ . / 가 ... (30)

❖ Discussion 15 ❖

4 11 : 20 ~ 12 : 00 : .

1. MRI / ... (32)

2. K- _____ . / ... (33)

3. Ilizarov / ... (35)

4. _____ / 가 ... (37)

5. / ... (38)

❖ Discussion 15 ❖

Lunch (12:00 ~ 13:00) Convention center

5 13 : 00 ~ 13 : 40 : .

1. Ovadia Beals 2 3 / ... (39)

2. / ... (40)

3. : / ... (41)

4. Half Pin : _____¹ . _____² . _____² / ... (43)

5. _____ . _____ / ... (45)

❖ Discussion 15 ❖

Symposium 13 : 40 ~ 15 : 00 _____ :

❖ _____ ❖

1. Fractures of the Distal Femur; Angle Stable Device vs Condylar Buttress Plate (15)
_____ / ... (49)

2. Fractures of the Proximal Tibia(1); Plating-Evaluation & Planning (15)
_____ / ... (53)

3. Fractures of the Proximal Tibia (2); Plating-Approach & Fixation Technique (15)
_____ / 가 ... (56)

4. Fractures of the Proximal Tibia (3); Complications and Late reconstruction (15)
_____ / ... (61)

5. Nailing of Proximal Tibial Fractures. Pitfalls and Tips (15)
_____ / ... (66)

❖ Discussion 5 ❖

Coffee Break (15 : 00 ~ 15 : 20)

15 : 20 ~ 15 : 50 :

15 : 50 ~ 16 : 20 : .

Clifford B. Jones

- 1) Intramedullary Nailing of Proximal Femoral Fractures (15) (71)
- 2) Percutaneous Femoral Nailing: Technique and Results (15) (72)

16 : 20 ~ 17 : 00

B : Room

1 09 : 00 ~ 09 : 40 : .

1. _____ / ... (75)

2. _____ / ... (77)

3. _____ / ... (78)

4. _____ . - / ... (79)

5. - 3 - _____ . / ... (80)

3. _____ / ... (88)

4. _____ / ... (89)

5. - Joystick _____ / 가 ... (90)

❖ Discussion 15 ❖

4 **11 : 20 ~ 12 : 00** :

1. _____ / ... (91)

2. _____ / ... (92)

3. _____ / ... (93)

4. _____ / ... (94)

5. 65 _____ / ... (95)

❖ Discussion 15 ❖

Lunch (12:00 ~ 13:00) Convention center

1. K- _____ . / ... (96)
2. _____ . . / ... (97)
3. (Pin Leverage) _____ / ... (98)
4. CHILD . . _____ . / ... (99)
5. - 2 - _____ . / ... (100)

❖ Discussion 15 ❖



A: ROOM



Avascular Necrosis and Subcapital Femur Neck Fractures

가

_____

가

가

가

가

가

60

1999 3

2001 2

46

60 , 2

가

31

3 4

Garden

1 2

24

24

31

4 (13%)

가

11 0 ,

20 4 (20%)

가

24

가 19

3

가 24

12 1

가 (p=1.00).

가 4 2

60

가

(13%, 0%).

가

가

Factors Predisposing to Complications after Internal Fixation of Femoral Neck Fx

| Year | Sample Size (n) | Study | Fixation Method | Complication Type | Number of Complications | Percentage (%) |
|------|-----------------|---------------------|------------------|-------------------|-------------------------|----------------|
| 1996 | 1 | Lunceford | Knowles pin | Nonunion | 1 | 100% |
| 2001 | 12 | Garden stage, Singh | cannulated screw | Nonunion | 1 | 8.3% |
| 2001 | 52 | Garden stage, Singh | Knowles pin | Nonunion | 38 | 73.1% |
| | | | | Malunion | 2 | 3.8% |
| | | | | AVN | 12 | 23.1% |
| 2001 | 52 | Garden stage, Singh | cannulated screw | Nonunion | 14 | 26.9% |
| | | | | Malunion | 4 | 7.7% |

17가

Complications after Bipolar Hemiarthroplasty for Intertrochanteric Fractures in the Elderly

가 , 가 . , , 가 가 , . 13 75 .

1989 3 2002 10 75 153 , 가 (A)가 79 , (B) 74 . A 76 95 79.5 , B 75 91 81.1 , 가 131 , 가 21 , 가 2 , 110 , 87 , 85 , 15 , 21 , 25 , 18 , 3 3 , 91 . Boyd-Griffin A II 20 , III 42 , IV 17 , B II 24 , III 28 , IV 22 . A 1 , 45 . student's t-test

, A 6 (7%), B 1 (1%)가 A B , A 5 , 2 , 1 2 , 1 가 .

A - 1 - 3

A 32 (40%), B 29 (39%) , A 6 (7%), B 3 (4%)
 , A 56 (70%), B 44 (59%) . A
 1 (1%)가 , A 5
 (6%), B 3 (4%)가 , A 23 (29%), B 18 (24%)가 .
 A 13 (16%), B 11 (14%)가 , A 6
 (7%), B 11 (14%)가 . A B 1 , A
 , B
 A 7.5 , B 8

75

가

가 . ,

Comparitive Study for Pullout Strength of PFN and Gamma Nail

가

3

(back out)

가

가

가

16 composite femur

Instron

drill

drill

7 mm

4

femur

Gamma

(G full)

1.20±0.23

kN

PFN

(P full)

1.65±0.28 kN

Gamma

drill

7 mm

(G short)

1.12±0.14 kN

PFN

(P short) 0.71±0.11 kN

G full

G short

가

G full , P full

가

G short

P short

가

PFN

drill

가

PFN

가

PFN

taper

Treatment of Severe Comminuted Subtrochanteric Fractures of Femur using Rowe Plate

가 , 가 가 가

1994 3 2001 1 46 가

13 19 (12~28) ,

Seinsheimer 가 가 .

12 , 6.2 (5~8)

seinsheimer , 1 2 , 8

1 III B 3 , IV 8 , V 2 가 2 .

1 , 1 2 cm .

AO group 가

piriformis fossa , 가 가

The Significance of Transverse Fracture Line in Surgical Treatment of Femur Intertrochanteric Fracture using Compression Hip Screw

1999 1 2002 6
 Evans , Tip-Apex distance
 (TAD), Singh 가 24
 (group A: 16) (group B: 8)
 가 , ,

1. (group B) 14.8±9.3
 mm , (group A) 6.7±3.6 mm 가
 (p value > 0.05).

2. (group B) 8.00±8.12
 , (group A) 2.75±2.63 가 (p
 value < 0.05).

3. (group B) 7.60±2.61 mm ,
 (group A) 0.5±1.80 mm 가 (p value < 0.05).

가

:

Impacted Cancellous Allograft and Valgus Fixation of Intertrochanteric Fracture Nonunion

가

· · · · ·

가

1995 6 2002 10 5

가

23 48 , 5 , 4 7 mm slippage 16 1

가

1998 5 2002 3
가 80 가 8 , , , ,
가 가 2
Singh , 2 Kyle-Gustilo 4~5
가 가
가 4 , 2 , 2
가 1~2
가
:

**Femoral Neck Fracture after Removal of the Intramedullary Nail for
Fixation of the Intertrochanteric Fracture
- Report of Two Cases -**

· _____ ·

· , 가
(gamma interlocking nail) proximal femoral nail (PFN) ·
, 가 가
2 (insufficiency)

1~64

· 2~80

hip pin

, 가 , 2 1

가

=Abstract=

Loss of Fixation after Internal Fixation of Intertrochanteric Femoral Fracture with Compression Hip Screw

- A Case Report -

Jong-Oh Kim, M.D. and Sang-Yeol Chang, M.D.

*Department of Orthopaedic Surgery, College of Medicine,
Ewha Womans University, Seoul, Korea*

It is documented that intertrochanteric fracture of femur shows increasing incidence with advancing age. The fracture is more common in elderly female and classified mainly into stable and unstable pattern. Key to stable reduction is restoration of posteromedial cortical continuity and this prevents complication after internal fixation. Among several devices for internal fixation, the compression hip screw is most commonly used one. And this has fixation failure rate of about 20% which will mostly happen in 3 months after operation. The causes of fixation failure after operation using compression hip screw can be divided into two categories, one for patient factor and the other for surgical or technical factor.

Severe osteopenia and unstable fracture pattern are patient factors. Eccentric placement of the lag screw within femoral head and poor reduction quality are surgical factors. We report 6 cases of fixation failure after operation using compression hip screw.

Key Words: Intertrochanter, Fracture, Hip screw

가 가

가

가

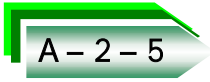
가

,
20%

가

,
3

가



A-2-5

lag screw
6

:
911-1 (158-050)

Tel: (02) 650-5276, Fax: (02) 642-0349

Closed IM Nailing of Femoral Fracture using a Radiolucent Table and Skeletal Traction

2000 1 2002 6

15 (A)

15 (B)

가

가

A 4 , B 3

A 116 , B 82 ,

A 28 , B 12

A Comparative Study of Reamed and Unreamed Nail for Femoral Shaft Fracture's Treatment

1997 6 2000 4
105 1 가 95
74 , 21 Winqvist-Hansen
I 20 , II 37 , III 15 , IV 2
I 0 , II 7 , III 10 , IV 4 .
가
(p<0.005) 107 , 94
250 ml (p<0.001). 가 400 ml,
가
가 , 가
가 .

-
**Interlocking Intramedullary Nailing in the Treatment of
 the Femoral Shaft Fracture**
 - Comparative Study between Reamed and Unreamed Nailing -

1998 9 2001 12 3 6
 53 16
 69 14 69 8
 , 5 , 3 .
 가
 . 가 (46.4%) , (21.7%), (18.8%),
 (13.0%) , 41.2 .
 72.5% 가 , (39.1%),
 (18.4%) . 53 19.5 ,
 16 23.7 (31)
 22.5 , (28) 18.5 . 가
 , 53 7 (13.2%) ,
 16 2 (18.8%) . 10 8 가
 , 1 , 1 . 2

Treatment of Distal and Supracondylar Femoral Fractures with a Retrograde Supracondylar Intramedullary Nailing

(Retrograde supracondylar intramedullary nail, MDN Zimmer® nail)

(load-sharing device)

1999 1 1 2001 12 31 12 가 13
 1/3
 6 , 7 , AO/ASIF A1 5 , A2 7 , A3 1 ,
 2 , 2 가
 가 1
 , 가 가
 12 ,
 ,
 20 (16~25) 13 12 (92%) 1
 4 6°
 5 , , 3
 , 13 11

2 100° 가 .

1

가

· _____ ·

=Abstract=

Pathogenesis of Delayed Posttraumatic Vertebral Collapse

Kee-Yong Ha, M.D., Jin-Sung Cheon, M.D. and Sang-il Seo, M.D.

*Department of Orthopaedic Surgery, Kang-Nam St. Mary's Hospital
The Catholic University of Korea, College of Medicine*

가

5 가

67 1

,

cleft

MR-angiography

(segmental a)

cleft

H-E

1. MR-angiography

가 1

가 4

2. : H-E

(thrombosis)

가 4

, 1

가

cleft

,

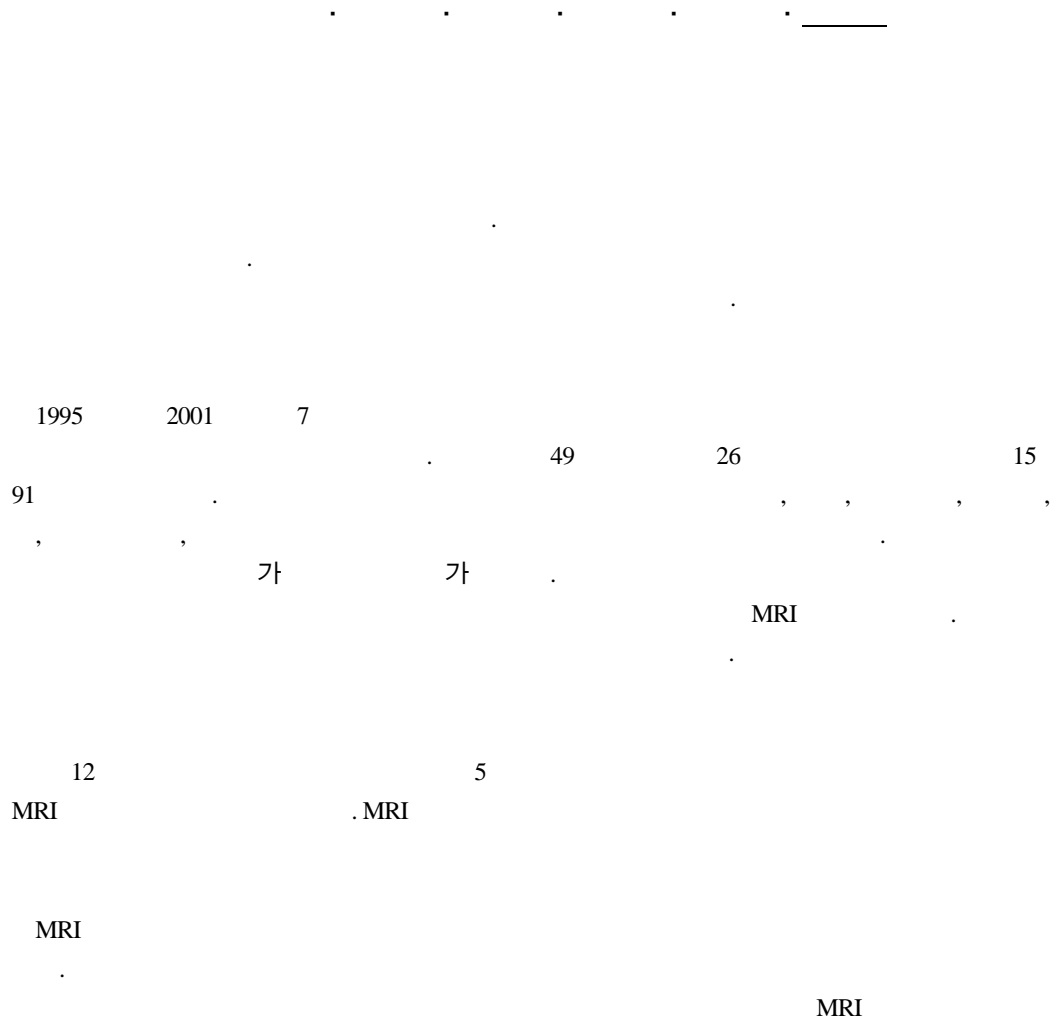
cleft

가

: , , ,

MRI

Usefulness of MRI in Case of Distal Femoral Intercondylar Fracture



A-4-2

1 ,

2 .

pull out

type IV

K-

가

MRI ()

Ilizarov

The Clinical Result of Tibial Plateau Fracture using Ilizarov Fixation and Bone Graft

ilizarov
ilizarov

1995 6 2002 6 ilizarov
6 가 가 80 , 80
, 6 5 2
18
19 80 48.7 가 54 (19 ~80 , 47.9),
가 26 (19 ~72 , 50.6)
가 58 (72.5%) 가 , 6 (15%),
3 (7.5%), 3 (7.5%)
Schatzker , I 10 (12.5%), II 20 (25%), III 2
(2.5%), IV 10 (12.5%), V 10 (12.5%), VI 26 (35%)
Blokker 가
가 .
5.3 12.9 7.8 ,
7 15.9 10.7 . Blokker 가 가 80 62
(77.5%)



A-4-3

ilizarov

, Blokker

가

ilizarov

Meniscal Injuries with Tibial Plateau Fractures

가

MRI

가

23

2000 3 2002 10

23

Schatzker

I 3 , II 7 , III 4 , IV

1

V

VI

8 가

MRI

가

가

6

2

가

23
(48%)

13 (56%)

5 (22%)

11

(73%) 가

1

3

11 8

5

5

8

5

2

56%

가

2

1998 1 2000 12
 46 , 36:10, 47.5 A
 B , A 18 , B 28
 Kelmm & Boner
 가

A 11.5 , B 18.5 . A
 , , 1 4 , 1~3
 8 . 6 6
 . B 14
 A (3) 가
 , (2) , (1) , B (22) , (24) ,
 (12) , (7) , (4) .
 가 A 11 (56%), B 13 (34%)
 가

Ovadia Beals 2 3

**Limited Internal Fixation for the Treatment of the Pilon Fracture,
Especially Ovadia and Beals Type 2 or 3**

가 Ovadia Beals 2 3

20

1995 5 2000 12 K- Ovadia Beals
Beals 2 3 가 20 (12~38

) K- 가 5 10 가

가 Mast Teiper 11 , 4 , 0

Ovadia Beals 2 3

Interlocking Intramedullary Nailing for Most Distal Tibial Fracture

· · · · · _____

가
5

2001 1 2001 12 12 가 가 5
38 (23~74) , 가 2 , 가
3 .

가 1.2 cm (0~3.5 cm)
19.4 (14~26) ,
1 5 , 35 .

**Safe Corridors for Transfixion Wire Placement during
External Fixation of Distal Tibia Fractures:
A Radiological Study**

60

1.

37

2.

가 19 , 가 18 35 (19~67)
(CT)

Scout AP view Gantry

Scanning

5 mm 12
1 cm, 1.5 cm, 2 cm, 2.5 cm

3.

(Tibialis anterior tendon)

(Peroneus brevis tendon)

(Anterior border)

1 cm

| | 1 cm Left | 1 cm Right | 1.5 cm Left | 1.5 cm Right | 2 cm Left | 2 cm Right | 2.5 cm Left | 2.5 cm Right |
|--|-----------|------------|-------------|--------------|-----------|------------|-------------|--------------|
| | 30.6 | 30.7 | 30.7 | 30.3 | 29.5 | 29.9 | 28.4 | 29.3 |
| | 4.6 | 4.8 | 4.8 | 4.6 | 4.6 | 4.6 | 4.3 | 5.0 |
| | 20 | 21 | 20 | 20 | 18 | 20 | 18 | 15 |
| | 44 | 44 | 42 | 42 | 40 | 40 | 38 | 40 |

1 cm

30.6

2.5 cm

28.4

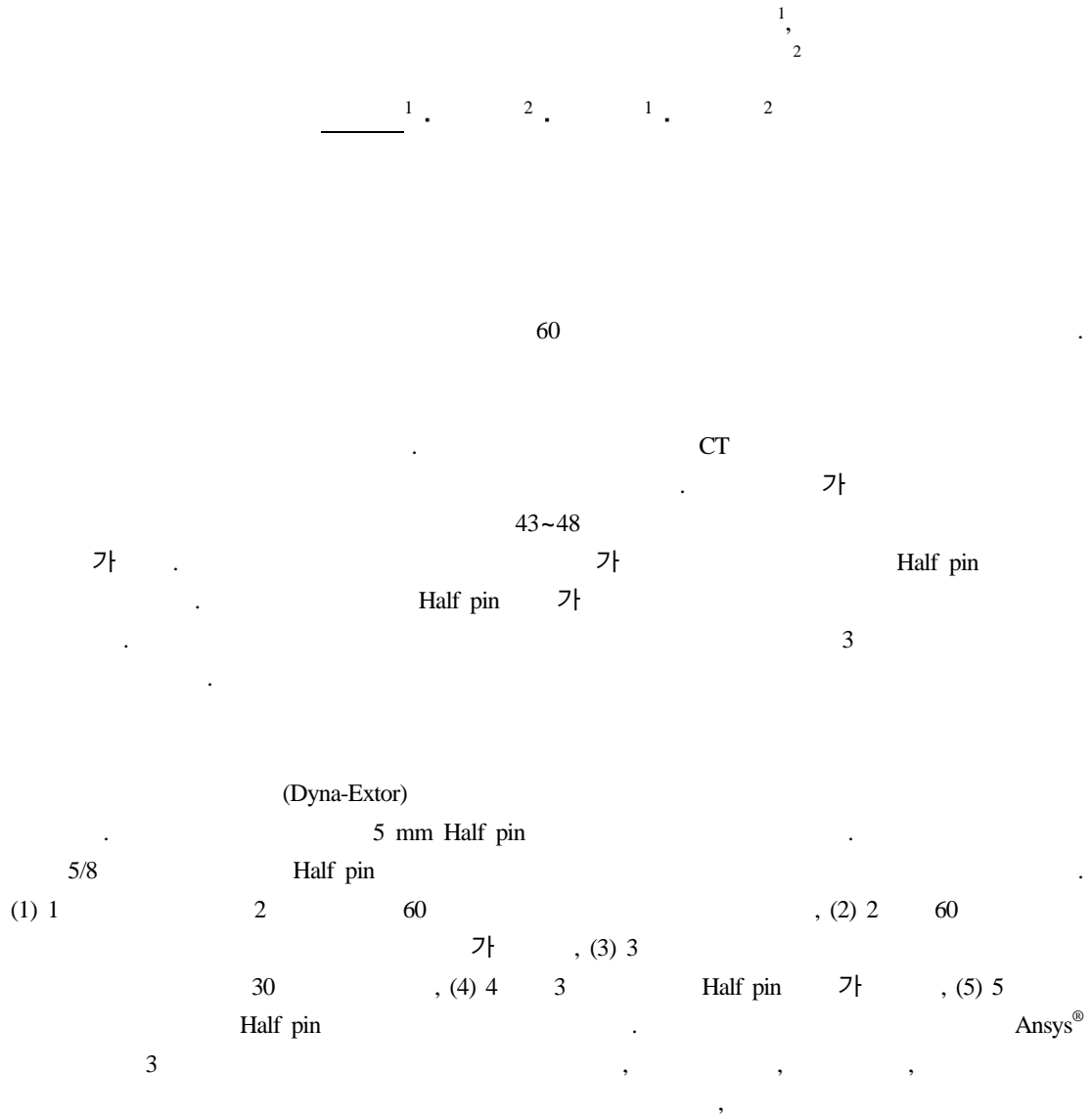
43~48

가

가

Half Pin :

**Effect of Half Pin Inserted to the Anteromedial Surface of the Articular Fragment
in the Treatment of Distal Tibial Fractures using Hybrid External Fixator:
A FEM Study**



A - 5 - 4

(stiffness) 가 가

15%

1 5 가

| | Axial Compression (N/mm) | Torsion (Nm/o) | AP Bending (N/mm) | Lt-Rt Bending (N/mm) |
|---------|--------------------------|----------------|-------------------|----------------------|
| Group 1 | 41.15 | 1.66 | 9.83 | 21.07 |
| Group 2 | 52.63 | 2.18 | 11.59 | 30.04 |
| Group 3 | 35.71 | 1.53 | 5.79 | 21.63 |
| Group 4 | 176.24 | 3.29 | 50.26 | 50.62 |
| Group 5 | 216.45 | 3.49 | 69.49 | 60.32 |

60 (1) 가 (2)

가 가

3 (30)

4, 5 3 1 Half pin 가
가 3 2

가 Half pin

가 Half pin 3

=Abstract=

The Prediction for Neutral Rotation of Tibia by the Image of Contralateral Tibia-Fibula

Jung-Jae Kim, M.D., Ji-Hyun Ahn, M.D. and Woo-Shin Cho, M.D.


Department of Orthopedic Surgery, Asan Medical Center, College of Medicine, University of Ulsan, Seoul, Korea

15
 가
 가가 (C-arm) 가 (CT)
 C (- : Tibiofibular
 Overlap Ratio) 가 가 .
 - 가 (2-D CT)
 79 -
 paired t-test .
 3 (3-D CT) 5
 15 15 31 3-D CT
 20 5 가
 31 -


79 2-D CT -
 2가 가 (p=0.836).
 - 3-D
 CT 10 5
 3 가 . 10 5
 5 가 . 5 가 .
 10 5 5 가 .
 - 가 .
 - 가 .
 :

Corresponding author: Jung-Jae Kim, M.D.

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SYMPOSIUM



Fractures of Distal Femur

- Angle Stable Device vs. Condylar Buttress Plate -

I. Introduction

6~7% of all femur fracture

high energy trauma in younger patients, low energy one in elderly with osteoporosis

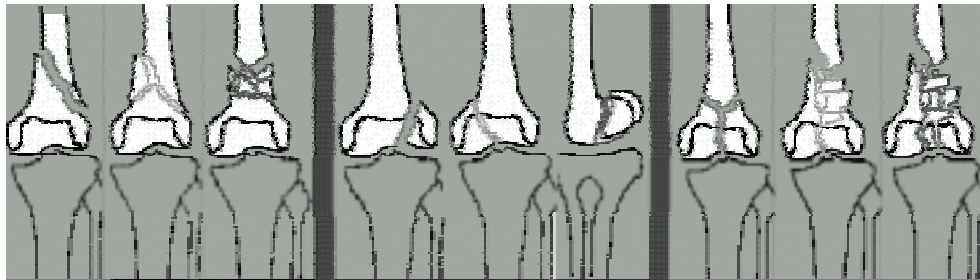
ORIF with blade plate since 1970s.

II. Classification of Fractures (AO Muller Classification)

Type A: extra-articular fracture

Type B: partial articular fracture

Type C: complete articular fracture



A1

A2

A3

B1

B2

B3

C1

C2

C3

III. Decisions Regarding Treatment

1. patient general factor: age, activity, medical condition
2. soft tissue condition, open vs. closed
3. fracture type, displacement, degree of comminution, damage of articular surface
4. quality of bone: osteoporosis
5. associated injury

6. surgeon's experience and hospital facility

Surgical treatment should be considered for all displaced fractures of the distal femur.

IV. Principles of Operative Treatment

1. anatomical reconstruction of the articular surface
2. restoration of rotational and axial alignment
3. stable fixation of the condyle to the shaft of the femur
4. early functional aftercare
5. more biological, atraumatic approach

V. Approaches

1. standard lateral approach,
2. extended lateral approach tibial tuberosity osteotomy, patellar tendon Z plasty
3. modified anterior approach (Swashbuckler approach)
4. minimally invasive lateral approach
5. medial approach for type B2, 3
6. anterior approach: anteromedial, anterolateral
7. small midline approach for distal nailing

VI. Implants with Fixed Angle

Implant selection is determined by the pattern of the fracture, the quality of bone, the condition of patient and the experience of surgeon.

1. Condylar blade plate

advantage: excellent fixation and resistance to bending and torsional force

If correctly inserted, anatomical alignment can be achieved easily.

Indicated supra and intercondylar fractures (33-A, 33-C1, 2)

disadvantage: technically difficult

contraindicated in small condylar fragment or articular comminution extensive exposure

familiarity with instrumentation and preop. planning are essential.

2. Dynamic condylar screw

advantage: technically easier to use than blade plate

adjustment can be made in the sagittal plane

compression of simple intercondylar split

relatively minimal exposure

disadvantage: more difficult to gain sagittal rotational stability

occupying a large volume in condylar region

contraindicated in small condylar fragment or articular comminution

3. LISS-DF (less invasive stabilization system-distal femur)

advantage: "internal fixator" preventing pressure of the plate against bone preserve vascularity

anatomically contoured plate and self tapping screw

minimal exposure, minimally invasive

good angular and rotational stability

disadvantage: not popular with not so many experiences

VII. Implants: Buttress Plates

1. Condylar buttress plate

preferred implant for complex fracture (33-C3)

advantage: individual placement of screws over wide area

buttressing the lateral femoral condyle

disadvantage: no angular stability between the plate and screws

To overcome this problem the use of a medial plate may be necessary.

2. Other buttress plates (T-plate, L-plate, cloverleaf plate)

VIII. Other Implants or Fixator

1. Screws for type B fracture

interfragmentary lag screw & buttress screw

2. Retrograde nailing

advantage: good axial and bending stability

technically easier than anterograde nailing

indicated 33-A, 33-C1, 2 and distal fractures below hip implants or above total knee implants

disadvantage: intra-articular entry portal, patellofemoral problem

stress riser in proximal tip area

less torsional stiffness than DCS

3. External fixator

used for temporary stabilization and definitive stabilization spanning external fixation, hybrid external

fixation

IX. Aftercare

Early gentle ROM exercises are started 2 days after surgery with the limitation of weight bearing.

X. Complication

1. Early complication

1. vascular complication
2. infection
3. failure of reduction: length (cable method), alignment (AP & Lat. Plane), rotation (lesser trochanter sign)
4. early failure of fixation esp. in osteoporosis

2. Late complication

1. late infection
2. nonunion
3. malunion
4. knee stiffness
5. posttraumatic arthrosis

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(1)

- 가

가

가

가

1.

가

가

가

- 가

가

10~15

. CT

10~15

. MRI
가

가
MRI가 CT

2.

Schatzker 가 , 6가 . 1
 , 2 , 3 ,
 4 , 5 , 6 가
 . Bennett Browner Schatzker 2 4
 가 가 , 2 가 4
 가 . AO A , B C

3.

, 가

4.

, 가
 CT MRI

가

가

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Fractures of the Proximal Tibia - Approach & Fixation Technique -

가

Anatomy

Lat: saddle shaped, convex in sagittal & concave in coronal plane
 Med: larger, concave in both plane
 3° varus, 10~15° post. slope
 LM-bears most of load
 MM-load share equally between medial and exposed cartilage

Mechanism of Injury

valgus or varus forces combined with axial loading
 Location of fracture: degree of flex or ext of the knee

Classification

Rasmussen classification

| | | |
|-------------------|-----|-----|
| Lat. plateau Fx. | 70% | |
| Split | | 14% |
| split-compression | | 25% |
| compression | | 31% |
| Med. plateau Fx. | 12% | |
| Split | | 6% |
| split-compression | | 5% |
| compression | | 1% |
| Bicondylar Fx. | 18% | |
| Split | | 7% |
| split-compression | | 11% |

Schatzker classification

| | |
|---|-----|
| Type I - pure cleavage | 6% |
| Type II - cleavage with depression | 25% |
| Type III - pure central depression | 36% |
| Type IV - medial condyle fracture | 10% |
| A: split or wedge | |
| B: depressed and comminuted | |
| Type V - bicondylar fracture | |
| Type VI - tibial plateau Fx with dissociated metaphysis and diaphysis | 20% |

Moore Classification

| | | |
|----------|-----------------|-----|
| Type I | split | 37% |
| Type II | entire condyle | 25% |
| Type III | rim-avulsion | 15% |
| Type IV | rim-compression | 12% |
| Type V | four part | 11% |

AO-ASIF Classification

| | |
|----------|---------------------------|
| Type I | split |
| Type II | depression |
| Type III | split depression |
| Type IV | bicondylar and comminuted |

Hohl classification

| | | |
|------------|-----------------------------|-----|
| Type I - | minimally displaced | 22% |
| Type II - | local compression | 26% |
| Type III - | split compression | |
| Type IV - | total condylar | 15% |
| Type V - | split | 3% |
| Type VI - | rim-avulsion or compression | 15% |
| Type VII - | bicondylar | 15% |

Treatment of tibial plateau Fx.**1) Conservative treatment**

early exercise and mobilization
cast immobilization

traction and mobilization
cast bracing

2) Surgical treatment

C/R & percutaneous I/F

O/R & I/F

a) C/R & percutaneous internal fixation

poor skin condition

open fracture c contamination

old age on poor general condition

b) open reduction and internal fixation

*Incision

med or lat. parapatellar incision

midline incision in bicondylar Fx.

Ant. approach with osteotomy of tibial tubercle (complex fx.)

Two incision-ant. and posteromed. or posterolat

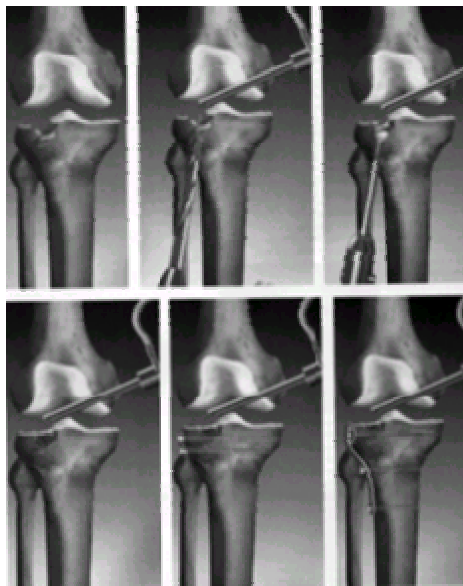
cutting patellar tendon in Z-fashion (Schatzker)

*compression Fx.

elevation of depressed fragment

bone graft

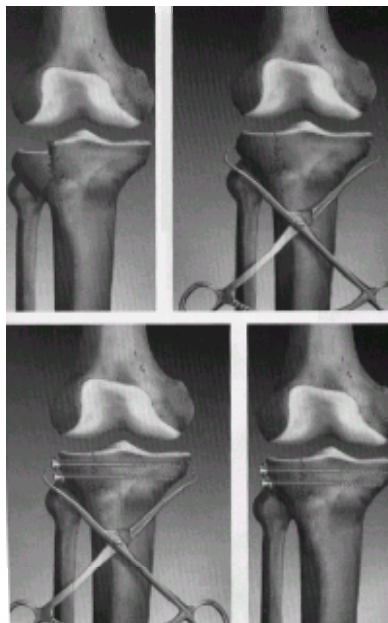
wire, bolt, Knowles pin, single plate



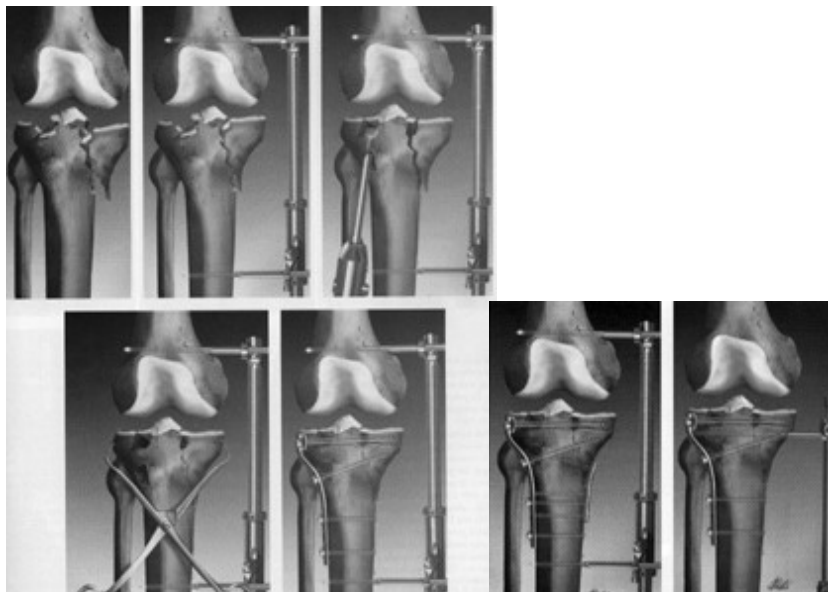
- *split-compression Fx.
 - elevation of fragment
 - reposition of split fragment
 - bone graft
 - I/F c screw & plate (Buttress plate)



- *split Fx.
 - I/F c simple screws and washers
 - Buttress plate



- *Bicondylar Fx.
 - extensive exposure
 - screws & plate
 - two plates
 - bone graft



- *Arthroscopic -assisted procedures
 - selected tibial plateau Fx.
 - use of arthroscopy is increasing

The goal of Treatment

- Achieve
 - stable
 - well aligned
 - mobile joint surface irregularity
 - adequate soft T
- Prevent Lat. degenerative change

Complication and Late Reconstruction of Fractures of the Proximal Tibia

Fractures of the proximal tibia involving the tibial plateau articular surface are relatively common injuries that range from nondisplaced fissures to destruction of the knee joint.

Recognition of complications and their appropriate treatment are as important as the most important step in the preoperative evaluation of the patient or the operative intervention. Although the outcome after surgical treatment of tibial plateau fracture has steadily improved because of a better understanding of soft tissue handling, preoperative planning, and fixation techniques, complications are unfortunately, common. Because of the wide range of fracture types and associated soft tissue and neurovascular structures involved, it is not surprising that the literature is confusing regarding the outcome of various nonoperative or operative treatment protocols.

There have been concerns that the associated soft tissue injury may lead to wound complications after internal fixation of tibial plateau fractures. These concerns have led to the increased use of limited surgical approaches, with or without external fixation for complex (high energy) fractures of the tibial plateau.

Complications can be divided into early (eg. Infection, thromboembolic disease, compartment syndrome) or late (eg. Osteoarthritis, stiffness, malalignment, nonunion).

Infection

Infection following tibial plateau fracture occurs in as many as 12% of cases. Infection can be a devastating complication of tibial plateau fracture management because of its intra-articular location. Other than open fractures, most deep infections in tibial plateau fractures result from insufficient attention to the soft tissue envelope.

Open fixation in a leg with severe swelling or blisters, wide exposures with extensive periosteal stripping, two incisions with too narrow a skin bridge, and overly aggressive early range of motion all increase the chances of wound breakdown and subsequent infection. The incidence of infectious complications can be decreased by careful timing of surgery, extraperiosteal dissection, and limited dissection of comminuted bone fragments. Indirect reduction techniques using a femoral distractor, ligamentotaxis, percutaneous reduction clamps, smaller implant, and cannulated screws also decrease the likelihood of further soft tissue devascularization, wound dehiscence, and deep infection.

Superficial wound problems in the early postoperative period should be treated aggressively with anti-

biotics, and there should be a low threshold for repeat irrigation and debridement. A deep wound infection with abscess formation should be packed open and closed secondarily. In the presence of infection, implants that provide stability should be retained; however if loose, they should be removed and the fracture treated with distal tibial pin traction or external fixation.

Thromboembolic Disease

The incidence of thrombophlebitis reported in the literature ranges between 5% and 43%. Thrombophlebitis is suspected when the calf is enlarged or painful. The patient often has a low grade fever. A positive Homans' sign or calf squeeze test and swelling confirm the diagnosis. Venography graphically demonstrate the site and extent of the clot.

The likelihood of thrombophlebitis is lessened by use of compressive stocking, the reverse Trendelenburg position, and anticoagulative agent, and by active movement of the ankle. Care must be taken, however, not to overdo anticoagulation because a deep hematoma could lead to skin slough and infection.

Compartment Syndrome

Increase swelling and pain, atypical of fracture pain, in the below a plateau fracture site suggest the possibility of compartment syndrome (especially Schatzker type V and VI fractures). Presenting signs and symptoms include pain out of proportion to the injury, swelling, pain on passive stretching, pallor, pulselessness, hypesthesia, and motor weakness.

This condition may develop after fracture or after operative reduction of a lateral plateau fracture in the anterior compartment fascia has been closed tightly or after tibial plateau fracture treated by continuous passive motion (CPM) and anticoagulant or after arthroscopic examination of a tibial plateau fracture.

If compartment pressures are found to be increasing or already are increased, appropriate fascial releases should be done immediately.

The prognosis after fasciotomy for compartmental syndrome depends on the duration of the increased pressure. If compartment pressure has been increased for more than 6 hours, some permanent impairment of function is likely. If treatment takes place later, remaining leg function or sensation may be so reduced that amputation of the limb is required.

Osteoarthritis

The incidence of secondary osteoarthritis has been reported to be between 17 and 52%. Post traumatic arthrosis may occur as a result of cartilage damage from the initial injury or can be related to residual joint incongruity and joint instability.

However, the tibial articular surface also seems to tolerate some degree of residual incongruity. In the literature, a reduction has been considered satisfactory with varying degrees of residual displacement ranging

from 2 to 10 mm. Residual displacement had only a weak association with the development of arthrosis.

Lansinger et al showed that outcomes were good when knee stability was maintained, regardless of the quality of the articular reduction. Volpin et al thought that the clinical outcome after a tibial plateau fracture depended more on the restoration of normal alignment, an early range of motion, and knee stability than on articular reduction.

Honkonen reported that 44% of his patients had arthritis at an average of 7.6 years of following when the meniscus had been totally removed, this percentage rose to 74%. He found that normal or slight valgus alignment and an intact meniscus led to the best prognosis.

Salvage for post-traumatic arthrosis depends on the age of the patient, the status of the individual plateaus, the alignment, and the bone stock of the leg.

Osteotomy is a good option for patient, who have some residual malalignment or who have one plateau with better cartilage coverage than the other.

Arthrodesis is the treatment of choice in younger patients with poor articular coverage of both plateaus.

In older patients, or patients who refuse arthrodesis, total knee arthroplasty (TKA) is a good option. TKA can be considerably more difficult in these cases because of previous incisions, retained hardware, malalignment, or lack of bone stock. Roffi and Merrit noted a poor outcome in patients who had undergone total knee arthroplasty after a variety of fractures around the knee. Weiss and Trousdale reported that their patients are at increased risk for perioperative complications, as evidenced by the high reoperation rate of 21%. The most common problems encountered in their patient population were related to soft-tissue healing, postoperative stiffness, and intraoperative disruption of the extensor mechanism.

Newer techniques involving tibial osteochondral allografts have been performed with mixed results.

Stiffness

Arthrofibrosis and resulting stiffness is common after tibial plateau fractures, particularly in more severe injuries. This untoward complication is thought to result from damage to the extensor retinaculum, to the joint surface as a consequence of the initial or surgical exposure for fixation, or to both.

When a CPM machine is used, the surgical wound should be inspected daily and movement discontinued if any signs of problems with wound healing appear.

Failure to regain at least 90 degree of knee flexion between 8 and 10 weeks postoperatively is worrisome and usually warrants additional treatment in physiologically young patients. The approach is to combine arthroscopic lysis of adhesions with gentle manipulation of the knee in an effort to regain functional knee motion.

Malalignment

Schatzker type V and VI fractures are the most likely to lead to malalignment. In general, slight valgus alignment is better tolerated than varus alignment.

Malalignment can also exist in the sagittal plane, with resultant excessive or minimized posterior tibial slope. This alters the loading of the articular surfaces as well as the flexion and extension range of the knee joint.

Excessive coronal or sagittal plane alignment can be treated with osteotomy, correction of deformity, and ORIF.

Nonunion

Nonunion at tibial plateau fractures is rare, and when it does occur, it is often accompanied by infection. Nonunion more frequently follows a high energy medial plateau fracture, a displaced bicondylar fracture, or a tibial plateau fracture associated with a metaphyseal fracture.

If there is no evidence of infection and there is severe arthritis, the nonunion is managed with an arthroplasty in patients older than 50 years of age. In a patient under 50 years of age who has an aseptic arthritic nonunion, the nonunion is managed with an arthrodesis.

Management of aseptic nonunions without arthritis consists of rigid stabilization in the form of plates and screws and autogenous cancellous bone grafting.

The principles of management of infected nonunions of tibial plateau fractures are debridement of necrotic tissue and foreign bodies, stabilization of the nonunion with screws and plates, management of dead space with antibiotic – impregnated beads or muscle flaps, good soft tissue coverage with local or free tissue transfer, and antibiotic coverage based upon the sensitivities of the pathogenic organisms.

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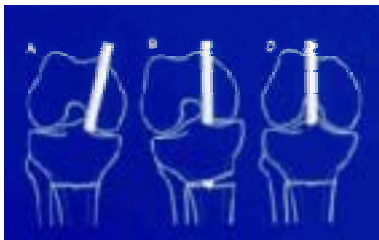
Nailing of Proximal Tibial Fractures. Pitfalls and Tips

(malalignment)

1.
 - 1)
 - 2) (anterior compartment muscles)
 - 3)
 - 4) Wedge (proximal bending of the nail)
 - 5) ()
 - 6) (distal entry)



2.
 - 1)
 - 2) (lateral compartment muscles)



가 가

1.

2. Semi-extended medial parapatellar arthrotomy nail

3.

4. Blocking screw nail ,

5.

5

Lang et al. (1995): 83% (), 25%

Freedman & Johnson (1995): proximal - 58%, middle - 7%, distal - 8%

Buehler et al. (1995): 8% (external fixator)

Tornetta & Collins (1986): 12% (semi-extended position)

Ricci et al. (2001): 8% (blocking screw)

가

가

가

가

90

()

awling

bony tunnel

Steinmann pin 2

malalignment

blocking screw axial
Steinmann

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Intramedullary Nailing of Proximal Femoral Fractures

Clifford B. Jones and James R. Ringler

Michigan State University, Grand Rapids Orthopaedic Residency Program Grand Rapids, MI

Purpose: To evaluate the results and complications of cephalomedullary nailing of proximal femoral fractures.

Materials & Methods: Over a five year period, at a level-one trauma center, all patients with proximal femoral fractures were retrospectively evaluated from prospectively gathered data. Twelve orthopaedic surgeons were involved with the care of the patients. Treatment options were dependent on individual surgeon preference. A total of 239 patients were entered into the study group. When excluding fractures treated with plating or hemiarthroplasty, a total of 81 patients were stabilized with reconstruction nailing (n=48) and intramedullary hip screws (n=33). The average age was 67 yo (range 23~92 yo). More females (n=51) than males (n=30) were noted. The mechanism was low energy fall (n=55), motor vehicle accident (n=12), high energy fall (n=11), and tumor (n=3). Weight bearing amount and timing were determined by the individual surgeon.

Results: Seventy-five of the 81 fractures healed. Five fractures developed nonunions requiring intervention. Four of these five were from varus reduced fractures and tip apex distances greater than 30 mm. All four required operative intervention (3-hemiarthroplasty, 1 valgus osteotomy). One of these five was from a well aligned fracture, but with continued tumor involvement. This nonunion was successfully treated with repeat excision and autografting. One fracture was reduced and healed in 110 degrees of varus. Because of pain, limp, and leg-length discrepancy, a valgus osteotomy realigned the proximal femur. Two patients required proximal screw removal (2-reconstruction nailing) because of settling of fracture and prominent lateral hardware. Thirty-nine fractures required percutaneous spike pusher or Weber clamp placement in order to realign the fractures. Twenty-three fractures had a coronal split of the piriformis fossa and trochanter.

Discussion: With reconstruction nailing or intramedullary hip screws, proximal femoral fractures can be successfully stabilized and treated. The concept of tip apex distance for dynamic hip screws applies for intramedullary hip screws. If a varus reduction is noted, a high complication rate can be expected. Percutaneous methods to reduce and realign the proximal femoral fracture assist in placement of the nail and cephalomedullary screws.

Conclusion: A successful outcome can be expected with a well reduced and stabilized proximal fracture treated with an intramedullary nail.

Percutaneous Femoral Nailing: Technique and Results

Clifford B. Jones and James R. Ringler

Michigan State University, Grand Rapids Orthopaedic Residency Program Grand Rapids, MI

Purpose: To improve the technique and results of standard intramedullary nailing of proximal and diaphyseal femoral fractures.

Methods & Materials: All patients were followed with clinical and radiographic exams. Follow-up has averaged twelve months (range 8~16 mo.).

Results: A consecutive series of 78 diaphyseal and 43 pertrochanteric femoral fractures were entered into the study group. An initial group of 3 surgeons has expanded to a core group of 8. The percutaneous device was applied without complications except one case. During the fifth reconstruction case, the reconstruction extension guide failed at the joining site. The initial design, which has since been corrected, had a stress riser that initiated the failure. The same insertion device was used for all types of body habitus without conversions. Average incision size was 1.8 cm (range 1.2~2.6 cm). No proximal cross-locking failures or misplaced screws were recorded. All proximal interlock screws were inserted without complications: 78/78 OPIS and 86/86 PCMRS screws. Five of 78 (6.4%) patients with diaphyseal and 6/43 (14.0%) patients with pertrochanteric fractures complained of gluteal or abductor pain for the AO type 32 and AO type 31 fractures, respectively. Two of 78 (2.6%) and 1/43 (2.2%) patients with AO type 32 and type 31, respectively, developed heterotopic ossification (HO) which was Brooker Class I. Twelve of 78 (15%) patients with isolated femoral diaphyseal fractures were discharged home on the first post-op day.

Discussion: The trend from standard large incisions with soft tissue dissection and injury is changing to more limited incision or percutaneous techniques that do not disturb the soft tissues and vascular supply. The percutaneous femoral nailing technique provides a small incision with a more direct starting site on the femur. With the direct starting site and no gluteal dissection, the soft tissues (adipose and muscle) are not injured as extensively as the standard approach. This tissue friendly technique can be measured by the very low complaints of pain and risk of HO. Because the percutaneous technique uses a longer insertion device and potentially increases the inaccuracy of the proximal screw interlock guide, the risk for an incorrectly inserted screw increases, but none were recorded.

Conclusion: Percutaneous femoral nailing is an effective and improved technique of inserting antegrade femoral nails.

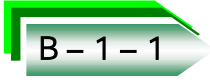


B: ROOM



- The Necessity of Deltoid Ligament Repair in Lateral Malleolar Fracture Combined with Medial Clear Space Widening -

1996 1 2002 2 4 mm
 , 1 가 가 82 , 82 가
 73 , 9 31 (16~68), 13.2 (12~50) . Danis-
 Weber B 70 , C 12 . 6 mm 9
 , 74
 C , , ,
 , 66 , 16
 , 9 . 6 ,
 Kumler 가 가 Cedell, Leeds Ehlich Meyer
 , 가 .
 9
 , 74 65
 , 9 . 가
 , 6 가
 5.89 mm (4.5~13) ,
 2.54 mm (1.5~3.5) 95.2%



B-1-1

_____ .

가 ,

· ,
:
· ,

The Relationship between Radiographic Parameters and Clinical Results after Operative Treatment of Displaced Intraarticular Fracture

가

1997 1 2001 12 1
 가 가 35 37.7 (15~68) ,
 26 , 9 가 28 , 7 .
 22 , 13 Sander II 10 , III 18 , IV 7 .
 Creighton-Nebraska Health foundation Assessment Score
 , tangential view, Broden view Bohler angle, Gissan angle, Heel height,
 Calcaneal length, Talocalcaneal angle, Talar declination angle, subtalar incongruity
 CNH score Pearson correlation

78 (33~96) Bohler angle 15 , Gissan
 angle 6.5 , Heel height 4.7 mm, Calcaneal length 0.2 mm, Talocalcaneal angle 5.5 , Talar declination angle
 2.2 , subtalar incongruity 0.54 mm . Subtalar incongruity 0.784 가
 가 가 .

가 subtalar incongruity
 가 .

Treatment of Sndesmotic Injury of Ankle with Bioabsorbable Screw Fixation

polylactic acid (PLA)

2000
가

2001
8

PLA

1

PLA

6

가 Olerud and Molander 가

가

가 가 6 , 가 2

PLA

가

Treatment of the Calcaneal Fracture
- Axial Pinning & Plate Fixation -

가 가

가

1993 1 2002 1 1 가 20
. 12 8 . 12 8
8 . 5 , 3 , 4
가 , Salama 가
Böhler angle .

6 (12 ~8 8) 가
, , 가 Salama 가 1
. Böhler 가
가

가

- 3 -

**Curettage and Bone Graft for Chronic Calcaneal Osteomyelitis following
Operative Fixation of Fractures**
- 3 Cases Report -

· _____ ·

| 가 | 가 |
|--------|--------|
| 2 | 2 |
| 2 | 3 |
| 3 | 1 |
| 1998 1 | 2001 1 |
| 3 | 3 |
| 1 | 3 |
| | 1 |

(tension suture technique)

가 1 29 , 가 17 (: 12~47) .
 가 1 , 1 가
 . 가 ASES score Neer score system .
 7 , 17 , 가 3
 , 11 . 가
 가 8 .

124° (70°~160°)
 , 40° (-10°~70°), 90° 61° (0°~90°) 가 (pain scale)
 2.9 . ASES 가 75.3 .

Polarus IM Nailing for the Fracture of the Around of Shoulder Joint

1999 2 2002 6
 9 . 58 84 72 ,
 가 5 , 가 3 1 .
 3 , 1/3 3 , 1/3 3 1 ,
 2 , 2 ,
 1 , 1 , 1 , 가 1
 3 , 1 , 1 , 가 3 ,
 1 . 가 Kona 가 가 .

16 , 2 .
 , 3.1 .3 가 6 , 3
 가 3
 . Kona 가 가 6 2
 fair, 1 poor . Poor 가
 ,
 1 .

Operative Treatment of Floating Shoulder

· _____ · · · ·

· · · · · 9

· · · · ·

1996 7 2000 8 9

· 38.8 4 , 1

· 3 , 2 , 1 , 1 6

· , 3

· 4 , 5

Hardegger 7 , 1 , 1

· 2 , 1 , 1

· 가 ,

·

Bosworth Screw

Wolter Plate

The Treatment of Acromioclavicular Dislocation Comparison Study
between Bosworth Screw and Wolter Plate Technique

가

가

6가

Rockwood Green

Bosworth Wolter 30

1996 1 2002 2

23 , Wolter 7 1 가

42.1 18 69 가 21 .

가 , 5 , 6 2 , 2 ,

3 . Bosworth 5.7 , Wolter 5.4

ASES UCLA score 가 .

1.9 ASES UCLA 가 93.4%

. 2 Bosworth

Wolter plate

Bosworth

가

Wolter plate fixation 가

가

Neer 2 가
. 가
. , K- 가 가 .
가 14

1996 1 2002 1 Neer 2 14
. IIa 9 , IIb 5 , 18 61 40 , 8 ,
6 가 6 , 가 5 . K-
가 3
. 2 3 3.6
velpeau 가 Kona 가 . 7.8

8.8 8.3 ,
. Kona 가 가
. 10 ,
4 . 1

2 가
가 .

Reconstruction

Anterior Inferior Reconstruction Plate on Acute Midshaft Clavicle Fracture

가

가

, ASES

1997 2 2002 2 (Allman II) Reconstruction plate
 38 1 가 34 VAS
 , ASES score, . 1999 8 Geometry가

15 17 (12~43), 19 8.6 (4~17) , ASES
 score 8.7 (4~15), 92 94 가 6.8
 VAS 1.2

Operative Treatment of the Clavicular Fracture with Cannulated Screw

1999 12 2002 12 가
 23 . 15 60 40.1
 10 1/3 16 , 1/3 7 가
 12 . , 가
 가 23 (100%) , 7, 9
 22 (95.7%) . ,

Surgical Treatment of Unstable Pelvic Bone Fracture with Sacroiliac Joint Fracture and Dislocation

21

1998 2002

가 4) Key & Conwell 2

가 3

11 (6~24) 가 16 , 5 . 21 18
, 3

18 (90.2%) 가 2

가

:

- Joystick

가

· · _____

-

·

·

-
가

2

2

2

Joystick
6 pin

가 Steinman pin

-

Joystick

·

: - , Joystick

:

520-2

가

Tel: (042) 220-9530, Fax: (042) 221-0429

e-mail: weonkim@kornet.net.

1989 3 2002 3 53 ,
 53.4 (18~87) 57.6 . Muller
 2
 , 3 가 가 .
 Jupiter
 (25 , 47%) (19 , 35%)가 가
 가 가 , Muller C3 (25 , 47%) 가
 , C2 (19 , 35%) C1 (9 , 16%) .
 11 3 , 3 , 3 , 1
 1 . 102.8 (19.2~122) , Jupiter
 가 (excellent) (good)가 38 (71.7%) , (fair)
 (poor) 15 (28.3%) . 2
 가

Treatment Results of Capitellum Fractures

가

1998 3 2002 7 12 가 4
 , 1 Hahn-Steinthal 2 , 2 McKee
 4 (coronal shear fracture)가 1 Kocher-Lorenz 1 ,
 S-pin (threaded Steinmman pin) , Kocher lateral J-approach
 1~2
 3
 4
 Mayo 가 가
 (congruity)
 3 5~125 가
 1 (misdiagnosis)
 45 45~110
 가 ,

The Relationship between Proximal Radius Fracture, its Operative Treatment and Posterior Interosseous Nerve Injury

1985 1 2002 12
 1,013 , 44.7 5 19 90 . 14 5

19 6 , 8 가 ,
 Monteggia 4 , 1 (proximal half)
 가 9 , 가 3 .
 5 , 3 , 1 ,
 1 , 1 가 .

(proximal half)

Arthroscopic Management of Intra-Articular Fractures of the Distal Radius

_____ .

가

가

1995 12 2001 1 51 ,
 45.7 가 1.6:1 . Chinese finger trap system
 3~4 4~5

MCU MCR

K-
 K- 14 42 , 28.3

Sarmiento Demerit point system , 1 가
 26 , 20 , 5 . 가

(congruity) 가가 (triangular fibro-
 cartilage complex) 가

65

**Surgical Treatment of Fractures of the Distal Radius
in Patients Older Than 65 Years**

가 가 가 가 가

65 K-

1998 1 2001 12 65
12 가 24 K-
14 , K- 10 ,
Frykman Sarmiento
Demerit Point System (, ,)

Demerit Point System K- 9 (64%), K-
9 (90%) , 1 Fryxman VIII

K- 23.2%, 12%,
41.7%, K- 11%, 5.9%, 27.4%

K-

65

K -
**Percutaneous Intramedullary Multiple K-wires Fixation
for the Metacarpal Fractures**

_____ .

K-

1
가

1995 1 2002 2 114
K- 1 가 37 44 ,
, 2 가 , K- 2
가

가 4 . 20 , 20 , 3 K- 2 가 40 , 3
3 , 4 , 6 5 3 6 .

K-

가가 . 가 ,

Triplane Fracture of the Distal Tibial Epiphysis

1998 3 2001 10
 가 가 12 . 가 8 , 가 4 , 1
 14.2 (12 ~16) , 18 (12 ~30) .
 8 , 3 , 1 , 10 , 2
 가 가 9 , 7 가 가 3 ,
 , 8 4
 , 가 Modified Weber protocol .
 Modified Weber protocol 가 가 9 , 가 3 ,
 가 , .
 10 , 2 10 .
 가 가 ,

(Pin Leverage)

Reduction of Radioulnar Shaft Fractures of Children using Pin Leverage

(Pin leverage)

1997 5 2002 2

22

Thomas 가

10.5 , 2 4 가

13.2 , 10.0 . 11.5 , 11.8 ,

42 , 4.6 , 1.7 , 1.9 , 0.8 , 0 ,

49.6 , 40 . 1 ,

가 21 , 1 (, Thomas 가

CHILD

Comparison of Postoperative Healing Process as Child's Classification in Liver Cirrhosis Patients

1998 1 2003 3
 19 15 15 가 14 1
 , 가 8 , 2 , 가 4 , 1 ,
 6 , 3 , 2 , 1 , 1 ,
 1 , 1 . CHILD
 A: 7 , B: 8 , C: 0 ,
 15 6 (40%) , Child A 2 (28%), Child
 B 4 (50%) , 15 2 (13%) Child A: 1 (14%), Child B:
 1 (12.5%) 28 14
 가 .
 가 .

multi-center study가 .

: ,

