

- 1 **Biomechanics & Peals in Treating PIP Fractures & Fracture/Dislocations**
- 2 **PIP Joint Vulnerable to Injury**
 - Long lever arm
 - Limited laxity
 - Propensity for stiffness
- 3 **Axial Load (impaction)/Shear**
- 6 **Classification of Stability Kiefhaber & Stern Modification of Hastings Classification**
 - Stable: <30%, Stable & Congruent through full ROM
- 7 **Classification of Stability Kiefhaber & Stern Modification of Hastings Classification**
 - Tenuous: 30-50% reduces with <30° flexion
- 8 **Classification of Stability Kiefhaber & Stern Modification of Hastings Classification**
 - Unstable: >50%, or <50% but requires >30° flexion to maintain reduction
- 9 **Treatment: Stable and Tenous**
 - Stable
 - <30%, Stable & congruent through full ROM
 - Tenuous
 - 30-50%, reduces with <30° flexion
- 10 **Volar Fractures/Dorsal Dislocation**
 - McElfresh, Dobyns, & O'Brien (*JBJS* 1972)
 - SAC
 - Dorsal Digit Splint
 - Flex 15° past point of instability
 - Decrease flexion by 25 °/wk.
 - Delay full ext. 6-12 wks.
- 11 **Volar Fractures/Dorsal Dislocation**
 - Results parallel accuracy of reduction
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- - V-sign (*Hastings*)
- 12 **Extension Block Splinting:**
McElfresh, Dobyns, O'Brien, JBJS 1972
- 17 patients: 16 acute, 1 chronic
 - Splint : Wrist with digital ext. block
 - ROM : "90 to 105 degrees of flexion"
 - Bulky splint : Requires close monitoring
 - 5 cases : Flexion contracture > 20°
 - Fracture size : only 10-30% of P2
- 13 **Unstable:**
>50%, or <50% but
requires >30° flexion to maintain reduction
Treatment Options:
- Percutaneous reduction, K-wire fixation
 - ORIF
 - External Fixation (dynamic)
 - Osteotomy
 - Palmar Plate Arthroplasty/Graft
- 14 **Unstable: >50%**
- Percutaneous reduction, K-wire fixation
 - Extension Block
- 15
- 19 **Percutaneous reduction**
Extension Block K-wire
- 20 **Unstable: >50%: External Fixation**
Pins & Rubber Band Traction
Suzuki Y, Matsunaga T, Sato S and Yokoi T
JHS (Br) 1994; 19B:98-107
- 21 **Pins & Rubber Band Traction**
Suzuki Y, Matsunaga T, Sato S and Yokoi T
JHS (Br) 1994; 19B:98-107
- 22 **Unstable: >50%: External Fixation**
Ruland T, Hogan CJ, Cannon DL, Slade JF
JHS 2008;33A:19-25

- 25 **When will not Close Reduce:
The Best Option in 2018: ORIF**
- 26 **Volar Fracture, Dorsal Dislocation**
- 27 **Volar Fracture, Dorsal Dislocation**
- 28 **Volar Fracture, Dorsal Dislocation**
- 29 **>50% Unreducible: ORIF**
- 30 **>50% Unreducible: ORIF**
- 31 **Volar Articular Involvement >50%
Late Treatment**
- Osteotomy (Zemel)
- 32 **Volar Fractures/Dorsal Dislocation**
- *“With disruption of greater than 40% of the volar articular surface of the middle phalanx it is unlikely that a congruous, stable reduction can be achieved.”*
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- 33 **Results: Volar Plate Arthroplasty
R. Eaton JHS 1980**
- 10 year study
 - 24 patients
 - 7 acute (<1 week) 95° (75-120)
 - 17 late (>6 weeks) 75° (30-110)
- 35 **Volar Plate Arthroplasty**
- 36 **Volar Articular Involvement >50%
Treatment Unpredictable**
- Role of Volar Plate Arthroplasty: Unclear
 - Results at Indiana Hand to Shoulder Center Unpredictable..
 - Visit by R.Eaton Operated three cases
- 39
- 40 **F/E Axis of PIP Joint**
- 44 **Pilon Fractures**
- Severe Comminution
 - ? Surpass ability to fix

- External Fixation
- Traction splint
- Limited ORIF, bone graft, dynamic external fixation

45 **Pilon Fractures**

46 **Treatment by External Fixation**

- Traction
 - Roberston & Cawley 1946
 - Robert R. Schenck 1986

47

48 **Pilon Fractures**

49 **Pilon Fractures**

50 **Pilon Fractures**

51 **Pilon Fractures**

52 **Pilon Fractures**

53 **Pilon Fractures**

57 **Critical Assessment of PIP Stability after Palmar Lip Fracture Dislocations**
Hamlet & Hastings 56th Annual Meeting ASSH 2001

- 59 1. <42% all Joint Stable, all Positions of Extension
 2. 42-60%: Require progressive ° Flexion
 3. > 60% Grossly Unstable Despite Flexion

60 4. Collateral Ligaments Play No Role in Dorsal/Palmar Stability

61

71 **Reduce the Joint**
When Unstable, Restore Palmar Buttress

- Dorsal Block Splinting
- Percutaneous K-wire Fixation
- ORIF
- External Fixation – Traction
- Palmar Plate Arthroplasty
- Hemi-Hamate Resurfacing Arthroplasty

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- 72 **Hemicondylar Hamate Replacement Arthroplasty (HHRA)**
Hastings, Capo, Steinberg

- Autogenous local osteochondral graft from dorsal 20-50% of ipsilateral hamate
- Bicondylar facet, separated by central ridge

- 74 **Hamate as Autograft**

- Articular contour:
 - Similar radius of curvature as base (P2)
 - Bicondylar facet, 4th/5th MC:
 - Replicates bicondylar facet of P2
- Sizeable osteochondral graft can be rigidly fixed with screws
- Local autogenous graft from same operative site

- 81 **Indications for HHRA**

- Comminuted Unstable PIP Palmar Lip Fracture/Dislocations
 - Acute
 - Neglected, chronic
- Comminuted Lateral Plateau Fractures
- Salvage after Failed
 - External Fixation
 - ORIF
 - Palmar Plate Arthroplasty

- 84 **Think of HHRA When Other Simpler Methods Are Not Applicable**

- Percutaneous reduction, K-wire fixation
- ORIF
- External Fixation (dynamic)
- Osteotomy
- Palmar Plate Arthroplasty/Graft
- Palmar Buttressing Graft (HHRA)

- 94 **Example W.F.-7 mo. Post Injury**

- 95 **Example W.F.**

- 99 **Example W.F.**
Fixation 1.3 & 1.0 mm. Screws

100 **Rehabilitation**

- 3-5 days postoperative:
 - Dressing change
 - Edema control
 - AROM & PROM
 - 5° Dorsal block splint (4-6 weeks)
- 6 weeks: Strengthening
- >6 weeks: treat any residual PFC with stretching or splinting

101 **Example W.F.**
Range of Motion at 8 Wks. After Surgery

104 **Outcomes**

- *Hastings H, Capo J, Steinberg B (N=10)* Avg. 33.1 months (0.5-102 mo.)
 - PIP 26.5°/90.5° (+15-60°/70-105°)
 - DIP 1.5°/60.5° (+10°-15°/5°-105°)
- *Williams RMM, Kiefhaber TR, Sommerkamp TG, Stern PJ (N=13)*
 - PIP 87° (65-100°)
 - DIP 57°

105 **Calfee RP, Kiefhaber TR, Sommerkamp TG, Stern PJ:**
J Hand Surg Am, 2009 Sep;34(7);1232-41

- N=33 pts.
- Evaluated 22 (14 acute < 6 wks., 8 chronic mean 30 wks.)
- Mean f/u 4.5 yrs.
- Active PIP ROM 70° (acute 71°, chronic 69°)
- Mean flexion Contracture 19°
- Mean VAS for pain 1.4 acute 0.7, chronic 2.5
- Little Functional Impairment (Dash 5 – acute 2, chronic 9)
- Grip Strength 95%
- 1 patient revised

109 **Treatment of unstable proximal interphalangeal joint fractures with hemi-hamate osteochondral autografts**
M. Burnier¹, T. Awada², F. Marin Braun², P. Rostoucher¹, M. Ninou¹ and L. Erhard¹; JHS(E) 2016

- N=19 pts., mean age 39 yrs.
 - 10 chronic > 6 wks, 9 acute < 6 weeks

- Mean f/u 24 mo.
- Postop mean Flexion 83°, Mean Ext. 17° (AROM 66°)
- Mean VAS 1.1, Mean QuickDash 11
- Of note:
 - Operative findings: Moderate mirror injuries on the head of the proximal phalanx were discovered intraoperatively in all patients
 - 2 cases required teno/arthrolysis
- No donor problems

113 **Must Tip the Graft to Restore Palmar Buttress**

- Failure to do so: most commonly associated with poor result

115

- Injured Deer Hunting with Fall from Tree Platform. HHRA 5 mo. 3 wks. after Injury

116 **G.S. 8.5 yrs after HHRA**

117 **G.S. 8.5 yrs after HHRA Video**

118 **Take Home: Treatment PIP Fx/Dislocation**

- Requires Palmar Buttress for Stability
- <30%: Dorsal Block Splint

119 **Take Home**

- >30-50%: Must Restore Palmar Buttress
 - Acute- try external traction
 - Delayed: ORIF is best

120 **Take Home**

- When PIP Subluxated/Dislocated & Not Reducible/Stabilized by Simpler Techniques ...Best Salvage is to Restore Palmar Buttress
- When Not amenable to Osteotomy.....
- HHRA fits the requirements...the best I have found
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121 **Take Home- HHRA**

- Must “tip” graft to properly restore palmar buttress
- Failure to do so: most commonly associated with poor result

122 **Take Home**

- Intermediate Results 4-10 yrs.
- Most +/- 85% satisfied
- Some radiographic degenerative changes

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