



**2009 OTA Annual Meeting
Manchester Grand Hyatt
San Diego, CA**

(#F6) Skills Lab: Clavicle / Proximal Humerus

Elizabeth H, Level II

**1:31pm – 3:01pm
Friday, October 9, 2009**

Moderators: Lawrence X. Webb, MD

**Faculty: Eben A. Carrol, MD
Barnaby T. Dedmond, MD
Kyle J. Jeray, MD
Clifford B. Jones, MD
Michael D. McKee, MD
Joseph Veneziano, Jr., MD**

The material presented at this course has been made available by the Orthopaedic Trauma Association for educational purposes only. This material is not intended to represent the only, nor necessarily best, methods or procedures appropriate for the medical situations discussed, but rather is intended to present an approach, view statement or opinion of the faculty which may be helpful to others who face similar situations.

Disclosure: Faculty disclosure can be found starting on page 67 of the 2009 OTA Annual Meeting program.

Skills Lab for 2009 OTA Annual Meeting

Proximal Humeral & Clavicle Fracture Fixation Skills Lab

Friday, October 9, 2009

1:30 – 3:00 PM

San Diego, CA

Percutaneous Pinning of Proximal Humeral Fractures

“What does it take to obtain & maintain reduction?”

Clifford B. Jones, MD

Clinical Professor, Michigan State University/CHM

Orthopaedic Associates of Michigan, Grand Rapids, MI

Introduction

Bimodal Distribution:

Young (hi eng, MVA), Old (low eng, falls)

Difficult, Exposure, Stiffness, Short Segment Fixation, Osteoporosis

Vascular Supply

Anterolateral branch of anterior humeral circumflex

Liang (bicipital groove)

Fracture Displacement

Greater tuberosity – supraspinatus (external rotation, cephalad migration)

Lesser tuberosity – infraspinatus (internal rotation)

Proximal diaphysis –

Pectoralis Major – adduction, internal rotation

Deltoid – adduction, shortening

Combined Deformity: apex anterior, adduction, varus, short, internal rotation

Equipment (besides patience)

Pins: 2.5 mm terminally threaded Schantz pins (look in small ex fix sets)

Radiolucent table (and arm board) backwards (base at feet)

turn 90° (ipsi arm)

Patient: at far cephalad and lateral position

Shoulder off the table

C-arm Fluoroscopy @ head of table, center over shoulder, roll for axillary

Check pre prep to confirm position of body and adiposity

Reduction Technique

Reduction for varus, short, apex anterior:

traction, later translation, poster push

Reduction for valgus impacted:

joy stick in head to disimpact, medial reduction

Reduction for tuberosities:

joy stick, “walk” to reduction with arm abd → add

Pin Insertion

(long 2.5mm drill sleeve assist, begin ⊥ then direct, divergent head pins)

5 mm incisions, 90/90 fixation, cut below muscle/skin

↑ migration: violation of chondral surface: remove/redirect pin or too short

Lateral Pins (#3-6): begin with power,

use manual to advance subchondral bone

Tuberosity pins (#2-4): begin/end with power into medial shaft cortex

Failure:

non divergent pins – poor relative stability

pins not in subchondral bone – too short

chondral tract hole – must redirect or remove pin

Post Op Protocol

FF (no rotation/Abd 2° tuber pins) only first 6-7 wks, pin removal office/OR
Unlimited ROM, strength, ADL (PT begins after pin removal for 6-12 wks)

Results

ROM @ 6mo, Function at 12 mo

AVN low: 4-12% for 3/4 Part Fx

Potential improved ease for 2° procedures (less scarring)

Results and Functional Outcomes of Closed Reduction Percutaneous Pinning of Displaced Unstable Proximal Humeral Fractures

Purpose: To evaluate the results and outcomes of closed reduction percutaneous pinning (CRPP) of proximal humeral fractures.

Materials & Methods: Consecutive patients with unstable displaced proximal humeral fractures treated with CRPP between June 2001 and January 2007 were retrospectively reviewed. All patients were treated with CRPP based upon fracture pattern and surgeon preference. Implants were terminally threaded 2.5mm Schantz pins. Pins were removed at 6 weeks. Healing, reduction quality, range of motion, functional outcome (DASH and SMFA), and complications were measured

Results: Ninety fractures in 89 patients with female preponderance (67F, 22M) and an average age of 61 (17-93 yo) were noted. Bimodal age distribution of younger (<60 yo, 42 pts, 47%) and older (≥60 yo, 47 pts, 53%) groups were noted. Seventy-eight fractures (87%) were isolated. Neer classification was 2 part (21, 24%), 3 part (50, 56%), and 4 part (19, 21%). AO/OTA classification was A2 (5, 6%), A3 (21, 23%), B1 (1, 1%), B2 (59, 66%), and C2 (4, 4%). Neer 2 part versus 3/4 part correlated with AO/OTA A versus B/C groups, respectively ($p<0.001$, $r=0.57$). Pin placement averaged 4 lateral and 2 greater tuberosity pins. Humeral reduction quality was measured: head-shaft angulation 132° (range 110-170°) and apex anterior angulation 12° (0-75°). Complications were malunion (12, 13.5%), nonunion (4, 4.4%), and AVN (2, 2.2%). Total pin related complications occurred in 19 (21%) patients: loosening (6, 6.7%), migration (7, 7.8%), fixation failure (10, 11.1%), and pin impaction (4, 4.4%). Older patients had higher rates of AVN and pin complications ($p<0.03$). Worsening Neer classification not AO/OTA was related to higher AVN rates ($p<0.03$) but not pin complications. DASH scores at one year averaged 30.5 (range 0.75-81.7). SMFA measurements improved up to two years. Only the arm/hand measurements at 6 month versus 24 months were significantly different ($p<0.05$).

Younger patients had significantly improved outcome measurements compared to older patients at 6 months but not at 1 and 2 year intervals.

SMFA	6 mo	12 mo	24 mo
Daily Activity	27.59 (0-88)	29.22 (0-93)	23.06 (0-90)
Emotional	32.01 (0-64)	29.70 (0-75)	23.12 (0-61)
Arm/Hand	20.79 (0-69)	18.60 (0-81.3)	12.19 (0-56.25)
Mobility	24.55 (0-72.22)	24.56 (0-83.33)	19.04 (0-81)
Function	26.71 (0-71)	25.69 (0-83.82)	19.27 (0-66.36)
Bother	25.92 (0-75)	26.05 (0-92)	19.90 (0-56)

SMFA	AO/OTA Class		SMFA	AO/OTA Class		SMFA	AO/OTA Class	
	6mo	A B&C		12 mo	A B&C		24 mo	A B&C
Function	9.93		16.32		7.98			
	sig p=.001	28.11		27.87	sig p=.043		21.26	
Bother	15.63		18.33		14.58			
		26.81		27.99			20.83	
Arm/Hand	14.07		11.25		2.09			
		21.36		20.08	sig p=.016		13.97	
Mobility	8.33		15.55		6.48			
	sig p=0.05	25.90		26.87	sig p=.05		21.26	
Daily Activity	6.25		14.50		5.47			
	sig p=.001	29.37	sig p=.05	32.42	sig p=.018		26.25	
Emotional	12.5		25.71		21.43			
	sig p=.000	33.63		30.92			23.44	

Conclusion: Closed reduction percutaneous pinning of unstable displaced proximal humeral fractures is a technically dependent procedure with pin related problems but low rates of AVN. Older patients have higher rates of AVN and pin related complications. Outcome measurements improve up to 2 years with significant differences noted between AO/OTA A versus B/C groups and age.