Proximal Humeral Fractures

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Introduction

전체 골절의 약 4%~5%를 차지
상완골 골절 중 가장 흔하며(45%), 40세 이상에서 76%로 증가
Osteoporosis와 중요한 factor
Female/male= 2 / 1
Non displaced stable Fx.: 80%
Displace unstable Fx.: 15-20%
Check Points prior to Tx.:
- Associated dislocation
- Neurovascular status
- Concomitant rotator cuff tear
- Possibility of AVN
- Indication for Hemiarthroplasty

Anatomy

Osteopenic bone
4 segments
- Humeral head (articular segment): anatomic neck
  Surgical neck
- Greater Tuberosity: rotator cuff (SS, IS, TM)의 insertion
- Lesser Teberosity: subscapularis의 insertion
- Humeral shaft(Bicipital groove): the long head of biceps
  --- surgical reconstruction의 landmark

Neurovascular
Vascular:
Anterior humeral circumflex artery
Ascending branch
arcuate artery - penetrate bone in the intertubercular groove
area - most of humeral head

Posterior humeral circumflex artery

Neurological:

Brachial plexus injuries (5~45%)

Axillary n. injury(m/c)

Muscular (Deforming forces)

Pectoralis major pulls shaft medially

Rotator cuff pulls GT posteriorly/medially/superiorly

Subscapularis pulls LT medially

Biceps interposition

Classification of Fractures

Neer(1970) s 4 parts Fx. Classification

Greater than 1cm displacement

Greater than 45 degrees angulation

Key principles

Appropriate radiograph(quality, view)

Comminution정도는 고려되지 않음

Degree of fissures는 배제

Special Fx. Considerations

- Impression Fx.
- head split Fx.
- Fx & D/L,

AO/ASIF/OTA Comprehensive Long Bone Classification system

3 main groups(A,B,C) and 3 subgroups

Mechanism of Injuries

Young: violent forces

Elderly: trivial forces

Physical Examination

Pain and swelling

Crepitus with motion

Impressive ecchymosis

Careful neurovascular exam.

Rule out associated D/L

Associated Injuries
Rotator cuff tears with wide displacement of the tuberosities
Axillary artery laceration in four part fracture
Brachial plexus injuries: 6%
Interposition of LHB

Evaluation

Plain film X-ray: trauma series (AP/Lat of scapula, Axillary)
CT scan: helpful in head split, impression Fx., Fx & D/L, GT displacment
MRI: rarely indicated(occult nondisplace Fx., rotator cuff tear, occult articular injury, osteonecrosis)

Treatments

1) Options of Tx.

Quality of bone
Age/ Activity level
Medical Condition
Associated injuries
Dominent or non dominant arm
Accurate classification of Fx.
Experience of Surgeon

2) Nonsurgical Treatment

A. Majority: none to minimally displaced Fx.
Sling
Sling & Swathe
Velpeau
Early mobilization within 2wks(10days if possible) to 4wks

B. Cx of Non surgical Tx.
AVN: common in 3 or 4 part Fx
3 part(3~14%), 4 part(13~34%)
Non-union: uncommon
O/R & I/F with bone graft or humeral prosthesis로 치료

Malunion: due to inadequate reduction
Stiffness

3) Surgical Treatment

A. Methods
C/R & percutaneous pinning
Open Reduction & Internal fixation
Interosseous sutures or wires
Pins, screws
AO buttress Plate & screws
Intramedullary rods
Figure of 8 tension band
Interlocking nail
Hemiarthroplasty

; Technique with interfragmentary and axial stability without excessive soft tissue dissection --- most successful

B. Two part Fractures

Fx. site	Approach	Fixation option	complication	기타
Anatomical neck(AN)	Deltopectoral	Interfragmentary screws(young pt) Hemiarthroplasty(old pt)	Loss of fixation Nonunion AVN	Very rare
Surgical neck (SN)	Percutaneous Deltopectoral	K-wires / S-pins Plate & screws Intramedullary rods Figure of 8 tension band Interlocking nail	Nonunion, Malunion, Stiffness, NV injury, Loss of fixation	Results depend on stable fixation & early mobilization
Greater Tuberosity(GT)	Superior deltoid split	Interfragmentary sutures and screws	Loss of fixation Malunion, Axillary N injury	3mm displaced -- pt c overhead activity: OR
Lesser Tuberosity(LT)	Deltopectoral	Interfragmentary sutures / screws	Nonunion, Loss of fixation	Often with posterior D/L

C. Three Part Fractures
1. The greater tuberosity is much more commonly involved than the lesser tuberosity.
2. Surgical approach: Deltopectoral approach or percutaneous
3. Fixation options

a. percutaneous pins
b. interfragmentary suturing or wiring
c. plate and screws
d. interfragmentary wire or/and suture with intramedullary flexible rods

D. Four Part Fracrures
Hemiarthroplasty is treatment of choice
High incidence of AVN and malunion
Frequently be seen in the elderly
O/R & I/F시행 시 poor results 흔히 발생
Younger than 40 yrs without D/L: open reduction
Four part valgus impacted fracture: percutaneous or open reduction

E. Nonoperative considerations (relative)
Inactive pt
Poor medical risk
Dementia
Alcoholic

F. Cx of Surgical Tx
AVN: common in 3 or 4 part Fx
Fx후 2년까지 발생 가능
T-plate이용: 34% 발생 보고
Loss of fixation - malunion /nonunion
Impingement: migration of GT
Cephalad placement of internal fixation devices
Stiffness: due to inadequate rehabilitation
Infection
Vascular: older pts에 흔함
Axillary a. 와 anterior humeral circumflex a 의 junction 부근
Neurologic: 6–45%
Complete axillary n. injury by 3–6 mo: exploration
Heterotopic ossification: forceful manipulation 혹은 surgical Tx가 delay시 발생

Outcomes

The outcome of nonsurgical treatment of nondisplaced and minimally displaced proximal humeral fractures; fair or poor in 23% of pts

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