



Cooper Medical School
of Rowan University

Neurogenic Heterotopic Ossification of the Elbow

Orthopaedic Rehab Association
28th Annual Meeting

Meghan Morley, MD and David A. Fuller, MD

Camden, NJ October 6, 2018



- no disclosures

Heterotopic Ossification Associated With:

- Fractures / dislocations
- Soft tissue trauma
- Burns
- Decubitus ulceration
- Neurologic injury



Neurogenic Heterotopic Ossification

New extra osseous (ectopic) bone in soft tissue surrounding peripheral joints in patients with neurologic disorders

- Spinal Cord Injury
- Traumatic Brain Injury



Objectives of Talk

- Describe Elbow Neurogenic HO
- Incidence/Epidemiology
- Treatment
- Future Directions



Description: 1971

Traumatic Quadriplegia with Ectopic Ossification

H L Frankel MB MRCP

*(National Spinal Injuries Centre,
Stoke Mandeville Hospital,
Aylesbury, Buckinghamshire)*

Miss M K, aged 49

History: Patient sustained a cervical injury with resulting quadriplegia. Ectopic ossification began to develop around both elbows within four weeks of the injury. Fig 1 shows an X-ray of the right elbow taken three months after the injury. The left elbow was similarly affected and ectopic ossification also developed later around the hips.



Incidence:

Copyright 1980 by *The Journal of Bone and Joint Surgery, Incorporated*

Periarticular Heterotopic Ossification in Head-Injured Adults

INCIDENCE AND LOCATION

BY DOUGLAS E. GARLAND, M.D.*, CRAIG E. BLUM, M.D.†,
AND ROBERT L. WATERS, M.D.*, DOWNEY, CALIFORNIA

From the Head Trauma Service, Rancho Los Amigos Hospital, Downey

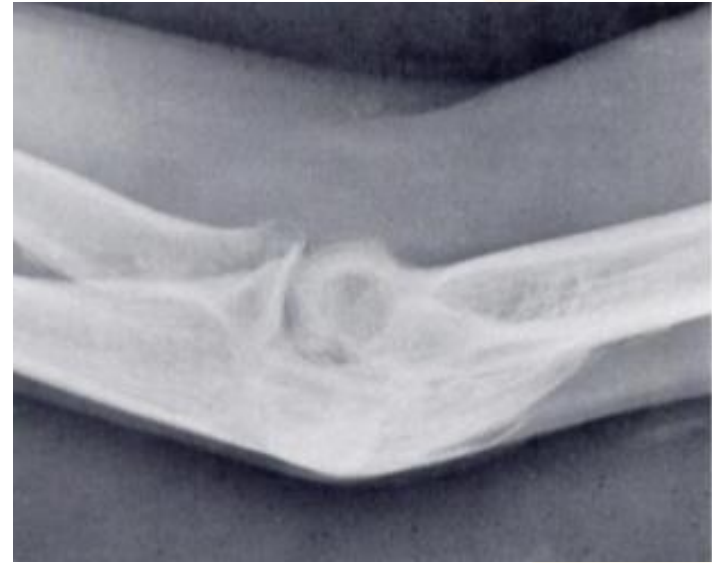
- 496 TBI, adults
- No traumatized joints
- “clinically significant”
- 100 joints in 57 patients (11%)
44 hips, 27 shoulders, 26 elbows, 3 knees

Elbow

- Posterior
 - 19 patients

- Anterior
 - 6 patients

- Combined (Ant + Post)
 - 1 patient



Risk Factors for HO in SCI

- More common in cervical and thoracic level injuries than lumbar
- Higher incidence in complete lesions
- Always occurs below the level of the SCI

Dalyan M et al; *Spinal Cord* 36: 405-8, 1998

Wittenberg RH et al: *J Bone Joint Surg* 74B: 215-8, 1992

Causes of HO in TBI and SCI

- Trauma
 - Microtrauma
- Genetic Predisposition Suspected
 - HLA Antigens Suspected
 - Fibrodysplasia Ossificans Progressiva
- Humoral Growth Factors
- Neural Factors

Microtrauma as a Cause of HO

- Lack of early motion may lead to joint stiffness and subsequent motion may traumatize soft tissues
- HO produced in rabbit experimental SCI model by forcible passive movement of paralytic, previously immobilized legs

Izuma K; *Paraplegia* 6: 351-63, 1983

Genetic Predisposition To HO ?

- Association found with HLA-B27 in 43 SCI patients studied
 - Larson et al; *Rheumatol Rehabil* 20: 193-7, 1981
- No Association Found with HLA Antigens
 - Weiss et al; *J Rheumatol* 6: 88-91, 1979
- No Association found with HLA-B27 or HLA-B18 found in TBI and SCI patients with HO
 - Garland et al; *Arch Phys Med Rehab* 65: 531-2, 1984

Genetic Predisposition to HO Suspected

- Fibrodysplasia Ossificans Progressiva (FOP)
 - An uncommon disorder with spontaneous formation of HO
 - Autosomal dominant inheritance
- Possible increased incidence of HO after total hip arthroplasty in patients with ankylosing spondylitis

Neural Factors and HO

- Neurologic injury may create a permissive local environment
 - Autonomic dysregulation
 - Interstitial edema
 - Hypersensitivity
 - Hypoproteinemia
 - Venous hemostasis
 - Increased vascularity
 - Hypoxia of local tissue
 - Substance P
 - Macrophages

Prophylaxis Development HO

- General efficacy not proven in patients after neurologic injury in SCI and TBI to reduce incidence of neurogenic HO

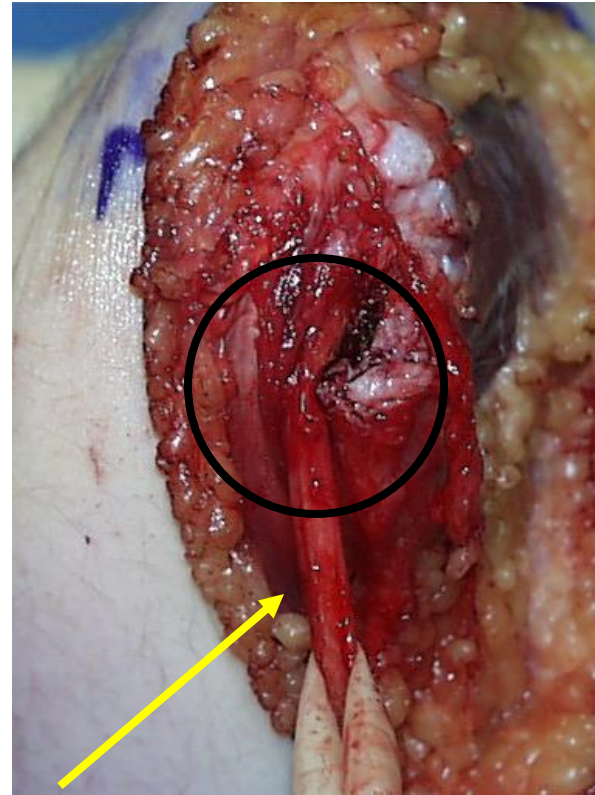
Clinical Signs of HO:

- Pain
- Redness
- Swelling
- Loss of joint motion
- DDx:
 - DVT**
 - Cellulitis**
 - Arthritis**
 - Hematoma**
 - Tumor**
 - CRPS**



Complications of HO

- Joint ankylosis
- Neuropathy
- Vascular compression
- CRPS
- Fractures



Ulnar Nerve entrapped in
HO posterior to elbow

Diagnosis of HO in SCI

- Ultrasonography useful in early diagnosis
- Ultrasonography suggestive of trauma in etiology of HO

Snoecx M et al; *Paraplegia* 33: 464-8, 1993

Diagnosis of HO in SCI

- Bone Scan Very Useful in Early Diagnosis
- Radiographs Show HO Later

Banovac K et al, *Spinal Cord* 35:156-62, 1997

Early Diagnosis of HO

- Serum alkaline phosphatase, calcium and phosphorus levels individually not diagnostic
- Elevated alkaline phosphatase and elevated phosphorus are associated with HO

Kim SW et al; *Paraplegia* 28: 441-7, 1990

Early Management of HO

- IV didronel 300 mg/day X 3 days
- PO didronel 20mg/kg/day
- Indocin SR 75 mg po qd
- Treatment of spasticity using phenol, botox, intrathecal baclofen
- Gentle ROM of joints

Currently No Standard Recommended Early Treatment

Surgical Treatment

Copyright 1979 by *The Journal of Bone and Joint Surgery, Incorporated*

The Surgical Treatment of Heterotopic Ossification at the Elbow Following Long-Term Coma

BY JOHN B. ROBERTS, M.D.*, AND DOUGLAS G. PANKRATZ, M.D.*,
COLUMBUS, OHIO

- 9 elbows in 7 patients
- Mature bone
- Immediate ROM
- Dramatic Improvements in ROM (flexion/extension)



Surgical Considerations/Approaches

Soft Tissue Contractures and Spasticity

Flexion or Extension Deformity

(trying to correct flexion deformity puts NV structures at greater risk)

Location

Posterior/PosteroMedial/Anterior
unique surgical incisions

- generally for neurogenic HO, favor medial/posteromedial approach
- need to safely get to bone

Surgical Considerations/Approaches

Poserior, PosteroMedial

Ulnar nerve in Cubital tunnel

Anterior

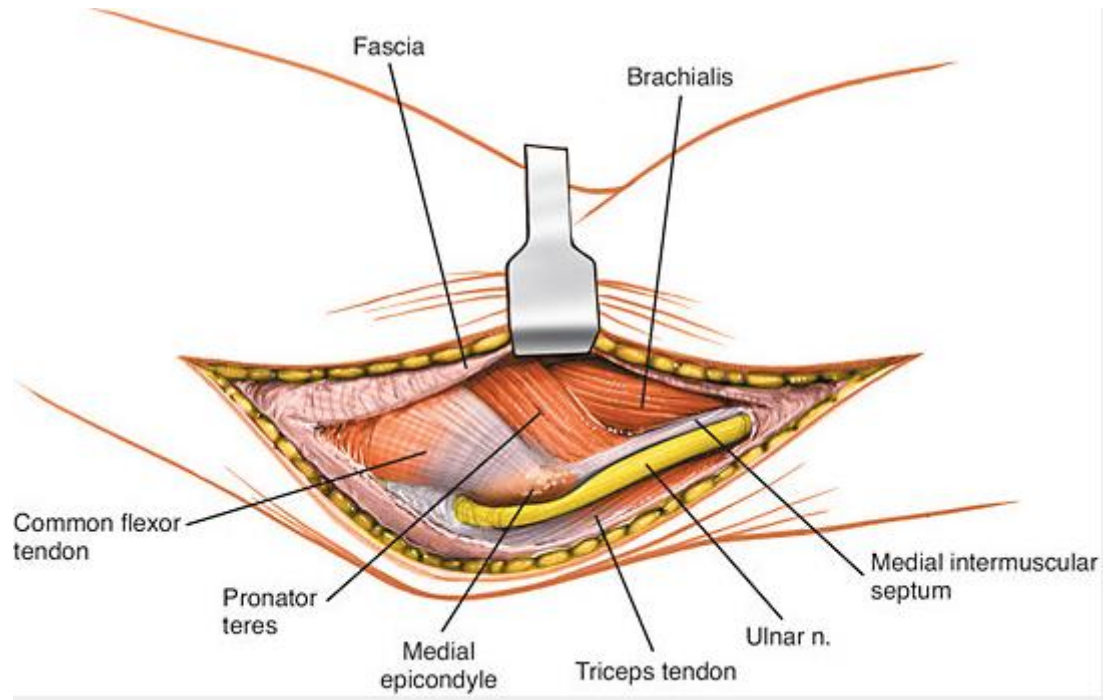
Radial/Median Nerves

Brachial Artery

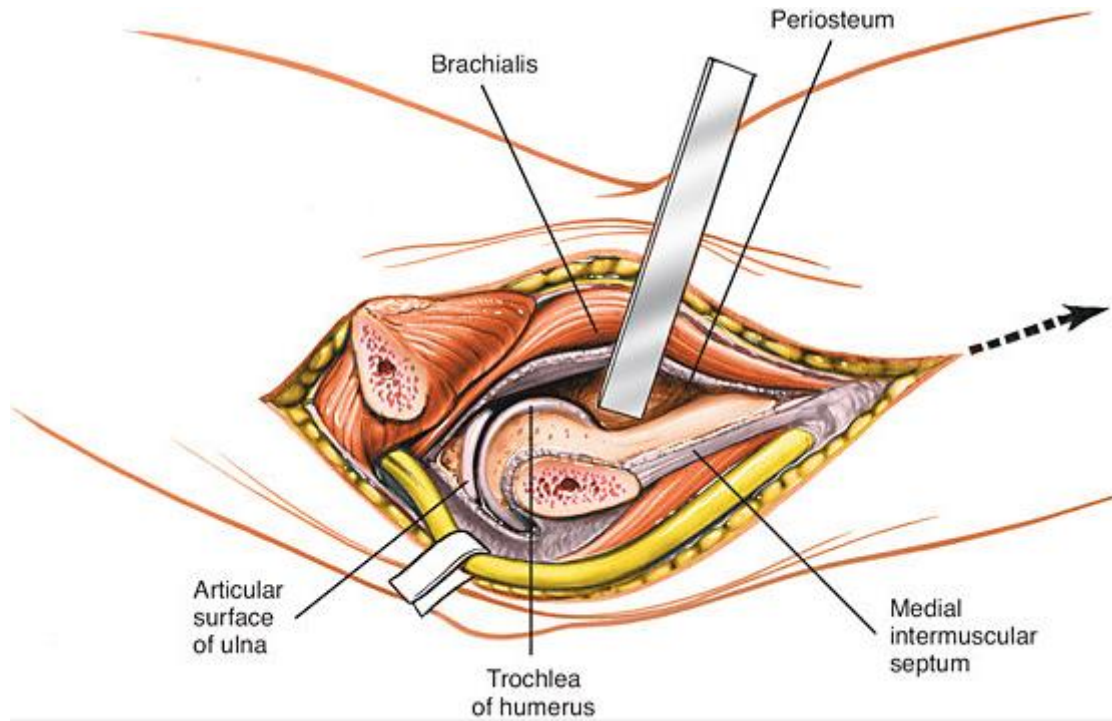
Skin



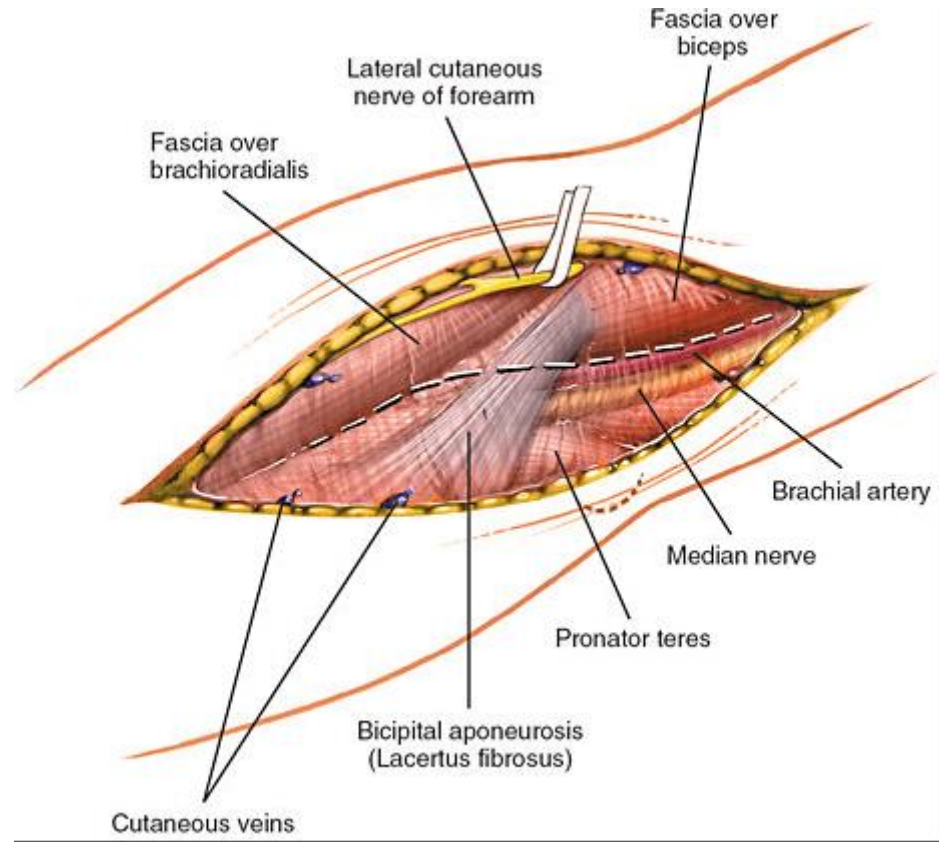
Medial Approach



Medial Approach



Anterior Approach



Anterior Approach

