Neurogenic Heterotopic Ossification of the Elbow

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• 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
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.

Frankel, HL. Proc Roy Soc Med 64:12, 1971
Incidence:

- 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

Gartland et al, JBJS, 1980
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
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

• No Association Found with HLA Antigens

• No Association found with HLA-B27 or HLS-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

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

- 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

Posterior, PosterioMedial
Ulnar nerve in Cubital tunnel

Anterior
Radial/Median Nerves
Brachial Artery

Skin
Medial Approach
Medial Approach
Anterior Approach
Anterior Approach