# Post-stroke pain

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Disclosures: None

# Outline

Introduction/Case

Central post-stroke pain

Complex Regional Pain Syndrome

Spasticity

Hemiplegic shoulder pain

Conclusion




# Who is this guy?

- Physical Medicine & Rehabilitation at St. Lukes
- Primarily neurorehabilitation and EMG but a sprinkling of MSK and OMT
- Residency at St. Lukes
- Military track + rural rotation site med school
- Rural full spectrum family medicine internship
- Flight surgeon x 4 years
- Hiking, biking, scuba diving, photography

68-year-old right-handed woman comes to your office 10 weeks after a left middle cerebral artery ischemic stroke. She has residual right-sided weakness and decreased sensation in the right hand. Her daughter notes she winces whenever her right arm is moved during dressing and transfers. Her pain is worse with movement and feels like a deep ache around the right shoulder with occasional burning into the forearm. Pain is limiting her participation in physical and occupational therapy.

# Introduction

- Nearly 800,000 strokes/year in USA
- Strokes leading cause of long-term disability, decreased mobility in >50% of survivors
- Pain develops in ~10% of ischemic strokes
- Overlooked due to variable characteristics, medical comorbidities, and impairments in cognition/communication
- Impact functional recovery, mobility, sleep

# A Few Definitions

- Hemiplegia – **paralysis** of one side of body
- Hemiparesis – **weakness** on one half of body
- Allodynia – pain with a stimulus that does **not** normally cause pain
- Hyperalgesia – exaggerated response from a normally **painful** stimulus
- Hyperesthesia – abnormal **increase** in sensitivity to stimuli

# Central Post-Stroke Pain
## aka *"Dejerine-Roussy Syndrome"*
## aka *"Thalamic pain syndrome"*

**Anatomic Location**

- Thalamic strokes or any impacting any CNS tracks responsible for pain transmission
  - Spinothalamic tract (pain, temperature, deep touch)
    - lateral spinal cord, medulla, pons, thalamus, post-central gyrus
  - Medullary tracts
  - Cerebral cortex (operculum and insular cortex )

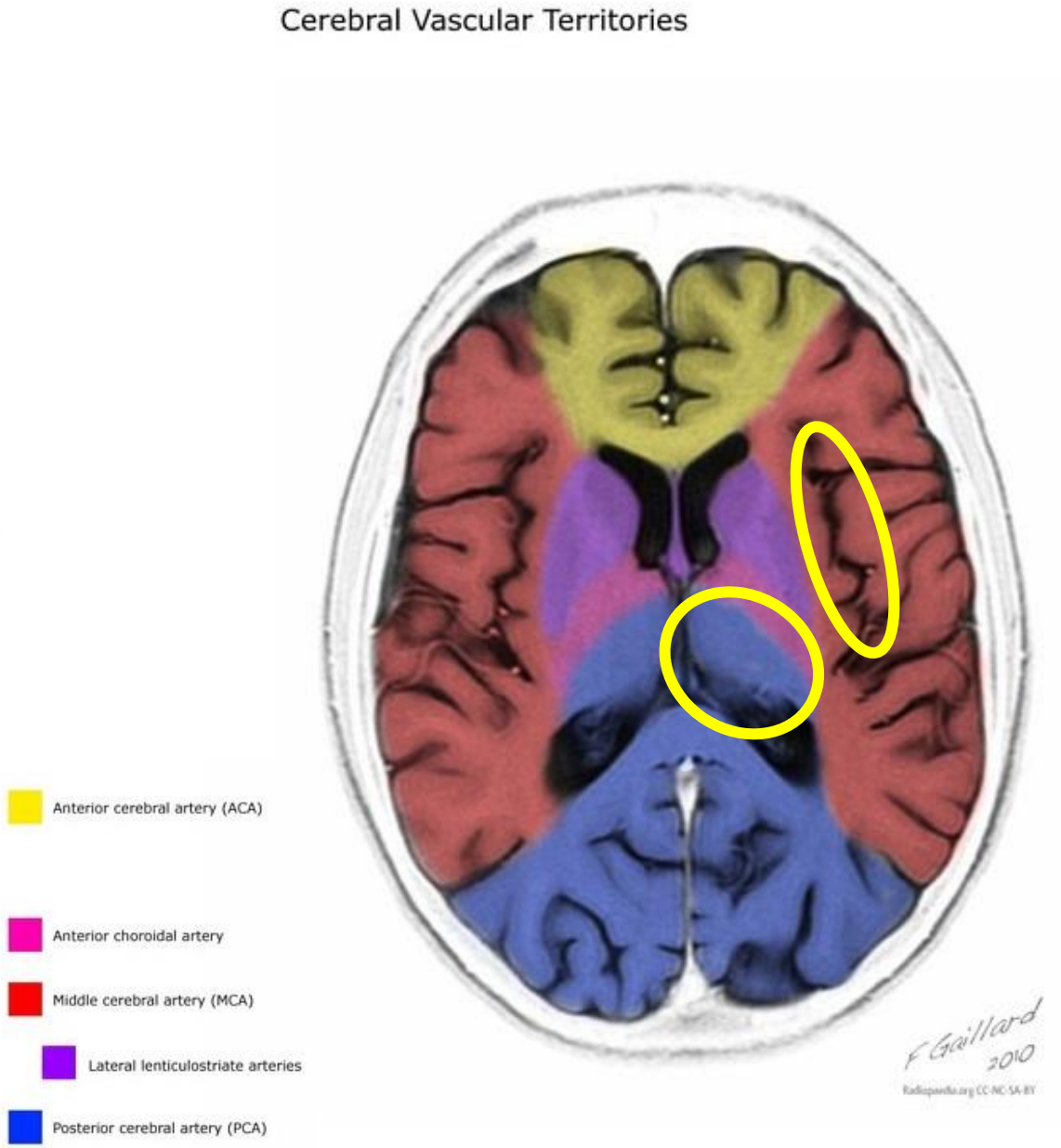



Image courtesy of Dr. Frank Gaillard, radiopaedia.org, rID 10814
https://radiopaedia.org/cases/cerebral-vascular-territories-illustration

# Central Post-Stroke Pain Continued

**Symptoms**

- Typically start 1-3 months post stroke,  incidence decreases after 6 months
- “Aching, dull, throbbing, sharp, stabbing, shooting, burning” **in area impacted by stroke**
- Sensations are induced (hyperesthesia or allodynia) or spontaneous

**Treatment**

- Amitriptyline 75mg qHS – **most studied** – dry mouth, constipation, urinary retention, orthostatic hypotension
- Lamotrigine 200mg daily – significant pain reduction – Stevens-Johnson, drug-drug interactions
- Pregabalin – improved sleep, anxiety, quality of life – dizziness, somnolence, edema, weight gain
- Fluvoxamine – SSRI, significant pain reduction if started within one year
- Less studied: gabapentin, other SSRIs and SNRI
- Interventions: Deep brain stimulation, cingulotomy, repetitive transcranial magnetic stimulation (rTMS)

# Complex Regional Pain Syndrome (CRPS)

- “Shoulder-hand” syndrome
- Risk factors:
  - Hemiparesis
  - glenohumeral subluxation
  - poor functional recovery
  - spasticity
- Clinical diagnosis with Budapest criteria
- Imaging not typically useful
- Diagnosis of exclusion

- Therapy and early mobility reduce disability
  - Mirror therapy and desensitization
- Treatments poorly researched in stroke
- Gabapentin
- Steroid burst
- Sympathetic blocks
  - **Pain Management Procedure**

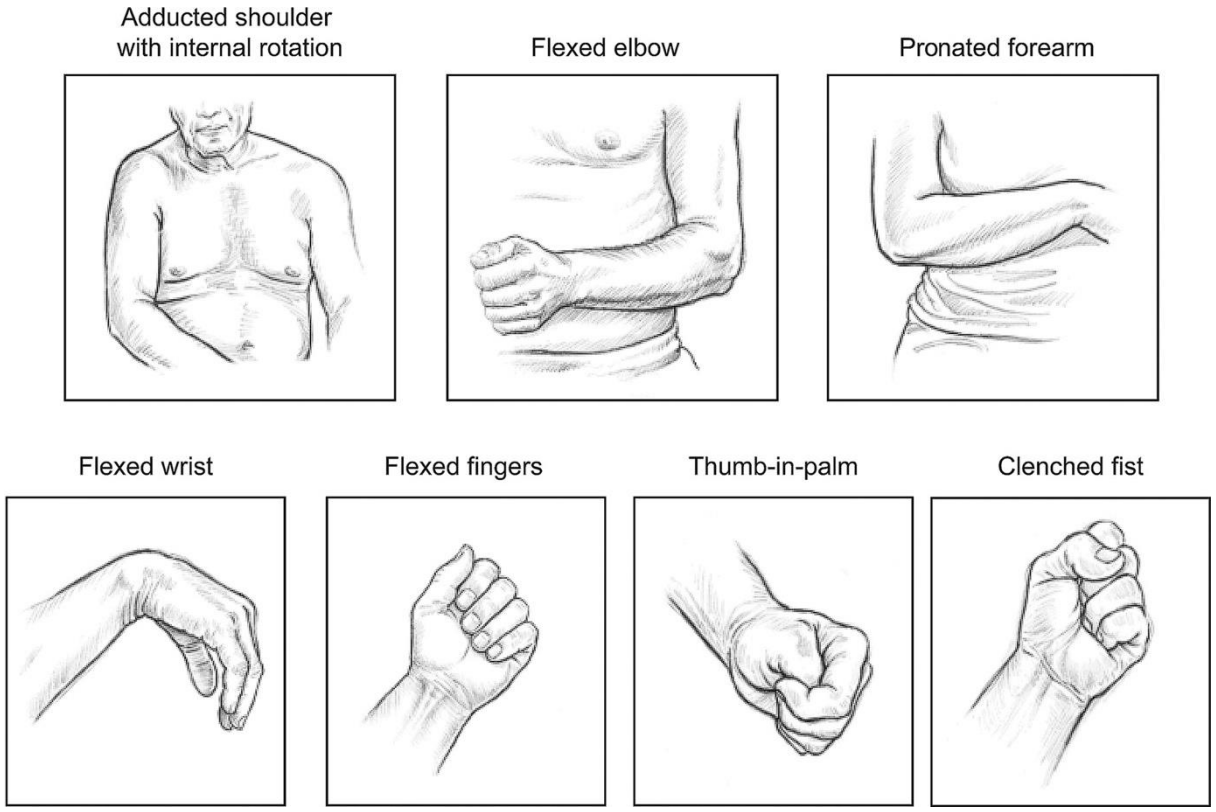
# Spasticity

"**Velocity and muscle length–dependent** increase in resistance to externally imposed muscle stretch. It results from hyperexcitable descending excitatory brainstem pathways and from the resultant exaggerated stretch reflex responses"

- Upper motor neuron conditions (stroke, TBI, SCI, MS, CP)
- 17-43% of patients 3-12 months post-stroke
- May NOT be painful!
  - Cramping, spasms, tightness, knot, etc.
- Limits mobility, transfers, increases skin breakdown and caregiver burden
- If untreated will develop contractures

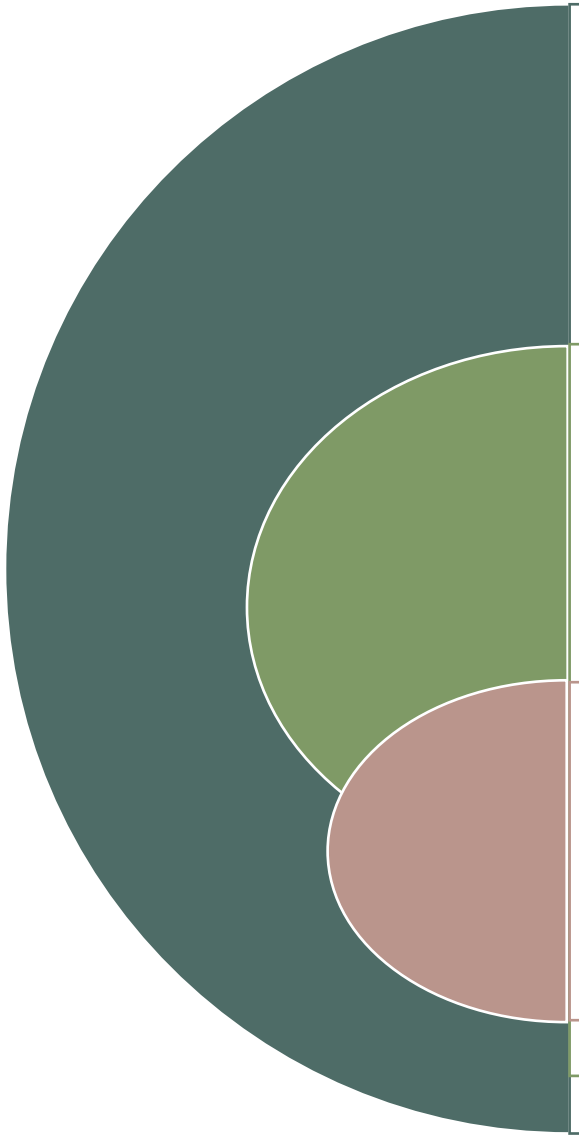
# Spasticity Exams

- Modified Ashworth scale most common
  - Range extremity at high velocity and grade based on catch and resistance
  - Graded 0, 1, 1+, 2, 3, 4 (contracture)
  - Repeat testing can decrease spasticity
- Skin breakdown in hands
- Watch patient walk if safe
- What bothers patient/caregivers?




From Simpson, D.M., Patel, A.T., Alfaro, A., Ayyoub, Z., Charles, D., Dashtipour, K., Esquenazi, A., Graham, G.D., McGuire, J.R. and Odderson, I. (2017), OnabotulinumtoxinA Injection for Poststroke Upper-Limb Spasticity: Guidance for Early Injectors From a Delphi Panel Process. PM&R, 9: 136-148. https://doi.org/10.1016/j.pmrj.2016.06.016
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# Spasticity Treatment



## Maintain ROM

- **Frequent** stretch, heat, massage, etc
  - Self, family/caregiver
  - Therapy

## Pharmacologic

- Baclofen, tizanidine, dantrolene, diazepam
  - Sedation, fatigue, confusion, decreased muscle strength

## Interventional

- Chemodenervation
  - Botulinum toxin and phenol
- Cryoneurolysis
- Intrathecal baclofen pump

# Pharmacologic Treatment of Spasticity

| Medication | Dosing | Side Effects |
|---|---|---|
| Baclofen | Starting 5mg BID/TID<br>Max 80mg daily (divided dosing) | Drowsiness, weakness, constipation, confusion<br>**Sudden withdrawal may lead to seizures** |
| Tizanidine | Starting 2mg q8hr<br>Max 36mg daily (divided dosing) | Sedation, dizziness, constipation, bradycardia, Stevens-Johnson, hepatotoxicity (monitor LFTs) |
| Dantrolene | Starting 25mg<br>Max 400mg daily (divided dosing) | **Hepatotoxicity** (needs LFT monitoring), weakness, drowsiness |
| Diazepam | Starting 2mg BID<br>Max 60mg daily (divided dosing) | Somnolence, impaired memory, respiratory depression, dependence |

Adapted from Verduzco-Gutierrez, M., Raghavan, P., Pruente, J., Moon, D., List, C. M., Hornyak, J. E., Gul, F., Deshpande, S., Biffl, S., Al Lawati, Z., & Alfaro, A. (2024). AAPM&R consensus guidance on spasticity assessment and management. *PM&R*, *16*(8), 864–887. https://doi.org/10.1002/pmrj.13211

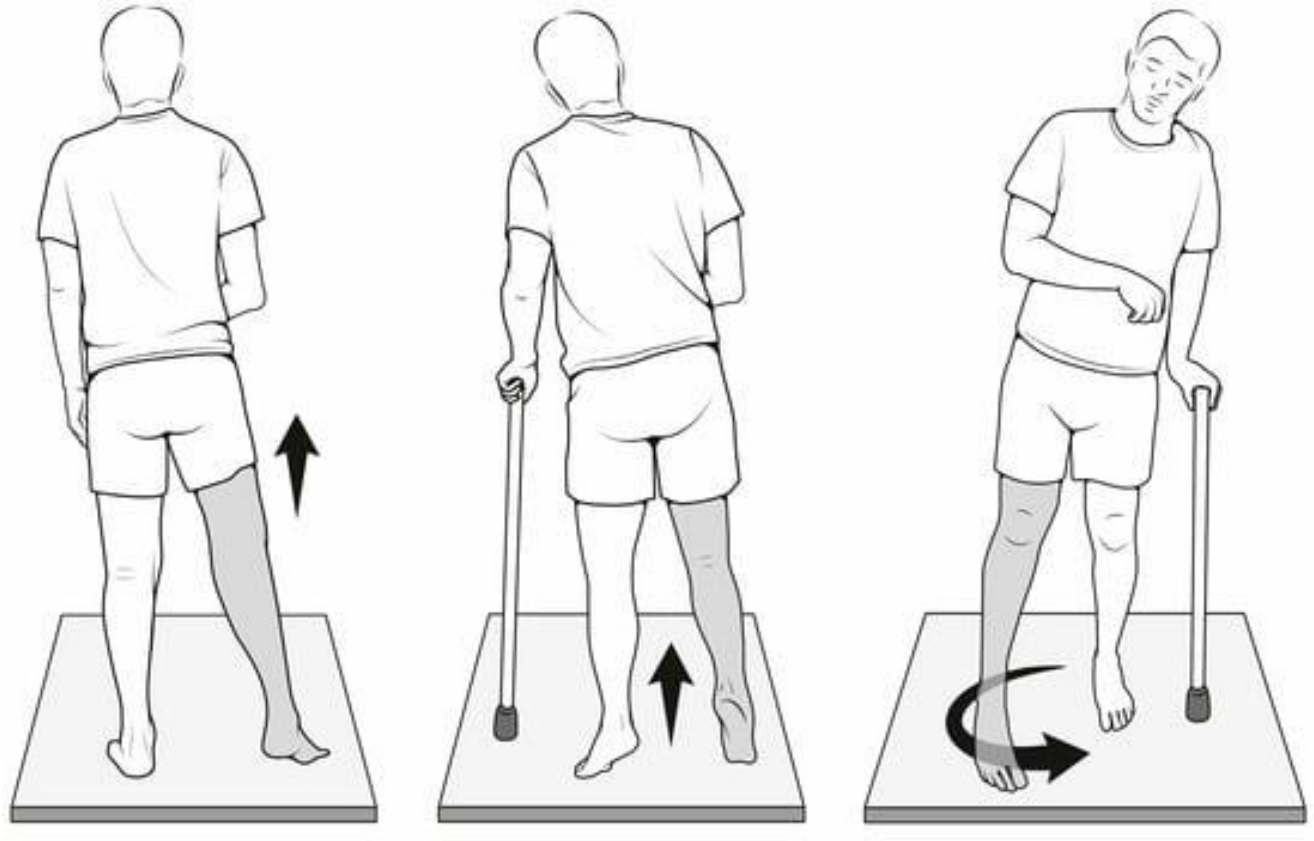
# Hemiplegic shoulder

- Prevalence 5-84% (based on definitions used)
- Multifactorial
- Likely combination of central pain/CRPS as well
- Supportive devices: slings, taping, wheelchair arm trough
- Gentle passive ROM (overhead pully NOT recommended)
- Treat underlying spasticity and/or central pain
- Glenohumeral or subacromial injections
- Suprascapular nerve block/ablation

Other Factors

- Subluxation – sulcus sign
- Weakness
- Spasticity
- Tissue injury
- Abnormal joint mechanism
- Rotator cuff pathology
- Frozen shoulder
- Scapular dyskinesis

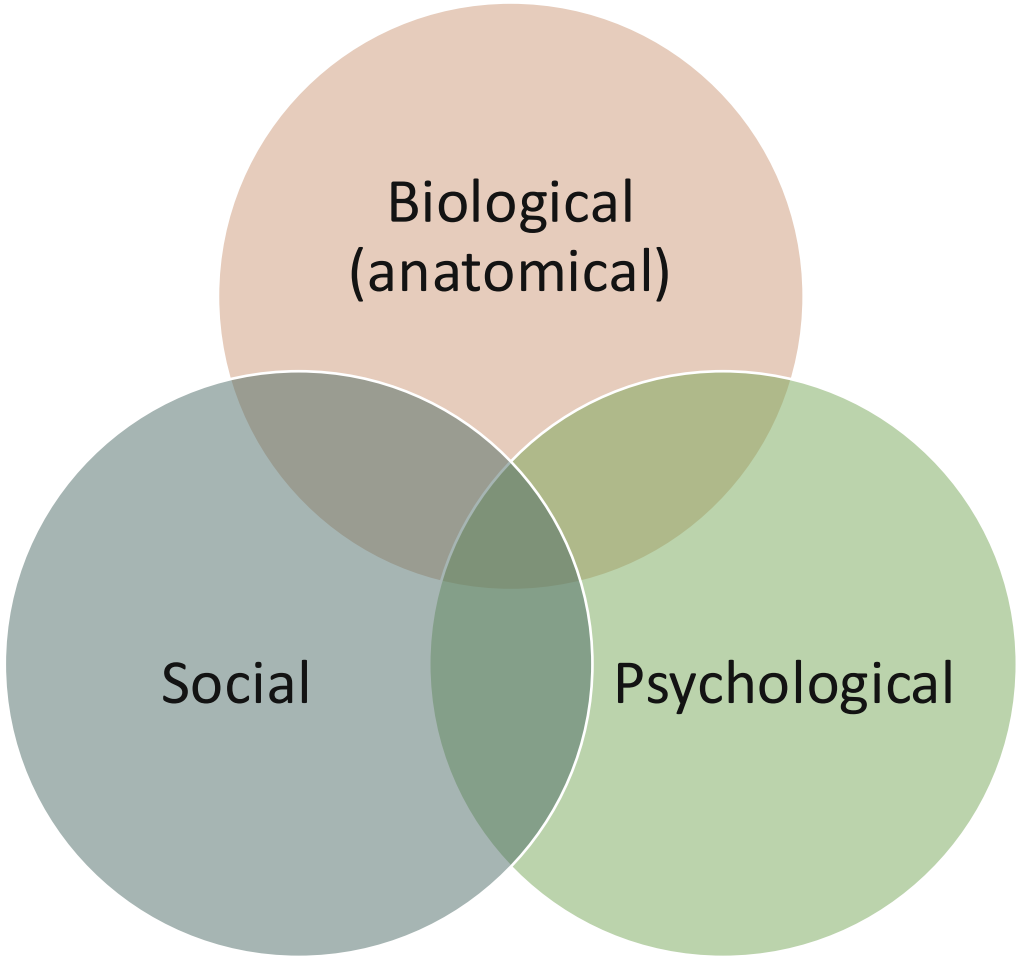
# Other Biomechanical Concerns



- Decreased activity levels
- Altered gait mechanics
- Compensating for weak side/using limb more
- Pre-existing/underlying degenerative process (including spine)
- Treat MSK concerns, brace as needed
- Use caution with NSAIDs

From Nesi, B., Taviani, A., D'Auria, L., Bardelli, R., Zuccarello, G., Platano, D., Benedetti, M. G., & Benvenuti, F. (2023). The Relationship between Gait Velocity and Walking Pattern in Hemiplegic Patients. Applied Sciences, 13(2), 934. https://doi.org/10.3390/app13020934
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# Biopsychosocial Model of Pain




- Depression common post stroke (33% compared to 13% of age matched subjects)
  - Associated with increased mortality and worse functional outcomes
  - SSRIs and TCAs most studied
  - Psychotherapy not found to be beneficial
- Impaired sleep common and leads to fatigue and increased pain sensitivity
  - Sleep disorders?
  - Sleep hygiene
  - Melatonin, trazodone
- Altered societal role

# Case -- Revisited

68-year-old right-handed woman comes to your office 10 weeks after a left middle cerebral artery ischemic stroke. She has residual right-sided weakness and decreased sensation in the right hand. Her daughter notes she winces whenever her right arm is moved during dressing and transfers. Her pain is worse with movement and feels like a deep ache around the right shoulder with occasional burning into the forearm. Pain is limiting her participation in physical and occupational therapy.

# Case -- Continued

Inspection: sulcus between the acromion and humeral head

Palpation: tenderness over the biceps tendon and supraspinatus

PROM: decreased external rotation and abduction with pain

Tone: Increased tone in shoulder internal rotators and elbow flexors

No warmth, erythema, swelling of the whole limb, or nail/skin changes.

# Case -- Continued

Hemiplegic shoulder pain – still consider CRPS and CPSP

Support shoulder: taping and/or arm trough

Continue PT and OT

Trial baclofen?

Glenohumeral joint injection?

Refer to physiatry?

# Review

## CENTRAL POST STROKE PAIN

- “Aching, dull, throbbing, sharp, stabbing, shooting, burning” in area impacted by stroke
- Amitriptyline
- Lamotrigine
- Pregabalin

## SPASTICITY

- Velocity dependent muscle overactivity
- Lead to contracture, pain, limited function
- Maintain ROM
- Baclofen, tizanidine, or dantrolene
- Interventions with PM&R

## COMPLEX REGIONAL PAIN SYNDROME

- Budapest criteria
- Early desensitization, mirror therapy
- Gabapentin
- Steroid burst
- Interventions with Pain Management

## HEMIPLEGIC SHOULDER

- Multifactorial
- Taping/support
- Treat underlying issues +/- joint injections
- Remember other MSK issues

# Questions?

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