Upper Extremity Contractures

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No relevant disclosures

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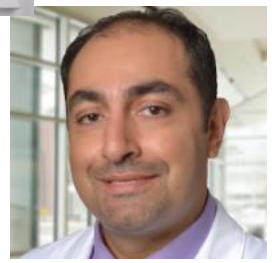
Stanford MEDICINE

THE UNIVERSITY OF ARIZONA



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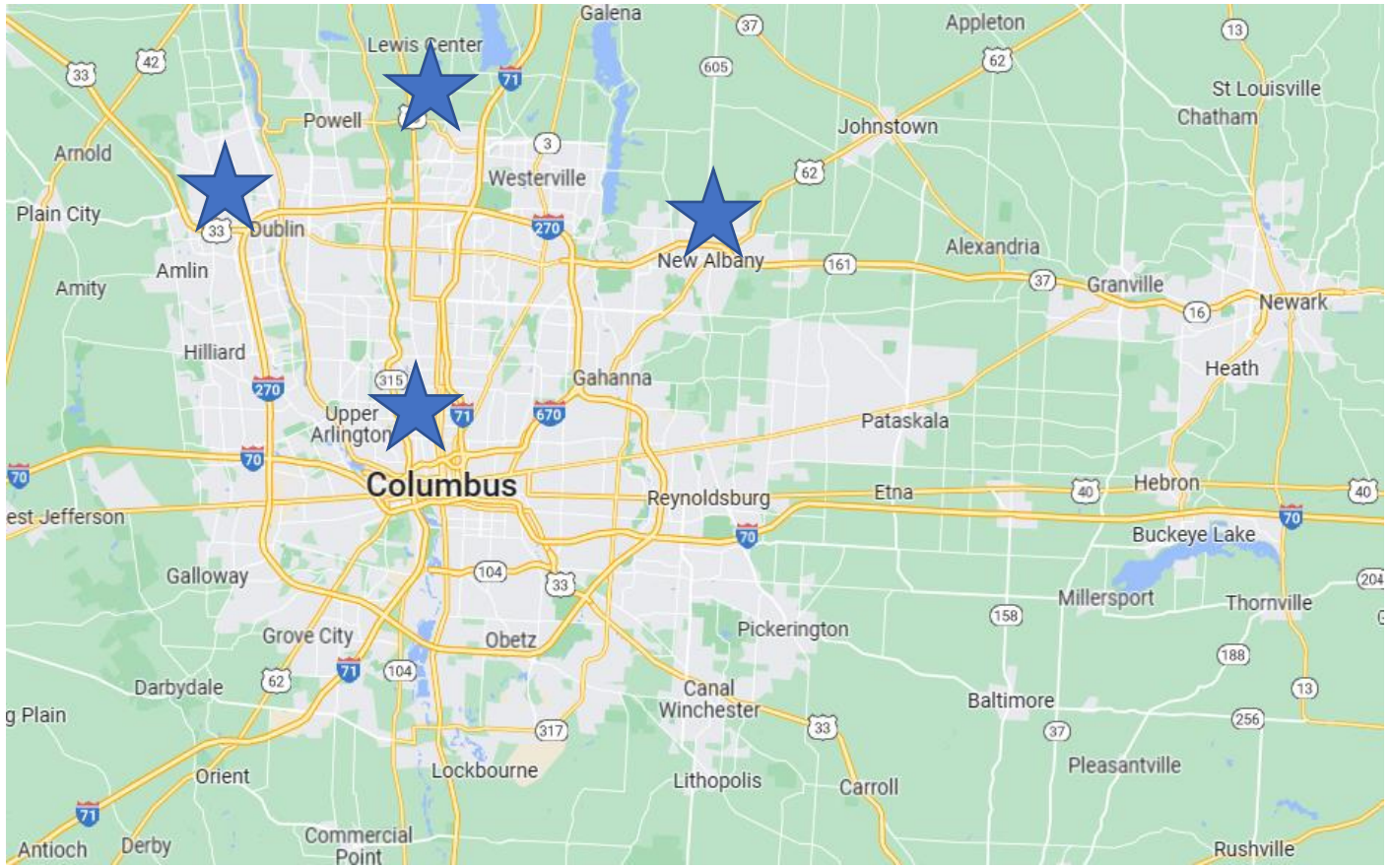


Overview

- Stroke is **common**
- Typical contractures
- Non-surgical management
- Surgical management
- Personalizing treatment

CVA/Stroke

- >700,000 “first-ever” strokes in USA annually[1]
- 80-90% of patients survive[1]
- Average survival after stroke = 8 years[1]
- Generally considered leading cause of disability in the US[2]

1. Broderick J et al. The Greater Cincinnati/Northern Kentucky Stroke Study: Preliminary first-ever and total incidence rates of stroke among blacks. Stroke 1998;29:415-421.

2. Rosamond W, et al. Heart disease and stroke statistics: 2007 update. A report from the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. Circulation 2007;115:e69-e171.

Upper Extremity Reconstruction in the Tetraplegic Population, a National Epidemiologic Study

Catherine M. Curtin, MD, David R. Gater, MD, PhD,
Kevin C. Chung, MD, *Ann, Arbor, MI*

- About 50% of patients with tetraplegia could benefit from surgery
- 14% of patients who could benefit from upper extremity surgery had been offered these procedures

Contracture Etiology

- Spasticity
  - Stroke
  - Cerebral Palsy
  - Traumatic Brain Injury
  - Spinal Cord Injury
- Posttraumatic
  - Burn
  - Scar Tissue
  - Nerve Injury
- Dupuytren Disease

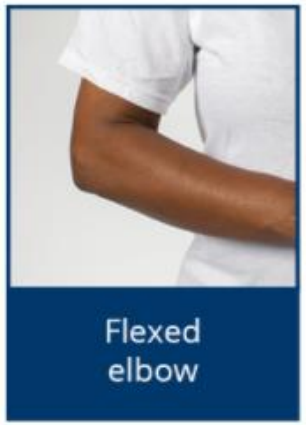
Joint Contracture

- Defined by decreased ROM
- **Spasticity**: contracture typically results from 3 physiologic processes:
  - Primary spasticity
  - Muscular fibrosis
  - Joint contracture

Spasticity

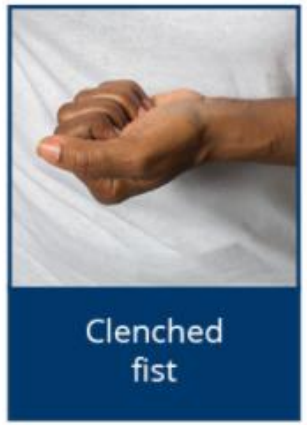
- Motor disorder
- Velocity-dependent increase in muscle tone
- One component of the upper motor neuron syndrome

Common contractures


Flexed elbow


Bent wrist


Pronated forearm


Clenched fist


Thumb in palm

- **Impact:**
  - Cosmesis
  - Hygiene
  - Function
  - Independent living

Goals of Care

- PREVENTION of CONTRACTURE
  - Early stages can be passively corrected
  - Therapy
  - Bracing
  - Functional electrical stimulation

Goals of Care

- Hygiene
- Cosmesis
- Decrease pain
- Improve level of function
  - Improved joint position
  - Improve grasp, release, and pinch
  - House Classification

Photo credit: Michael Bednar, MD

House Classification of UE Functional Use

0 Does Not Use	
1 Poor passive assist	stabilizing weight
2 Fair passive assist	can hold object placed in hand
3 Good passive assist	holds object for other hand
4 Poor active assist	active grasp, weak
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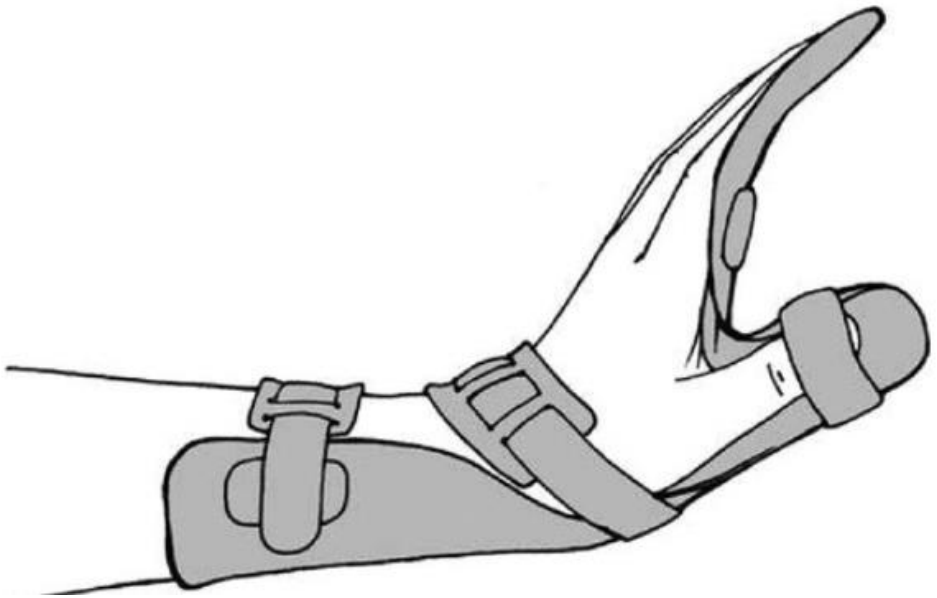
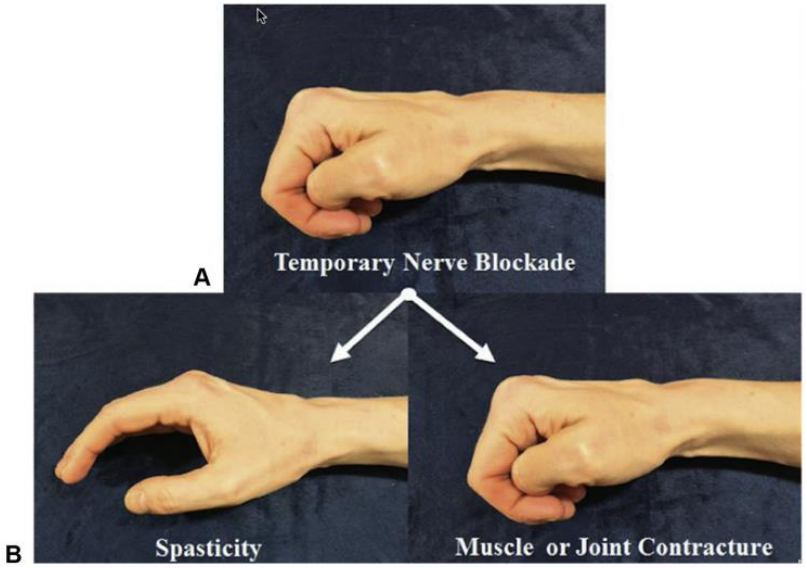
What can be done?



- Bracing/Splinting
  - Static progressive
  - Dynamic
  - **Static resting**
- Physical/Occupational therapy
- Functional electrical stimulation
- Antispasmodic Medications
  - MC = Baclofen
- Botox
  - Diagnostic and therapeutic
- **Surgery**

Contracture Assessment

- **What is the nature of their contracture?**
  - Muscle contraction
  - Joint contracture



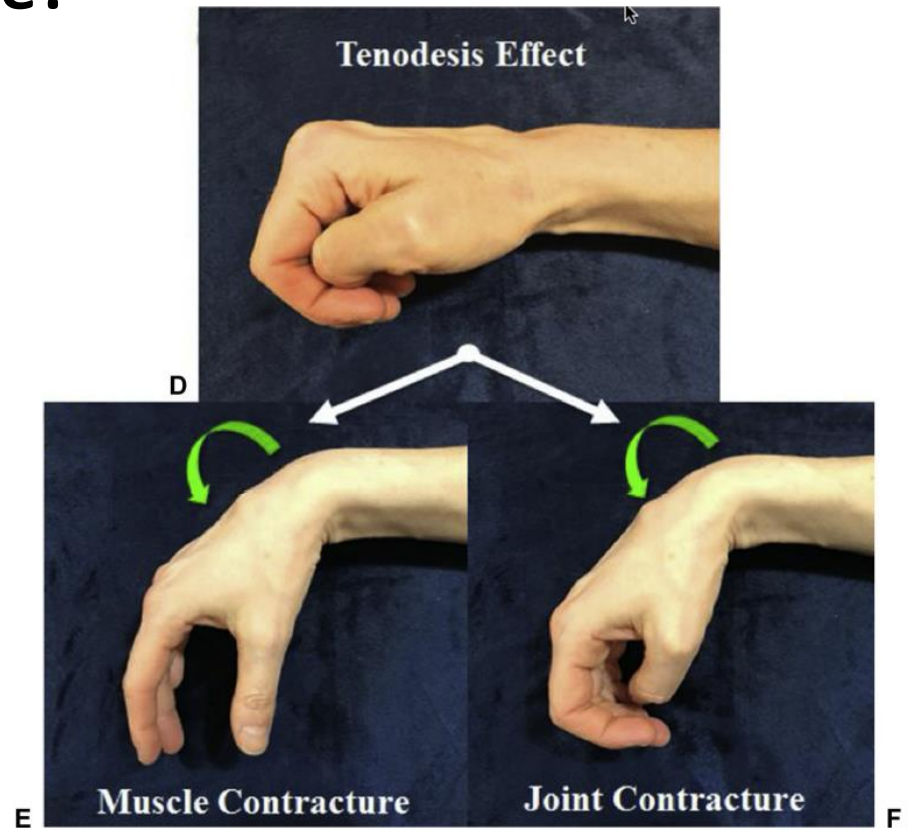


Photo credit: Rhee P. Surgical Management of Upper Extremity Deformities in Patients with Upper Motor Neuron Syndrome. JHS 2018

Contracture Assessment

- What is the nature of their contracture?
- **How is the contracture changing over time?**

Contracture Assessment

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- How is the contracture changing over time?
- **How far out from CVA?**

Contracture Assessment

- What is the nature of their contracture?
- How is the contracture changing over time?
- **How far out from CVA?**
  - **CVA:** Majority nerve recovery in 2-6 months, up to 12 months
  - **ABI:** recovery within 6-12 months
  - **TBI:** recovery within 12-18 months

Extremity Impairment from Stroke

Grade	Motor Control	Description
1	Flaccid	Hypotonic, no active motion
2	Rigid	Hypertonic, no active motion
3	Reflexive mass pattern (synergy)	Mass flexion or extension in response to stimulation
4	Volitional mass pattern	Patient-initiated mass flexion or extension movement
5	Selective with pattern overlay	Slow volitional movement of specific joints; physiologic stress results in mass action
6	Selective	Volitional control of individual joints

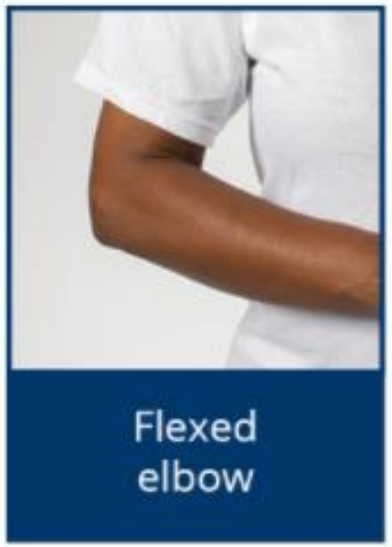
Prognosis for Contracture

- Predictors of difficult contracture
  - Time from flaccid paralysis to some motor activity
  - Sensory impairment
  - Poor cognition

Contracture Assessment

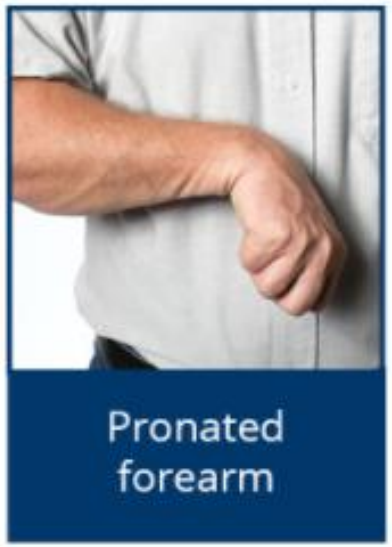
- What is the nature of their contracture?
- How is the contracture changing over time?
- How far out from CVA?
- **Does the patient have volitional control?**
  - **Higher functioning**
  - **Candidate for tendon transfers?**

Surgical Treatment by Region

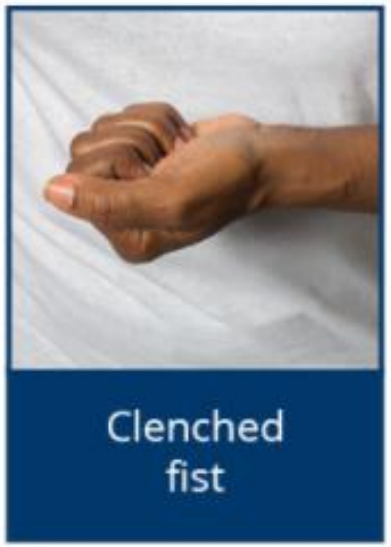


Flexed elbow

Bent wrist



Pronated forearm



Clenched fist

Thumb in palm

Surgical Treatment by Region

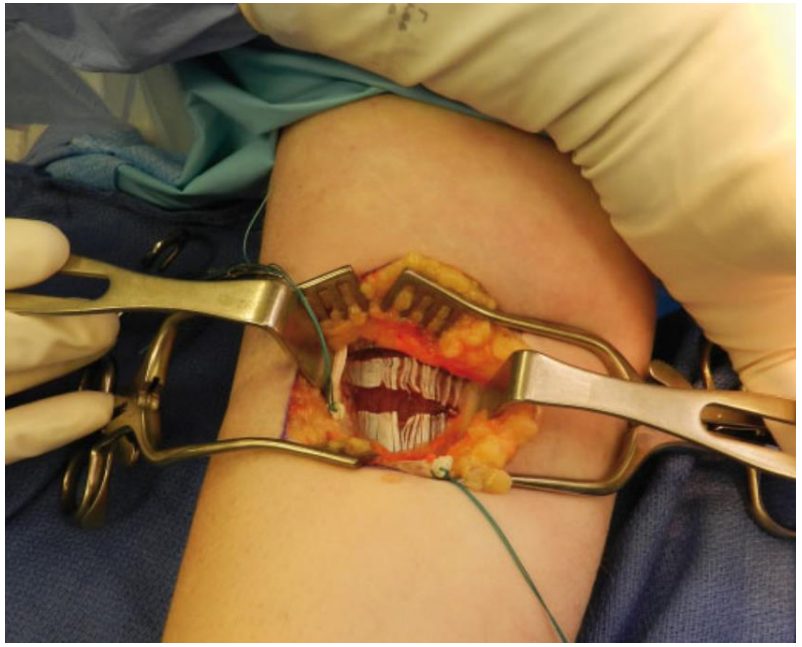
- **Shoulder adduction & internal rotation**
  - Etiology:
    - Pec major
    - Latissimus
    - Teres major
    - LH triceps
  - Maintain motion: latissimus transfer

Surgical Treatment by Region

- **Shoulder adduction & internal rotation**
  - Release: Tenotomy versus lengthening of pec major, subscap, and/or latissimus dorsi
  - Namdari et al (2011, 2012)
    - Tenotomy: 95% of 36 patients pain free, 97% patients satisfied
    - Lengthening @ 1yr: 94% patients pain free, 92% patients satisfied

Surgical Treatment by Region

- **Elbow flexion**
  - Elbow flexor lengthening versus full release
  - Dy et al (2013): 5-year follow-up on 23 elbows after partial release
    - Gained 12deg active extension
    - Gained 63deg active flexion
  - Namdari et al (2012)
    - Full release
    - 61deg improvement in passive ROM
    - 94% patients improved pain
    - 1 recurrence



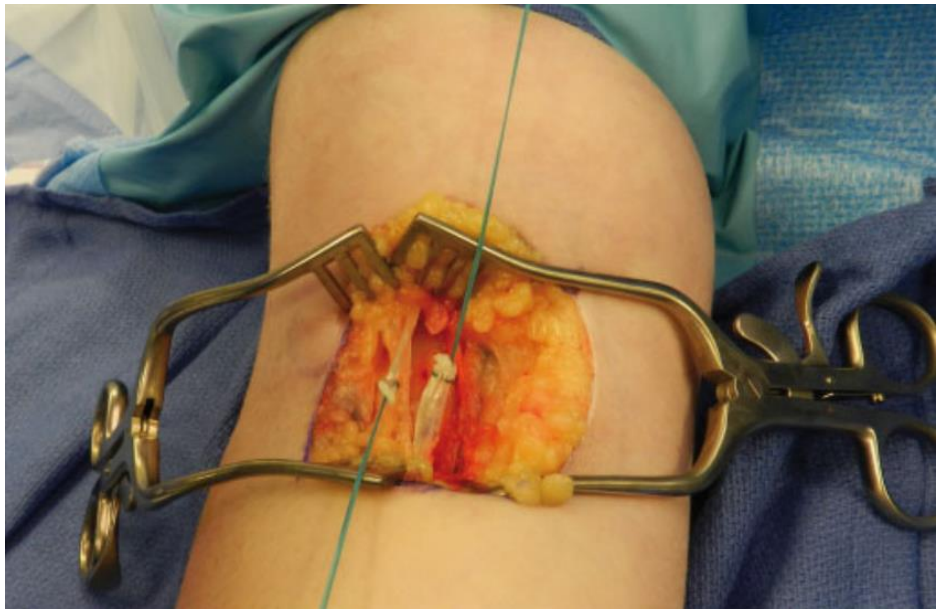


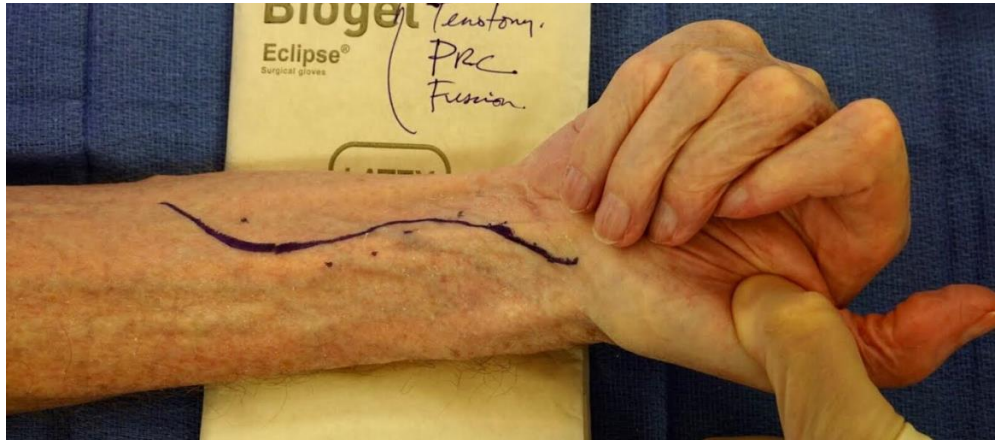
Photo credit: Van Heest et al 2019

Surgical Treatment by Region

- Forearm pronation
  - Flexor pronator slide
- **Wrist & finger flexion**
  - Spastic wrist flexors
  - Weak wrist extensors
  - Flexed posture weakens grip by decreasing tenodesis effect that occurs with wrist extension

Surgical Treatment by Region

- **Wrist & finger flexion**
  - Tendon transfers
  - Tendon lengthening
  - FDS to FDP transfer
    - Peraut et al (2018): 96% resolution in hygiene problems
  - Wrist arthrodesis



House Classification of UE Functional Use

HYGIENE

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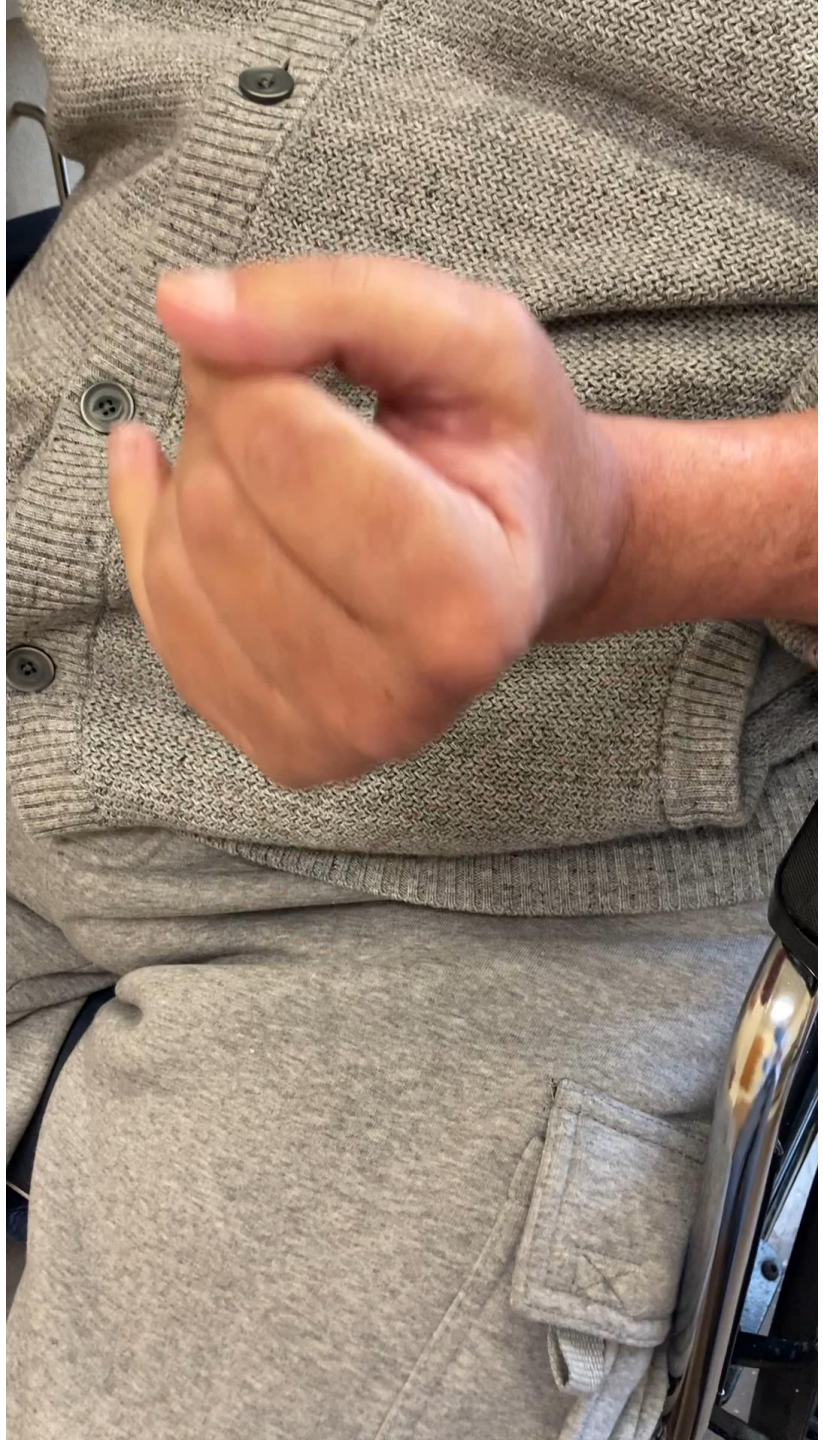
2 months post-op



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Surgical Treatment by Region

- Clenched fist
  - Flexor tendon lengthening/tenotomy
  - Ulnar MN neurectomy
- Thumb-in-palm
  - d/t contracture of any intrinsic or extrinsic muscles

Success Rate

- Most studies describe **> 90% satisfaction** in pain reduction, cosmesis

- *Recurrence* dependent on
  - Contracture severity
  - Procedure performed

- Recurrence for wrist flexion contracture
  - Wrist arthrodesis: 0%
  - Tendon lengthening/transfers: 20-29% recurrence

Who is a good candidate?

- Medically fit for surgery
- Good cognition
- **12 months** after CVA
- Motivated patient
- Caregivers able to help with recovery

Perioperative Planning

- 1-2 hours
- **Outpatient** surgery
- Often single event, multi-level
- Low blood loss
  - Anticoagulants
    - Continue ASA
    - Hold Eliquis, Xarelto 24-48hr post-op
    - Bridge Coumadin
    - Restart Eliquis, Xarelto, Coumadin 24 hours post-op
- Splint x 1-2 weeks then rehab

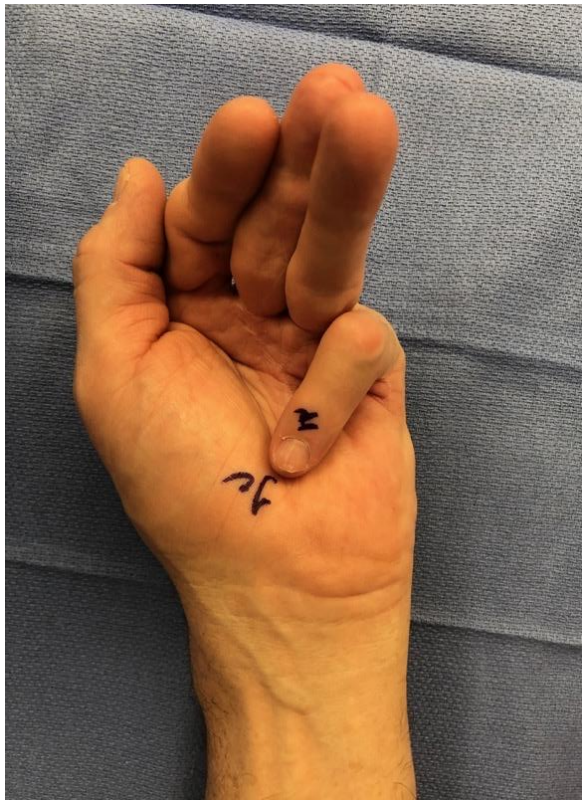
Surgery: Under-utilized for these patients?

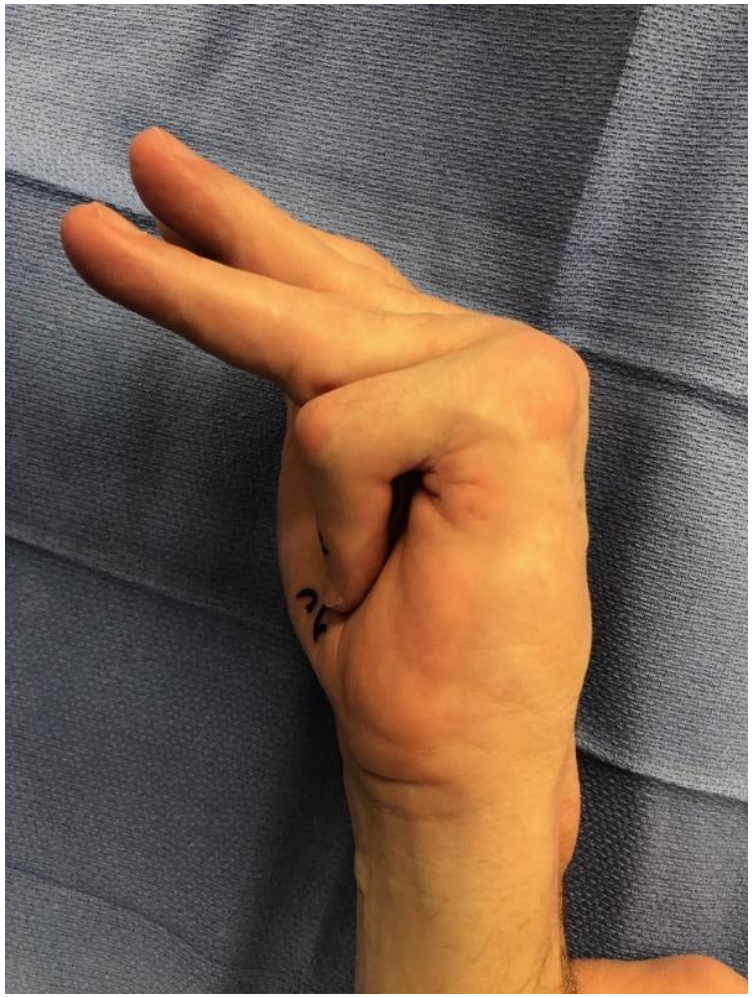
- Patients typically not *ideal* surgical candidate
  - Communication between subspecialities

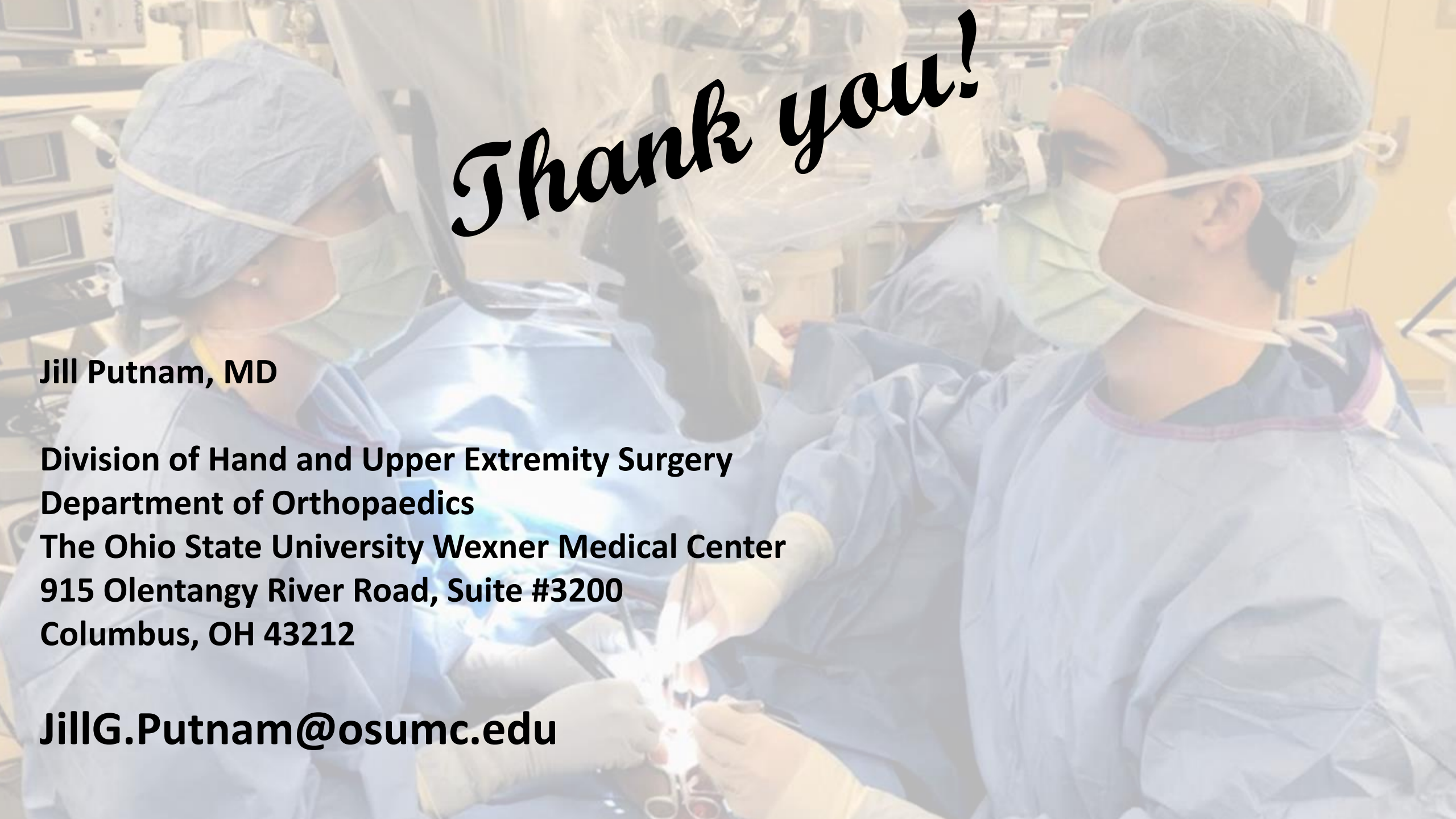
- Barriers to surgical care
  - Insurance coverage
  - Patient disability
  - Level of caregiver support
  - **Failure to coordinate care**

Other Causes of Contracture

- Burn contractures
- Dupuytren contracture
  - Thickened palmar fascia
  - Can be nodules or cords
  - Often progressive







Thank you!

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