

# Shoulder and Scapular Rehabilitation for Adult Brachial Plexus Injuries

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Brachial Plexus and  
Peripheral Nerve Program



I have no financial relationships relevant to this presentation.

# Objectives

- Participants will be provided with a brief overview of the anatomy of the brachial plexus.
- Participants will understand the difference between nerve graft and nerve transfers and how it relates to rehabilitation techniques.
- Participants will learn activation techniques for 3 common brachial plexus reconstructions.
- Participants will understand the progression of exercises.

# Outline

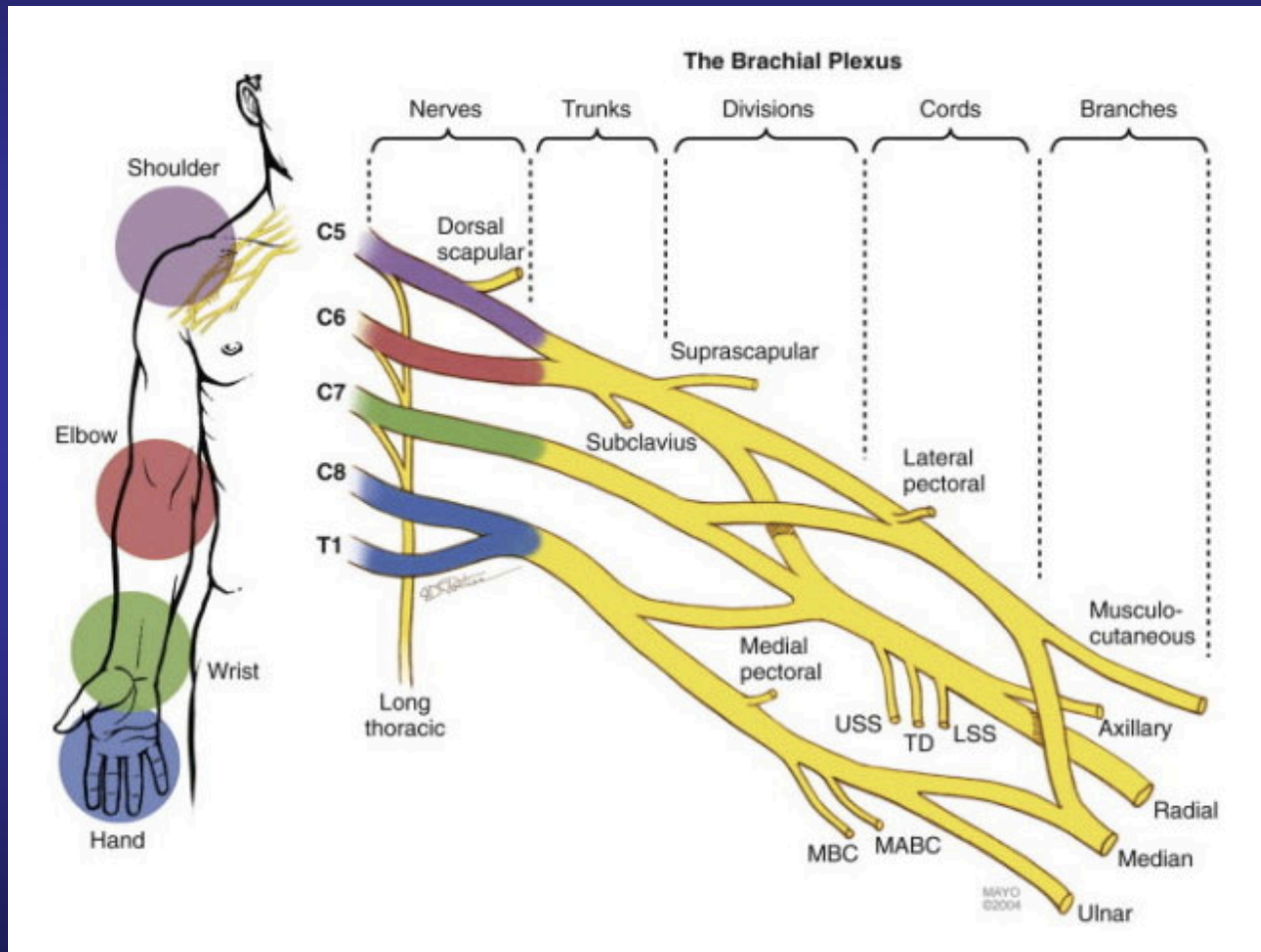
## **Surgical Interventions**

- Brief anatomy Review
- Surgical Procedures
- Healing Process

## **Formulating a Treatment Plan**

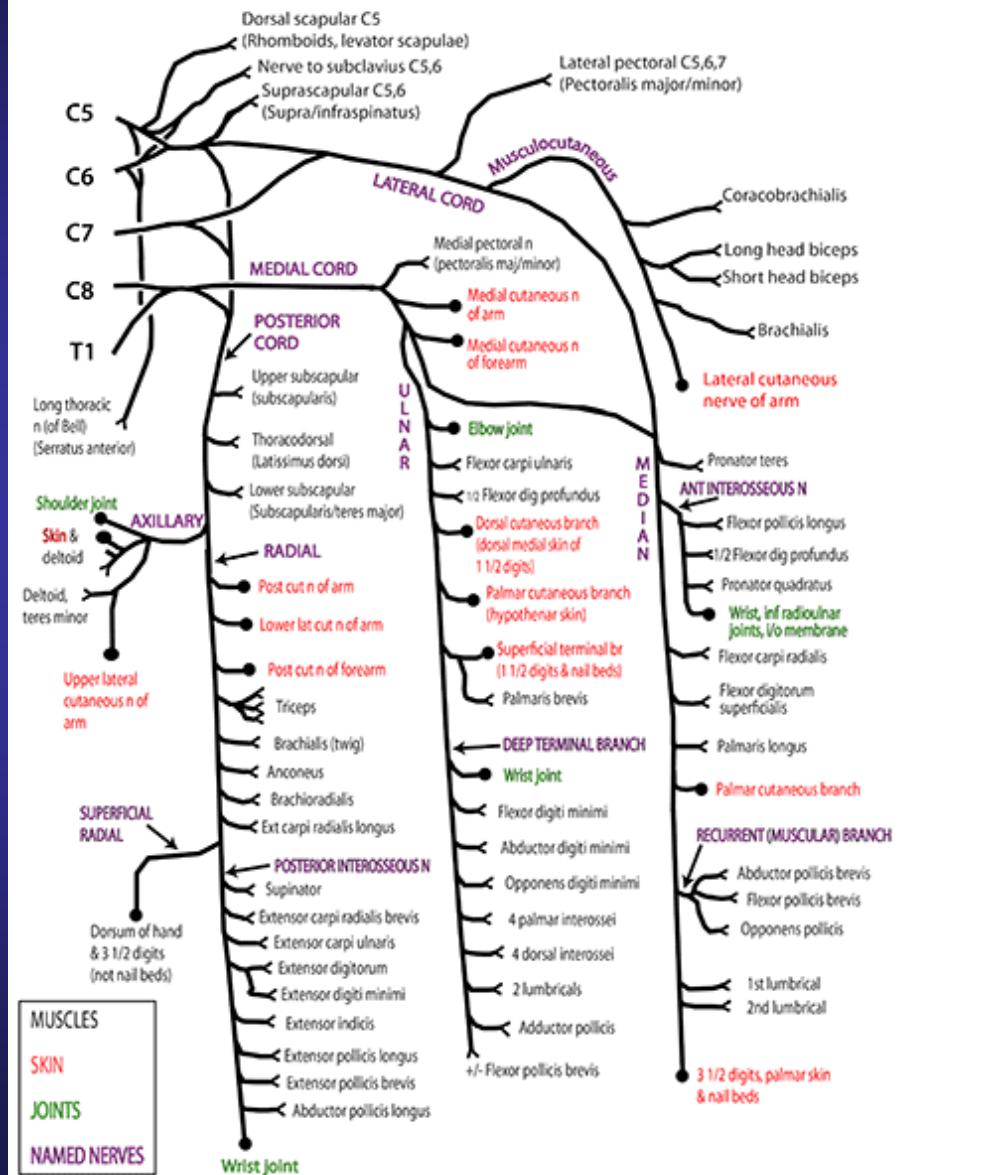
- What you need to know from the Surgeon
- Restrictions
- Timing for Interventions
- Activation Techniques
- Therapy Progressions
- Managing Patient Expectations

# The Brachial Plexus



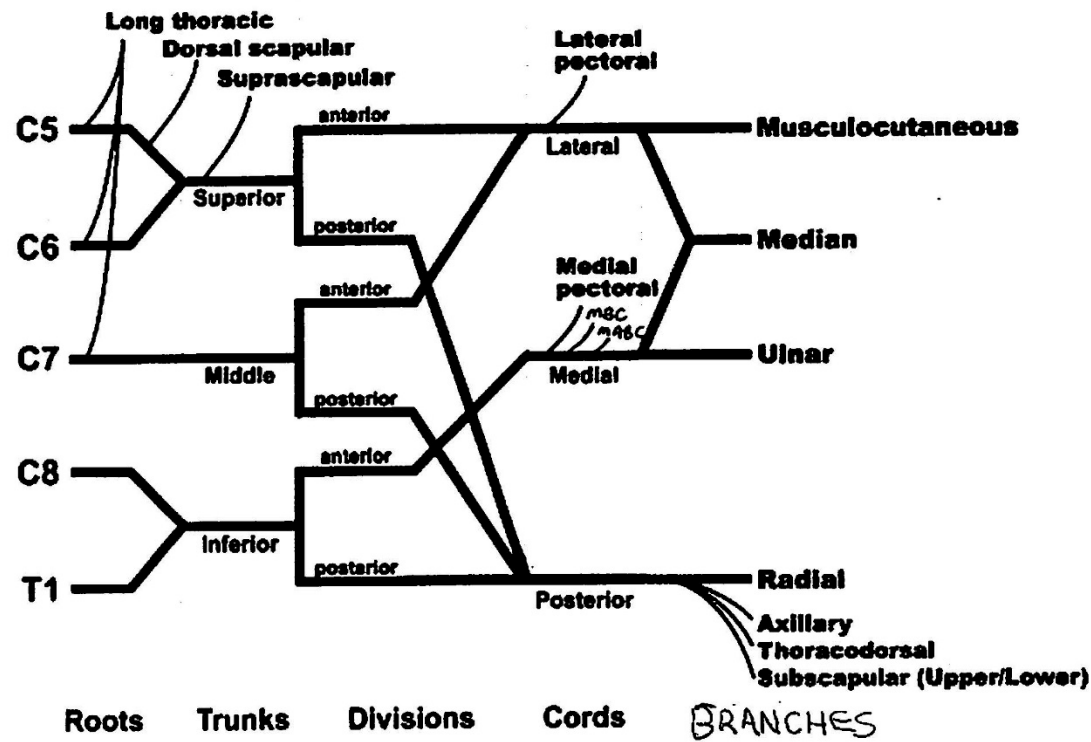
# The Muscles

## BRACHIAL PLEXUS - FULL DISTRIBUTION



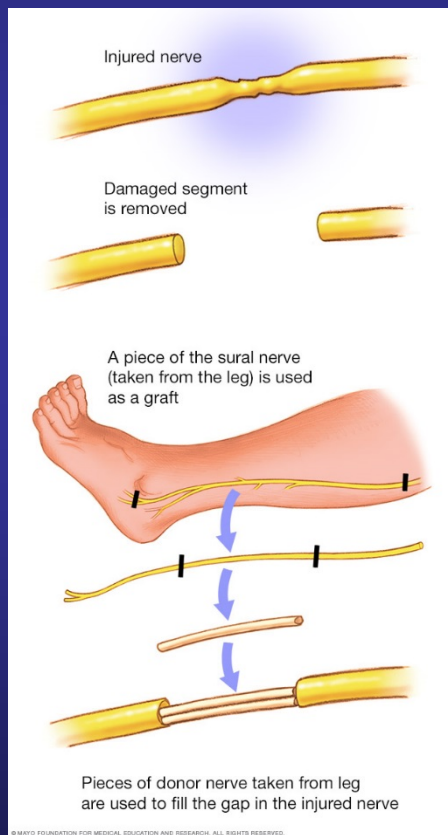
# Robert Taylor Drinks Cold Beer

Brachial Plexus (schematic)

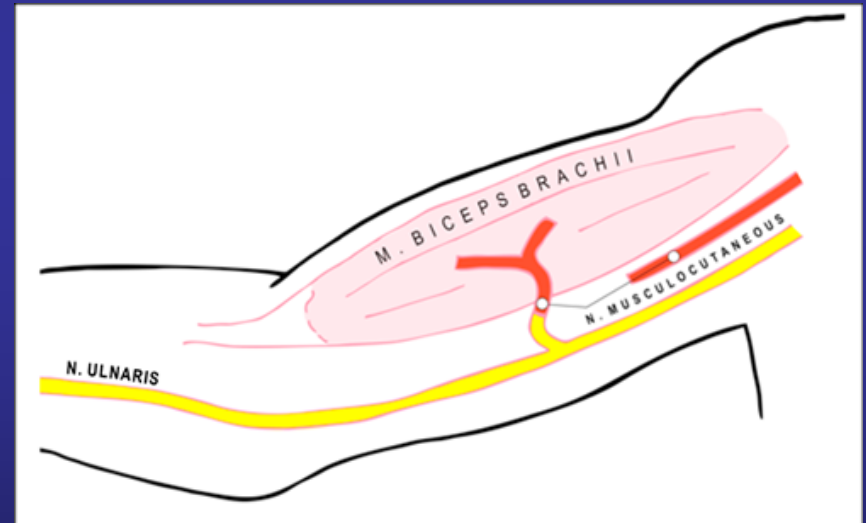


# Two Main Surgical Procedures

## Nerve Grafts



## Nerve Transfer





# Science of Healing

- Nerve repair= 3-6 weeks to regain enough strength to tolerate mobilization
- Tendon Transfers= 6 weeks to heal
- Axonal regeneration= “1 mm per day” or 1” per month”.

# Prior to Surgery

- Full assessment
- Focus on joint protection
- Range of Motion
- No e-stim
- Gravity eliminated exercises
- Strengthen uninvolved muscles

# Formulating Your Treatment Plan Following Surgery

- How long to immobilize
- Protective orthosis?
- Starting PROM
- Movement Restrictions
- Expectations
- Donor used will dictate activation process

# Get the Scoop

- Read surgical report
- Ask questions
- Repair will guide the breakdown of individual movement challenges

# Thorough Evaluation

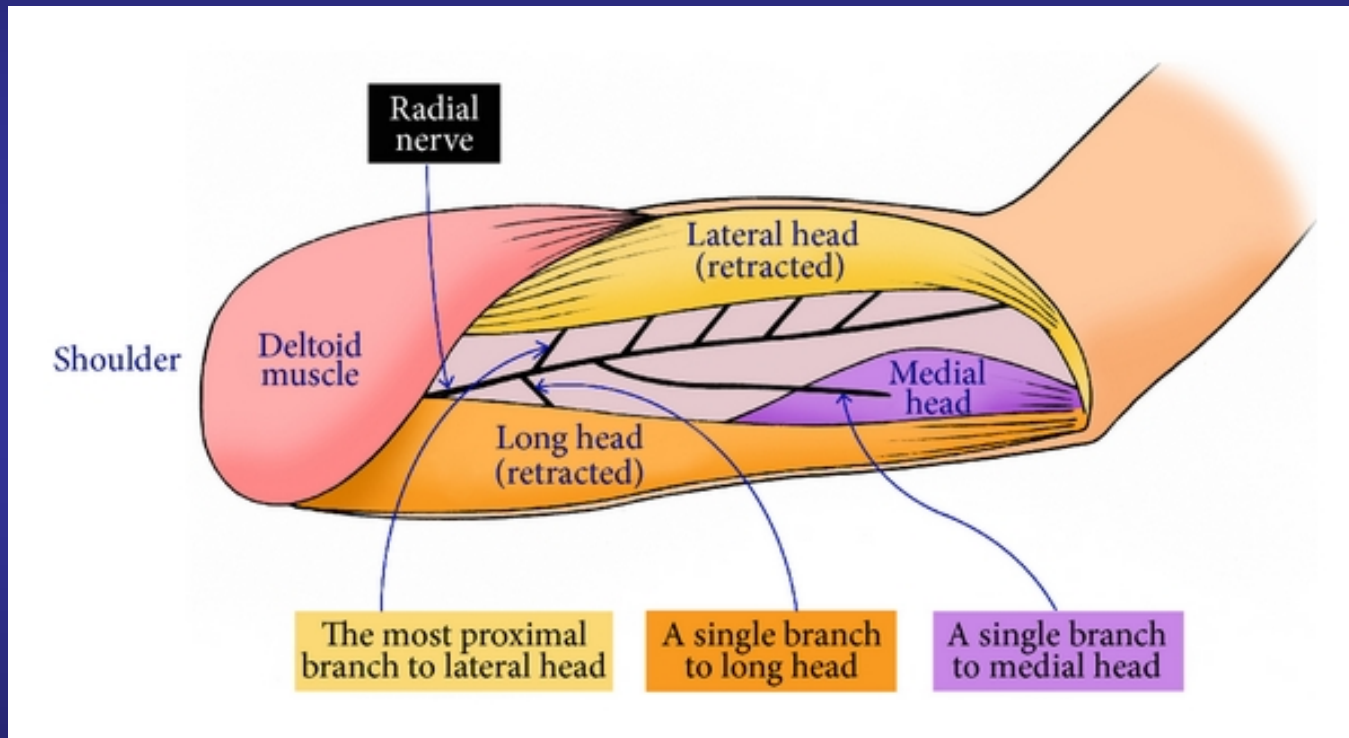
- Determine what is working, what is not
- Routine PROM,AROM
- MMT
- If saw patient prior to surgery.....

# Activation Techniques

# Three Top Targets

- Shoulder flexion/abduction
- Elbow flexion
- External rotation

# Triceps to Axillary





# Shoulder flexion/abduction

- Triceps branch to axillary nerve
  - What does the triceps branch of radial nerve do?
  - What does the axillary nerve do?

- Triceps branch



Use any muscle that extends

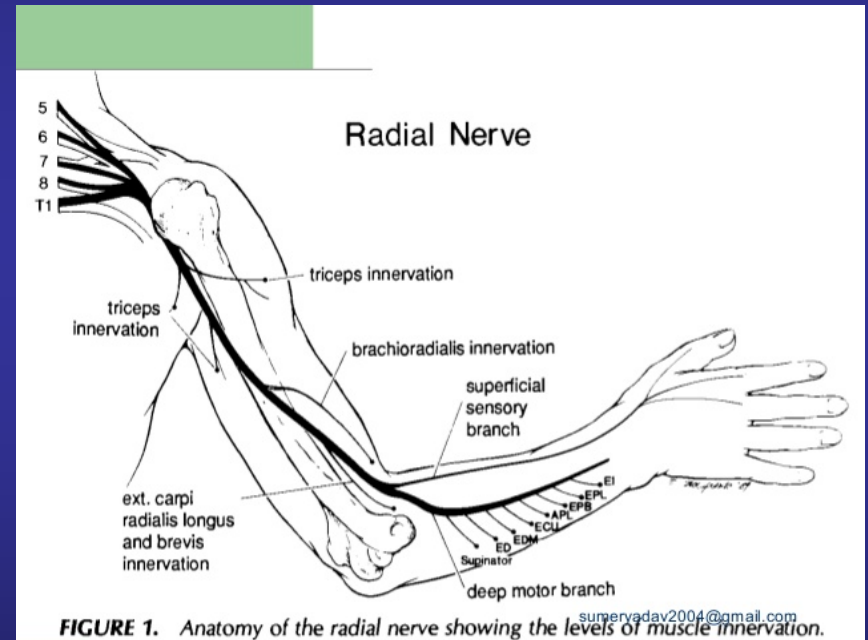
- Axillary branch



Shoulder forward flexion and abduction

# Who to Recruit

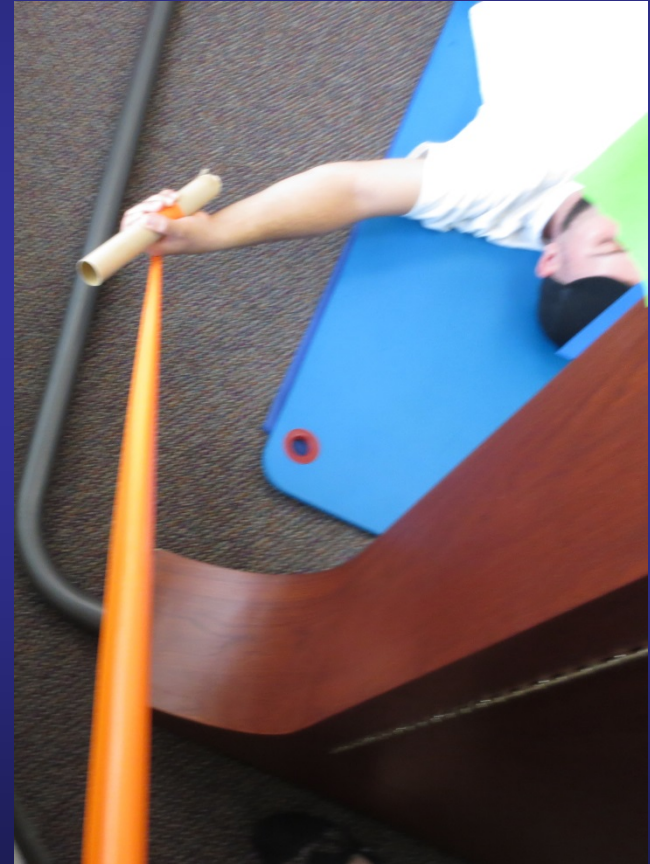
- Think elbow/wrist, thumb, finger extension to move the shoulder in abduction and forward flexion
- Triceps and wrist extension strengthening



# Gravity Eliminated Strengthening



# Shoulder Abduction



# Triceps to Axillary Assist



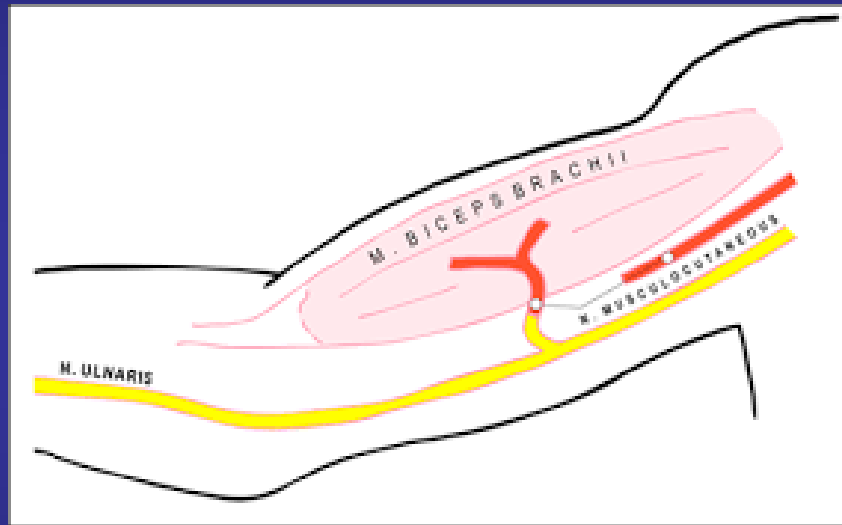
# Shoulder Flexion-Gravity Eliminated



# Shoulder Flexion



# Ulnar to Musculocutaneous





# Elbow Flexion

- Ulnar nerve branch to musculocutaneous
- What does the ulnar nerve branch do?
- What does the musculocutaneous do?

Ulnar branch



Use any muscle innervated by the ulnar nerve

- Key pinch
- Ulnar deviation of wrist

Musculocutaneous nerve



Elbow Flexion

# Who to Recruit

- Think key pinch and wrist ulnar deviation to flex the elbow.

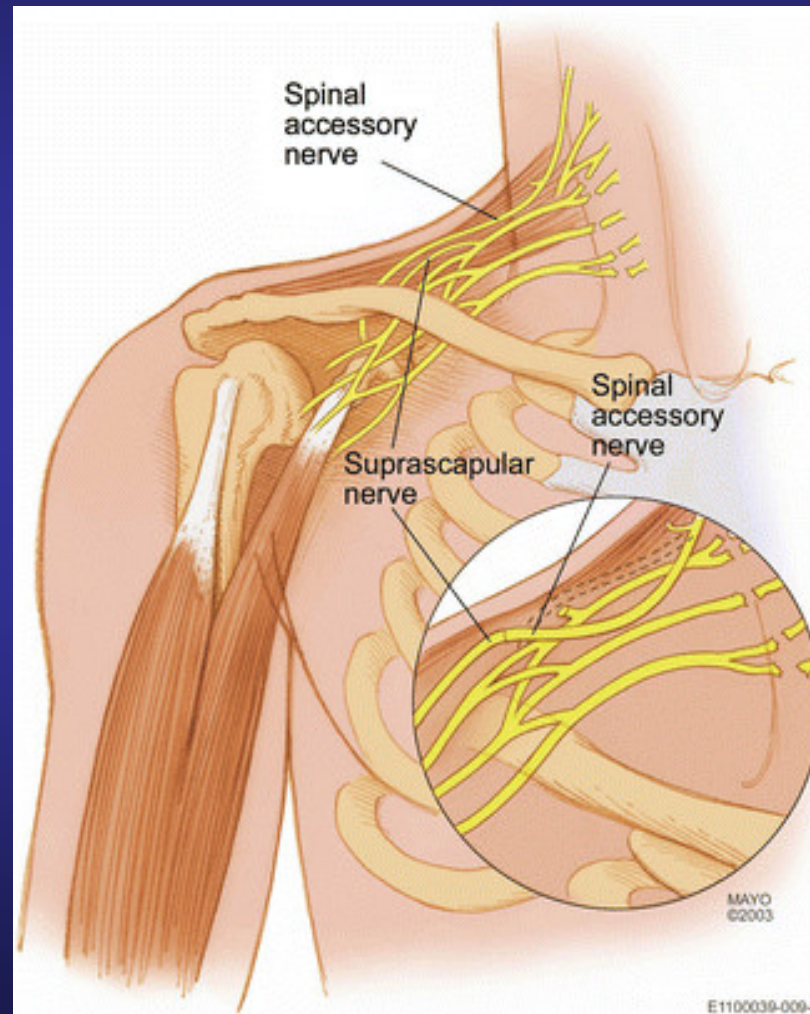




# Biceps Strengthening



# Spinal Accessory to Suprascapular



# External Rotation

- Spinal Accessory to Suprascapular
- What does the spinal accessory branch do?
- What does the suprascapular nerve do?

Spinal Accessory



Turning head to opposite side w/extension and shrugging

Suprascapular



External rotation

# Who to Recruit

- This one is tricky
- Shrug shoulders and turn head away from involved arm while looking up.

# External Rotation





# External Rotation/Mirror



# External Rotation



# Ext Rotation With Suspension



# Exercise Progression

- Continue with pre-op exercises
  - PROM important
  - AROM and AAROM as tolerated
  - Palpation of muscle- can begin gravity eliminated strengthening
- Neuromuscular re-education techniques
- Pool therapy
- Advanced therapy techniques

# Expectations

- Nerve transfers
  - Typically 70 to 90 MAX shoulder flexion
  - Elbow to 90-110 degrees
  - External rotation to neutral
- Nerve grafts
  - Used to bridge the gap
  - Typically no neuromuscular re-ed needed

# Therapy Progression

- Activation Techniques
- Gravity eliminated positioning
  - maintain passive range of motion
  - avoid fatigue initially
  - add weight when reach a functional arc of motion GRAVITY ELIMINATED and continue to increase
  - When achieve AROM to above shoulder, begin anti-gravity strengthening

# Modalities

- Tri-pull tape:
- E-stim
- Kinesiotape
- Suspension Exercises
- Pilates

# Advanced Interventions



# Biofeedback

- Facilitation
  - Electrodes placed on desired muscles to achieve activation
  - Sound response to activation
- Decrease co-contraction
  - Electrodes placed on co-contracting muscles
  - Goal is not to hear sound.

# Bioness

- Wireless hand rehab system that delivers low-level electrical stimulation to activate the nerves that control the muscles in the hand and forearm



# MyoPro



# Physiotouch



# Managing Patient Expectations

- Repair does not equal 100% return
- Pain can still persist
- Recover is LONG & SLOW
- Therapy is teamwork, but ultimately their responsibility
- Psychosocial issues
- Long term management

# A Word About Neonatal Brachial Plexus Palsy

- Long-term compensatory patterns
- Trigger points
- Ulnar neuropathies/carpal tunnel syndrome
- Posterior subluxation
  - Bicep tendon
  - Tight upper trapezius
- Overuse of uninvolved arm

# References

- Wheelock Margie MD, *Nerve transfers for treatment of isolated axillary nerve injuries*, *Plast Surg* 2015 Vol. 23 No. 2
- Christine B. Novak, PT, PhD, *Rehabilitation of the Upper Extremity Following Nerve and Tendon Reconstruction: When and How*, *Semin Plast Surg* 2015;29:73–80.
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- Hayner, Kate A., *Effectiveness of the California Tri-Pull Taping Method for Shoulder Subluxation Poststroke: A Single-Subject ABA Design*. *AJOT*, Nov/Dec 2012, Vol. 66 Issue 6
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# Questions?





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# Thank You

