The image features a dark blue background with seven circles arranged in a 2x4 grid. The top row contains three circles, and the bottom row contains four circles. The circles in the top row are: a white outline circle, a solid dark blue circle, and a solid dark blue circle. The circles in the bottom row are: a solid dark blue circle, a solid dark blue circle, a solid dark blue circle, and a white outline circle. The text "Carpal Tunnel Syndrome" is centered horizontally and overlaid on the circles in the top row.

# Carpal Tunnel Syndrome

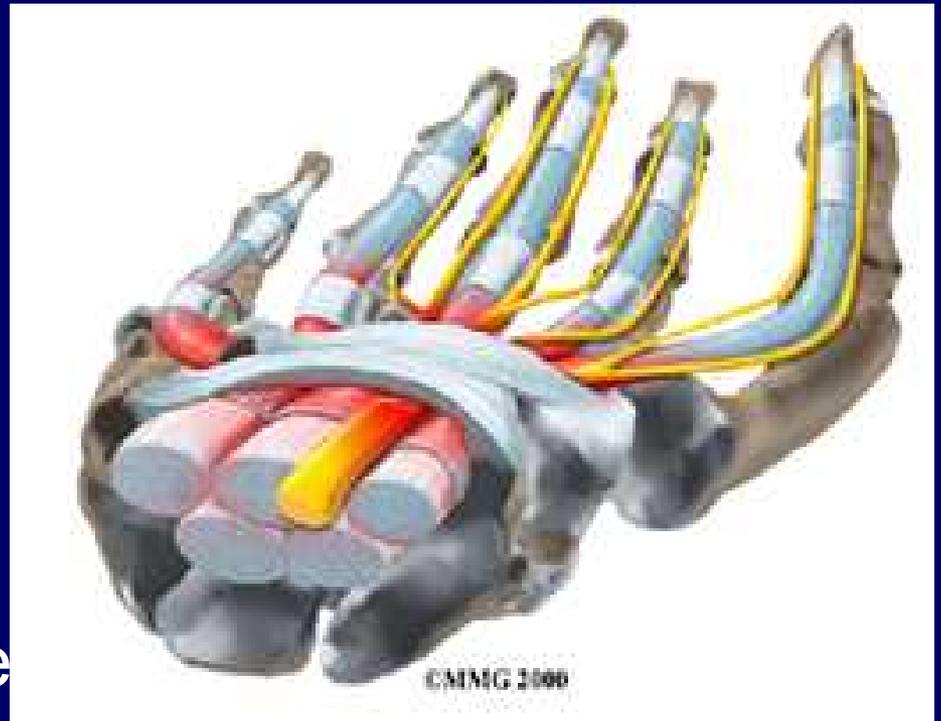
# Case Study

Samantha is a 26 y/o costume designer. Her work consists of long hours of sewing in a cluttered back room w/little table space. Sam's hobbies include playing the harp, walking her dogs, and creating 3D artwork. She is currently experiencing pain in her hands and wrists which worsens at night, and tingling in her thumb, index and middle finger during the day resulting from Carpal Tunnel Syndrome. She currently wears a splint at night and is scheduled for outpatient release surgery. She has given up her activities and her main goal is returning to work.

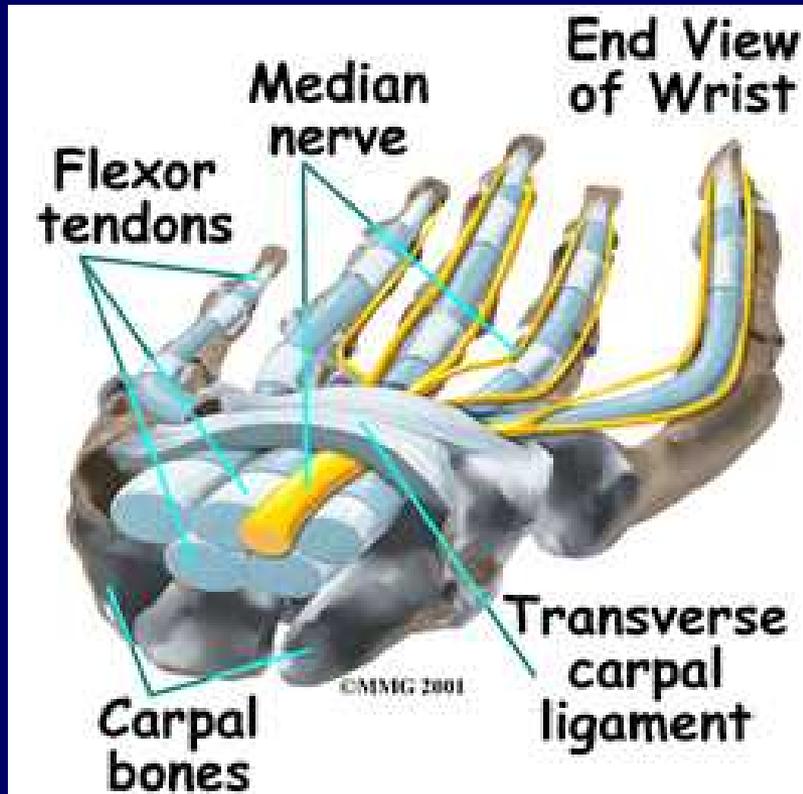
\*We are post-op OT

# What is Carpal Tunnel Syndrome?

- The median nerve is compressed inside the carpal tunnel of the wrist.
- Also known as nerve entrapment.
- People can develop this condition regardless of the type of work they do.



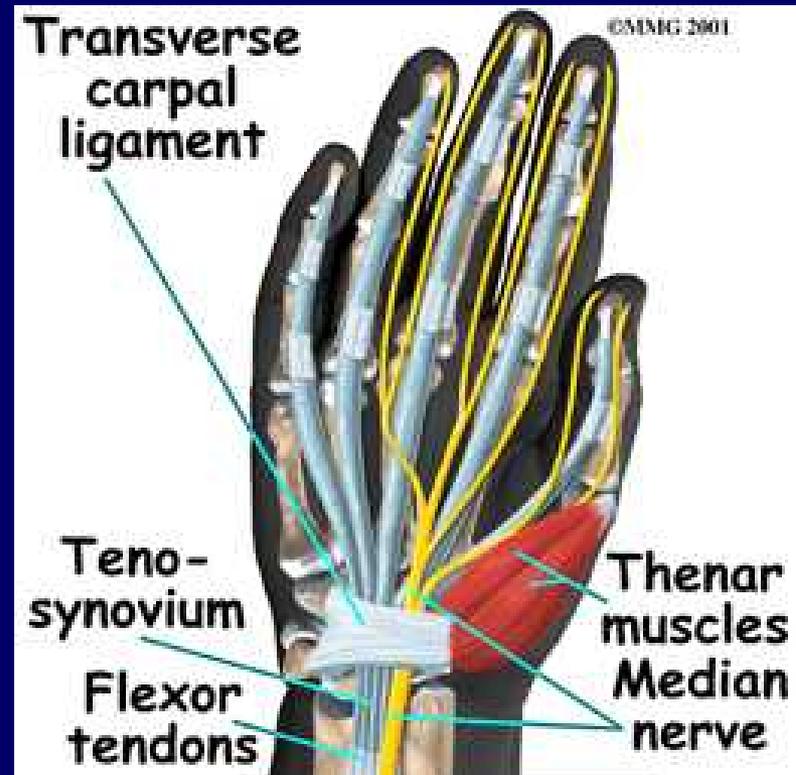
# The Anatomy



- Carpal Tunnel – opening through the wrist to the hand
  - Formed by:
    - Bottom: Bones of wrist
    - Top: Transverse carpal ligament

# The Anatomy

- The median nerve and flexor tendons pass through CT into the hand.
  - Median gives sensation to thumb, index, long and 1/2 of ring finger
  - Median controls thenar muscles of thumb
    - opposition

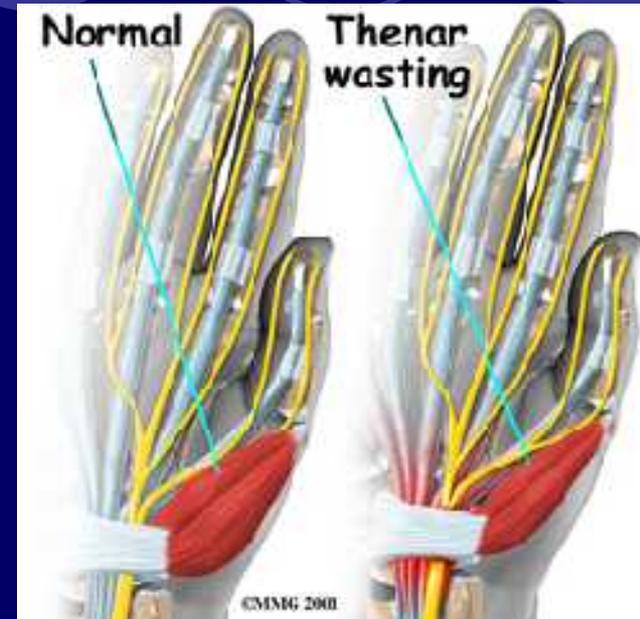


# The Causes

- Any condition that:
  - makes the area inside the CT smaller
  - increases the size of tissues within the tunnel
    - Ex. Traumatic wrist injury, pregnancy, diabetes, low thyroid function, hypothyroidism, arthritis
- Risks in the way tasks are performed
  - Force, posture, wrist alignment, repetition, temperature, vibration
- Extraneous factors
  - Smoking, obesity, caffeine

# What it Feels Like

- Gradual numbness followed by pain in areas supplied by median nerve
- Pain can spread up the arm to the shoulder and neck



- If pressure continues-thenar muscles can weaken and atrophy

# Physician Diagnosis

- #1- Pt. description of symptoms and physical exam
  - Little finger is unaffected
    - If hand feeling “asleep” pinch little finger to see if it numb
- If more information is needed an electrical study of the median nerve in the wrist can be performed

# OT Assessments

- Person

- Tinel & Phalen
- Sensory Testing
- Grip & Pinch Strength
- Boston Carpal Tunnel Questionnaire
  - Consists of a set of questions pertaining to patient symptoms and functional activities

- Environmental

- Ergonomic assessment using activity analysis

- Occupation

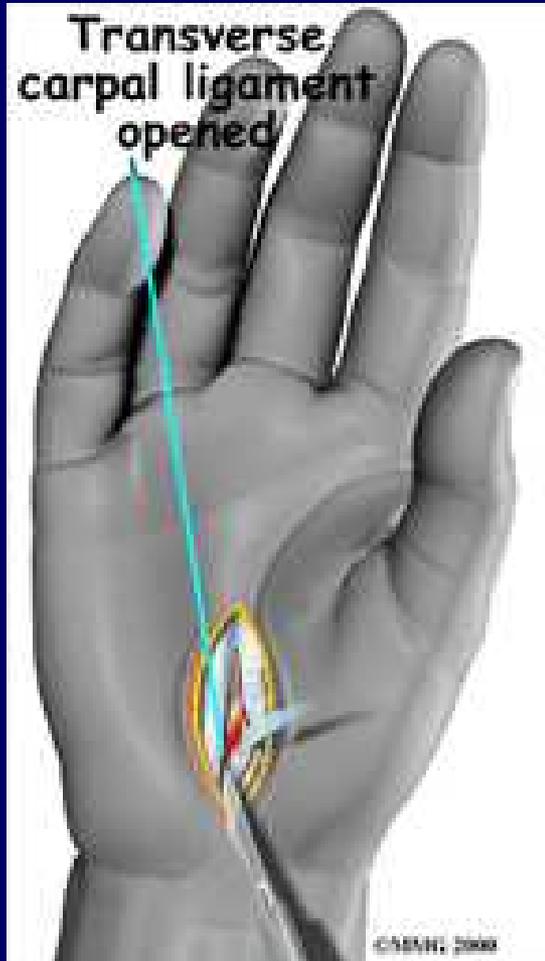
- COPM
- Activity analysis of making 3D art

# Conservative Treatment

- Be cautious of:
  - repetitive hand motions, heavy grasping, positioning
- Splinting
- Medication:
  - Anti-inflammatory meds
  - Cortisone injection into CT



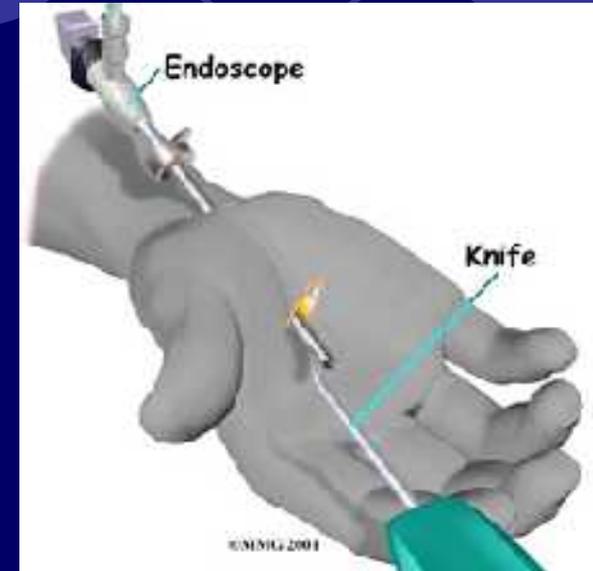
# Surgical Treatment



- Open-Incision
  - Most common
  - Small incision made on palm of hand (< 2in)
  - Cut through palmar fascia and carpal ligament
  - Stitch skin together
    - Leave TCL separated

# Surgical Treatment

- Endoscopic CT release
  - Newer procedure
  - Smaller incision
    - Some surgeons make 2 incisions (see picture)
    - Single incision is becoming more popular
  - Fiber optic TV camera
  - Still release TCL



# OT Strategies to Facilitate OP

- Nerve and tendon gliding
- Scar adhesion prevention
- Splinting
- Activity analysis and task modification/  
adaptation
- Patient education
- ROM
- Edema control

# Wrist Immobilization Splint

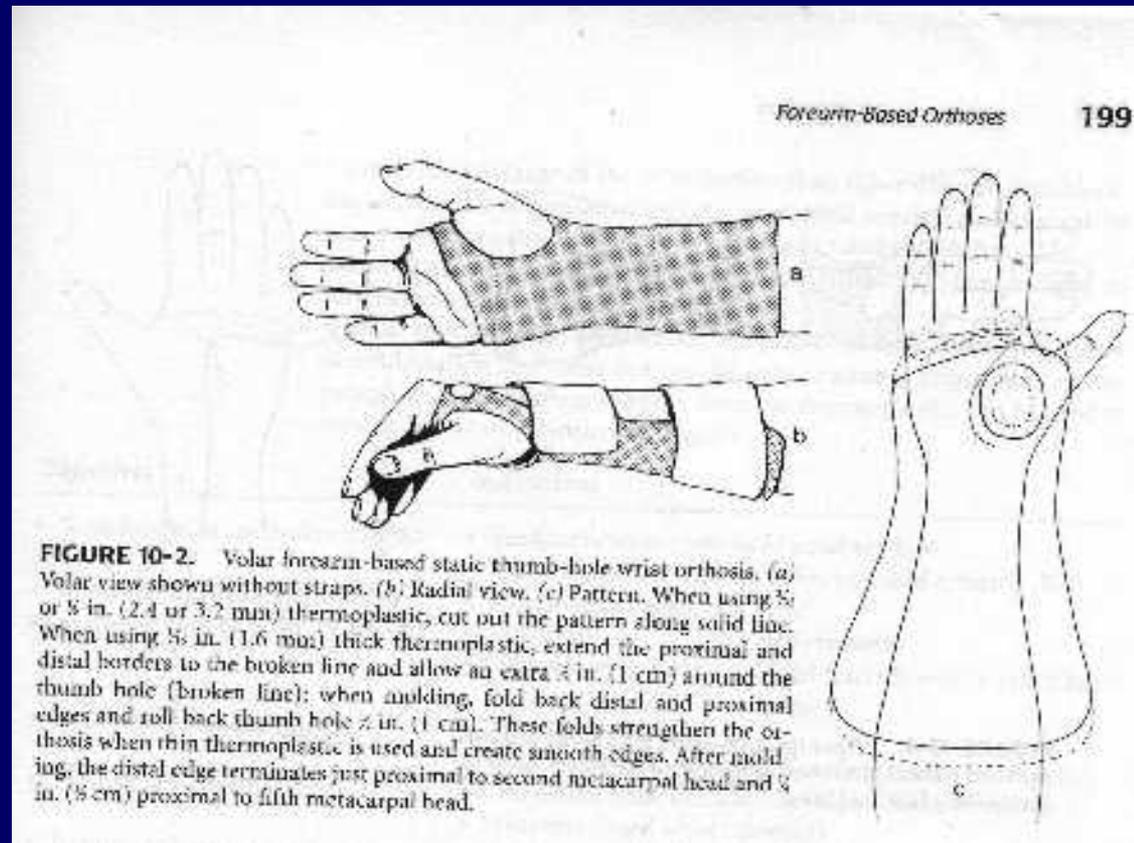
## Evidence:

- A study conducted on the effectiveness of splinting in the conservative treatment of CTS found that use of the wrist immobilization splint (fig. 10-2) caused disappearance of clinical symptoms of CTS in 75% of patients (Papez & Walker, 2004)

## Wearing Schedule:

- Research has indicated that most optimal results are seen with both day and night splint wear (Walker, Metzler, Cifu, & Swartz, 2000).

## Volar forearm-based static thumb-hole wrist orthosis



(Mckee & Morgan, 1998)

# Splinting After Surgery

- **Wrist Immobilization Splint**
  - A volar splint with the wrist in a neutral or *slightly extended position*
- **Goal:** minimize pressure on median nerve, provide support during activities, maintain gains from exercise, and rest the extremity during the healing phase.
- “There is no consistent protocol... some physicians do not prescribe splints at all. Others may recommend a wrist immobilization splint 1 week after surgery with the therapist providing instructions for splint-wearing schedule...” (Coppard & Lohman, 2001)
- **Mixed Evidence:**
- Patients randomized to 2 weeks of wrist splinting or bulky dressing only.
  - No differences between groups on patient satisfaction, strength, complication rates, range of motion (Bury, Akelman, & Weiss, 1995).
- Patients randomized to splinting of the wrist or range-of-motion exercises (wrist and fingers are exercised separately to avoid bowstringing) for 2 weeks
  - Patient that had splinting had delays in return to ADLs and work, delayed recovery of strength, and increased pain and scar tenderness in the first month (Cook, Szabo, Birkhotz, & King, 1995).

# Nerve Gliding Exercises

- **Purpose: prevent scar adhesion, maintain ROM, & muscle strength**
- Median nerve slides during movement instead of continually being stretched
- Clenching of digits causes median nerve to slide backwards into the forearm
  - Fingers straight = median nerve out towards hand
  - Backward extension = Out further
- Sliding of median nerve during flexion of wrist & fingers is 2 to 4 times greater at wrist than in upper arm.
- Adhesion between median nerve & flexor tendons result in stretching of the nerve
- Place hand in warm water for 4 mins. & then cold for 1 min. (3-5 times/day)
- Hold stretch for 7 secs. & repeat 5 times each session

# Nerve Gliding Exercises

A: wrist in neutral, fingers & thumb bent in toward palm

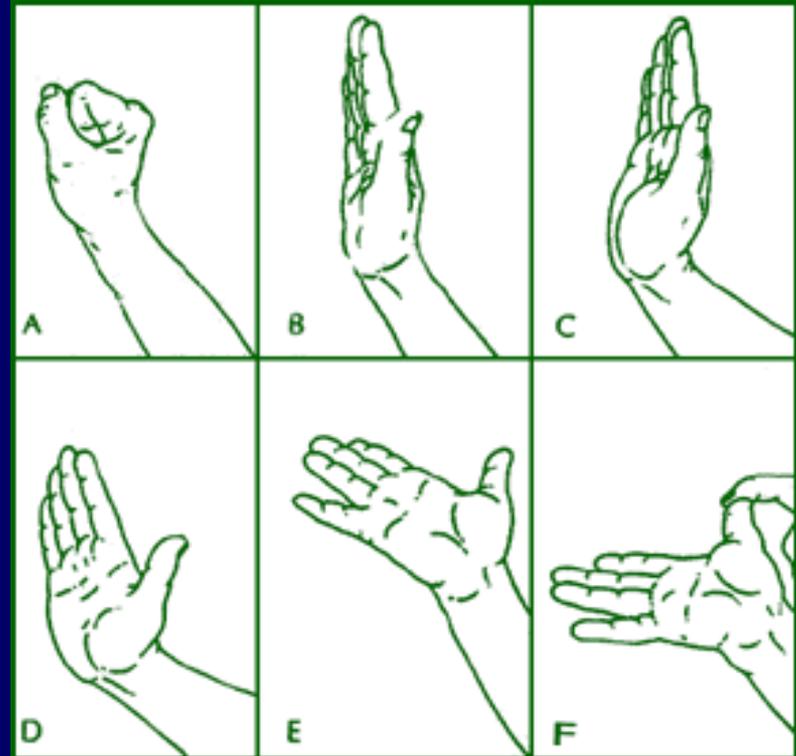
B: wrist in neutral, fingers & thumb straightened

C: wrist & fingers bent backwards, thumb neutral

D: wrist, fingers, & thumb stretched backwards

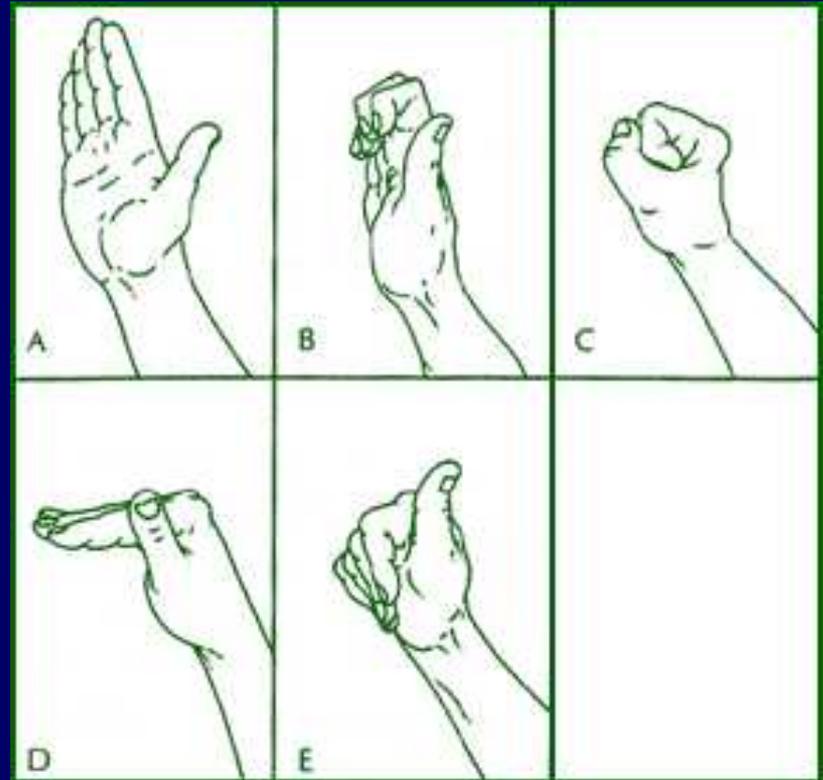
E: wrist, fingers, & thumb extended & spread, With palm facing ceiling

F: wrist, fingers, & thumb bent backwards, palm facing ceiling & other hand gently stretches thumb outwards



# Tendon Gliding Exercises

- A: wrist neutral, fingers straightened, thumb stretched away from fingers sideways
- B: wrist neutral, DIP & PIP flexed
- C: wrist neutral, IP flexed, thumb wrapped around fingers
- D: wrist neutral, DIP & PIP extended, MP flexed @ 90
- E: wrist neutral, DIP extended, PIP & MP flexed



# Case Study: OP Problem Areas

- Work

- Hand Sewing
- Cutting



- Leisure

- 3D artwork
- Playing Harp
- Holding leash to walk her dogs



# Frame of Reference

- Biomechanical

- Occupation requires the ability to move the limbs and endurance to persist in movement until the goal is accomplished
- The body needs rest to heal itself, but without stress, the bones, muscles, soft tissues, and cardiorespiratory system lose the ability to function.
- If ROM, strength, endurance are regained, the client or patient will use these prerequisite skills to regain functional skills.
- Apply purposeful activity and exercise that stretch soft tissues, active and passive movement to preserve and restore full range of motion, resistance and other stress to strengthen weak muscles, and graduated, increasing levels of aerobic exercise to improve endurance.

# Frame of Reference



- Rehabilitation

- Client can regain independence using compensation when underlying deficits cannot be remediated.
- Minimum level of emotional and cognitive prerequisite skill must be present to make independence possible
- Motivation for independence cannot be separated from environmental context.

# Intervention Plan

## Immediately Post-op:

- Volar forearm-based static thumb-hole wrist orthosis in slight extension (wrist immobilization splint)
  - Rest, protection, & prevent wrist flexion
- Begin exercises as soon as Dr's precautions allow
  - Prevent scarring and increase ROM
- Monitor edema

## 2 weeks Post-op:

- Volar forearm-based static thumb-hole wrist orthosis in neutral
  - Maintain functional gains, decrease pressure & pain
- Nerve & tendon gliding exercises
  - Prevent scar adhesions
- Active use of hand
  - Maintain ROM & Strength
- Pt education on environmental & occupational risks of work & leisure activities
  - Prevent pain and future complications
- Scar management

# Treatment Principle Examples

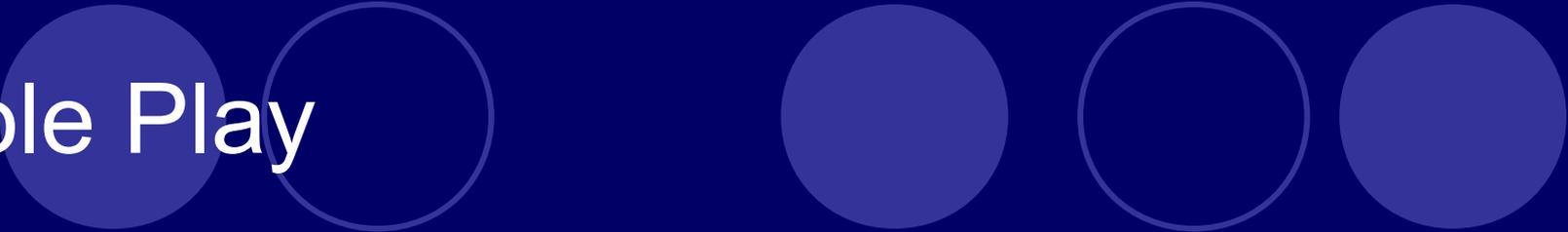
## Biomechanical

- Flexing resistive exercises, beginning with low resistance and high reps and progressing to increased resistance with lower reps., will increase Sam's strength resulting in the ability to hold her dog leash and improved work performance

## Rehabilitation

- Use adaptive strategies of splint wearing and spring loaded scissors will prevent inflammation of the carpal tunnel which will result in resuming work activities

# Role Play



- Enjoy!
  - 4 weeks post surgery
    - Splint and tendon exercise check-up
    - Nerve gliding exercises
    - Strengthening exercises
    - Adaptive strategies discussion

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