Elbow Contracture Management For Patients with Various Conditions Including Brachial Plexus

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Disclosure

I have no financial or commercial disclosures relevant to this presentation

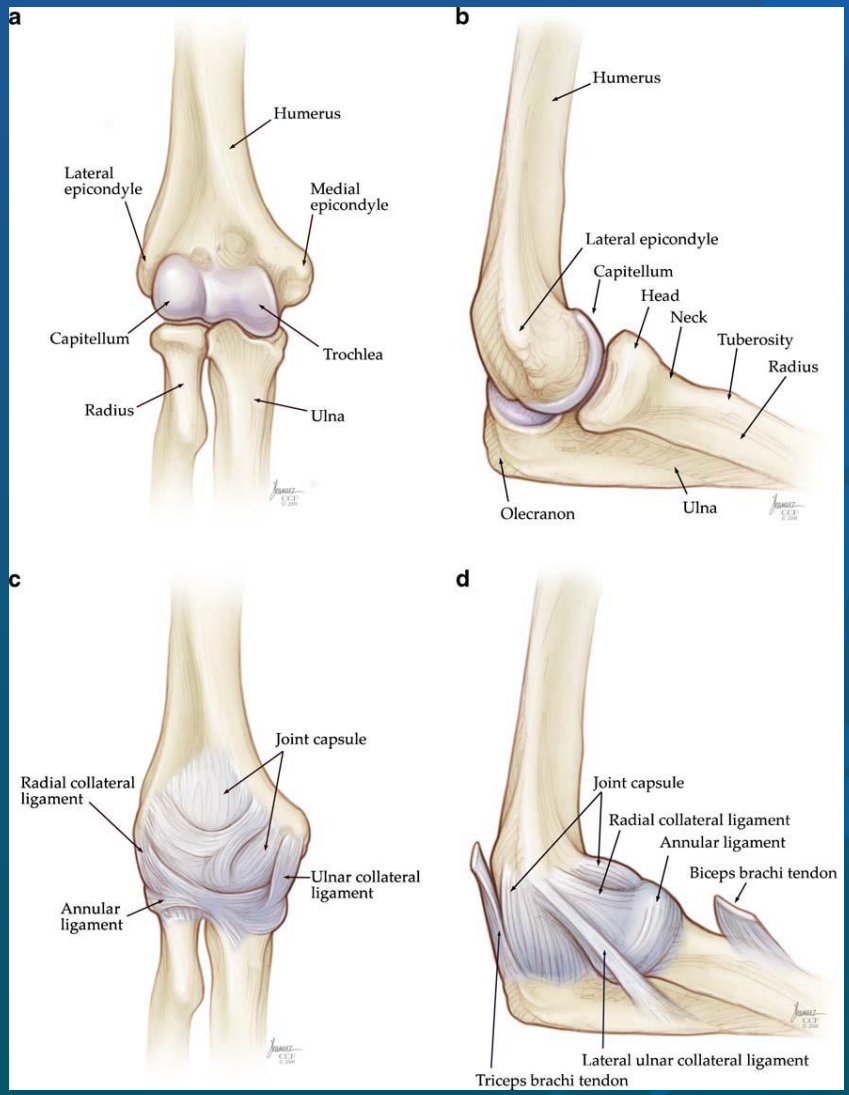
Learning Objectives

Participants will learn the following:

- Timing for serial casting versus splinting
- Clinical decision making for casting materials and alternative casting designs
- Strategies for casting safety / effectiveness
- Cessation of casting process
- Home programming to facilitate elbow extension

ELBOW JOINT

- Flexion and Extension
- Pronation and Supination



Nandi

Contracture Management Options

- Range of Motion (Roll) (Marik) (Tan)
- Kinesioatping (Roll) (Marik)
- NMES (Nandi) (Justice)
- Moist Heat
- Exoskeleton (Estilow) / Robotics (Kim)
- Physiotouch
- Therapeutic Ultrasound
- Botox Injection (see reference list)
- Splinting (Edelstein) (Tan) (Nandi)
- Low Load Prolonged Stretching Devices (Nuismer)
- Casting (Nandi)
- Surgery (Last Resort) (Nandi)

PROM

- USE CAUTION
  - May cause tearing and scarring of the overstretched tissues which limits elasticity and extensibility

- Literature suggests that low load long duration stretch is optimal
  - Decreases the risk of tearing soft tissue
  - Optimizes plasticity
  - Realigns collagen fibers

Kinesiotaping / NMES

Facilitation

- Triceps

Lymphatouch aka Physiotouch

- **LymphaTouch® enhances manual therapy**

- Lymphadema
- Muscle Tightness
- Muscle Pain

Botulinum Toxin A

Rule of Threes

- Begins effect at 3 days
- Peak effect at 3 weeks
- Lasts for 3 months

UE Conditions

- **MS** (Seyler)
- **Capsulitis** (Seyler)
- **Lateral Epicondylitis** (Seyler)
- **TBI** (Seyler)(Autti-Rämö)
- **CVA** (Seyler)
- **CP** (Seyler) (Autti-Rämö)
- **MS** (Seyler)
- **Pain** (Seyler)
- **NBPP** (Buchanan) (Seyler)

Timing of Splinting

- Plateaued response to casting
- Can do serial splinting if indicated
- Range limitation 20-40 degrees

Choices of Splinting Materials

Custom

- Cast
- High Temp
  - Orthotist
- Low Temp
  - Perforated
  - Solid

Off the Shelf

- Adjustable Joint

Static Progressive Stretch

- JAS Splint (Bonutti)

What is Serial Casting?

- Modality that can be used in conjunction with other traditional rehab modalities
- Literature demonstrates that AAROM/PROM/splinting may not make an effective long-term impact

Why Does Serial Casting Work?

- Inhibits abnormal tone
- Lengthens soft tissue
- Decreases joint contractures

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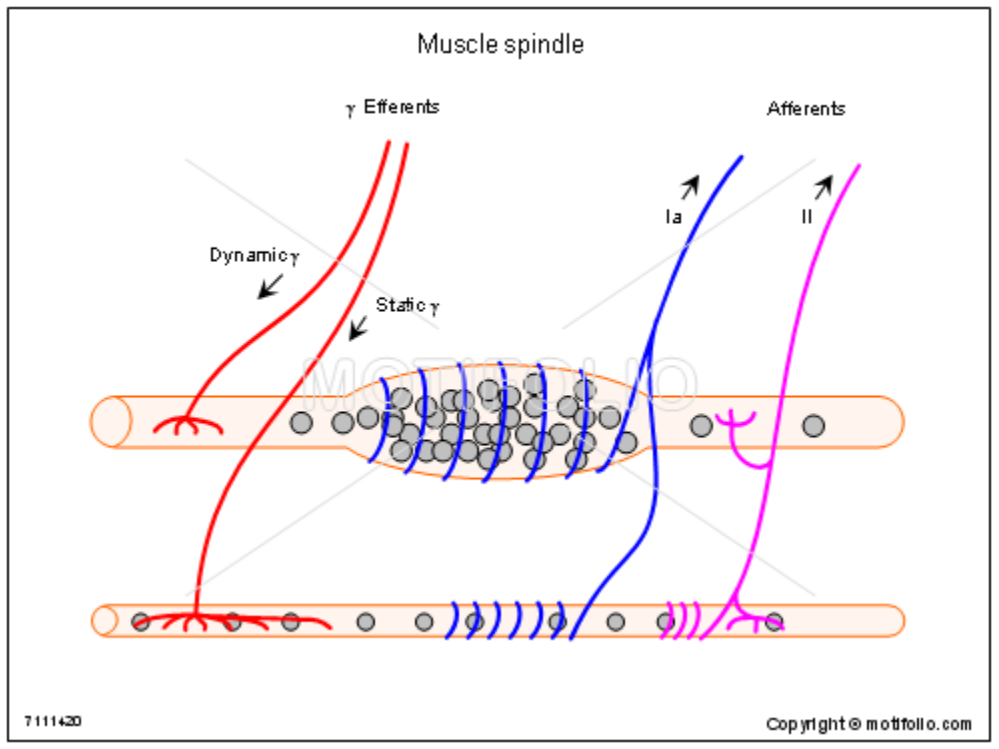
Muscle Spindles



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- Muscle contractions are regulated (in part) by the muscle spindles
- They lie parallel to muscle fibers in striated muscle
- Help regulate the excitability of the muscle
- Responsive to changes in length and tension

Contractures and Hypertonicity

- Resultant from neuromuscular, neurological and soft tissue disorders
- Limits ADL's and IADL's

Spasticity

- Associated with hyper-excitability

- Casting may decrease this excitability
  - Neutral warmth
  - Circumferential pressure
  - Increased weight

  Ultimately
  - Regulates muscle spindles

Williams and Goldspink

- Decreased number of sarcomeres in muscle which is maintained in a shortened length
- Results in decreased extensibility, loss of flexibility
- Estimated that sarcomeres decrease 25-40% within 14-28 days after experiencing hypertonicity
- Increased number of sarcomeres in muscle which is maintained in a lengthened position

Moseley, Hassett, Leung, Clare, Herbert and Harvey

- Serial casting study in 2008 completed with brain injured patients

- Findings:
  - Serial casting reduced contracture by an average of 22 degrees
  - One day later this effect had decreased to 11 degrees of gain
  - After four weeks, all gain of range of motion had been LOST

- Serial casting or inhibitory casting must be utilized in conjunction with a physical range of motion program along with a positioning program post casting.

Who Benefits From Serial Casting of the Elbow?

Diagnoses:

- CP (Pohl) (Yasukawa)
- SCI
- TBI (Moseley)
- Burns (Bennett)
- CVA (Finn)
- **BPP (see ref list)**
- AMC (Smith for wrists)
- Haemophilia (Gilbert)

Timing of Casting

- Post – Botox 1-3 days
- Range limitations >40 degrees

Options for Casting Types

- **Fiberglass**
  - Soft
  - Standard
- **Plaster**

Considerations For Casting

- How old is the contracture?
- How significant is the abnormal tone?
- Were there Botox injections given?
- Goals for casting:
  - Functional gains
  - Gains for pain management
  - Gains for easier caregiving

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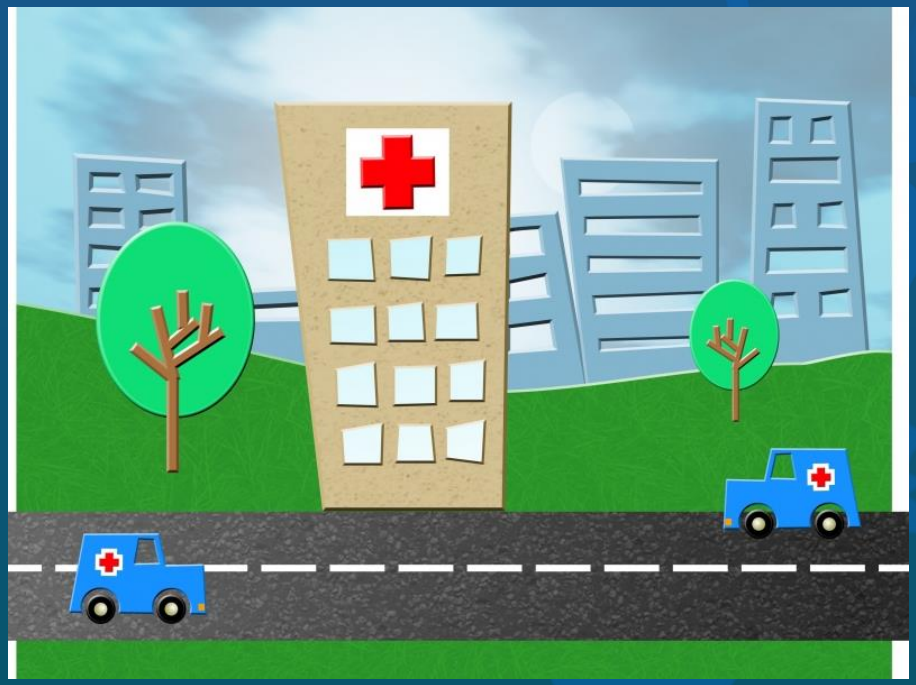
Where Can Serial Casting Occur?

- In-patient setting
  - Acute
  - Rehabilitation
- Out-patient setting
- Long-term care facilities



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Serial Casting – It Takes 2

- Therapist
- Aide or second therapist
  - One does wrapping
  - Other does holding of the extremity

Why do you need a holder?

- http://longislandbankruptcyblog.com/wp-content/uploads/2010/01/moving-target.jpg

Casting Guidelines

- Check skin integrity. Skin on the limb to be casted must be free of wounds, IV or other lines and edema.
- Patient must be homeostatic.
- Rarely do we cast bilaterally at the same time. Cast one side first and gain range of motion. Bivalve your final cast for one side prior to beginning casting on the other side if needed.
- Assess PROM and AROM (as appropriate). Make note of muscle length when assessing range. Is the ROM issue isolated or does it cross multiple joints? This will assist in determining what type of cast will be most effective.
- Sensation--is the patient able to indicate a potential pressure area?
- Assess abnormal tone.
- Assess motor control (if appropriate) and functional use of the extremity to be casted.

Documentation

EXTREMITY

- Tone (high, low, normal)
- Range of Motion (active and passive)
- Strength (MMT/grip)
- Function
- Condition of Skin
- Roles of Clinician

CAST

- Position of Joint in Cast
- Type of Material Used
- Distal Circulation
- Parent Instructions

Assessment Between Casts

- Check skin integrity!
  - Wash the extremity
  - Check the skin closely for any signs of pressure from the cast
  - Reddened, dusky or purple skin, blisters or soft spots, pressure over bony prominences or at the proximal/distal ends of the cast.
  - **Document**

Assessment Between Casts

- Assess **PROM/AROM**
  - Should typically gain 15-20 degrees of range of motion.
  - **Document each visit**
  - Gain of 10 degrees or less
    - Consider bi-valved cast for positioning
    - Re-evaluate the length of time the cast was donned

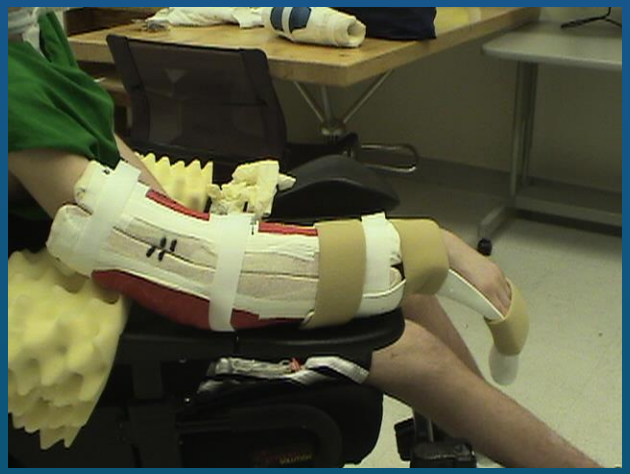
Typical Sign Posted at Bedside after Donning a Cast

- This cast was donned for positioning and not a fracture.
- Cast location:
- Time Fabricated:
- Please check for capillary refill q 20 minutes for the first hour . Then check every hour for the next 8 hours. After 8 hours, please check every shift.
- Keep cast elevated
- If issues arise with this cast please page :

  _____

- Thank you!!!

A Typical Sign Posted at the Bedside for Splint / Bi-Valved



- Stretch arm then place into cast, secure with Velcro straps
- Stretch hand then place into hand splint, secure with Velcro straps
- Customize wearing schedule (i.e. wear all night and 2-3 hours during the day as tolerated)

Outpatient Casting Hand Out

Cast Care

1. The cast can NOT get wet. Please discuss hygiene/bathing recommendations with your child's therapist.
2. Monitor the leg(s)/arm for cast tolerance, checking for:
    a. Edema or swelling
    b. Uneven skin temperature
    c. Poor capillary bed refill. (Apply pressure to the nail bed until it turns white. Release pressure. Blood flow should return to skin in less than or equal to two seconds)
    d. Skin discoloration
3. Check the cast using the following schedule:
    a. Once every 20 minutes for the first hour
    b. Then once an hour for the next 8 hours
    c. Then once every 8 hours after that
4. If cast intolerance is present, please contact your physical/occupational therapist by telephone.
5. Cast Schedule: Your therapist will determine your weekly casting schedule. If for any reason you are unable to return for your next scheduled casting appointment in 7-10 days, please contact your therapist immediately for further instructions.

If therapist is unavailable:

[ ] **Soft fiberglass cast**: Carefully unroll and remove casting material by hand.

[ ] **Hard fiberglass cast**: Contact your physician or local emergency room for emergent removal.

Outpatient Casting Hand Out

Cast Removal Form

If your child is not tolerating his/her **"hard" fiberglass cast**, please contact your child's pediatric outpatient therapy clinic to discuss care or to arrange a removal appointment.

Briarwood Pediatric Rehabilitation: # 734 998-7710

Brighton Center for Specialty Care: # 810-263-4000

Pediatric Rehabilitation Center-Commonwealth: # 734 763-2554

IF YOU ARE UNABLE TO CONTACT YOUR THERAPIST OR REFERRING PHYSICIAN PLEASE: TAKE YOUR CHILD TO YOUR LOCAL EMERGENCY ROOM TO HAVE THE CAST REMOVED. Please give this letter to the emergency room physician.

Date: _____

Patient: _____

MRN: _____

Diagnosis: _____

To Whom It May Concern:
The above named is a patient of:
Dr._____
Department _____

He/She is currently receiving occupational/physical therapy at one of Michigan Medicine's outpatient therapy clinics, as prescribed by the physician indicated, for serial casting to increase functional range of motion of his/her:

- ☐ Left Ankle/ Knee/ Wrist/ Elbow
- ☐ Right Ankle/ Knee/ Wrist/ Elbow

The cast is **not** for fracture treatment. If this patient presents to you with signs of cast intolerance, **the cast should be removed.**

Thank you,

_____

Occupational Therapist/Physical Therapist

Supplies for Casting

- Stockinette Sleeve or Glove
- Under-Cast Padding
- Cast Tape (soft or rigid)
- Plastic Guide
- Gloves
- Bucket for Warm Water
- Cast Saw
- Head Phones
- Cast Spreader
- Casting Scissors
- Finishing Tape
- Velcro Hook Sticky Back
- Velcro Loop Non-Sticky Back

Steps Involved With Don Cast

1. Evaluation of Arm
   - Skin Integrity
   - ROM/Strength
   - Function
2. Don gloves
3. Don stockinette
4. Don under-cast padding
5. Get casting materials wet
6. Don casting materials
   - Consider use of lotion
7. Let dry

www.pattersonmedical.com

Steps Involved With Doff Cast

1. When dry (24+ hr.)
2. Consider uni-valve or bi-valve cast
3. Cover patient with sheet or gown
4. Consider goggles or head phones
5. Turn on cast saw
6. Demonstrate how the cast will not cut skin
7. Use up and downward motions versus drawing a line

(Prevents saw blade from getting too hot)

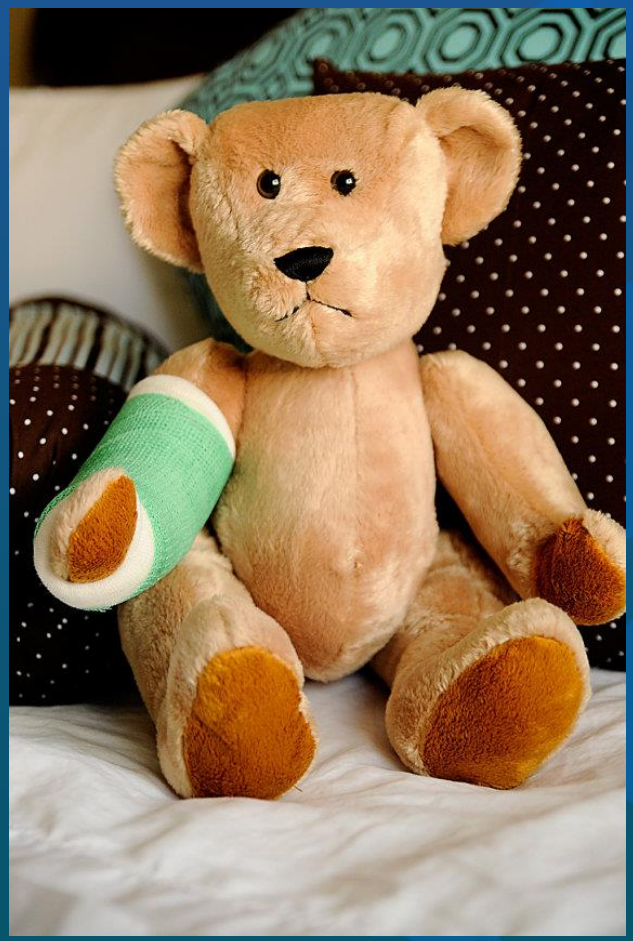
8. Use spreader to separate cast
9. Use scissors to cut padding and liner
10. Clean skin and dry

Cast Changes

- Typically every week
- Improvements vary from individual
- Bi-Valve each cast your remove
- Cease casting when gains in passive motion are minimal to none

After Doff of Cast

1. Re-evaluation of arm
   - Skin integrity
   - ROM / strength
   - Function
2. Based upon results don new cast or finish current cast
3. If patient has maxed out on range of motion use current as a splint
4. Finish edges with tape
5. Add Velcro straps
6. Develop home program / wearing schedule



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Problem-Solving Casting Tolerance

- Skin
- Pressure Points
- Intolerance
- Activity
- Age
- Behavior
- Cognitive Skills
- Additional medical considerations

TIPS

- Windows
- Padding
  - Bony = donut
  - Muscle atrophy = build up
- Hand and arm cast
  - Wrap distal to proximal
- Elbow cast
  - Proximal to distal

Bi-Valved Cast

Bilateral Casting

- One extremity at a time
- One joint at a time
- Gradually add joints

Casting Options

Developing Competency Protocols

- Read 3 journal articles to review theory behind serial casting
- Possibly attend a training course
- Observe and hold for application of 3 casts
- Apply and remove 3 casts
- Post-test on theory for casting

Home Program Post-Casting

- Splint use
  - Nightly (long-term)
- Range of Motion
  - Active
  - Passive
  - Self stretching
- NMES
  - Triceps
- Strengthening
  - Side sitting
  - Reverse prop
  - Planks
  - Dips
  - Push ups
  - Alternative

Serial Casting Specific to NBPP

NBPP with elbow flexion contractures

<u>Casting*</u>

- Elbow flexion contracture >40’
- PROM – HEP
- Plaster or fiberglass
- Weekly cast changes
- End casting if plateau or 5 weeks max

*Ho et al, 2010

Elbow Splinting for NBPP

NBPP with elbow flexion contracture

Splinting*

- Elbow flexion contracture 20’ - 40’
- HEP-PROM
- Night splint: low temp thermoplastic
- Remold every 2 weeks until plateau

*Ho et al, 2010

Case Study

Patient (hn)

- History of onset
- History of treatment
- History of modalities

Current Plan

- Imaging
- Botox
- Casting

Result

- Pre-Range
- Post-Range
- Number of Casts

Complications

- Clavicle Fracture (2)
- Compliance

Don Constraint Casting Video

Doff Constraint Casting Video

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Helpful Web Sites

- PROTOCOLS
- http://www.cincinnatichildrens.org/assets/0/78/1067/2709/2777/2793/9199/fa42566b-64d7-4d5b-8c38-62a82d660937.pdf

THANK YOU

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