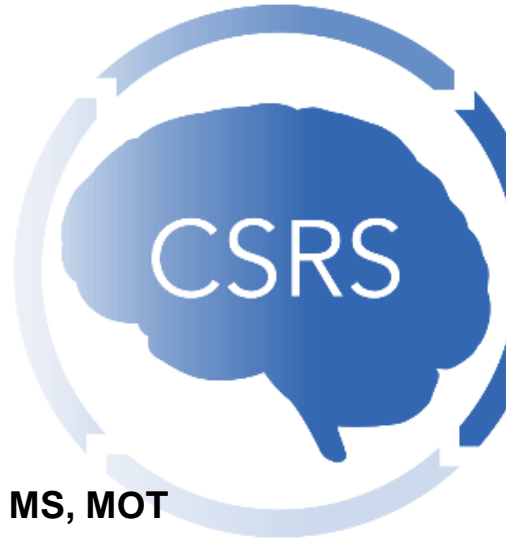


# The Low Tone UE: Positioning and Treatment



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## Triage for Early Extension & Abduction

**Active finger extension is a strong predictor of short, medium, and long-term post-stroke recovery (Smania et al. 2007)**

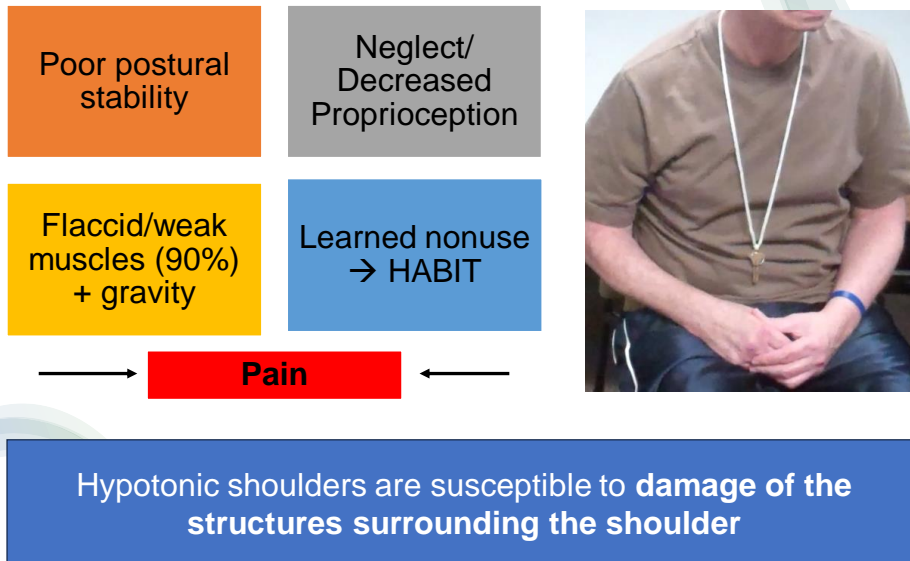
**Minimal UE shoulder abduction & proximal motor control at admission to rehabilitation → “good” chance of regaining some hand capacity** whereas patients without proximal arm control had a poor prognosis for regaining hand capacity (Houwink et al. 2013).

**Patients with some finger extension & shoulder abd. on Day 2 → 98% probability of achieving some degree of dexterity at 6 months;** Only 25% in those who did not show similar voluntary motor control.

**60% of patients with finger extension within 72 hours had regained full recovery of upper limb function @ 6 months (Nijland et al. 2010).**

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## Causes of poor positioning in the low tone UE



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## The Big Winner for Shoulder Pain? Acupuncture/Acupressure

### ACUPUNCTURE

- Multiple RCTs across approx. 500 subjects
- 3-5x/week for 2 wks.

### ACUPRESSURE

- Similar effects and Level of Evidence but fewer RCTs

MOTOR FUNCTION			
LoE	Conclusion Statement	RCTs	References
1b	Acupuncture with herbal therapy may produce greater improvements in motor function than acupuncture.	1	Seo et al. 2013

SPASTICITY			
LoE	Conclusion Statement	RCTs	References
1b	Acupuncture may produce greater improvements in spasticity than conventional therapy	1	Mendigutia-Gomez et al. 2016

RANGE OF MOTION			
LoE	Conclusion Statement	RCTs	References
1a	Acupuncture may produce greater improvements in range of motion than conventional therapy	2	Mendigutia-Gomez et al. 2016; Zhao et al. 2015
2	Superficial needling acupuncture with club swing may produce greater improvements in range of motion than conventional therapy.	1	Ni et al. 2017

PAIN			
LoE	Conclusion Statement	RCTs	References
1a	Acupuncture may produce greater reductions in pain than conventional therapy.	2	Mendigutia-Gomez et al. 2016; Zhao et al. 2015
1b	Acupuncture with herbal therapy may produce greater reductions in pain than acupuncture.	1	Seo et al. 2013
2	Superficial needling acupuncture with club swing may produce greater reductions in pain than conventional therapy.	1	Ni et al. 2017

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## SLINGS AND OTHER AIDS **FOR SUPPORT AND POSITIONING:**

Joint protection strategies - used AT ANY STAGE of recovery to prevent or minimize shoulder pain.

- Positioning and supporting the arm during rest [Evidence Level A].
- Protecting and supporting the arm during functional mobility [Evidence Level B].
- Protecting and supporting the arm during wheelchair use or transfers by using a hemi-tray or arm trough [Evidence Level B].

*During the flaccid stage* slings can be used **to prevent injury**; however, **beyond the flaccid stage the use of slings is controversial.**

Canadian Stroke Strategy

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## Posture *Before* Positioning or Rehab!



On Our YouTube Channel



ComfyBrace \$23.99



External rotation ← → Trunk extension

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# Pillows

## PROS:

Abundant; Pliable; Many sizes; useful in side lying or sitting

## CONS:

May not maintain or approximate appropriate shoulder position; Not useful while standing.

## Variations:

pool noodles; wedges; NERF football,



Set aside 4-6 pillows in addition to what is available in the room

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## Which sling...for support and transfers? Hemi-Sling

### WHAT:

Sling that supports UE across body and underneath elbow

### PROS:

Abundant; Keeps UE across body during transfers; Good for patients w neglect; May assist w balance (1)

### CONS:

Does not approximate position in humerus; May facilitate learned nonuse; deconditioning; poor arm swing



Alt: Fanny pack; Scarf

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## Humeral “Cuff” Slings

**WHAT:** Humeral cuff that is held in place by adjustable straps, either around body or proximal to cuff.

**PROS:** Approximates humerus position; some allow UE swing; worn under or over clothes; adjustable; some allow distal UE use; Can integrate modalities with some types

**CONS:** limits shoulder mobility (e.g., external/internal rotation); tricky to don – requires practice!

Neurexa shoulder orthosis (Walmart)



Ali-Med Hemi Shoulder sling



OmoTrain shoulder brace

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## “Home-Made” Humeral Cuff “Sling”



Available on YouTube channel

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# Distal Support Slings



**WHAT:** Supports UE distally; uses weight of the patient's forearm as a counterbalance to maintain positioning between the humerus and the shoulder joint (GH)



**PROS:** Approximates humerus in some pts; adjustable into EXTERNAL ROTATION; Can integrate modalities; unweights the UE; Distal activation?



**CONS:** May discourage arm swing post acutely → may throw off balance; May not effectively approximate shoulder; May restrict distal UE use



Givmohrsling.com: ≈ \$72.00



AliMed shoulder sling: ≈ \$86.00

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- **THERE'S BARELY A SOCKET!**  
Ball of the arm bone moves against a basically-flat surface on shoulder blade.
- **HUMERAL HEAD > 2X SIZE OF FOSSA**
- **THE ONLY BONE THAT CONNECTS IS THE COLLARBONE (SC JOINT)**
- **3 DEGREES OF FREEDOM** (the most in the body)



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# Shoulder Subluxation Assessment

**Excellent intrarater reliability (ICC=.980);**  
**Moderate interrater reliability (0.79)**

**Cannot detect small subluc < .05 cm**

**Ultrasound:** More sensitive (Kumar et al., 2011; Lee IS, et al., 2009; Huang et al., 2012)

There is a **weak correlation** between size of subluc & fx;  
 There is **no correlation** between size of subluc & pain;  
**Speed of UE recovery is associated w pain**

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## How About *Slings* for Shoulder Subluxation?

MOTOR FUNCTION			
LoE	Conclusion Statement	RCTs	References
1b	Sustained positioning may not have a difference in efficacy when compared to conventional therapy for improving motor function.	1	De Jong et al. 2006
1b	Continuous passive range of motion exercises may not have a difference in efficacy when compared to self-directed range of motion exercise for improving motor function.	1	Lynch et al. 2005
SPASTICITY			
LoE	Conclusion Statement	RCTs	References
1a	Sustained or static positioning may not have a difference in efficacy when compared to conventional therapy for improving spasticity.	3	De Jong et al. 2006; Ada et al. 2005; Turton & Britton 2005
1b	Continuous passive range of motion exercise may not have a difference in efficacy when compared to self-directed range of motion exercise for improving spasticity.	1	Lynch et al. 2005
RANGE OF MOTION			
LoE	Conclusion Statement	RCTs	References
1a	Sustained or static positioning may not have a difference in efficacy when compared to conventional therapy for improving range of motion.	5	De Jong et al. 2006; Gustafsson & McKenna 2006; Ada et al. 2005; Turton & Britton 2005; Dean et al. 2000

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## SLINGS FOR RESTORATION (cont'd)

- Immobilization increases the risk of other pain syndromes including adhesive capsulitis and joint contracture and should be avoided (Dohle, 2013).
- May encourage flexor synergies, inhibit arm swing, contributing to contracture formation.
  - GIVE-MOHR: Good for maintaining arm swing; ADL participation???
- Slings are likely not beneficial for shoulder hemiplegia following stroke. (Ada et al., 2016; van Bladel et al., 2017)
- Ada et al, Cochrane Database Systematic Review: "There is insufficient evidence that to conclude whether slings and wheelchair attachments prevent subluxation, decrease pain, increase function or adversely increase contracture in the shoulder after stroke"
- Bladel et al., 2017, sling vs no sling, 6-week duration  
 "The control group (no sling) showed the least amount of shoulder subluxation. There were no significant differences between groups for pain, PROM, spasticity, or function between groups."

EBRSR: "Slings are likely not beneficial for shoulder hemiplegia following stroke"

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**Electrical stimulation is effective for pain and muscle activation...**  
 but the causes of shoulder pain may vary

**ACUTE PHASE**: Pain d/t new, **excessive stretches and associated damages to the soft tissues** (capsule, ligaments, and muscles)

**CHRONIC PHASE**: Pain due to **sustained, abnormal positioning**; **shortening** of capsule and ligaments and **possible muscle contractures**

Vafadar, *Biomed Res Intl*; 2015; Ada, *Aus J Physio*; 2002; Wang et al, *Am J PMR*; 2000

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## Where should I place electrodes?

- Posterior deltoid and supraspinatus
- **BUT** Cadaveric studies - the supraspinatus is not a powerful migrator **in some patients**
- Posterior deltoid and teres minor/infraspinatus **in some patients may be more effective**



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## What's Next?

Begin Movement Rehabilitation  
**BUT MONITOR OTHER IMPAIRMENTS**  
 (sublux; core stability; posture; scapular mobility)

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**Functional/meaningful/avocational objects and/or activities at all points**



No volitional movement? **Closed Chain/Active-assist/ISOMETRIC TOWARD A TARGET**



Grade up when **6-7/10** successful attempts



**Feedback** – cheering, videos, pictures, feeling, targets, **rhythm and anticipation**

**“Metronome Beats”**

<https://stonekick.com/metronome.html>

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## Closed to Closed-ish Chain for Activation



**“Football”**



**Towel w compelled wb**



**“Ergonomic Computer Wrist Extender”**

### **POSSIBLE CHALLENGES WITH “TOWEL:”**

STAND/SIT?/TANDEM STAND?  
UE SUPPORT/NOT SUPPORTED?  
BEAT?/METRONOME?  
EYES OPEN/CLOSED?

ANGLE OF INCLINE?  
SURFACE (slick?)  
BASE OF SUPPORT?

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“Slide”

Mobile Arm Support (Saebo)  
w. trigger-switch stimulation

### POSSIBLE CHALLENGES FOR “SLIDE”:

ANGLE OF INCLINE?  
UE SUPPORT/NOT SUPPORTED?  
RESISTANCE? HARD STOP?

SURFACE (slick?)  
BEAT?/METRONOME?  
EXTERNAL/INTERNAL ROTATION

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## Mobile Arm Support Suggestions (“Gravity Compensation”)

**“Gravity compensation facilitated active arm movement  
excursions without impairing motor control...”**

- Prange et al *Neurorehabil Neural*; 2009



Saebo MAS (\$7k)



[www.amazon.com](http://www.amazon.com)

\$18.98



Thanks to:

Allora Bellanger, PT, DPT, CSRS  
TIRR Memorial, Houston

PVC Platform w theraband  
and annoying children

Tie a theraband to a doorknob, drape it over  
the top of the door, tie to patient wrist

Items with the word “boom” (mic stand)

Krabben et al, *J Neuroeng Rehabil*; 2012;  
van der Kooij et al, *Ann Int Conf Eng Med Biol Soc* 2009

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## Sitting balance progression

*What muscles will she use?*



Ipsilateral anterior  
nonparetic



Ipsilateral posterior  
nonparetic

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## Sitting balance progression

*How can I increase challenge?*

*(eg, change height of chair)*



Ipsilateral anterior  
nonparetic



Try to attain  
trunk flexion;

Push back against  
your hand as they return  
to extension



Ipsilateral posterior  
nonparetic

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## Sitting balance progression:

Stabilize @ the elbow and wrist →  
A single functional unit: forced activation  
 through the shoulder



Contralateral anterior  
paretic



Contralateral posterior  
paretic



IMAK Pillo  
Splint



LQO Adult  
Elbow  
Fixation  
stabilizer

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### Progress to sidelying



High-low  
table

Shoulder flexion,  
Gravity eliminated

**“PUSH UP/DOWN TOWARD  
YOUR HEAD/DOWNTOWARD  
YOUR FEET!”**  
 (Shoulder flexion/extension)

### Gravity Compensation w. proximal/distal support



Elbow flexion,  
Gravity eliminated

**“PULL IN!”**  
 (Elbow  
flexion/extension)

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## How Do I Know If The Muscles Are “Activating?”



Look;  
Palpate;  
Portable sEMG device (lab)

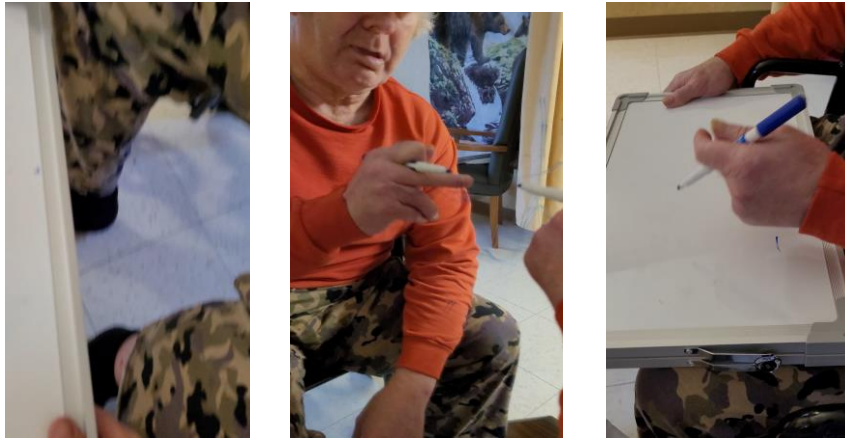
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## Upgrading or Downgrading?



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## Open → More Closed-Chain & More Proximal

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### QUESTIONS?



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