

NEUROLOGICAL SPASTICITY : DILEMMA IN FUNCTIONAL GAINS

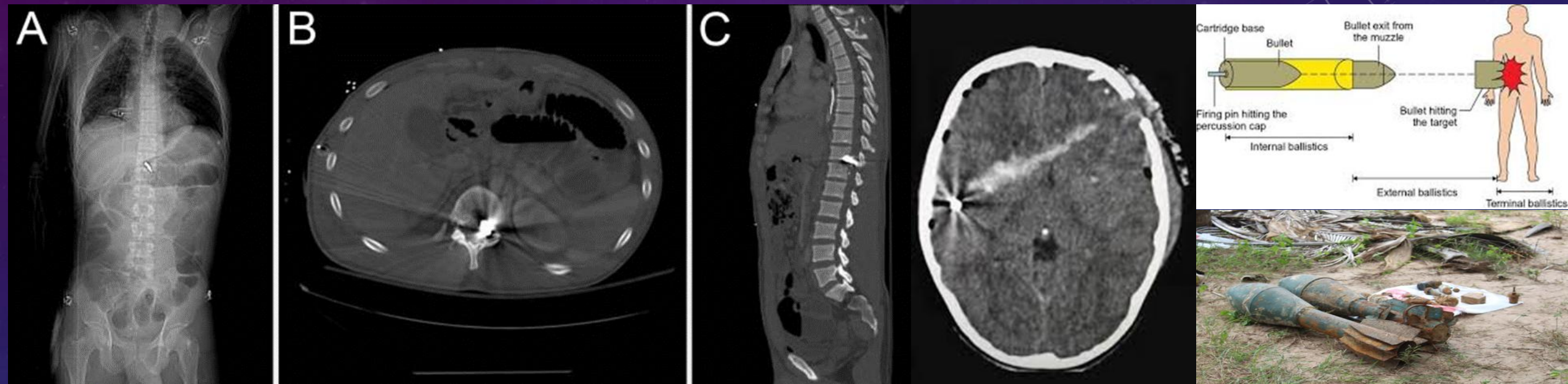
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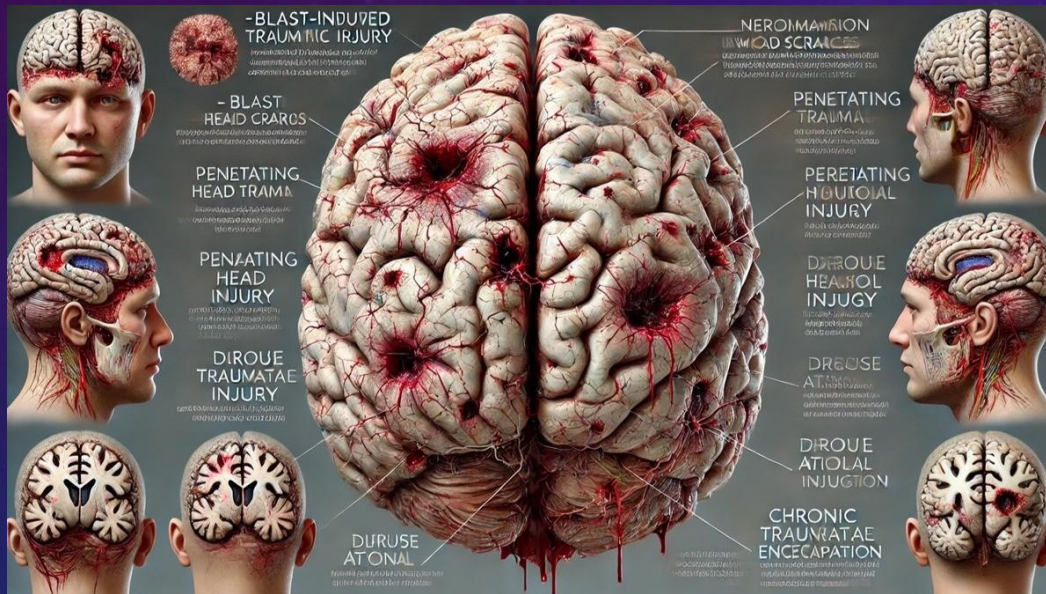
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BRAIN AND SPINAL CORD INJURIES – DIRECT FIRE AND INDIRECT FIRE

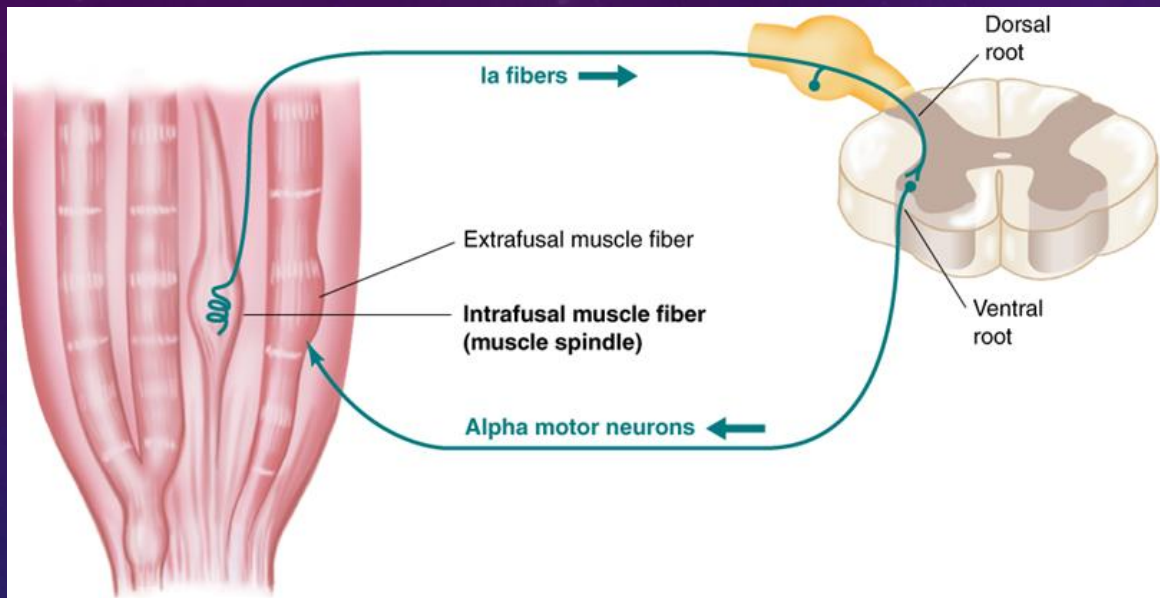


LESION LOAD OF THE INJURY



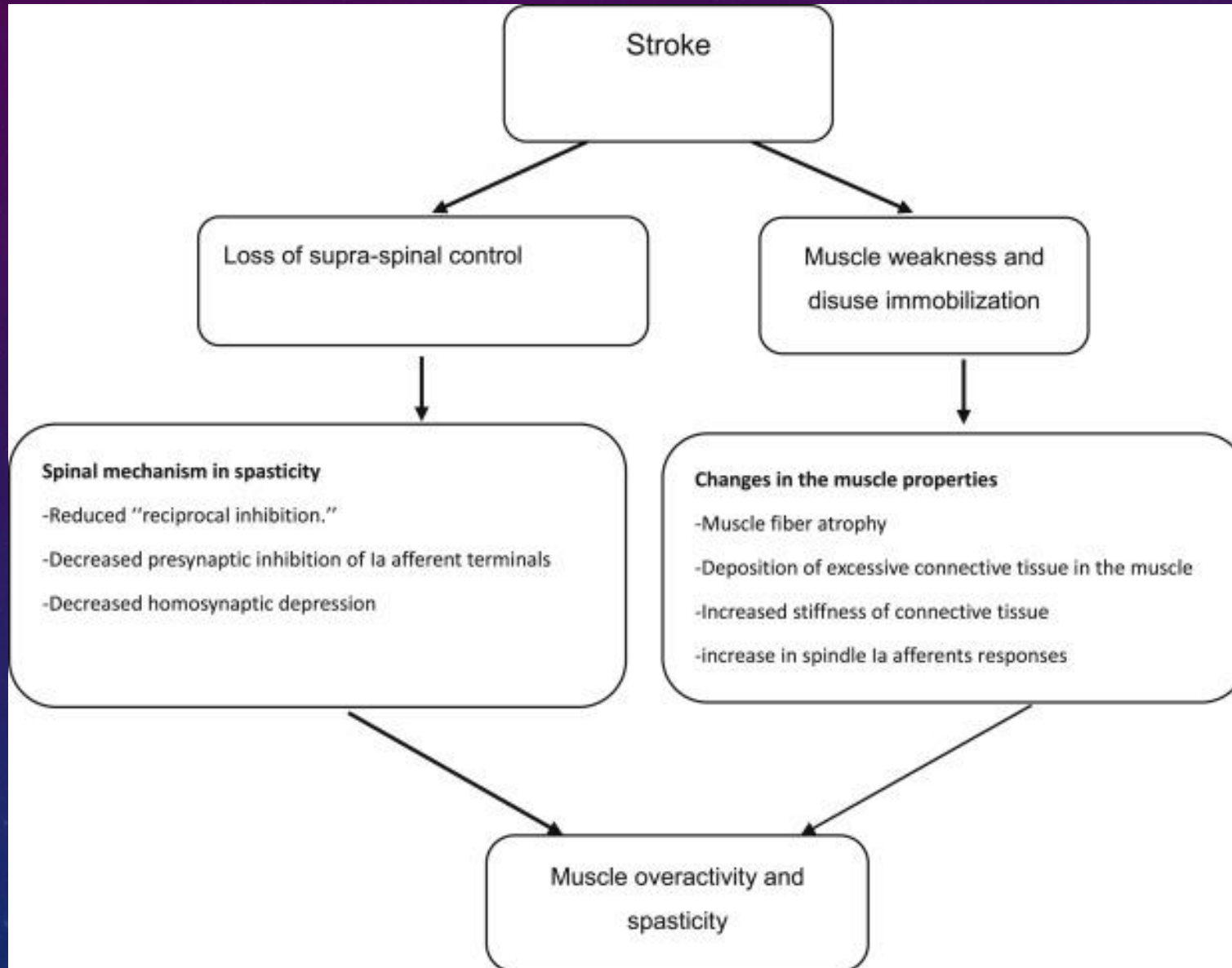
- **Severity Correlation:**
Complications such as spasticity are common with higher-volume/severe brain injuries

PATHOPHYSIOLOGY OF SPASTICITY



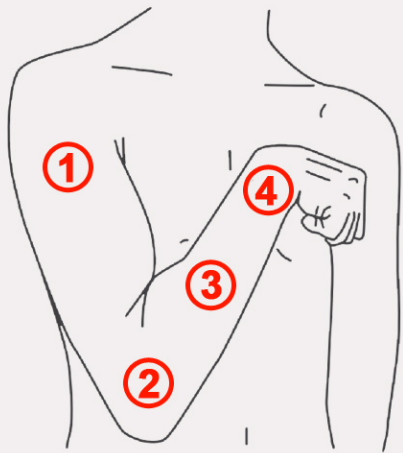
- **Absence of an UMN (cortical) inhibitory control on spinal reflex**
- Hyperactive stretch reflexes mediated by muscle spindle stretch receptors
- Decreased threshold of alpha lower motor neuron
- Presence of contributory factors for spasticity

SPINAL VS SUPRA SPINAL EFFECTS



UPPER LIMB SPASTICITY – FLEXOR INVOLVEMENT

In case of post-stroke spasticity, there is the most frequent pattern in the upper limb:



- ① Internal rotation and adduction of the shoulder
- ② Flexion at the elbow
- ③ Forearm pronation
- ④ Flexed wrist



- ⑤ Tight fist



- ⑥ Clenched thumb

Common Limb Deformities in Upper Limb Spasticity



Pronation of the forearm seems to be more commonly encountered than supination after central nervous system injury.



In those with **thumb-in-palm** deformity, the thumb is held fixed within the palm with its distal aspect flexed. The thumb is limited in its use as a result of the abnormal posture.

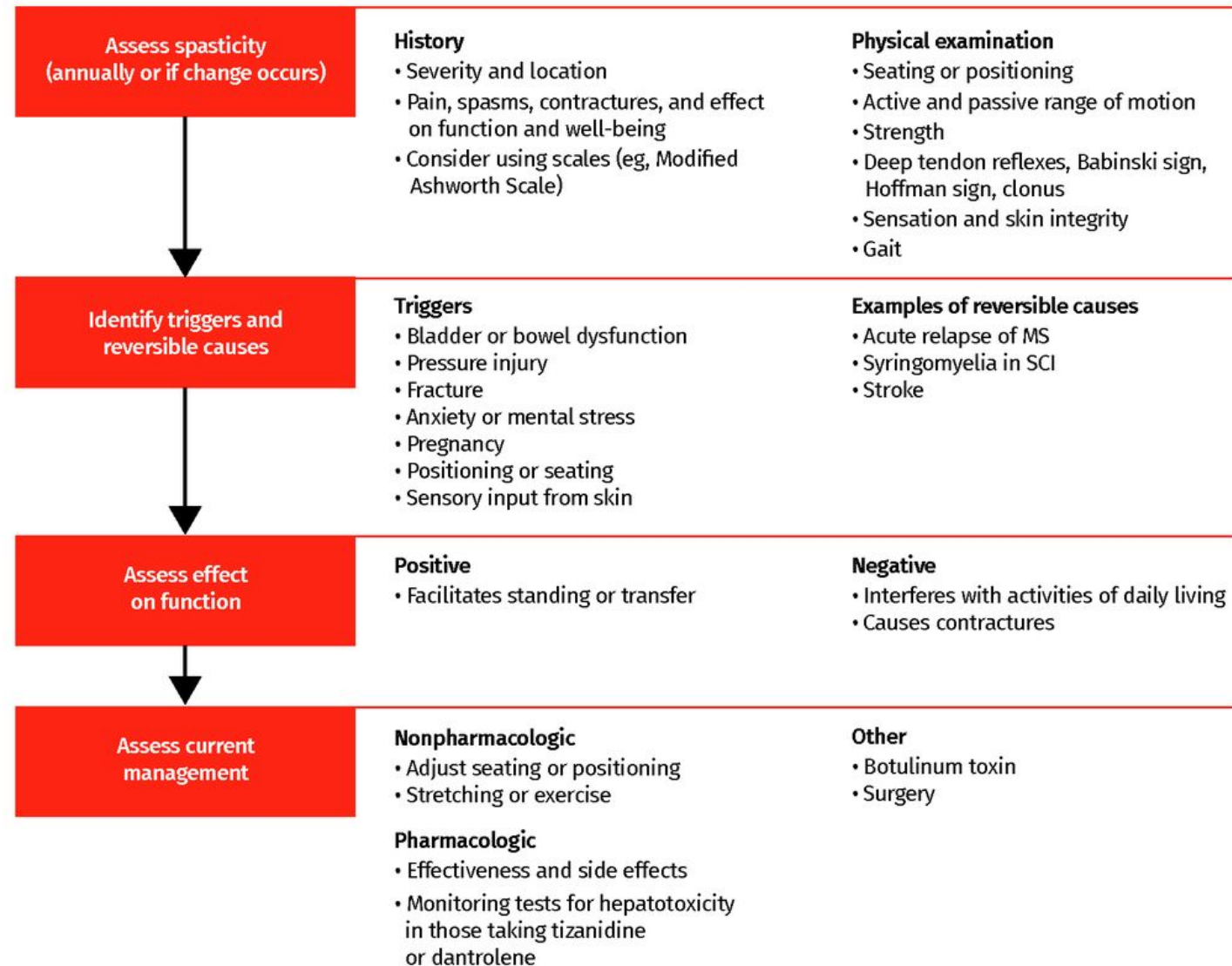


In those with **clenched fist**, the fingers are tightly flexed into the palm. This can lead to poor palmar hygiene and pain with finger manipulation.

LOWER LIMB SPASTICITY- EXTENSOR INVOLVEMENT



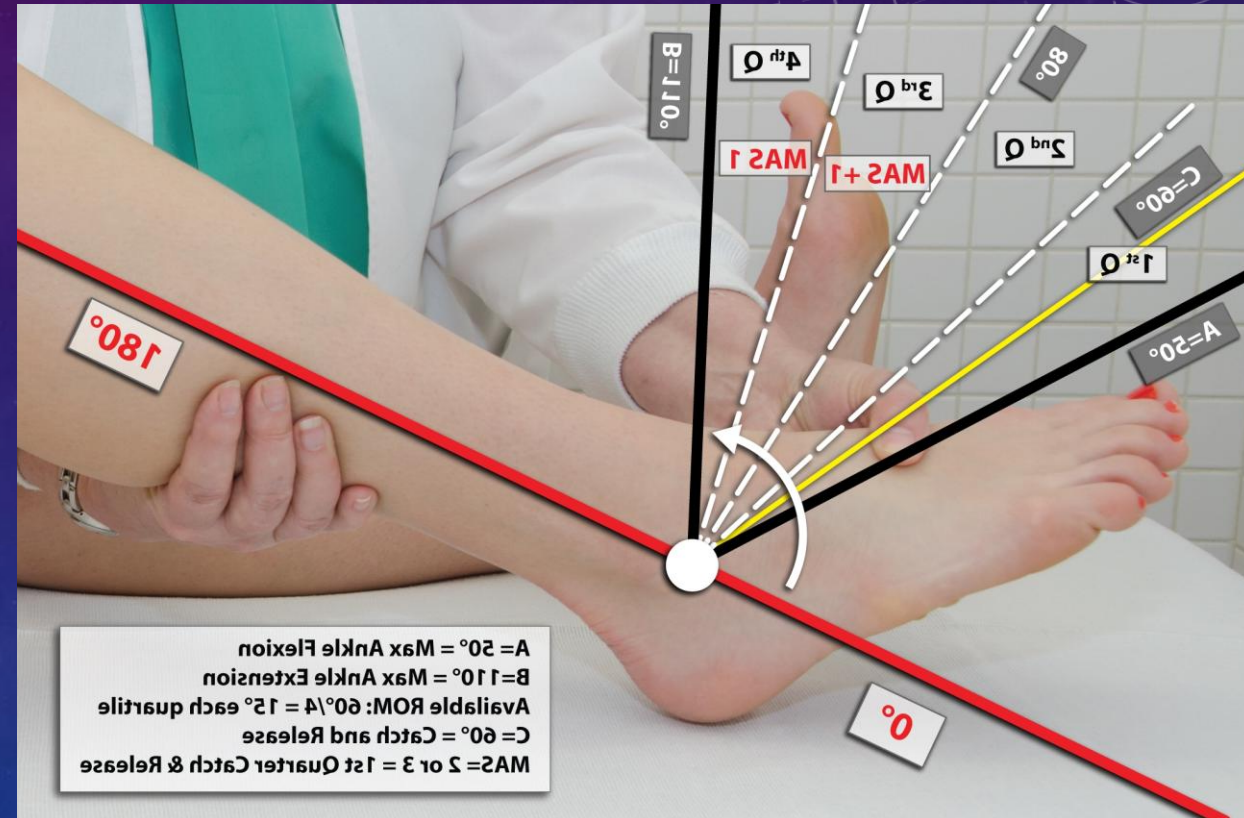
Figure 2. Strategies for assessing spasticity



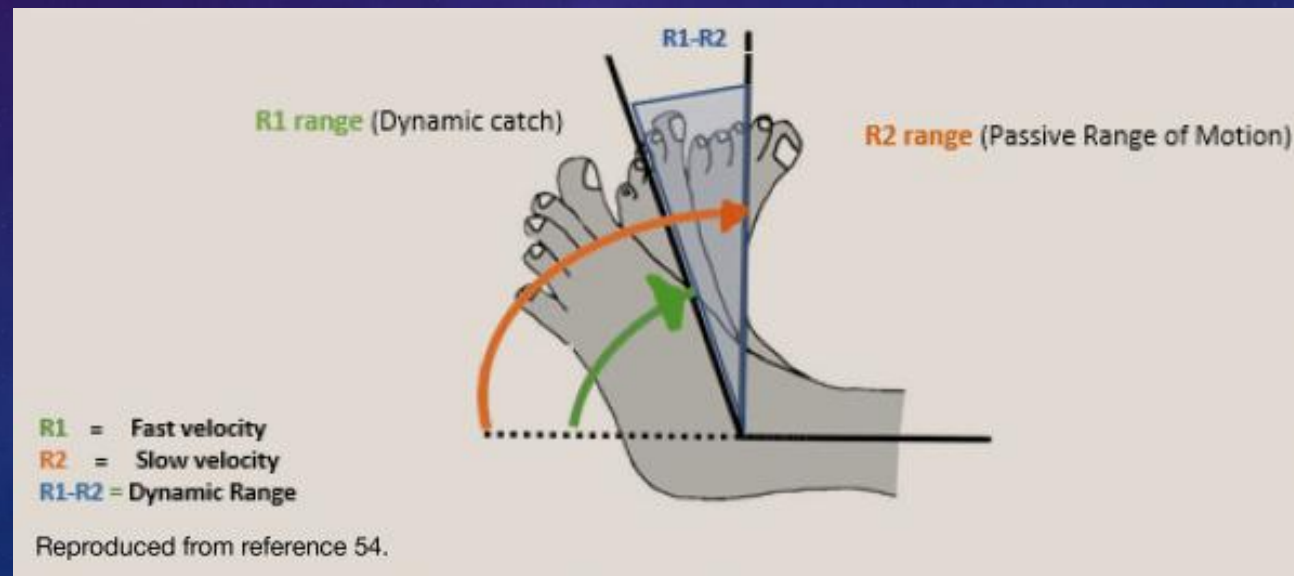
MS—multiple sclerosis, SCI—spinal cord injury.

ASSESSMENT: MODIFIED ASHWORTH SCALE (MAS)

- The patient should be instructed to relax
- Place the patient in a supine position
- If testing a muscle that **primarily flexes a joint**, place the joint in a maximally flexed position and move to a position of maximal extension
- If testing a muscle that **primarily extends a joint**, place the joint in a maximally extended position and move to a position of maximal flexion



ASSESSMENT: MODIFIED TARDIEU SCALE



R2 - R1



TARDIEU SCALE

Range of motion measured at two different velocities

V1 – Slow as possible (R2)

V2 – Fast as possible (R1)



Large spasticity angles indicate a large dynamic component (spasticity), whereas small differences indicate predominantly muscle contracture



ASSESSMENT

A GUIDE TO THE MODIFIED TARDIEU SCALE



GOAL ASSESSMENT AND DOCUMENTATION

SPASTICITY CLINICAL ASSESSMENT ON FORM - LOWER LIMB

Name: _____
DOB: _____
MRN: _____
Diagnosis: _____
Phone: _____

BOTULINUM TOXIN INJECTIONS		Botulinum toxin used: <u>BOTOX</u> DYSPORT
DATE	MUSCLE INJECTED	DOSE
25/9/20	ⓐ adduct. longus	100 units
	ⓑ adduct. longus	50 units
	ⓒ adduct. longus	25 units
	ⓓ adduct. brevis	50 units
	ⓔ gastroc	50 units
	ⓕ tib post	25 units

DATE	FOLLOW UP TREATMENT YES / NO / NA ⓑ tib post.	REASON FOR NO FOLLOW UP, OR NON ATTENDANCE BY PATIENT
25/9/20	Therapy / Description (PT, OT, Casting, Splinting, Carer training) home stretching routine given to husband.	

TARDIEU SCALE/ MODIFIED ASHWORTH SCALE

Muscle & Position	L/R	Pre Injection Date: 25/9/20					 (4-8 weeks) Post Injection Therapy: PT /OT /Casting /Orth/Self Ex Date:				
		Fast	Slow	X	MAS	VAS	Fast	Slow	X	MAS	VAS
adduct longus + brevis	ⓐ	15'	30"	2	3	8/10					
adduct longus + brevis	ⓑ	10	40"	2	3	8/10					
gastrocs	ⓒ	-50	-30"	3	3	8/10					
tib post	ⓓ	0'	10"	2	3	7/10					
Main symptoms/Comments		• bilateral hip muscle spasm increasing difficulty 2 range of access for personal hygiene. • ⓐ calf spasm affects foot placement on plate.									

Tardieu: R1 - ft angle at which catch (fast), R2 - ft angle (slow), X: 0- no R to PROM, 1- at R, no catch, 2- clear catch at precise angle (R1), 3- fatiguable clonus <10 secs, 4- unfatiguable clonus >10 secs, 5- ft immovable
MAS: 0=No ↑ tone, 1=sl ↑ tone - catch/release or minimal resistance at EOR, 1+=sl ↑ tone with catch and minimal resistance through remainder ROM (<1/2), 2=more marked ↑ tone through most of ROM but body part easily moved, 3=considerable ↑ tone, PROM difficult, 4-rigid in F/E

VISUAL ANALOGUE SCALE (VAS) /10

(Main symptom identified by patient/carer, agreed by assessment team as treatable condition)

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GAIT VELOCITY

ITEM	Pre Injection (m/min)		Post injection (m/min)	
	Time	Velocity	Time	Velocity
Comf Gait Speed (10m)				
Fast Gait Speed (10m)				
Aid Use				
Safety Level	I	S/B L/A 2xA	I	S/B L/A 2xA

GAIT ENDURANCE (Optional)

ITEM	Pre Injection (m/min)		Post injection (m/min)	
	Distance	Velocity	Distance	Velocity
6 Min Walk Test				
Time Walked (if < 6 min)				
Aid Use				
Safety Level	I	S/B L/A 2xA	I	S/B L/A 2xA

TUG

	Pre Injection	Post injection
Time		
Aid Use		
Safety Level	I	S/B L/A 2xA

After 1 practice run

GOAL ATTAINMENT SCALING

No:	Goal(s)	Score	Definitions
①	improve ease of access to personal area for personal hygiene.	2	2/10 difficulty
		1	4/10 difficulty
		0	6/10 difficulty
		-1	8/10 difficulty
		-2	10/10 difficulty
②	improve ⓑ foot positioning on wheelchair foot plate	2	100% of foot on foot plate
		1	75% of foot on foot plate
		0	50% of foot on foot plate
		-1	weight-bearing on toes via foot plate
		-2	foot completely off foot plate
		2	
		1	
		0	

Spasticity assessment

- Underlying diagnosis?
- Recovery to date?
- Cognitive status?
- MDT assessment
- Repeated clinical assessment
- Involve therapists and carers
- Tardieu scale spasticity (V1-3)
- House scale of function

- Is there volitional control?
- Which muscles are spastic?
- Is the antagonist functional?
- Is there a myostatic contracture?
- Is there a joint contracture?



POSITIVE AND NEGATIVE FEATURES

Table 1

Summary of symptoms and signs of upper motor neuron syndrome

Negative

Weakness

Reduced dexterity

Reduced speed of movement

Fatigability

Slowed movements

Positive

Flexor/extensor spasms

Spasticity

Dystonia

Increased tone

Clonus

Hyperactive deep tendon reflexes

Babinski sign

SPASTICITY MANAGEMENT: MULTI MODAL APPROACH

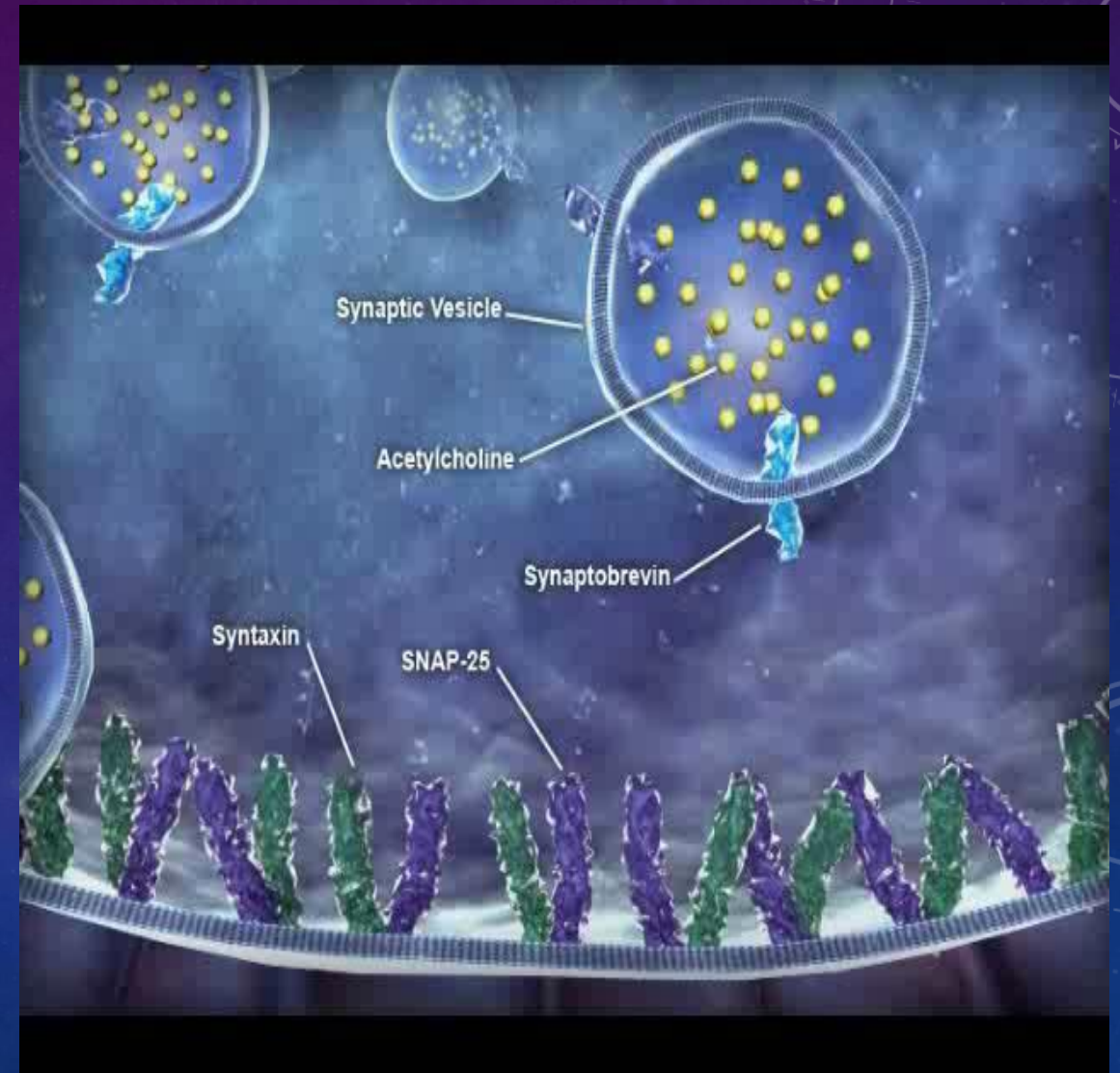
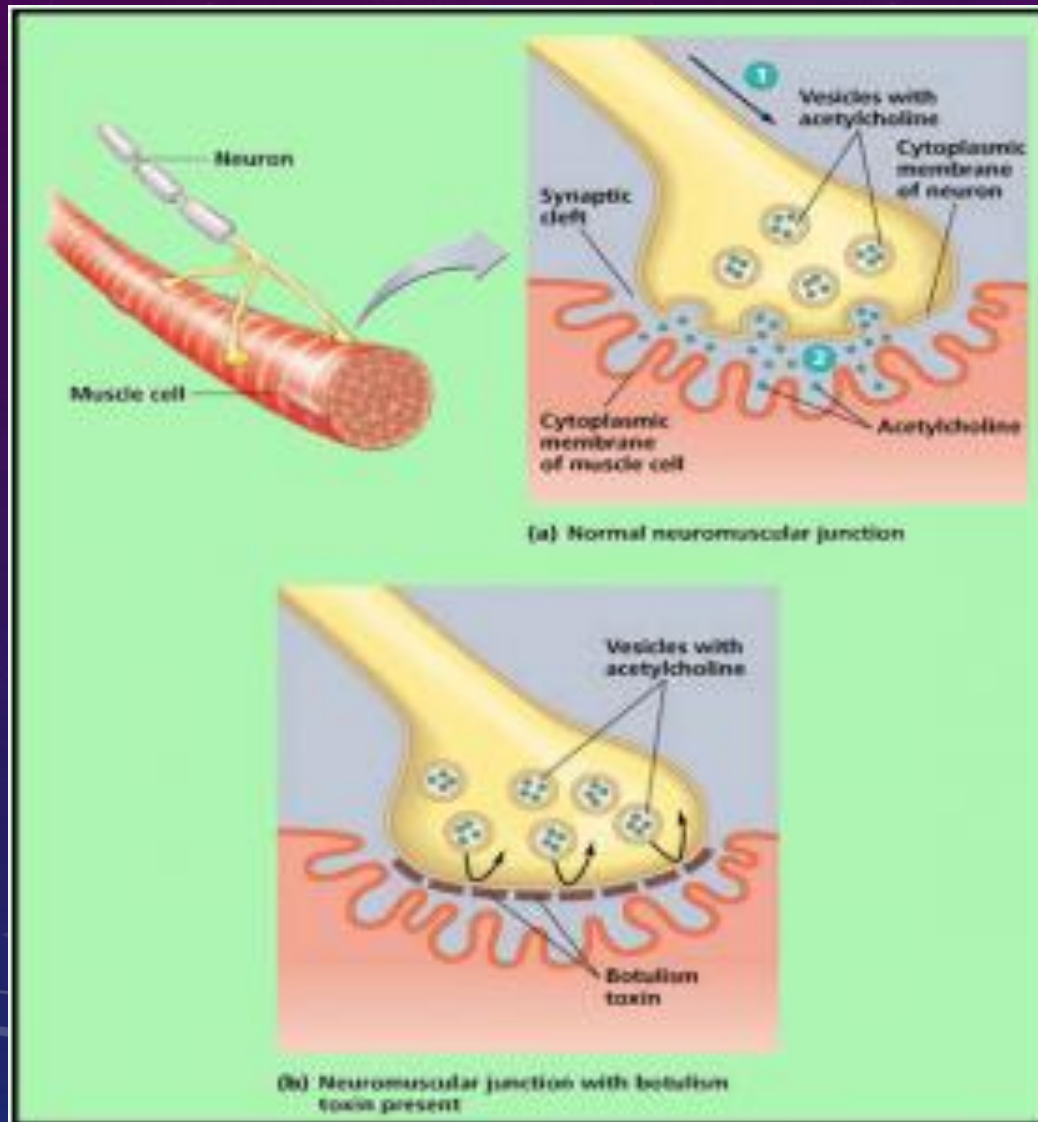
- Physical therapy
- Pharmacological management (Central vs focal)
- Surgery - tendon release, tendon transfer, arthrodesis
- Intrathecal therapies



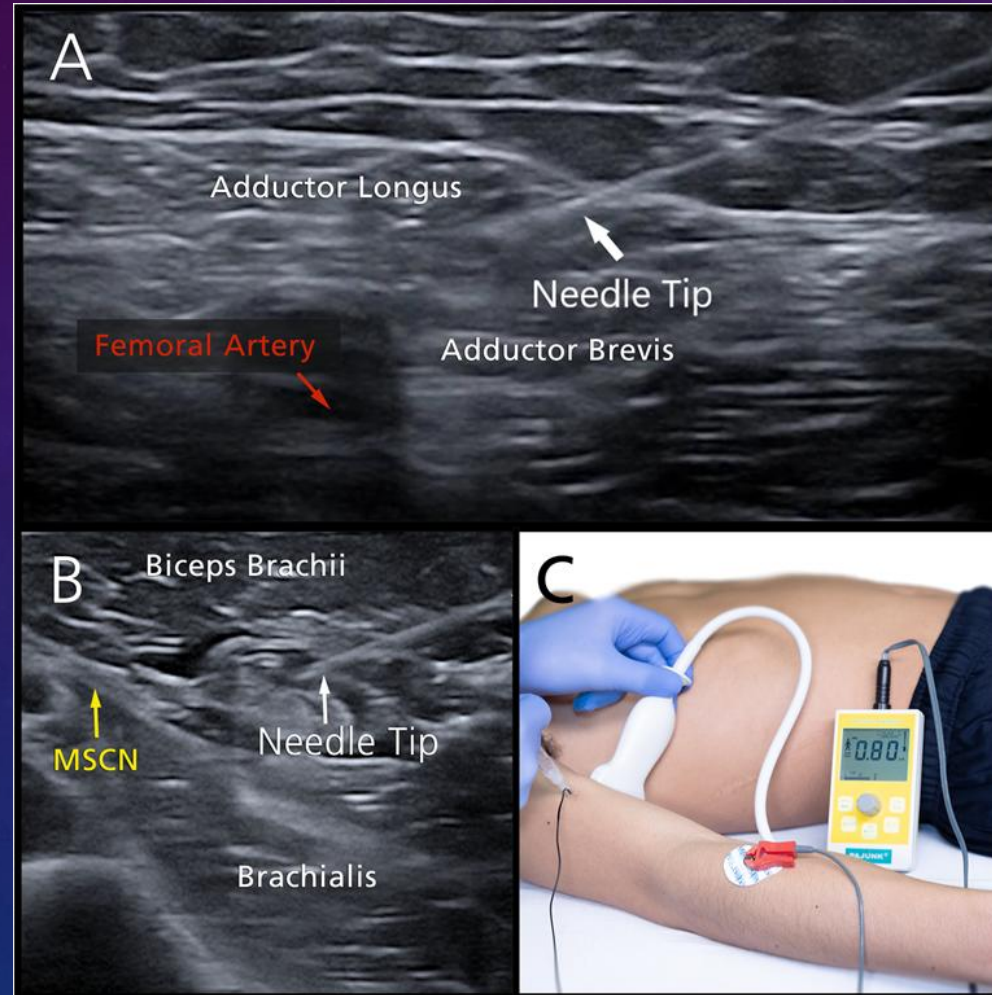
MANAGING SPASTICITY

- **Multi Modal Approach** with Physiotherapy and Occupational therapy interventions
- Patient and care giver centred goals and **education**
- Does the patient have the ability to participate in therapy
- **Does the patient need focal interventions i.e. Botulinum toxin**
- Will treatment **disrupt** current functional status
- **Define functional objectives for treatment** (Improving gait, hand function, perineal hygiene, ease of care, decrease painful spasms)

FOCAL SPASTICITY-: BOTULINUM TOXIN A



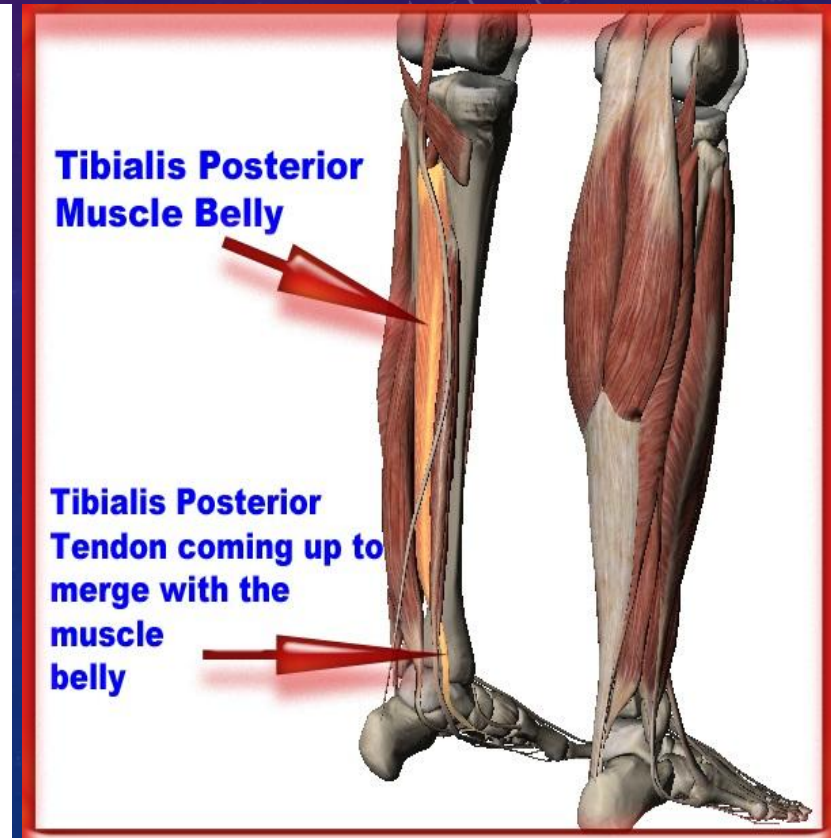
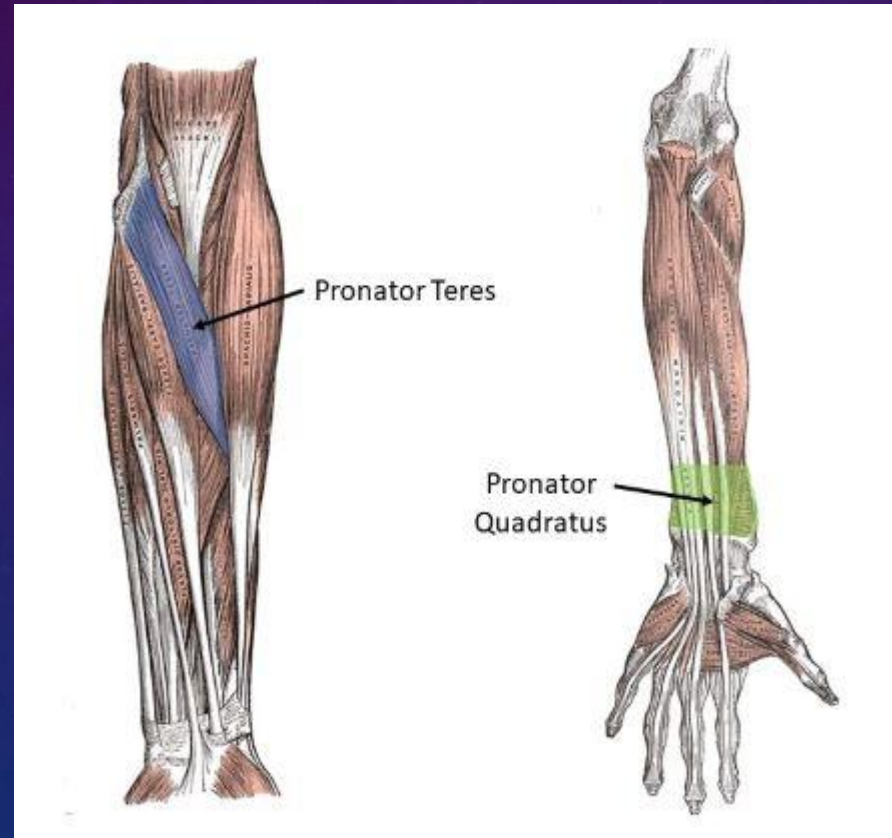
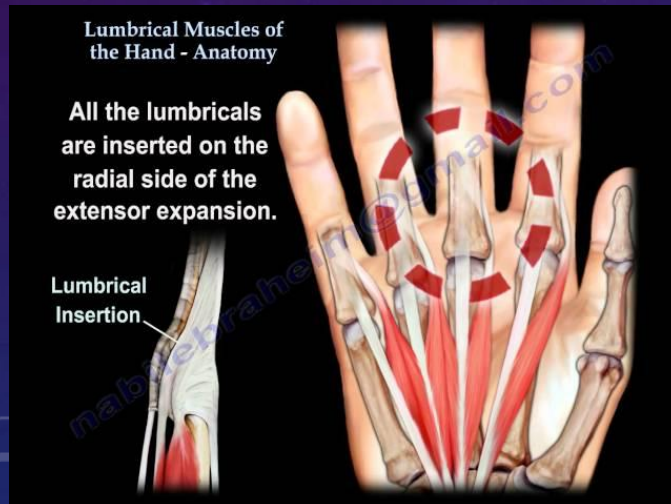
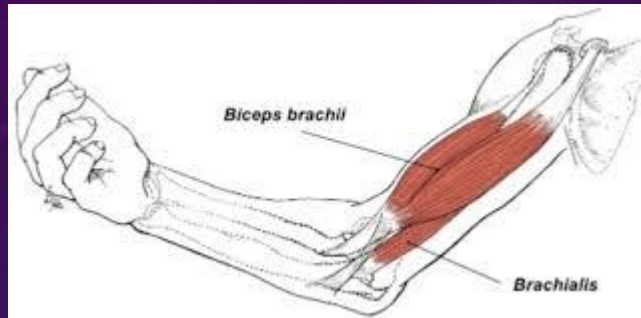
IMPORTANCE OF THERAPEUTIC NERVE BLOCKS



INJECT UNDER GUIDANCE – EVIDENCE FOR USS GUIDED INJECTIONS



CONSIDER MUSCLE ACTION AND BIOMECHANICS WHEN INJECTING



SUMMARY

- Velocity dependent increase in muscle tone and hyper excitable stretch reflexes
- Spasticity can be useful for ambulation
- Objective assessment: Modified Tardieu Scale
- **Always tag functional goals** for therapy and treatment
- **Apply multi modal treatment options**
- **In focal spasticity:** Botulinum toxin A and level of evidence
- Patient and carer **education**

