



# Pathophysiology of spasticity/ muscle hypertonia

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# Overview of presentation

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- Control of muscle tone
- Effects of UMN lesions
- Spasticity versus hypertonia
- Significance of maladaptive changes in spastic muscle



# The regulation of muscle tone

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Peripheral mechanisms of regulation –  
*spindle, Golgi organ, Renshaw cells, fusiform  
neurons*

- Supra spinal control

# Supra spinal control of muscle tone

<b>Tract</b>	<b>Function</b>
Rubrospinal	Postural tone
Tectospinal	Head movements/ vision
Vestibulospinal	Facilitates tone/ head movements
Lat. reticulospinal	Inhibits tone in limbs & trunk
Vent. reticulospinal	Facilitates tone in limbs & trunk



# Effects of upper motor neurone lesions

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- On muscle strength - *Muscle weakness, fatigability, loss of dexterity*
- On tone – *enhanced stretch reflex, agonist-antagonist co-activation, reflex restraint of voluntary movement*



# Spasticity versus hypertonia

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- Lance's definition of spasticity – “... *velocity dependent increase in the tonic stretch reflex ...*”
- Phenomena associated with spasticity – *flexor & extensor spasms, associated reactions, spastic dystonia, pain*
- Maladaptive changes in spastic muscle



# Maladaptive changes in spastic muscle

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- Thixotropy
- Visco-elastic properties of muscle
- Muscle fibre composition



# Changes in muscle fibre composition

Type	velocity	Fatigability
I (red)	Slow	Fatigable
IIB (white)	Fast	Fatigable
IIA (white)	Fast	Fatigue-resistant
<i>"New fibre"</i>	<i>Slow</i>	<i>Fatigable</i>



# Clinical relevance of muscle changes

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- Impairment level assessment
- Treatment of spasticity/ hypertonia



# Conclusions

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- “Pure” spasticity is uncommon
- Need for standardisation of assessment
- Importance of early treatment/  
prevention of maladaptive changes
- Implications for future research