Rehabilitation of Central-Neurological-Origin Drop Foot

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Content

I. Epidemiology
II. Pathophysiology
III. Rehabilitation protocols

Epidemiology

Stroke :20%
Traumatic brain injury(TBI):75%
Multiple sclerosis(MS) :60%
Spinal cord injury (SCI) :65-78%
Cerebral palsy (CP) : commonly affected

(Wilkenfeld, 2013)

Pathophysiology

Walking speed reduction, elevation in energy cost, and an increased risk of falling.

(Wilkenfeld, 2013)

Muscle weakness

Ankle dorsiflexors (primarily tibialis anterior) .
With or without the weakness of the evertors.

The ankle has a predisposition for staying pathologically plantar flexed.

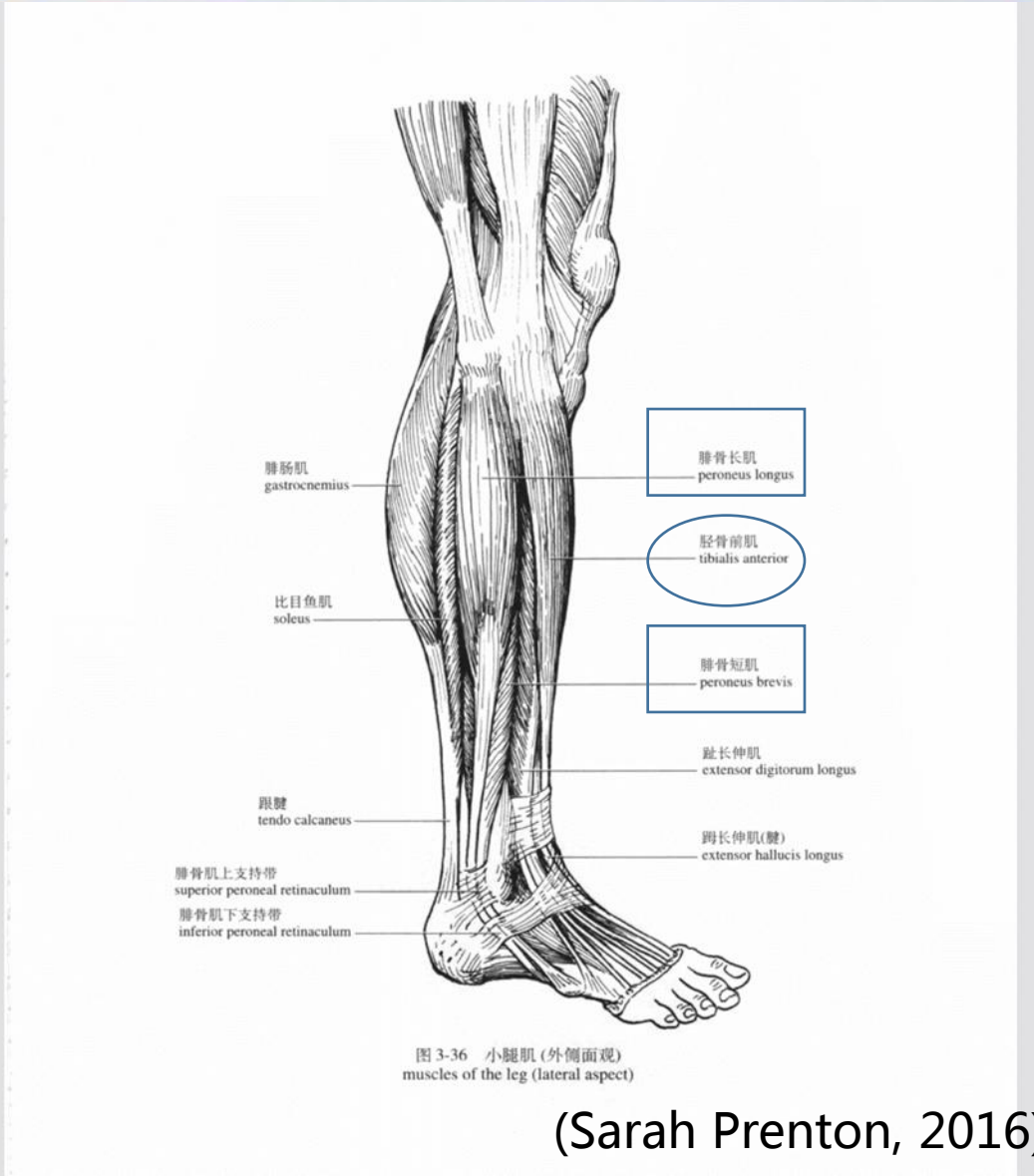


图 3-36 小腿肌(外侧面观)
muscles of the leg (lateral aspect)

(Sarah Prenton, 2016)

Spasticity

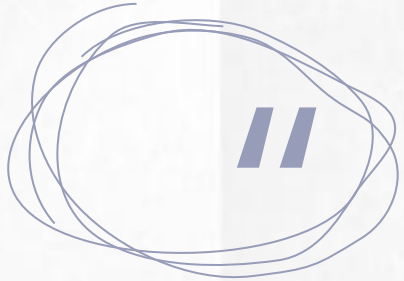
Spasticity is the hyper-excitability of the stretch reflex and the inappropriate increased tone.

Ankle plantar flexors (primarily gastrocnemius and soleus).

With or without the spasticity of the invertor (tibialis posterior) .

(Diane L., 2013)

Rehabilitation protocols



- **Ankle-foot orthosis(AFO)**
- ROM training
- Antispasmodic position
- **Stretching and muscle training**
- **Functional electrical stimulation(FES)**
- Botulinum toxin(BTX)
- Acupuncture
- Other considerations

1. ANKLE-FOOT ORTHOSIS

For stabilization and normal gait pattern

ANKLE PLACEMENT

POINTS

- Supine
- Functional position
- Vertical to bed
- Avoid pressure sore

EFFECTS

- Prevent or lignten foot drop
- Shifting the trim-line around the ankle
- Reduce muscle tone

(Shannon F. Alejandro, 2015; Joan Leung, 2003)

FOR WALKING

IMPACT

- Provide mediolateral stability in ankle in stance phases
- Facilitating the toe clearance in swing phases
- Promoting heel strike
- Enhance walking effciency

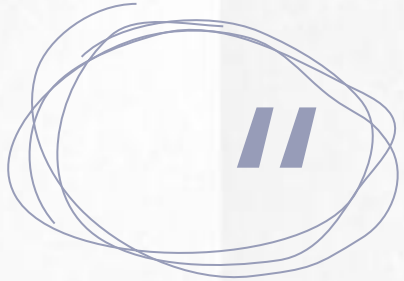
RISKS

- Disuse of muscles
- Possiblely delay the functional recovery

(Joan Leung, 2003)

2.
FUNCTIONAL TRAINING

Stretching and strength training



- **Reduce the tone of gastrocnemius muscle and soleus muscle**
- **Strengthen the remaining functional muscles**
- **Improve nervous control**

PASSIVE STRETCHING

- Supination
- Dorsiflexion and eversion of th
- Maintain 15 to 20s
- Slowly and slightly

(Kyoung-Sim Jung, PT, PhD,

ACTIVE STRETCHING

- Put the affected side on Inclined planes
- Move the center of gravity
- Promote the afferentation of sensory imformation

(Masamichi FURUSAWA, 2013)

STRENGTH TRAINING

- Supine, seat or stand
- Start with isometric contraction
- Progressive training program

(Qian Kailin, 2001)

NORMALLY UESD TECHNIQUE

Neurophysioligical technique
normal neurophysiologicl developement

Bobath technique
Motion control
Reflex inhibition pattern

Brunnstom technique
Motion pattern
Control association response

Proprioceptive neuromusclar facilitation
Rhythmic contraction stretching.

Rood technique
Controlled sensory stimulation

Biofeedback therapy
Facilitate the developemment of compensatory function

3.
Functional Electrical Stimulation (FES)

Effect Of The Traditional FES

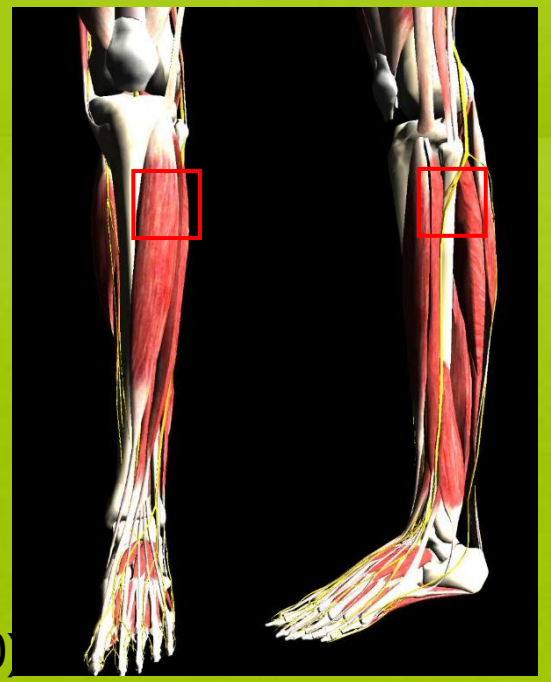
- Strengthening muscles, decreasing pain and increasing range of motion
- Promote the link of corticospinal tracts
- Promote the central neuroplasticity

(Sukanta K, 2011 ; Motta-Oishi A A ,

The Location Of Electrodes

- one placed over the origin of the tibialis anterior muscle and the other placed over the common peroneal nerve posterior and proximal to the fibular head.

(Trisha M. Kesar, 2010)



Parameter Setting

- **Wave mode** : square wave, sinusoidal wave
- **Current intensity** ：catch the motion threshold but avoid electric burns
- **Pulse Duration** :enough to make muscles contract
- **Pulse Rate** ：30-50pps
- **Duty Cycle** ：Starter from 1：5，and gradually extended the stimulation time
- **Treatment frequency** ：15-30mins several time a days to twice a week

(Rakesh Pilkara,2014)

The dynamical FES

- These systems use surface electrodes over the peroneal nerve to activate the musculature and a sensor to determine when the leg is in swing phase and in need of stimulation to activate dorsiflexion.

(Ari Jacob Levi Wilkenfeld,2013)

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Thanks!