Foot drop in MS: Evaluation and Treatment

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Objectives
Operational definition for foot drop in MS

- Any limitation of gait due to insufficient dorsiflexion seen at any point in the gait cycle.
- Can present as an actual dropping of the forefoot resulting in inappropriate contact of the front of the foot with the support surface, or, a gait compensation/deviation used to prevent that contact.

Foot drop

- Common impairment seen in MS
- Often encountered, little studied
- Occurs in many different of conditions
- CNS and PNS
- Foot drop in MS represents a special case requiring specific evaluation and intervention
What causes foot drop?

- Plantarflexion Spasticity
- Dorsiflexion weakness (primary, secondary CNS/PNS)
- Decreased walking/inactivity
- Sensory loss
- Fatigue

Foot drop in MS is unique

- Can be progressive—should we therefore be involved in prevention?
- Worsens with fatigue—may appear minimal or absent in patients until fatigue occurs. Can we evaluate for this? Are their treatments?
Prevalence

- No studies on prevalence in MS
- 90% of all persons with MS do complain of walking deficits—what percentage includes foot drop
- Chart review from HKPT from 1-114-7-1-14 found evidence of foot drop in 76% of patients

Treatment lit review

- 5 subjects with mild MS
- 4 sets of 10 isometric contractions, at 60% of MVC, 3X/week, 8 weeks.
- Outcome measures—subjective time to fatigue during gait
- - dorsiflexion endurance measured by number of reps to fatigue
Mount et al

Results
- Improvements in distance to fatigue in 4/5 subjects, only 2 significantly
- Improvements in dorsiflexion endurance in 2/5 subjects

Comments
- No measurement recorded of active or passive dorsiflexion
- Improvements only seen in 2/5 patients, but only one intervention tried
- No correlation between central fatigue and improved endurance, suggesting that improvements seen may be due to multiple factors bit central and peripheral

Objectives

Introduction
Examination
Treatment
**Examination**

- Overall goals of the examination,
  - R/O Occult foot drop
  - Foot drop due to lack of ROM
  - Foot drop due to spasticity
  - Foot drop due to weakness besides the ankle joint

- Treatment Goals
  - Correct
  - Accommodate
  - Compensate

**Progressive disease** - a patient may not have foot drop early in the course of the disease, but it may develop later. Suggests a long term relationship with PT.

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**Examination Process**

- History – Medical Management
- Ruling out the Occult foot drop
- Assessing ROM
- Strength assessment of the ankle
- Looking at other parts of the body
Medical approaches

- Ampyra- potassium channel blocker
- Improved 25 foot walk time in 39-42% of MS patients. Has not been tested in longer walks; anecdotal evidence of improvements in foot drop
- Baclofen- antispasmodic-effective if there is a spasticity component.

Examination Process

History – Medical Management
Ruling out the Occult foot drop
Assessing ROM
Strength assessment of the ankle
Looking at other parts of the body
Occult foot drop

- Does not present on mat eval, or 25fwt, appears at end of 6MWT
- No plantiflexor spasticity on mat eval, appears when fatigued
- Assess foot drop in fatigued vs unfatigued state
- Assess spasticity in fatigued vs unfatigued state

6 minute walk- Minute 1
6 Minute walk- minute 6

Examination Process

- History – Medical Management
- Ruling out the Occult foot drop
- Assessing ROM
- Strength assessment of the ankle
- Looking at other parts of the body
Assessing Ankle ROM

- Always done first before assessing strength

Different causes of limited DF
- Hypertonicity
- Muscle
  - Which muscle, Soleus or Gastrox?
  - Muscle short or is hypertonic
- Capsule
- Positional fault

Normal DF Neuro-BioMechanics

Gastroc Soleus lengthens

Normal Tone

Talus moves posteriorly

Posterior portion of capsule elongates

How do we differentiate the culprit?
Assessing Ankle ROM

• Limited Dorsiflexion ROM
  — R/O subluxed talus (Post glide and recheck DF)
    • If increase in motion → Subluxed talus
  — Assess end feel and pt sensation
    • Capsular = Capsular end feel, no posterior pull sensation
    • Muscular = Springy end feel, posterior pull sensation
  — If muscular: Short or Hypertonic
    • Hypertonic – Post ms contraction felt with onset of ms contraction
    • Spasticity – Decr motion with Incr Velocity
    • Short: ROM not affected with velocity or ms contraction felt
How to differentiate?

Video Of Assessment

Examination Process

- History – Medical Management
- Ruling out the Occult foot drop
- Assessing ROM
- Strength assessment of the ankle
- Looking at other parts of the body
1 POSITIONAL FAULT/MUSCLE -

ON OUR OUTLINE I HAD R/O PF BUT I THINK IT FITS HERE

Robert J. Schreyer, 4/10/2014
Strength assessment of the ankle

- Many causes of weakness
- Look for compensation
  - Toe ext = weaker if asked patient to curl toes
  - DF with eversion – weaker if asked not to evert
- Antagonist over firing
  - Palpation of posterior muscles
- Lack of afferent
  - Strength increase with afferent input to DF’s
- Withdrawal response

Diagram:

1. Cause of DF weakness
2. Look for compensation
   - Toe ext = weaker if asked patient to curl toes
3. Antagonist over firing
   - Palpation of posterior muscles
4. Lack of afferent
   - Strength increase with afferent input to DF’s
5. Withdrawal response

DF with eversion – weaker if asked not to evert
Examination Process

- History – Medical Management
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- Assessing ROM
- Strength assessment of the ankle
- Looking at other parts of the body

Ruling out weakness to other areas

- Weakness of the ipsilateral flexors or contralateral extensors may cause a foot drag
- Differentiating
  - Do they have ROM? Is there tone?
  - MMT
  - Stabilizing the contralateral extensors and reassess foot drag
- Perform traditional testing methodologies
  - Also assess in a functional position
Functional Assessment – Stepping Through

- Re Assess with stabilizing each joint
- Prevent pelvis drop
- Give hip extension
- Prevent knee flexion
- Prevent ant translation of tibia

Re Assess with mobilizing each joint
- Give hip flexion (15 deg flexion)
- Prevent knee flexion (65 deg flexion)

How to differentiate?

Video Of Assessment
POSITIONAL FAULT/MUSCLE -

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Objectives

Introduction

Examination

Treatment

Treatment Outline

- MS Specific Treatment Considerations
  - Intermittent Training
  - Volume & Repetition

- Clinical Decision Process
  - Correct, Compensate, Accommodate

- An MS Footdrop Clinical Pathway
  - Factors effecting treatment of footdrop in MS

- Footdrop Algorithm
  - Presented via x-mind – or Prezi
MS Specific Treatment Considerations

- Intermittent training
- Volume and Repetition

Intermittent training

- Taking breaks
- Allows for greater training volumes to be achieved than continuous
- May allow for longer time to fatigue before footdrop is seen in gait?
- Example- walk until footdrop occurs, rest(stretch?) repeat.
**Volume and repetition**

- Training must occur at a high enough volume for lasting change to occur
- Lots of stretching
- Lots of active active ankle dorsiflexion
- Lots of practice of walking with appropriate dorsiflexion
- Take breaks!
- Cooling!

**Treatment Outline**

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The Clinical Decision

- When addressing limitations first determine strategy:
  - Correct – 1st Choice
  - Compensate
  - Accommodate
The Clinical Decision

- Correct – 1st Choice
- Compensate
- Accommodate

- ROM
- Strength
- Spasticity

The Clinical Decision

- Correct – 1st Choice
- Compensate
- Accommodate

- Synergists
  - Extensor Hallucis Longus
  - Extend Toe against a tight show
  - Thus blocking toe movement
  - Creating DF via EHL
  - Fibularus longus
  - Eversion with DF
The Clinical Decision

- Correct – 1st Choice
- Compensate
- Accommodate
- Orthoses
  - AFO
  - PLS
  - FES
  - Lightweight options
    - Dorsi-X
    - X-strap

Treatment Outline

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An MS Footdrop Clinical Pathway
Primary factors effecting treatment decisions

- ROM
  - Strength/Weakness
  - Spasticity
  - Fatigue
  - Strength/ROM Knee and Hip

Limited Dorsiflexion ROM

- R/O subluxed talus (Post glide and recheck DF)
  - If increase in motion = Subluxed talus
- Assess end feel and pt sensation
- If muscular: Short or Hypertonic
  - Hypertonic = Post ms contraction felt with onset of ms contraction
  - Spasticity = Decr motion with Incr Velocity
  - Short = ROM not affected with velocity or ms contraction felt

Capsular = Capsular end feel, no posterior pull sensation
Muscular = Springy end feel, posterior pull sensation
Increasing ROM: Muscle

- Muscle
  - Gastrox vs Soleus
  - Forefoot vs Rearfoot
- Rx;
  - Short = prolong stretching

ROM Stretching HEP

Rearfoot stretching

Bend knee to bias soleus

Forefoot stretching
Prolong DF: Nightsplints

Prolong DF
Increasing ROM: Positional fault

- Capsular
  - Mobs
- Positional fault
  - Mulligan
  - Manip

Increasing ROM: capsular

- Capsular
  - Mobs
- Posterior glide to talus
An MS Footdrop Clinical Pathway
Primary factors effecting treatment decisions

- ROM
- Strength/Weakness
- Spasticity
- Fatigue
- Strength/ROM Knee and Hip

Increasing Strength

- Conventional PRE
  - Can be aggressive in MS
    - DAPRE
- PNF
- NDT/Brunnstrom techniques
- Motor Control
- NMES
Strength - Compensation

- Extensor Hallucis Longus and/or Fibularus Longus use as a compensatory Dorsiflexor

An MS Footdrop Clinical Pathway
Primary factors effecting treatment decisions

- ROM
- Strength/Weakness
  - Spasticity
- Fatigue
- Strength/ROM Knee and Hip
Reducing Spasticity

- Stretch/ROM
- Agonist activation/strength training
- Medical referral/communication re: medications
- Resting/Night splints

An MS Footdrop Clinical Pathway
Primary factors effecting treatment decisions

- ROM
- Strength/Weakness
- Spasticity
  - Fatigue
- Strength/ROM Knee and Hip
Reducing effects of Fatigue

- MS Specific Treatment Considerations
  - Intermittent Training
  - Volume & Repetition

An MS Footdrop Clinical Pathway
Primary factors effecting treatment decisions

- ROM
- Strength/Weakness
- Spasticity
- Fatigue
- Strength/ROM Knee and Hip
Strength/ROM Knee and Hip

- Traditional PRE’s
- Functional training
  - Anterior elevation of pelvis
  - Extensor control
    - With various form of support
    - Leg press stability
    - Hip hiking
  - Flexion moment
    - Initiate with heel lift
    - Downgrade rectus femoris over activation

Clinical Pathway

- IF Limited address it first
- IF not limited Continue

Fatigue

ROM

Strength

Spasticity

Knee/Hip Strength/ROM

Correct ➔ Compensate ➔ Accomodate
Treatment Outline

- MS Specific Treatment Considerations
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Footdrop Algorithm

THIS IS ONLY A DEMO VIDEO OF WHAT WILL BE DISCUSSED ON THE SECOND PROJECTOR AT TIME TIME IN THE PRESENTATION. THE LIVE VERSION AT THE LECTURE WILL INCLUDE MUCH MORE DETAIL.
Clinical Pathway

DF ROM >0
- **Strength**

DF ROM <0
- Identify the limiting structure
- Reduce the limitation
- Night/Resting Splint to prevent worsening
- Refer for MD if Spasticity present

Clinical Pattern

Strength

Ankle Flaccid?
- Click treatment options

Ankle NOT Flaccid
- Assess for Spasticity

Back to ROM
Accommodate Flaccid Ankle

- >3+/5 Knee Extension
  - Hinged AFO w/ DF assist Adjustable PF Stop
- <3+/5 Knee Extension
  - Hinged AFO w/ DF assist AND DF Stop to prevent buckling
- <2/5 Knee Extension
  - Fixed AFO Fixed in PF to maintain knee extension

Back to Strength

Clinical Pattern - Spasticity

Spasticity >2 MAS
- Spasticity Management
- Stretching Program
- Positional Bracing
- MD – Medications
- Accomodation
  - Fixed AFO with Talar Strap

Spasticity <2 MAS
- Assess Strength
Clinical Pattern – Strength

<>1+<>

- Correct
- Strengthening
  - Manual
  - PNF
  - HEP
  - Motor Control
  - NDT, Brunnstrom
  - Spasticity Management
- Compensate
  - Synergists
    - EHL
    - Fibularis Longus
- Accommodate

Back to Spasticity

Accommodate – DF Strength < >1+/5

Accommodate

Does Pt. have medial/lateral ankle control

Yes

If Pt. has > 3+5 Knee Extension

Does Pt. have > 2+5 DF

Yes

Light weight alternatives
  - Dorsi-K
  - X-strap

PLS

Spiral Orthosis

Functional NMES
  - ONLY IF HIP FLEXION > 2+/5

No

Hinged AFO with DF assist AND

DF Stop to prevent knee buckling

Walk-aid

Bioness
Case report 1

- 35 yo MF newly diagnosed with MS 3 weeks ago
- 25 foot walk test 3.2 seconds
- BBS 55/56
- MMT 5/5 throughout, PROM WNL throughout
- 6MWT-1665'
- No evidence of spasticity or sensory loss.
- What other evaluative procedures could be done to assess future risk?
- Given the normal seeming exam, what interventions could be suggested?
Case report 1 - answers

- Retest all findings when fatigued
- Have patient perform some task or tasks which result in fatigue (EG 6MWT) and reassess all
- Early in disease impairments may not be evident unless "provoked"
- Treatment - Improve gait endurance
  - Improve flexibility of hamstrings, hip flexors, ankle plantiflexors

Case 2

- 50yo with 10 year HO MS
- Findings - foot drop in gait, compensated for with circumduction
- 15 degree plantiflexion contracture
- 6MWT 625 feet (250/200/175)
- BBS 49/56
- L ankle dorsiflexion, hip flexion/knee flexion 3-/5
- What further evaluations could be performed?
- What interventions could be initiated?