Differential Diagnosis and Treatment for a 48-year-old Female Patient with Chronic Saphenous Neuritis: A Case Report

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Background: Peripheral Neuralgias

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- Can have significant negative impacts on function and may lead to allodynia, kinesiophobia, or chronic regional pain[1]
- May be the result of trauma, surgery, inflammatory conditions, or compression by interfacing musculoskeletal structures
  - Medial leg neuralgias are especially common following knee surgeries and saphenous vein grafts[2–5]
- Are proposed to be at least partially related to **endoneurial hypoxia**[6,7]
  - Improving neural microcirculation is therefore an important goal of rehabilitation for the condition[8]

Background: Current Evidence

- Both **exercise** and repeated neural mobilization techniques incorporating **nerve tension/ relaxation** have been shown to promote increased perfusion/health to nerve tissue
- There is a lack of evidence supporting the effectiveness of neural mobilization for treatment of neuromusculoskeletal conditions, or the effectiveness of physical therapy for managing lower extremity neuralgias[9-11]

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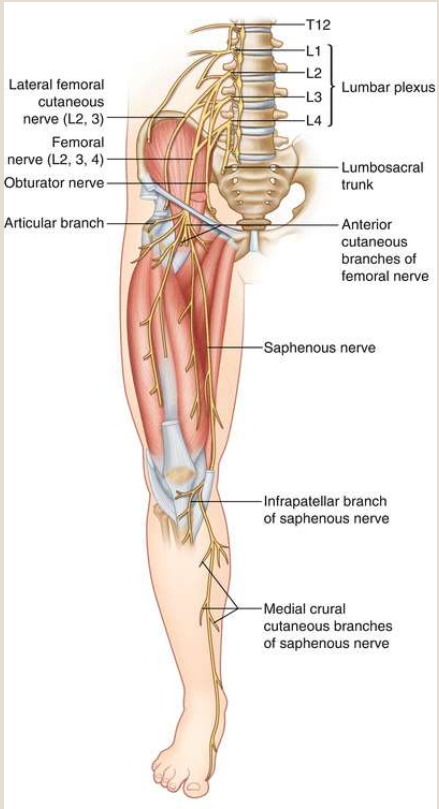

Saphenous nerve pathway.[1]

Purpose

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Examine the application of progressive loading for adjacent muscles in conjunction with graded neurodynamics to manage pain and improve activity tolerance for a 48-year-old female patient with a three-month history of saphenous neuritis.

Case Description: Subjective Reports

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Patient: 48-year-old female with a 3-month history of worsening tingling, burning sensations and pain, with accompanying swelling about her medial anterior R ankle which sometimes spreads to her plantar R foot

PMH/HPI: Patient states she has a history of trauma to R ankle ~ 30y ago

Medial leg/medial ankle/dorsal foot pain reproduced by:

- transferring out of bed in the morning
- running, walking, using rowing machine
- prolonged standing
- denies pain with driving or prolonged sitting; pain is relieved with weight shift/offloading of RLE

Social History:

- Works as a teacher; currently limited by pain at her job

Case Description: Objective Findings

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Initial Examination Date: 22 June, 2023

Patient-reported Outcome Measure: LEFS 59/80

Observations:

- Non-antalgic gait with mild arch collapse bilaterally
- Moderate offloading of R LE during sit-to-stand transfers
- Complete offloading of R LE in static stance

Case Description: Relevant Tests and Measures*

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Neurological Screen	Left	Right
LE Dermatomes, Myotomes, Reflexes	Normal	Normal

Strength Screen	Left	Right
LE MMT	5/5 throughout	**4/5 Tibialis Posterior (painful)**

Orthopedic Clinical Test	Left	Right
SLR	Negative	Negative
Slump	Negative	Negative

Girth Measurement	Left	Right
Mid-malleoli	9.5 in	**10.5 in**

*unless noted, tests/measures were symmetrical, symptom free, and within functional limits

Case Description: Relevant Tests and Measures*

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Trunk Motion	AROM and Notes
Lumbar Extension	Symptom-free, WFL
Lumbar Flexion	Symptom-free-WFL
Lumbar Sidebending	**Burning/tingling symptom reproduction with L sidebending into R ankle and metatarsal region**
Lumbar Rotation	Symmetrical, symptom-free, WFL

Osteokinematic Joint Motion Assessment
All hip, knee, ankle AROM/PROM pain-free and WFL in weightbearing
Closed-kinetic-chain R dorsiflexion was acutely painful with symptom reproduction

Accessory Joint Motion Assessment
Accessory motions at ankle and knee symmetrical and symptom-free

*unless noted, tests/measures were symmetrical, symptom free, and within functional limits

Differential Diagnosis

Saphenous nerve bias test.[16]

Hip flexor involvement? Stenosis?

- Pain with sidebending away
- Hip flexor is 5/5 pain-free bilaterally
- No pain with trunk extension
- No back pain

Segmental spinal hypermobility? L4 radiculopathy?

- (-) Slump/SLR
- Denies pain with prolonged sitting and driving (slump), but pain is reduced with offloading RLE
- (-) Symptom reproduction or hypermobility with spring testing L1-L5

Differential Diagnosis, cont.

Saphenous nerve bias test.[16]

Saphenous neuritis?

- Indescribable quality; tingling = pain[12]
- Pain is moderate (4/10 at worst)[12]
- Clearly defined area[12]
- Increased with CKC dorsiflexion (rowing, transferring out of bed, objective testing)

(+)Saphenous bias NTT on R LE strengthened hypothesis for peripheral nerve involvement

Selected Interventions

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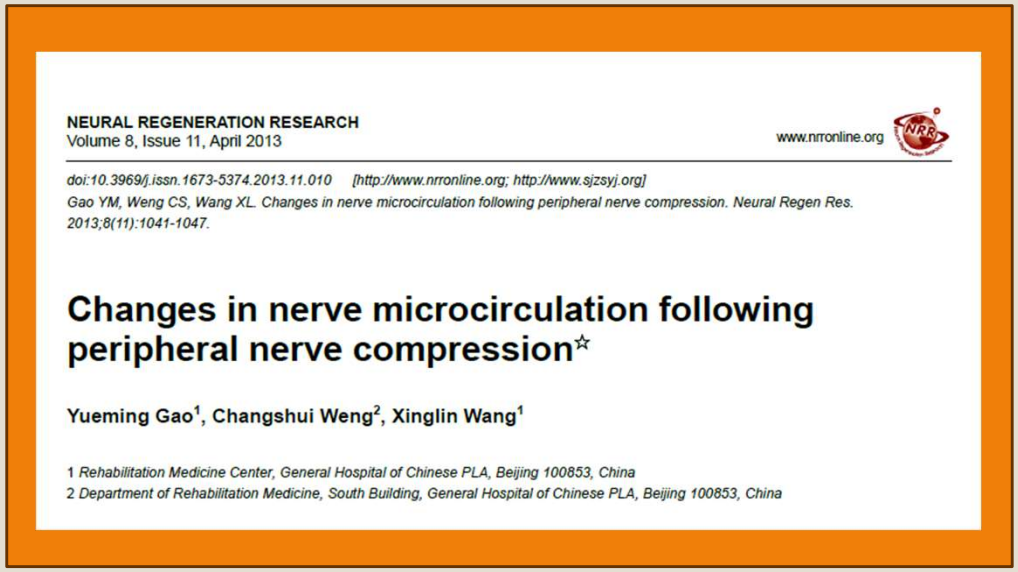
Selected Interventions: Therapeutic Exercise

Nerve tissues **and** microcirculation are both damaged following nerve injury[8]

Cell regeneration requires substantial nutritive substance delivery[8]

Nerves are partially supplied with circulation from small veins and arteries in neighboring tissue space and muscular blood vessels[8]



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Gao YM, Weng CS, Wang XL. Changes in nerve microcirculation following peripheral nerve compression. Neural Regen Res. 2013;8(11):1041-1047.

Changes in nerve microcirculation following peripheral nerve compression☆

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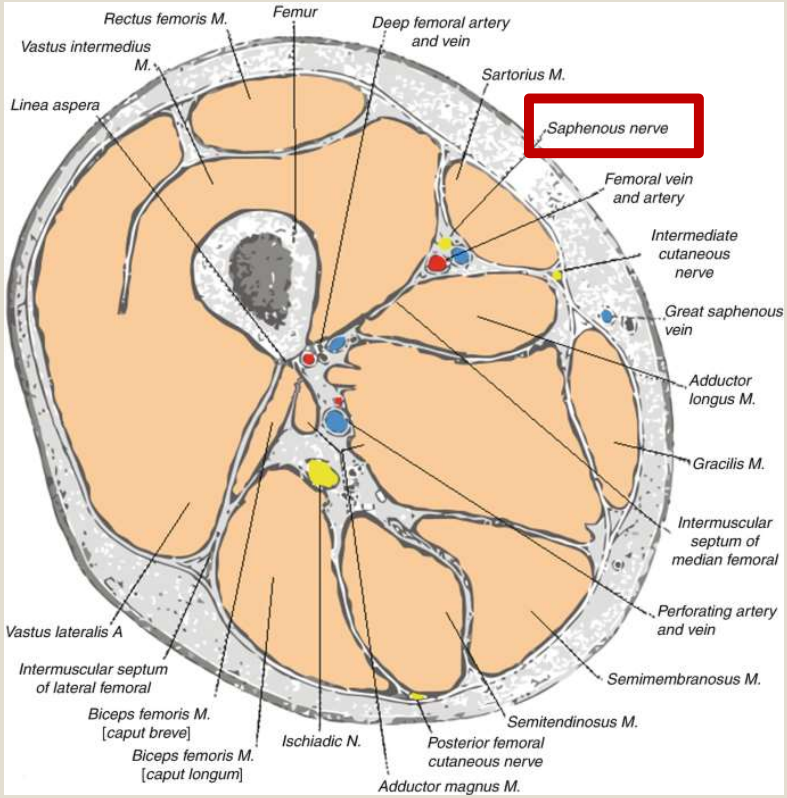


Location of saphenous nerve in adductor canal. [15]

Selected Interventions: Therapeutic Exercise*

1. Hip flexor complex: supine straight-leg raise

2. Hip adductor complex: side-lying hip adduction

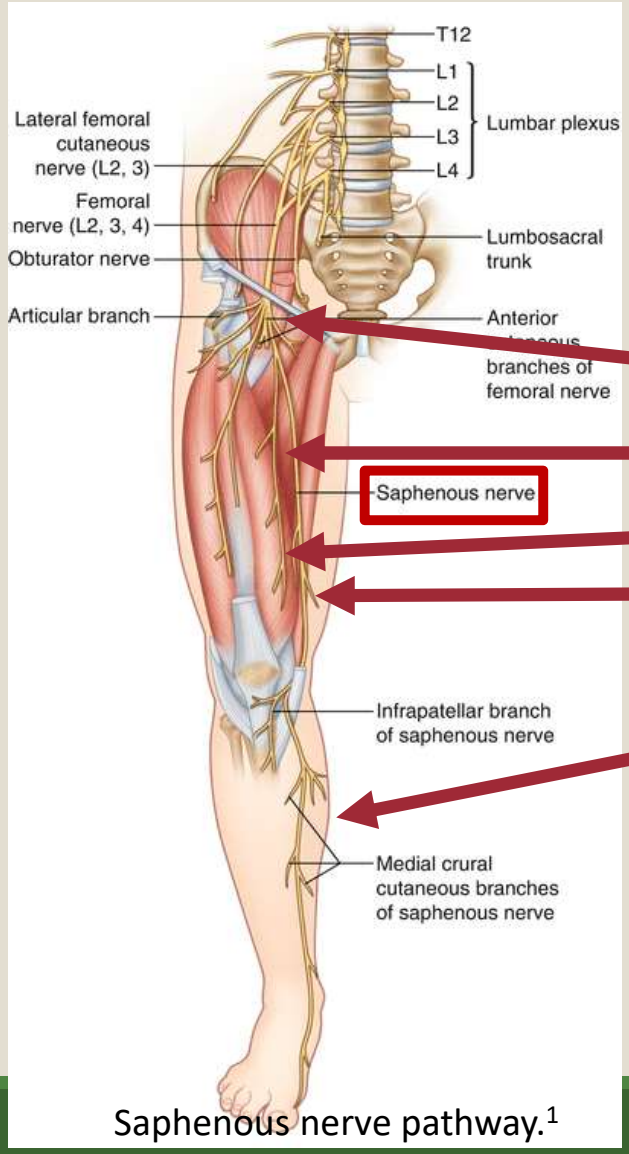
3. Vastus medialis: plantarflexed single-leg squat

4. Sartorius: seated, plantarflexed heel-to-shin

5. Posterior compartment of leg: band-resisted toe curl + ankle plantarflexion

- Progression: Toe curl + plantarflexion on foam

*All therapeutic exercises performed for 30 repetitions with pt.-selected rest intervals. Resistance progressed to patient tolerance utilizing ankle weights unless otherwise noted



Saphenous nerve pathway.[1]

Selected Interventions: Therapeutic Exercise*

1. **Hip flexor complex:** supine straight-leg raise
2. **Hip adductor complex:** side-lying hip adduction
3. **Vastus medialis:** plantarflexed single-leg squat
4. **Sartorius (resected):** seated, plantarflexed heel-to-shin
5. **Posterior compartment of leg:** band-resisted toe curl + ankle plantarflexion
   - Toe curl + plantarflexion on foam

*All therapeutic exercises performed for 30 repetitions with pt.-selected rest intervals. Resistance progressed to patient tolerance utilizing ankle weights unless otherwise noted

Selected Interventions: Neurodynamics

Maximal saphenous tension:

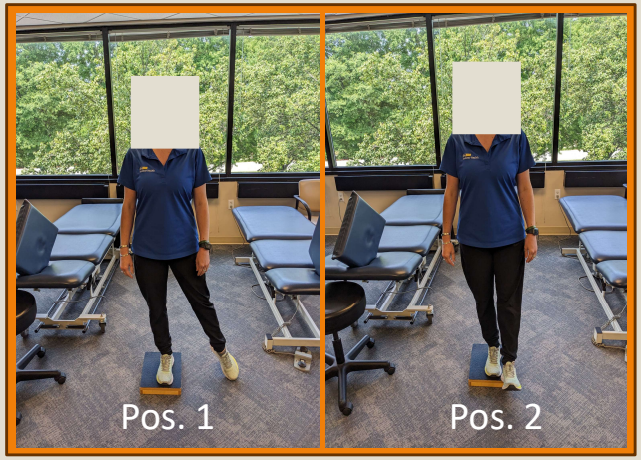
- hip ext, abd, ER
- knee extension
- Ankle/foot DF, eversion[16]

Neurodynamic interventions prescribed, per tolerance, to **add one tension component** each in **four phases**

Patient was instructed only to perform neurodynamic interventions in a **symptom-free ROM**

Saphenous nerve bias test[16]

Neurodynamic Intervention Progression



Phase 1 repeated neural mobilization, each consisting of one tensioning component (P1 abduction; P2 dorsiflexion), and one slackening component (P1 plantarflexion; P2 adduction)

Phase 2 repeated neural mobilization, consisting of Phase 1 mobilization but adding additional tensioning component (hip extension) to position 1

Phase 3 repeated neural mobilization, consisting of Phase 2 mobilization with the addition of additional tensioning component (hip ER) to position 2

All positions alternated 30 times each with pt.-selected rest intervals.

Selected Outcome Measures

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1. Numeric Pain Rating Scale (NPRS)
2. Lower Extremity Functional Scale (LEFS)
   - High responsiveness measuring function in patients with various LE conditions[12]
3. Saphenous nerve bias test
   - Moderate-to-high reliability for NTTs to detect mechanosensitivity[14]
4. Level treadmill ambulation speed
   - Patient reports of symptom reproduction during ambulation
   - Utility for measuring intra- and inter-session progress
     - Held for first 2 sessions due to symptom irritability

Selected Outcomes

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Outcome Measure	Session 1 (Initial Eval.)	Session 5 (Re-Eval.)	Session 8
NPRS	4/10 at worst	3/10 at worst	0/10 at worst
LEFS	59/80	67/80	67/80
Saphenous Bias NTT	Positive R	Positive R	Negative B

Outcome Measure	Session 1	Session 2	Session 3	Session 4	Session 5	Session 6	Session 7	Session 8
Level Treadmill Walking, 4 min	NT	NT	3.0mph	3.5mph (P!)	3.0mph	3.2mph	3.3mph	3.6mph

Discussion - Results

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Patient demonstrated the following improvements:

1. Reduced pain From 4/10 to 0/10 = Δ + 4 by session 7
2. Abolished sensations of burning and tingling by session 7
   - Reduced ankle circumference to 10 in on R from 10.5 in
3. Reduced symptom reproduction with provocative positions and functional activities
   - Increased level treadmill walking speed before symptom onset from 3.0 to 3.6mph
   - Abolished symptom provocation with lumbar sidebending away by session 5
   - Abolished symptom provocation with saphenous bias NTT by session 8
   - Rowing still painful; running still painful **primarily at the knee**
4. Subjective reports of improved function
   - "no pain… only tight sometimes in the ankle."
   - Able to teach full shifts without pain
   - Able to ambulate 4 mi without pain
5. LEFS from 59/80 to 67/80 = Δ + 8
   - LEFS change did not meet minimally clinically-important difference of 9 points due to persisting patient symptom provocation when running at session 8

Discussion - Limitations

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Contributing factors to positive outcomes may include:

- Patient's high prior level of function
- Patient's high motivation, self-efficacy, and compliance
- Structured progression of therapeutic interventions within patient tolerance

Further research is needed to determine:

- Prevalence of comorbidities including spinal cord involvement, nerve root involvement, or nerve trunk involvement in patients presenting with peripheral neuromechanical sensitivity
- Effectiveness and long-term outcomes for similar intervention protocols and populations

This is an examination of a single patient case with no control. Randomized controlled trials may indicate on the most effective treatments for optimal outcomes in this population

Clinical Implications

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For patients with PMH significant for LE trauma or surgery, peripheral nerve injuries should be considered as a possible contributing factor to symptoms, especially if symptom provocation patterns are not consistent with nerve root/trunk involvement.

Strengthening for adjacent muscles in conjunction with graded neurodynamics led to reduced pain, reduced symptom reproduction with provocative positions and functional activities, and subjective reports of improved function.

For patients with suspected peripheral nerve involvement, moderate-to-high repetition graded nerve tensioning movements and exercises for adjacent muscles may be considered as a possible intervention.

Thank you!

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