

# **PHANTOM LIMB PAIN**

## **Background**

1. Definition
  - painful sensations referred to an absent limb
2. General Information
  - previously believed to be a psychological condition, now determined to be an element of neuropathic pain
  - associated entities
    - phantom limb sensations: non-painful sensations in the absent limb
    - super-added phantom sensations: sensation of an object worn by phantom limb (e.g. wrist watch or ring)
    - residual limb pain: pain localized in the remaining limb
  - affects those who suffer from limb as well as body part loss (e.g. mastectomy)
  - notoriously difficult to treat

## **Pathophysiology**

1. Pathology of Disease
  - peripheral factors
    - following laceration of a nerve, formation of neuromas occur
    - neuromas show spontaneous and abnormal evoked activity following mechanical or chemical stimulation perceived as pain
  - spinal plasticity
    - sensitization of spinal pain transmission neurons
  - cerebral reorganization
    - in the absence of a limb, an 'open circuit' is created and remapping of the somatosensory cortex occurs which is thought to generate phantom phenomena
2. Incidence, Prevalence
  - 1.6 million amputees currently in the United States<sup>1</sup>
  - 41-85% of amputees suffer from phantom limb pain<sup>2,3</sup>
  - Incidence of phantom pain much lower in congenital amputees (3.7%)<sup>3</sup>
3. Risk Factors
  - preamputation pain in the limb
  - persistent postoperative pain at surgical site
  - amputation of more than one limb
  - foot or leg amputation
  - preamputation chemotherapy
  - ill fitting prosthesis
  - unsuccessful rehabilitation
  - female
4. Morbidity / Mortality
  - Morbidity
    - prevents successful rehabilitation
    - heightens disability
    - contributes to psychological instability

## Diagnostics

### 1. History

- multiple descriptions of pain syndromes in missing limb
  - 3 major types: lancinating, cramping, and burning
  - other types: sharp, pins-and-needles, itching, pinching, stinging, aching, crushing, twisting, and grinding
  - telescoping – middle portion of the phantom limb appears to be shortening while the distal end is attached directly to residual limb
- pain typically occurs in the distal portion of the phantom limb
- distribution of pain rarely follows path of severed nerve
- pain is often constant with intermittent exacerbations

### 2. Physical Examination

- identify sources of referred pain
  - back, bladder, etc.
- evaluate residual limb
  - dermatological
    - determine skin integrity
    - evaluate for infectious processes
    - other skin conditions (e.g. verrucous hyperplasia)
  - neurological
    - sensation to light touch, pain, and temperature
    - percussion of suspected nerve
    - strength of residual limb
- obtain pain journal
  - pain during prosthesis use
  - associated factors (e.g. diet, environment, etc.)
- evaluate prosthesis, if applicable
  - inspect device for irregularities

### 3. Diagnostic Testing

- Laboratory evaluation
  - no specified lab studies
- Diagnostic imaging
  - radiography of residual limb
    - evaluate for heterotopic ossification
    - residual bone evaluation
  - xeroradiography
    - imaging of residual limb within prosthesis
  - MRI
    - evaluation of soft tissue surrounding residual limb
  - CT
    - concern for bony abnormality of residual limb not appreciated with plain radiography (e.g. stress fracture)
- Other studies
  - electromyography
  - nerve conduction study
  - gait analysis

## Differential Diagnosis

1. Key Differential Diagnoses
  - referred pain
    - lower back
    - pelvic (e.g. bowel, bladder, etc.)
    - residual limb or contralateral limb
      - includes extensive DDx for limb pain
        - strain/sprain
        - stress fracture
        - osteosarcoma
        - heterogeneous ossification
        - abscess/cellulitis
        - deep venous thrombosis
        - acute limb ischemia

## Therapeutics

1. According to the USPSTF, there is inconsistent evidence supporting one specific type of pain control in post-amputation pain which includes phantom limb pain.
2. Pharmacotherapy (current studies have failed to reveal optimal drug therapy)<sup>4</sup>
  - NSAIDs (SOR:B)<sup>5,6,7,8</sup>
  - Acetaminophen<sup>6</sup>
  - Opioids (SOR:B)<sup>5,6,9,10</sup>
  - Anticonvulsants (e.g. gabapentin, pregabalin)(SOR:B)<sup>5,9</sup>
    - Gabapentin 300-1200 mg PO TID, increase over 7 days
    - Pregabalin 100 mg PO TID, increase over 7 days (painful polyneuropathy studies)
    - Conflicting studies present<sup>11</sup>
  - Antidepressants (particularly if concomitant mood disorder)
    - TCAs<sup>3,9</sup>
      - Recent RCT demonstrated no benefit of TCAs over placebo in PLP, (population was not controlled for mood disturbances)<sup>12</sup>
    - SSRIs (likely less effective than TCAs)<sup>3</sup>
3. Conservative Management
  - Desensitization
    - transcutaneous electrical nerve stimulation or TENS (SOR:A)<sup>2-7,13</sup>
    - percussion of residual limb<sup>5</sup>
    - massage of residual limb<sup>5</sup>
  - Physical and Occupational Therapy<sup>5</sup>
  - Prosthetic Adjustment<sup>5</sup>
  - Biofeedback (SOR:B)<sup>2,3,5,6</sup>
4. Adjuvant Therapies
  - Acupuncture<sup>5</sup>
  - Mirror Box Therapy<sup>5,14</sup>
  - Virtual Reality<sup>5</sup>
  - Calcitonin (early post-operatively)<sup>5,6</sup>
  - N-methyl-d-aspartate receptor antagonists (i.e. Ketamine)<sup>5,7</sup>

## **Follow-Up**

1. Return to Office
  - Time frame for return visit
    - depends upon intensity/level of pain
  - Recommendations for earlier follow-up
    - pain refractory to intervention
    - worsening pain
    - signs of infection in residual limb
2. Refer to Specialist
  - Physical Medicine and Rehabilitation
    - should be involved in the care of most amputees
  - Pain Management
    - refractory pain
  - Orthopedics
    - heterotopic ossification present
    - bony abnormality in residual limb
    - refractory pain
  - Neurosurgery
    - retractable pain and considering surgical relief
      - sympathectomy
      - dorsal root entry zone lesioning
      - cordotomy
      - rhizotomy
      - spinal cord stimulation
      - intrathecal delivery system
      - deep brain stimulation
3. Admit to Hospital
  - uncontrolled pain despite oral medications
  - need for surgical intervention (e.g. heterotopic ossification removal, amputation revision, etc.)
  - development of serious infection in residual limb

## **Prognosis**

1. Phantom Limb Pain is typically worse immediately following amputation; however, may be delayed for months to years post-amputation.
2. Generally pain will decrease as time from amputation increases<sup>3</sup>
  - 61 % of PLP sufferers continued to have pain 1 year post-amputation<sup>1</sup>

## **Prevention**

1. Multi-disciplinary team approach to pain
2. Pre- and immediate post-amputation pain control
3. Appropriate rehabilitation
4. Use of prosthesis, if applicable

## Patient Education

1. Amputee Coalition of America: <http://www.amputee-coalition.org>

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