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 limp 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\(^1\)
   - 41-85% of amputees suffer from phantom limb pain\(^2,3\)
   - Incidence of phantom pain much lower in congenital amputees (3.7%)\(^3\)
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)\(^4\)
   - NSAIDs (SOR:B)\(^5,6,7,8\)
   - Acetaminophen\(^6\)
   - Opioids (SOR:B)\(^5,6,9,10\)
   - Anticonvulsants (e.g. gabapentin, pregabalin)(SOR:B)\(^5,9\)
     - 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\(^11\)
   - Antidepressants (particularly if concomitant mood disorder)
     - TCAs \(^3,9\)
       - Recent RCT demonstrated no benefit of TCAs over placebo in PLP, (population was not controlled for mood disturbances)\(^12\)
       - SSRIs (likely less effective than TCAs) \(^3\)
3. Conservative Management
   - Desensitization
     - transcutaneous electrical nerve stimulation or TENS (SOR:A)\(^2,7,13\)
     - percussion of residual limb\(^5\)
     - massage of residual limb\(^5\)
   - Physical and Occupational Therapy\(^5\)
   - Prosthetic Adjustment\(^5\)
   - Biofeedback (SOR:B)\(^2,3,5,6\)
4. Adjuvant Therapies
   - Acupuncture\(^5\)
   - Mirror Box Therapy\(^5,14\)
   - Virtual Reality\(^5\)
   - Calcitonin (early post-operatively)\(^5,6\)
   - N-methyl-d-aspartate receptor antagonists (i.e. Ketamine)\(^5,7\)
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
   - 61% of PLP sufferers continued to have pain 1 year post-amputation

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

References


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