Medical Comorbidities Associated with Traumatic Limb Loss

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Disclosure

- I have no actual or potential conflict of interest in relation to this program/presentation

- The views expressed in this presentation are those of the author and do not necessarily reflect the official policy of Brooke Army Medical Center, the Department of Defense, Department of the Army, or the U.S. Army Medical Department

Purpose and Outline

Purpose: To review some of the most common medical comorbidities associated with combat related limb loss spanning from the acute to chronic phases.

Content

- Population statistics
- Residual limb complications
  - Soft tissue infections/complications
  - Phantom limb pain (PLP)
  - Heterotopic ossification
  - Symptomatic Neuromata
  - Dermatologic complications
  - Osteopenia/osteoporosis
- Secondary Health effects
  - Energy Expenditure and gait
  - Osteoarthritis
  - Low back pain
  - Diabetes
  - Aortic Aneurysm

Background

- As of March 2018: 1719 military amputees
  - 534 multiple limb loss

Unique Population

- Younger
- Blast Injuries
- Comorbidities
  - Fractures
  - Soft tissue damage
  - Peripheral nerve injury
  - Traumatic Brain Injury (TBI)
  - Post-traumatic stress disorder (PTSD)

Soft tissue, acute

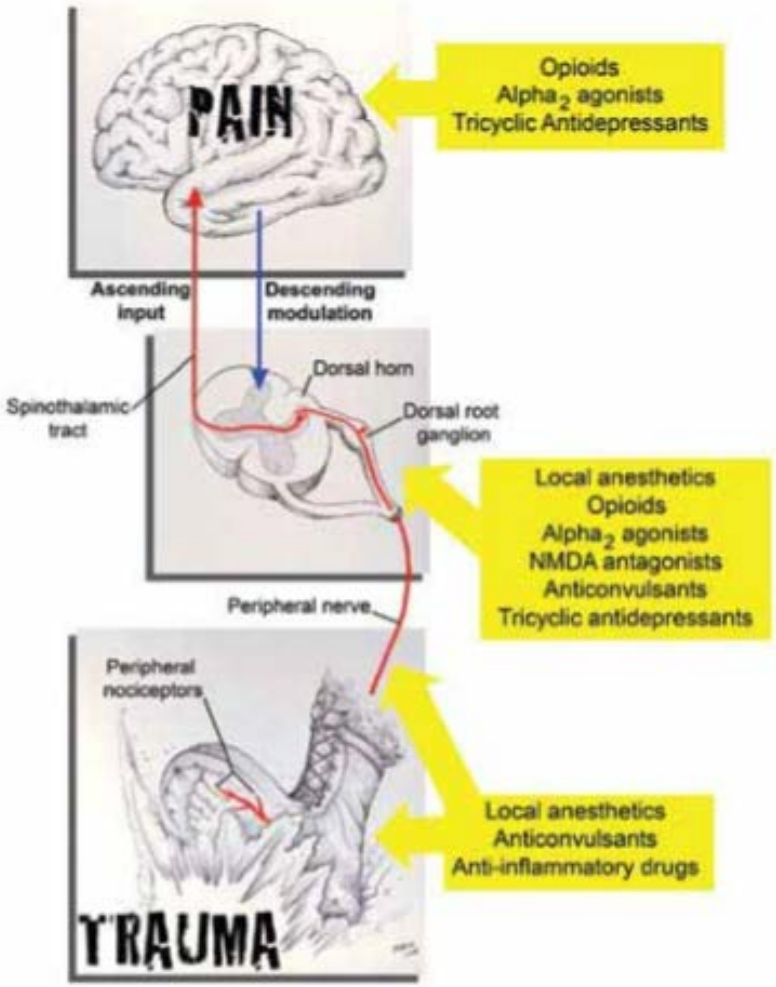
- Open wounds, serial debridement
- Burns
  - Average burn size 40% total-body surface area (TBSA)
  - 75% involve the residual limb
- Contamination
  - Greater than 30% critically colonized on presentation to tertiary referral center
- Infection
  - 20-40%
- Contracture

Phantom Pain

- Different than phantom sensation
- Occurs in up to 80% of patients
- Treatment
  - Early mobilization (+/- IPOP)
  - Desensitization
  - Mirror therapy
  - Pharmacotherapy
  - Interventional (including neuromodulation)

Multimodal pain management

- Nonpharmacologic
- Pharmacologic
  - Synergy between various classes of analgesic and adjuvant medications
  - In the chronic phase, recommend against opioid-centered pain plans
- Interventional
  - PRAA
    - Acute



Buckenmaier C, Bleckner L. *Military Advanced Regional Anesthesia and Analgesia Handbook.* Washington, DC: Borden Institute; 2009: Figure 27-1.

A Case Series of Dorsal Root Ganglion Stimulation for Refractory Phantom Limb Pain in Combat Injured Veteran Amputees

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Purpose

Dorsal Root Ganglion (DRG) stimulation was recently approved in the US and provides an opportunity for the treatment of pain conditions that traditionally have been refractory to neurostimulation and other pain management modalities. We present two cases of successfully treated phantom limb pain (PLP) in two combat injured US Army soldiers with DRG stimulation.

The first patient was involved in a blast injury resulting in multiple insults to include right lower extremity transtibial amputation and burns to his left lower extremity. He subsequently developed refractory PLP.

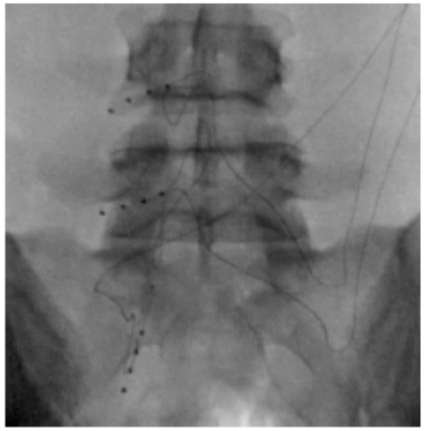
The second patient was also injured in a blast that resulted in a complete left sciatic nerve injury and CRPS type 2. After a prolonged period of limb salvage attempts that eventually failed, he underwent transtibial amputation and developed severe PLP. He was treated with various therapies including physical therapy, behavioral health therapy, oral pain medications including high dose opiates, cryoablation of the sciatic nerve, perineural catheter infusion, lumbar sympathetic blocks, spinal cord stimulation, peripheral nerve stimulation, and ketamine and lidocaine infusions.

Both patients were successfully treated with DRG stimulation that resulted in significant improvement in pain, decreased opioid use and increased function.

Methods

Case series, retrospective analysis of two cases involving DRG stimulation in the setting of PLP refractory to other modalities.

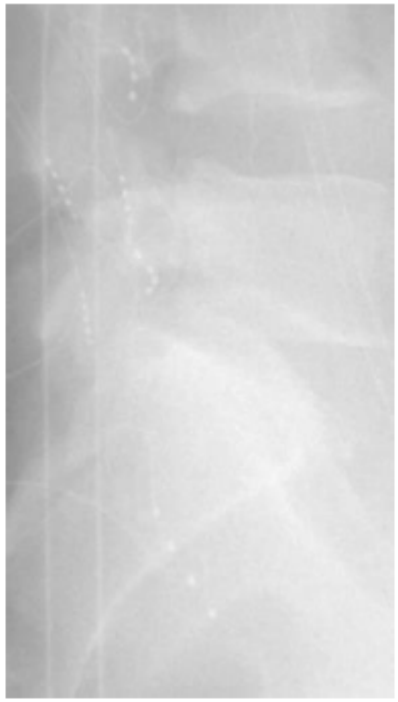
Lateral view, bilateral L4 and L5



AP view. Left L4, L5, S1

Results

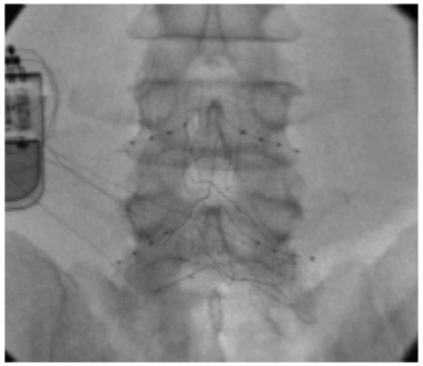
Significant decrease in opiate use of approximately 75% with maintained improvements at 12 months. Improved QOL and function.



Lateral view. Left L4, L5, S1

Conclusion

DRG stimulation presents a promising and viable option for reducing pain, increasing function and significantly reducing opioid use in refractory phantom limb pain.



AP view, bilateral L4 and L5

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Disclaimer

Soft tissue, prosthetic phase

- Ulceration
  - 57%
- Bursitis
  - Subcutaneous connective tissue
  - Deep
  - Aseptic vs septic
- (Symptomatic) neuroma
- Myodesis failure
  - 6%

Osseous complications

- Bone mineral density loss
  - Residual limb > intact limb
  - Disuse atrophy
  - Risk for insufficiency fractures
- Bone spurs (osteophytes)
- Heterotopic ossification (HO)
  - Amputation within zone of injury, blast mechanism
  - Incidence 67% in combat-related amputations

Dermatologic complications

- Prevalence 16-63%
  - Level of Amputation
    - Activity level
    - Bony prominences
  - Hyperhidrosis
    - 23-56%
- Epidermal Hyperplasia
  - Verrucous hyperplasia
  - Epidermoid cysts
- Acroangiodermatitis
- Marjolin’s ulcer (squamous cell carcinoma)

Gait

- Altered biomechanics
  - Amputation level
- Increased energy expenditure (% above baseline)
  - Long transtibial: 10%
  - Average transtibial: 25%
  - Short transtibial: 40%
  - Bilateral transtibial: 41%
  - Transfemoral: 65%

Overuse injuries

- Osteoarthritis
  - Younger age
  - Hip and knee joints of intact limb in those with unilateral limb loss
- Entrapment neuropathies

Low back pain

- General population prevalence: 6-33%
- Persons with lower limb loss: 52-71%
  - More bothersome than PLP and residual limb pain
  - Most important health related condition contributing to reduced QOL after remote traumatic amputation

Cardiovascular complications

- Higher lifetime risk in young persons with traumatic amputations
  - Contributing factors:
    - Hyperglycemia, hypertension, abdominal obesity, hypercholesterolemia, hyperlipidemia
    - Behavioral, psychological, dysregulation, hemodynamic*, social and environmental barriers
- Higher incidence of abdominal aortic aneurysm*
  - 6% vs 1%
  - Perturbed blood flow in the aorta due to asymmetric arterial blood flow to the lower limbs following amputation

Other medical complications

- Diabetes
  - Leading non-traumatic cause of amputation
  - Individuals with traumatic amputation are more likely to develop diabetes as they age
    - Insulin resistance
- Obesity
  - Likelihood increases with more proximal amputation
    - Transtibial: 37.9%
    - Transfemoral 48.0%
    - Bilateral TFA or TFA + TTA: 64.2$

Summary

- Acute Phase
  - Multimodal pain management, restore mobility and promote independence
- Chronic
  - Be aware of long-term health risks associated with amputation
  - Reinforce the importance of leading a healthy lifestyle, proper diet, exercise, avoidance of tobacco products, and regular wellness evaluations

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Questions?