Lawnmower Injuries

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Demographics

- 60000 ED visits per year
- 75 deaths annually
- 7% require hospitalization
- 2-5 surgeries per injury
- 64% require amputation
- $457 million annually
- Prosthetic costs of $73140 to $116040 from the time of injury to the age of 18

- 18.9% of all injuries are to the lower extremities
- 50% of amputation from lawn mower injuries occur in the foot
Demographics

- 58-77% males
- Age <14 and >44 years old
- 20% are in children under 18 years old
- 11.9/100000 children
- 2000 children permanently impaired per year.
Recommendations


- Children less than 14 years of age should not be allowed to operate ride-on lawn mowers.
- Adolescents should be trained in the use of these tools before independent use.
- Young children, especially those 5 years or younger, should be kept indoors when a lawn mower is in use.
- Continue to develop safety devices that will reduce the risk of injury to all lawn mower users.
Regulations

• Deadman’s switch
  • Required in July of 1982
  • Decreased lawn mower related injury by 40%

• Riding mower
  • Operator presence control
  • Higher seat back
Mechanism of Injury

- Blade spins at 3000 RPM
- Equivalent of dropping 211 lb weight 100 ft
- 3x the power of a .357
- 51% pulling mower backwards
- 24% pulling mower up a slope
Types of injury

- Laceration 41%
  - 71% occurring on the hands or feet
- Soft tissue 21.4%
- Burn 15.5%
- Fracture 10.3%
- Missile injury 5-9%
Types of injury

- Anger DM
  - 33 patients
  - 40 open fractures
  - 20 amputations
  - 18 lacerations involving skin and nail bed
  - 9 tendon lacerations
  - 2 closed fx
  - 2 segmental loss of bone
  - 1 segmental achilles
Complex soft tissue wounds

Types
- Degloving injuries
- Soft tissue avulsion
- Mutilation
Zones of injury

- Corcoran
Evaluation

- Soft tissue
- Osseous involvement
- Thorough exam (may need to use local anesthesia)
- Remove debris and contaminates
Tetanus

- Tetanus immune globulin is administered in the event a child has *not* received a minimum of three doses of tetanus toxoid, or if the immunization status is unknown. Tetanus toxoid (dT, DT, or DTaP) also is given in this situation.

- A booster dose should be administered if the child has not received a dose of tetanus toxoid in the last 5 years.

<table>
<thead>
<tr>
<th>Previous doses of tetanus toxoid*</th>
<th>Clean and minor wound</th>
<th>All other wounds</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tetanus toxoid-containing vaccine</td>
<td>Human tetanus immune globulin</td>
<td>Tetanus toxoid-containing vaccine</td>
</tr>
<tr>
<td>&lt;3 doses or unknown</td>
<td>Yes§</td>
<td>No</td>
<td>Yes§</td>
</tr>
<tr>
<td>≥3 doses</td>
<td>Only if last dose given ≥10 years ago</td>
<td>No</td>
<td>Only if last dose given ≥5 years ago</td>
</tr>
</tbody>
</table>

*If the status of the child's most recent tetanus toxoid dose is unknown, a dose of tetanus toxoid-containing vaccine should be administered, and the child's immunization status should be updated.
Treatment

- Intraoperative cultures
  - Aerobic, anaerobic, fungal, and acid-fast organisms
  - Open fractures -> bone biopsy
- Immediate and vigorous surgical debridement
- Pulse lavage as soon after the injury as possible
Infection

- **Campbell**
- Meta-analysis
- 9 studies, 355 cases
- 5-60% of injuries became infected

- **Anger**
- Mean of 3 infecting organisms
Organisms

- **Harkness**
- Fertilizer

- Environmental gram negative

- Gram Positive
- *Enterococcus*, coagulase negative *Staphylococcus* *Staphylococcus aureus*

- Soil related anaerobes
- *Clostridium* spp and *Bacteroides* spp

- Fungal infection has also been reported
Antibiotics

- Traumatic contaminated wounds
- Danger
  - Ciprofloxacin first line
  - Bactrim second line
  - Ceftazidime in children
- Anaerobes
  - Penicillin G or Clindamycin
- Absence of infection
  - Abx course for 5-10 days
Antibiotics cont.

- **Therapeutic Guidelines: Antibiotic**
  - Initiate monotherapy with zosyn or timentin
    - or clindamycin combined with either gentamicin or ciprofloxacin
  - For heavily soiled wounds: recommend initial therapy with vancomycin, imipenem and an aminoglycoside

- Fungal infection amphotericin B or voriconazole

- Modify once cultures become available.
Antibiotics cont.

- **Gustillo and Anderson**
  - I. Clean Wound <1cm in diameter
    - Abx choice: 1st generation cephalosporin (Ancef)
  - II. Wound 1.0-5.0cm in diameter with minimal soft tissue damage
    - Abx choice: Ancef, Clindamycin
  - III. Wound >5cm in diameter with extensive soft tissue damage
    - Abx choice: Ancef (or high dose PCN), Clindamycin and Aminoglycoside
Treatment cont.

• Love
  • 2\textsuperscript{nd} intra-operative debridement 24-72 hours after injury.
  • Planned delayed closure
• Graham
  • 28 Pts
  • “multiple debridement with irrigation”
• Peterson
  • Multiple debridement necessary
• Ryan and Hume
  • 6 cases
  • Primary closure is contraindicated
• Myerson 1991
  • under no circumstances should the skin be closed before 5-7 days
Treatment cont.

- Corcoran
  - 96 wounds in 70 patients
  - Primary closure does not increase chance of infection
- Anger
  - No difference between primary closure and secondary closure in regards to infection
- Goldsmith
  - 9 patients
  - Advocated for primary closure of digits and NWB surfaces.
The Reconstructive Ladder

- Free tissue transfer
- Local tissue transfer
- Tissue expansion
- Skin grafts
- Delayed primary closure
- Primary intention
- Secondary intention
Treatment Cont.

• Laing
  • Split skin grafting in 17 patients,
  • Local fasciocutaneous flap reconstruction in 3 patients
  • Microvascular free tissue transfer in 3 patients to reconstruct amputated heels
    • 2 free latissimus dorsi flaps and
    • 1 free thoracodorsal artery perforator flap.
Case

- 19 year old active duty male presents to the ED with right hallux wound secondary to a lawnmower injury. Pt was wearing military boots while mowing on a hill and slipped with his right foot ending up under the mower.
History

• PMH: denies

• Meds: denies

• Social History
  • Current smoker 1 pack year hx
  • Denies alcohol
  • 11 Bravo (infantry)

• ROS unremarkable except what was mentioned above
Physical exam
Plan

- Irrigation
- Wound dressed and posterior splint applied
- NWB to right lower extremity
- Ancef 1gm q8h
- Surgery in the AM
OR

- Debridement
- Pulse lavage
- Application of wound vac
Discharge

- Augmentin 125/875 BID
- Gram stain – no organisms seen
- Pre-irrigation cultures – results unavailable
- Post-irrigation cultures showed no growth
2\textsuperscript{nd} OR visit (6 days s/p injury)

- Debridement
- Graft application
Follow up

- 1 month
- Applied dermacell graft
Follow up

• 1 month + 1 week
• Reapplied dermacell
Follow up

- 2 month
- Pt still in CAM boot
- Prescribed orthotic with Morton's extension.
8 month follow up
References

References cont