Amputations

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INTRODUCTION

- 2003: 1116,000 amputations per year in the US, 56,000 are “major” (above the ankle)
- Diabetes (in addition to PAD) is the major risk factor – up to 90% of patients undergoing amputation have DM. Patients with DM have a 10-fold greater risk of amputation than do those without.
  - Neuropathy and infection, plus PAD

INTRODUCTION

- Significant variation:
  - 44/100,000 in Navajo men
  - 3/100,000 in Madrid, Spain
- African-Americans more likely than Caucasians, even after controlling for DM
- An increase in vascular surgeons in an area is correlated with a decrease in amputation rates!

PHILOSOPHY

- Why do we amputate?
  - Acute ischemia
  - Chronic ischemia
  - Infection
  - Trauma
  - (malignancies)
- Lack of tissue coverage remains a problem even when the limb is adequately revascularized.

PHILOSOPHY

- Goals (and a stepwise scheme for determining level):
  1. Remove all dead or nonfunctional tissue,
  2. Ensure healing (bone coverage), and
  3. Leave a remnant that can accommodate a prosthesis (in most cases). This does not always translate into “as long as possible.”
### PHILOSOPHY

- The shorter the stump, the better the healing
- The longer the stump, the better the rehabilitation

  **Below-knee:**
  - 10 to 40% increase in energy to walk
  - Prosthetic use 50 to 100%
  - Walk in = walk out
  - (15 to 25% revision to AKA)

  **Above-knee:**
  - 50 to 70% increase in energy to walk
  - Prosthetic use 10 to 30%

### WHAT LEVEL?

- Pulse immediately proximal – 100% healing
- Clinical judgment
  - BKA – 80%
  - AKA – 90%
- Toe pressures less than 38mm in diabetics predict universal failure of toe and forefoot amputation, but no comparable threshold values in those without diabetes.

### GENERAL PLAN

- Try to do one operation
- Don’t leave dog ears!
- Initial wound like any other; absolutely no weight bearing and minimal compression
- Stump shrinker only after initial healing; useless and painful before
- Have rehab MDs (and ideally prosthetists) visit patient before amputation, if possible.
- Refer to prosthetist as soon as initial healing has occurred (2 to 4 weeks).

### PHILOSOPHY

- The goal of revascularization is preservation of a *functional* limb.
  - Nonambulatory? Primary amputation

- The goal of amputation is to preserve as much *actual function* and give the patient as comfortable a life as possible.
  - Absolutely no prosthetic desired? AKA
  - Contracted, dementia, or bedridden? AKA

### WHAT LEVEL?

- Clinical judgment gives you 80% or better healing – what tests can do this?
  - Tc99m sestamibi scintography shows perfusion; best data show it can lead to a more distal amputation in some patients
  - Skin perfusion pressure (iodine 123 scintography) more than 20mm predicts healing in 99%
  - tcPO2 >40 predicts healing and <20 failure, but wide variation between these values.

### PROSTHETICS

- Toe and foot – no weight bearing prosthetic needed
- BKA – prosthetic transfers weight at knee (tibia and femur); length of BK stump only important for lever arm
- AKA – prosthetic transfers weight at hip and pelvis (ischium)
PHILOSOPHY

- Have a low threshold for 2 stage procedure in those with infection – can often save a full level
- When doing 2 stages, though, assume second stage (definitive closure) will be a level higher than the first stage because of the need to remove the dessicated surfaces (especially bone). Make the first stage as distal as possible!

LOWER EXTREMITY

- Toe
  - Base must be viable
  - Bone must be way back to allow tension-free closure
  - Non weight-bearing!

LOWER EXTREMITY

- Ray
  - Closure can be difficult
  - Avoid incisions on the plantar surface; ulcer does not have to be resected!

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LOWER EXTREMITY

- Ray
  - 1st MT head important for “pushoff” during walking; unusually prone to problems after amputation
  - TMA preferred over 1st ray?

LOWER EXTREMITY

- TMA
  - Preferred if 3 or more MT heads to be lost
  - Bone in front, muscle below – plantar flap
  - Non weight-bearing!
  - Shoe insert for gait and balance
LOWER EXTREMITY

- Midfoot
  - Lisfranc – tarsals
  - Chopart – “midfoot”
- Can have significant weight-bearing and deformity issues with time unless Achilles tendon division (etc) performed.

LOWER EXTREMITY

- Syme
  - Limb is shortened – calcaneous gone
  - Heel pad becomes weight-bearing, almost 100% failure rate in diabetics.

LOWER EXTREMITY

- BKA
  - Bone in front, muscle in back – posterior flap
  - Artistic endeavor. Avoid dog ears!

LOWER EXTREMITY

- TKA
  - Technically demanding, healing worse, but better rehab potential than AKA – good for young patients with high chance of rehab.

LOWER EXTREMITY

- AKA
  - Cylinder of tissue surrounding central bone – symmetrical “fish-mouth”
LOWER EXTREMITY

- Hip disarticulation
- Lateral decubitus position helps a lot
- Flaps often need to be determined on a case-by-case basis
- Bring muscles together for padding
- Careful dressings (VAC?) to reduce contamination

UPPER EXTREMITY

INTRODUCTION

RESULTS

• Mortality
  • Historically 20 to 40%
  • Modern numbers:
    • Major: 4 to 9%
    • Ankle and foot: 2 to 4%
  • Mortality depends on level, malnutrition, DM, age, cardiopulmonary disease

• Reoperation at a higher level:
  • Toe: 50%
  • Foot: 35%
  • BKA: 10 to 20%
  • (half of those with early wound problems are salvaged, half go on to AKA)
  • 10 to 20% require contralateral amputation within 1 to 2 years

• Chronic pain reported in up to 95% of amputees
• Rule out infection, continued ischemia before making the diagnosis of phantom limb pain
• Phantom limb pain very widely reported (5 to 85%) and very poorly understood
• Ischemia < trauma?
CONCLUSIONS

• Treat an amputation as a major vascular procedure – doing it right the first time will have a very significant impact on the patient’s life (and survival).