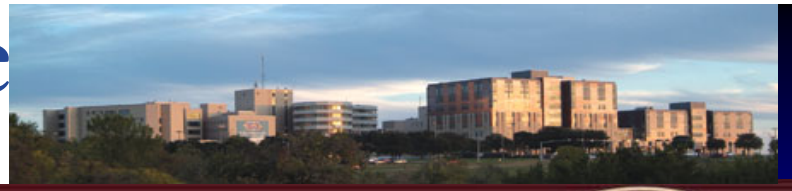
Baylor Scott & White HEALTH



THE TEXAS A&M UNIVERSITY SYSTEM
HEALTH SCIENCE CENTER

Do You Really Lose Your Cardiopulmonary Reserve After Major Amputation?

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Disclosure

I have no relevant financial relationships with proprietary entities producing health care goods or services related to the content of this presentation.

The content of this talk may not reflect the opinion of the United States Government

Facts

- Even in an era of modern arterial reconstruction, CLI = 30,000 – 50,000 major lower limb amputations per year
- Elderly patients who:
  - Do not walk
  - Are mentally incompetent
  - Have flexion contractures or severe arthritic joints
  - Have concurrent terminal illness

Primary amputation may be appropriate

Huston CC, Bivens BA, et al. *Arch Surg* 1980
Malone JM, Moore WS. *Ann Surg 1979*

Facts

- Patients requiring amputation for CLI commonly have advanced CAD
- Silent MI common if diabetic
- Increased risk for M&M
  - Recent MI, CHF, unstable angina, significant mitral / aortic disease
  - Poor potential for rehab with prosthesis

Malone JM. *6th Ed Vascular Surgery Comprehensive Review,* Ch 45

Cardiopulmonary Reserve After Amputation

- Means of assessing cardiac function
  - Stroke volume
  - End-diastolic volume
  - End-systolic volume
  - Heart rate
  - Work capacity
  - Systolic & diastolic blood pressure

Kurdibaylo SF, *J Rehab Res & Dev* volume 31 August 1994

Major Lower Limb Amputation

- Effects on cardiac function
  - Increased resting heart rate
  - Systolic & diastolic HTN
  - Decreased end-diastolic / end-systolic volume
  - Lack of increase in stroke volume when subjected to work or stress
    - Especially with AKA – decreased cardiac output

Kurdibaylo SF, *J Rehab Res & Dev* volume 31 August 1994

Cardiopulmonary Reserve After Amputation

- Means of assessing respiratory function
  - Respiratory rate
  - Breathing capacity
  - Minute respiratory volume

Kurdibaylo SF, *J Rehab Res & Dev* volume 31 August 1994

Major Lower Limb Amputation

- Effects on respiratory function
  - Decreased breathing capacity
  - Increased minute respiratory volume
  - Increased respiratory rate at baseline
- Stress or work increase respiratory function effects

Kurdibaylo SF, *J Rehab Res & Dev* volume 31 August 1994

Below Knee Amputations

- 10 – 40% increase in energy cost when ambulating using well fitted limb prosthesis compared to normal limbs
  - Compensate by walking slower to keep HR, respiratory quotient and related energy expenditure WNL
- Patients < 75 yo with moderate comorbidities can achieve successful, independent prosthetic ambulation in more than 70% of BKA provided they were ambulatory before amputation

Waters Rl, Perry J, et al. *J Bone Joint Surg* 1976

Below Knee Amputations

- Overall impact on survival with BKA
  - 49% - 3 year
  - 31% - 5 year
- Life Table analysis showed 50% surviving amputees required contralateral amputation within 2 years of original amputation

Bodily KC, Burgess EM. *Am J Surg* 1983
Couch NP, David JK, et al. *Am J Surg* 1977

Above Knee Amputations

- Wheelchair & walking crutches are minimum requirements for rehab
- Newer prosthesis may be better alternative
  - Light weight
  - Strong endoskeleton design
  - Sophisticated joints
  - Energy storage capacity

Isakov E, Susak Z, et al. *Scand Rehab Med* 1985

Above Knee Amputations

- Energy expenditure increased 50% - 70% with prosthesis
  - BKA – normalize cardiovascular physiologic effects by decreasing walking speed
  - AKA – can't normalize & have following
    - > 0_2 consumption
    - Increased HR
    - Significant decrease in respiratory quotient

Waters RL, Perry J. *J Bone Joint Surg* 1976
Wutschert R, et al *Diabetes Care 20* 1997

Above Knee Amputations

- Successful rehab – 36% - 76% determined by
  - Age
  - Comorbidities
  - Mental function
- Risk of opposite limb loss > 50% at 2 years

Malone JM, Goldstone J. *Vasc Surg Comprehensive Review* 1986

Pre-Op Factors Influencing Functional Outcome After Major Lower Limb Amputation

- Age ≥ 70
- Dementia
- ESRD
- Advanced CAD
- Non-ambulatory status

Older patients with dementia who lose leg from acute ischemia do poorest

Taylor S, Kalbaugh C, et al. *JVS* Aug 2005

Treatment Failure Triumvirate

- 1 or more endovascular interventions
- Open surgical bypass
- BKA / AKA

Commonly seen in patients with CLI

Durable reimbursement ?????

Taylor S, Kalbaugh C. *JVS* 2005
Filis KA, *J Nov Physiotherapy* 2012

Outcomes of Major Lower Limb Amputation

- **Mortality**
  - BKA – 4% - 16%
  - AKA – 12% - 40%
- **Morbidity**
  - Incidence of non-healing amputation stumps – 3 – 28%
  - 2/3 AKA have diabetes
  - 1/2 - 2/3 AKA have s/s cardiac & pulmonary disease

Taylor SM, Kalbaugh CA. *JVS* 2005

Conclusion

- Patients with major lower limb amputations
  - Ambulatory / functional capacity depends on dynamic capabilities of cardiac and respiratory systems
  - Maintain upper body strength & adequate physiologic response to exercise using remaining extremities
  - Rehab with newer prosthesis (even AK) can be successfully accomplished
- Future reimbursement probably driven by evidence based treatment protocols & optimal functional outcomes

Thank You