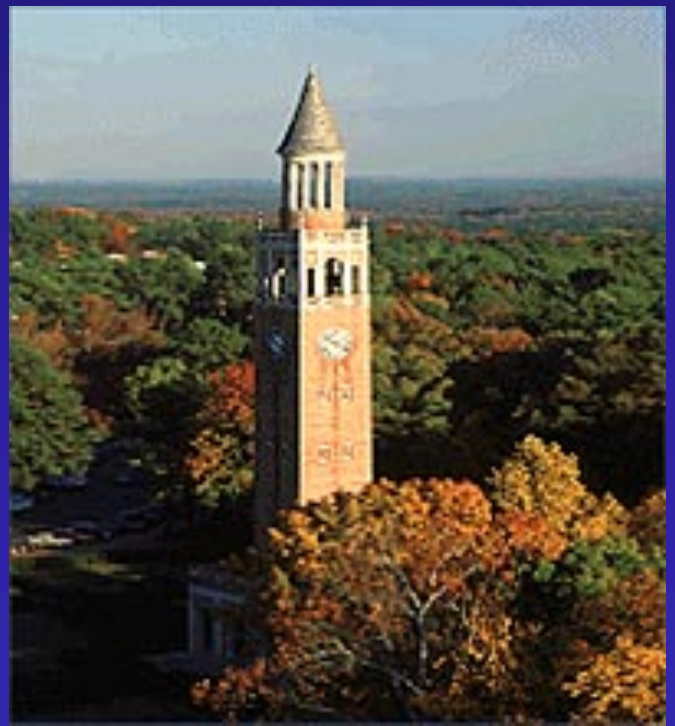
Limb Preservation: Ways to Incorporate Clinical Research into Your Practice



PNEC 2019

Bill Marston MD
Professor of Surgery
University of North Carolina Hospitals

Disclosures

- Boston Scientific, Pfizer
  - Consultant
- Avadim Therapeutics, Osiris
  - Principle Investigator
- Tactile Medical
  - Consultant
  - Investigator

- None relevant to presentation content

CLI

- How do we manage the patient to optimize quality of life while not expending all of dollars allocated to that patient's care?
- Avoidance of
  - Multiple readmissions
  - Multiple procedures
  - Failed procedures
  - Complications

Typical CLI case

- 44 YO male presents with L heel ulcer present 3 months despite attempted offloading and moist wound healing
- H/o DM, ESRD
- ABI/Doppler studies
  - ABI 0.37
  - Toe pressure 20

Choices for CLI patients complex

- Severity of symptoms
  - Rest pain
  - Depth/complexity of wound
  - QOL, life expectancy and potential to heal without revascularization

CLI patients are believed to be at high risk for limb loss without revascularization

Control group outcomes	Amputation rate at 12 months	Amputation rate in rest pain group
Restore –CLI J Vasc Surg 2011:54:1032	24%	14%
BMAC CLI Phase II J Vasc Surg 2011;54:1650	28.6%	12%

WIFI

- Incorporates severity of 3 separate wound characteristics
  - Wound grade
  - Infection grade
  - Ischemia grade
- All assessed as normal, mild, moderate or severe

From the Society for Vascular Surgery

An early validation of the Society for Vascular Surgery Lower Extremity Threatened Limb Classification System

David L. Cull, MD, Ginger Manos, MD, Michael C. Hartley, MD, Spence M. Taylor, MD, Eugene M. Langan, MD, John F. Eidt, MD, and **Brent L. Johnson, MS,** *Greenville, SC*

Objective: **The Society for Vascular Surgery (SVS) recently established the Lower Extremity Threatened Limb Classification System, a staging system using Wound characteristic, Ischemia, and foot Infection (WIfI) to stratify the risk for limb amputation at 1 year. Although intuitive in nature, this new system has not been validated. The purpose of the following study was to determine whether the WIfI system is predictive of limb amputation and wound healing.**

Methods: **Between 2007 and 2010, we prospectively obtained data related to wound characteristics, extent of infection, and degree of postrevascularization ischemia in 139 patients with foot wounds who presented for lower extremity revascularization (158 revascularization procedures). After adapting those data to the WIfI classifications, we analyzed the influence of wound characteristics, extent of infection, and degree of ischemia on time to wound healing; empirical Kaplan-Meier survival curves were compared with theoretical outcomes predicted by WIfI expert consensus opinion.**

Results: **Of the 158 foot wounds, 125 (79%) healed. The median time to wound healing was 2.7 months (range, 1-18 months). Factors associated with wound healing included presence of diabetes mellitus ($P = .013$), wound location ($P = .049$), wound size ($P = .007$), wound depth ($P = .004$), and degree of ischemia ($P < .001$). The WIfI clinical stage was predictive of 1-year limb amputation (stage 1, 3%; stage 2, 10%; stage 3, 23%; stage 4, 40%) and wound nonhealing (stage 1, 8%; stage 2, 10%; stage 3, 23%; stage 4, 40%) and correlated with the theoretical outcome estimated by the SVS expert panel.**

Conclusions: **The theoretical framework for risk stratification among patients with critical limb ischemia provided by the SVS expert panel appears valid. Further validation of the WIfI classification system with multicenter data is justified. (J Vasc Surg 2014;60:1535-42.)**

WIFI outcome prediction

WIFI clinical stage	Major Amputation	Wound Healing	Amputation-free survival
Stage 1	3%	92%	86%
Stage 2	11%	78%	83%
Stage 3	23%	65%	70%
Stage 4	38%	37%	36%

But wifi does not tell us who has highest chance of failure

From the Southern Association for Vascular Surgery

Current accepted hemodynamic criteria for critical limb ischemia do not accurately stratify patients at high risk for limb loss

Raghuveer Vallabhaneni, MD,[a] Corey A. Kalbaugh, MS,[a,b] Ana Kouri, BA,[a] Mark A. Farber, MD,[a] and William A. Marston, MD,[a] *Chapel Hill, NC*

- Determine risk of limb loss and mortality in patients with CLI who are **not** successfully revascularized
- Evaluate the accuracy of currently accepted hemodynamic criteria for CLI in predicting patients who are at high risk of limb loss
- Vallabhaneni et al, JVS 2016;63:105-12.

Results

- Final patient cohort 345 limbs in 296 patients

- ABI < 0.5: 119 of 345 (34%)
- Toe P < 50: 282 of 345 (82%)

Tibial vessel calcification limits usefulness of ankle pressures and ABIs

Patient survival by initial TP

	6 month	1 year	2 year	3 year
All limbs	76%	68%	57%	44%
Toe P 31-50	84%	78%	66%	53%
Toe P 11 – 30	80%	66%	55%	41%
Toe P 0-10	61%	57%	45%	34%

Difference between groups $P < .001$

Limb salvage by initial TP

	6 month	1 year	2 year	3 year
All Limbs	81%	76%	72%	69%
Toe P 31-50	91%	85%	82%	**82%**
Toe P 11 – 30	86%	80%	77%	**72%**
Toe P 0-10	58%	54%	48%	**40%***

Adjusted HR, Toe P 0-10: 3.70 (1.78,7.68), p=0.0004*

Amputation is not always failure

- When is early amputation the most appropriate care?
  - Poor medical condition – ESRD, CHF
  - Complex, multilevel vascular disease
  - QOL would not be different with amputation
  - Fatigue of dealing with chronic condition

JACC: Cardiovascular Interventions

Volume 10, Issue 11, 12 June 2017, Pages 1147–1157

Peripheral

Prognostic Impact of Revascularization in Poor-Risk Patients With Critical Limb Ischemia : The PRIORITY Registry (Poor-Risk Patients With and Without Revascularization Therapy for Critical Limb Ischemia)

Osamu Iida, MD[a], Mitsuyoshi Takahara, MD, PhD[b], Yoshimitsu Soga, MD[c], Nobuyoshi Azuma, MD, PhD[d], Shinsuke Nanto, MD, PhD[e], Masaaki Uematsu, MD, PhD[a], on behalf of the PRIORITY Investigators

- 662 CLI patients, 100 did not undergo revascularization
- Health-related QOL better at one year in survivors who had revasc
- 1 year survival rate
  - 55.9% in revascularized group
  - 51.0% in non-revasc group

If you are going to revascularize what is the best method?

- BEST trial will answer this for us
  - Or will it???

BASIL study: Bypass versus angioplasty in severe ischaemia of the leg

- 452 patients enrolled in 27 UK hospitals
- Randomized to bypass or angioplasty for revascularization
- Average follow-up 3.7 years
- Outcomes evaluated
  - Limb preservation
  - Mortality
  - Need for subsequent procedures

Bradbury et al, J Vasc Surg 2010;51:5s-17s

BASIL: Results

- Mortality at 3.7 Years

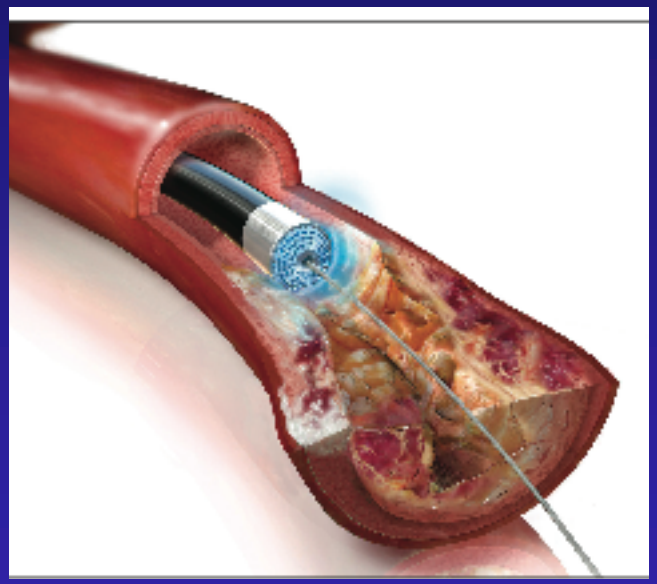
All patients	Angioplasty	Bypass
56%	59%	53%

- Alive with no amputation at 3.7 yrs

All patients	Angioplasty	Bypass
38%	37%	38%

Data perc revasc results

- Median patency rates for perc intervention below the knee < 12 months
- Repeat intervention often needed
- Secondary rates better, results are poor if time horizon is 5-10 yrs or longer



Data bypass revasc results

- 2-5 days in hospital
- 4-6 weeks recovery
- early graft loss rate of 15-25% in first 3-6 mo for distal BP
- 3 year graft patency rates avg 50-60%
- If they last 3 years, loss rate after is low

Revascularization choice

- Likely to remain dependent on patient factors
- Younger more active with long life expectancy may benefit from surgical bypass
- Sicker, needing wound healing prob benefit more from perc procedures or wound care

Hgb A1c and revasc outcome

- Review of over 7000 diabetic patients undergoing LE bypass revasc from VQI
- Pts with Hgb A1C > 10 had significantly higher 30 day complications than those with A1C 7-10
  - MACE
  - MALE
  - Amputation

Submitted for publication
J Vasc Surg

Increase focus on total pt care: Can limited life expectancy be improved?

- CLI event is opportunity to review entire medical management
  - Lipid-lowering therapies
  - Diabetes management – what is Hgb A1c
  - Hypertension
  - Renal insufficiency
  - Smoking
  - Activity level

Questions?