

Relationship between lower extremity amputations and utilization of vascular studies

S. Carpenter, D.O.; C. Le, M.D.; A. Schano, D.O.; F. Ghosheh, M.D.



Background

- As of 2010, an estimate of 202 million people were living with peripheral artery disease worldwide¹
- Diabetic foot disease is most often implicated with amputation of a lower extremity¹⁰
- Limb salvage management is possible for osteomyelitis or lower extremities ulcers^{2,4-9}
- A vascular studies should be mandatory for any diabetic foot wound and that vascular disease must be considered in patients with osteomyelitis⁹
- Many patients actually fear major amputation more than death³

Hypothesis

There is a significant number of patients who underwent amputations of at least part of the lower extremity without receiving appropriate imaging of their lower extremity anatomy that may qualify them for alternate intervention.

Methods

Predictor variable(s): Preoperative studies: CT, MRI, ultrasound of lower extremity arteries.

Inclusion variable(s): Patients with a dx of osteomyelitis, non-pressure chronic ulcers, symptomatic peripheral artery disease of lower extremities

Outcome variable(s): Acquired absence of portion of lower extremity

Exclusion criteria if appropriate: Age under 18, traumatic amputation of lower extremity (All ICD10 codes in S77, S78, S87, S88, S97, S98)

Analyses: Chi-square tests were conducted to analyze the proportion of amputee patients that received pre-operative studies based on different demographic characteristics.

Power Analysis: A power analysis revealed that 150 patients would be needed for the t-test. Through the HCA database we were able to compare 1104 cases of lower extremity amputation

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Results

	0 (N=968)	1 (N=136)	Overall (N=1104)
Sex			
F	245 (25.3%)	40 (29.4%)	285 (25.8%)
M	723 (74.7%)	96 (70.6%)	819 (74.2%)
Age			
Mean (SD)	71.6 (100)	71.3 (115)	71.6 (102)
Median [Min, Max]	61.0 [25.0, 999]	58.0 [27.0, 999]	61.0 [25.0, 999]
Payer			
Private	208 (21.5%)	29 (21.3%)	237 (21.5%)
Medicaid	131 (13.5%)	34 (25.0%)	165 (14.9%)
Medicare	606 (62.6%)	65 (47.8%)	671 (60.8%)
Other	23 (2.4%)	8 (5.9%)	31 (2.8%)
Race			
W	750 (77.5%)	96 (70.6%)	846 (76.6%)
B	201 (20.8%)	37 (27.2%)	238 (21.6%)
Other	17 (1.8%)	3 (2.2%)	20 (1.8%)
LOS			
Mean (SD)	17.6 (10.9)	7.63 (8.53)	16.4 (11.1)
Median [Min, Max]	21.0 [0, 35.0]	5.00 [0, 34.0]	19.0 [0, 35.0]

Imaging Studies	N	Procedure			
		Payer	0	1	Total
Angiography	20	Private	208	29	237
Bone Scan	6		87.8 %	12.2 %	100 %
CT Scan	13	Medicaid	131	34	165
CT Angiogram	5		79.4 %	20.6 %	100 %
MRI	74	Medicare	606	65	671
Duplex Ultrasound	66		90.3 %	9.7 %	100 %
		Other	23	8	31
			74.2 %	25.8 %	100 %
		Total	968	136	1104
			87.7 %	12.3 %	100 %

$\chi^2=20.017 \cdot df=3 \cdot \text{Cramer's } V=0.135 \cdot \text{Fisher's } p=0.001$

Sex	Procedure			Race	Procedure		
	0	1	Total		0	1	Total
F	245	40	285	W	750	96	846
	86 %	14 %	100 %			88.7 %	11.3 %
M	723	96	819	B	201	37	238
	88.3 %	11.7 %	100 %			84.5 %	15.5 %
Total	968	136	1104	Other	17	3	20
	87.7 %	12.3 %	100 %			85 %	15 %
				Total	968	136	1104
					87.7 %	12.3 %	100 %

$\chi^2=0.844 \cdot df=1 \cdot \phi=0.031 \cdot p=0.358$

$\chi^2=3.167 \cdot df=2 \cdot \text{Cramer's } V=0.054 \cdot \text{Fisher's } p=0.176$

Discussion

Peripheral vascular disease is prevalent throughout our population. Much of the existing literature exist from diabetic foot disease. Surgical amputation is a significant medical event that has life altering social and economic consequences. Alternative therapies exist for limb conservation. Some of these interventions include arterial bypass, external fixation, antibiotic-coated implants, staged revascularization with muscle flap transfer, or percutaneous angioplasty and stenting.

Very few patients in this sample received an advanced imaging evaluation prior to undergoing amputation. Many of the imaging modalities obtained do not evaluate the vasculature. Bone Scans, CT scans, and MRI would be used to evaluate osteomyelitis alone.

Vascular evaluations are needed to utilize other interventional therapies as an alternative to avoid amputation. Incorporating regular advanced vascular imaging and working with vascular interventionists could reduce the number of lower extremity amputations.

Amputation is a significant event that effects patents regardless of race, gender or socioeconomic status. Interestingly there is a 76% increase in the odds of receiving an MRI (or other pre-amputation test; regression model not reported) if the patient has Medicaid compared to private insurance.

Conclusion

The majority of lower extremity amputees did not have prior vascular imaging. There is an opportunity to obtain vascular imaging to better stratify patients into alternative limb salvaging therapies.

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