

Transitibial Amputations in Patients with Diabetes with and without End-Stage Renal Disease

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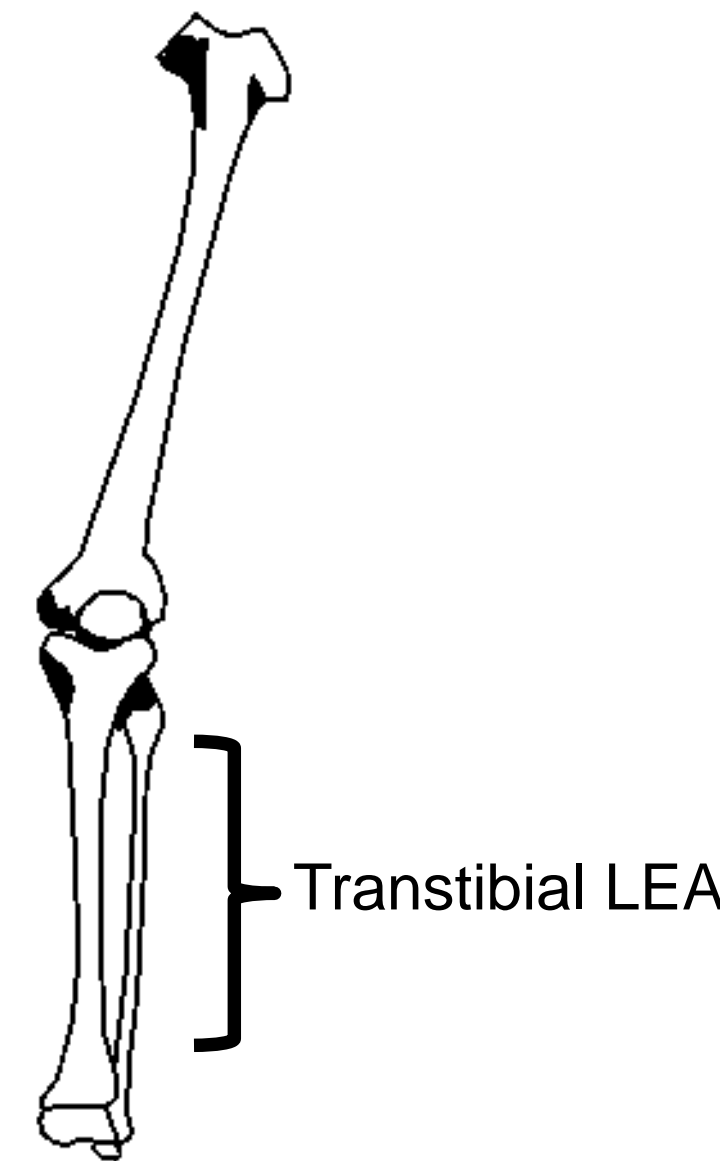
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Introduction

- Transitibial lower-extremity amputation (LEA) is a commonly performed procedure in the setting of diabetic foot disease when limb salvage is not a feasible option.
- LEA is correlated with increased morbidity, decreased function and premature mortality.
- End-stage renal disease (ESRD) is a common complication of long-standing diabetes mellitus.



Purpose

1. Report on a consecutive series of diabetic patients who underwent transitibial LEA for chronic infections and nonreconstructible deformities.
2. Compare outcomes of LEA patients with and without ESRD.
3. Identify risk factors for mortality after LEA.

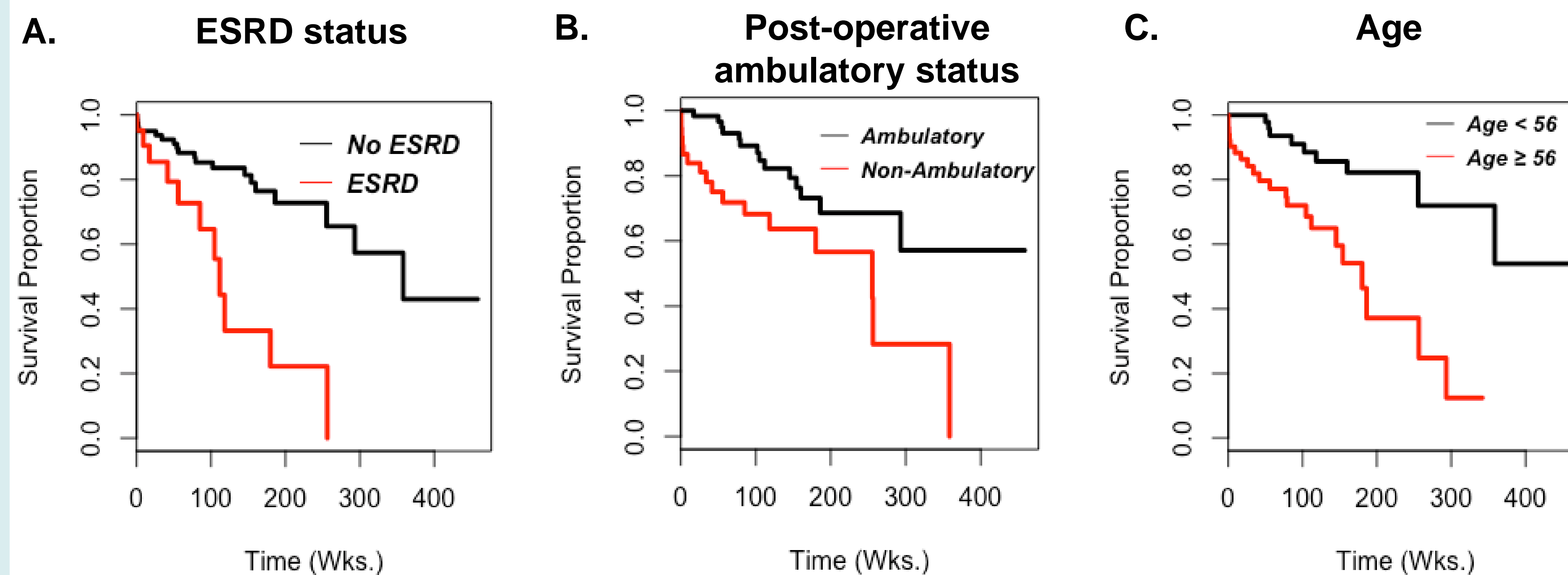
Methods

- Among patients who underwent transitibial LEA by the senior author (DKW) between April 1, 2006 to January 1, 2016, 102 patients were identified retrospectively for inclusion in the study. Patients were subsequently divided into groups based on ESRD status.
- Factors such as presence of osteomyelitis, Charcot neuropathy, peripheral artery disease, diabetic foot ulcers, gangrene, and other comorbidities were identified and recorded.
- The technique used for LEA involved a long, posterior myocutaneous flap. The modified Ertl transosseous bridge technique was utilized to stabilize the tibia and fibula. A drain was placed in most patients and removed within 1-2 days. The remaining limb was kept in extension with a U-shaped plaster covering the posterior and anterior aspects of the leg. A rigid, removable plastic brace was typically applied on post-operative day 3.
- Statistical analysis was performed using GraphPad Prism version 7 (Graphpad Software, La Jolla California USA, www.graphpad.com) and R version 3.1.1 (Vienna, Austria).

Post-operative outcomes of patients by presence of ESRD

Outcome Measure	Overall N = 102		ESRD N = 21		No ESRD N = 81		P-value
	N	(%)	N	(%)	N	(%)	
Stump Issues	31	(30.4)	6	(28.6)	25	(30.9)	0.84
Contralateral Limb Status							
Amputated	10	(10.3)	4	(21.1)	6	(7.8)	0.029
Foot Surgery	24	(24.7)	6	(31.6)	18	(23.1)	0.55
Foot Problem	33	(34.0)	8	(42.1)	25	(32.1)	0.41
Mortality	30	(29.4)	11	(52.4)	19	(23.5)	0.0095
Ambulatory Status							
Post-operative	64	(62.4)	9	(38.1)	55	(68.1)	0.034

Patient survival after LEA is correlated with ESRD, ambulatory status, and age



- A. Patients with ESRD had a significantly higher hazard of dying than those who did not have ESRD after transitibial LEA (HR=4.06, 95% CI=1.83–8.56, p<0.0005).
- B. Ability to ambulate before and after LEA were assessed. Although pre-operative ambulatory status was not significantly associated with mortality, ability to demonstrate ambulation post-operatively was associated with an decreased hazard of mortality (HR=3.8, 95% CI=0.20–0.83, p<0.05). However, post-operative ambulatory status was significantly correlated with ESRD status (p<0.05). Furthermore, the predictive value of post-operative ambulatory status for mortality was not significant when controlled for ESRD status.
- C. The median age in our study population was 56 years (25th to 75th IQR=51–63). After dichotomizing our study population into groups <56 and ≥56, we found that age ≥56 was significantly correlated with a greater hazard of dying (HR=4.30, 95% CI=1.88–9.82, p<0.005). Unlike post-operative ambulatory status, there were not any significant associations between age and ESRD status (p=0.11) or ambulatory status (p=0.14).

Discussion

Transitibial LEA is associated with increased mortality and decreased function. Our study, along with others, have reported that approximately one-third of patients do not ambulate after transitibial LEA.

In this series, patients with ESRD had significantly shorter time to final follow-up, higher HbA1c, higher serum creatinine, lower hemoglobin, greater duration of diabetes, higher incidence of peripheral artery disease, and higher incidence of vascular intervention. Post-operatively, patients with ESRD had a higher instance of amputation of the contralateral limb, increased mortality, and lower rates of ambulation. Using the multivariate Cox proportional hazards model, a significantly increased hazard of dying was associated with ESRD, inability to demonstrate ambulation after LEA, and age greater than or equal to 56.

Although a database study would provide a larger sample size to observe outcomes of LEA than a single-surgeon series, having experiences with each patient has the advantage of evaluating LEA outcomes in a clinical setting. Although seen as a last resort procedure with poor outcomes, our study demonstrated that 43% of patients (24 out of 56) who were not able to ambulate pre-operatively were able to ambulate after LEA. As a result, the authors conclude that LEA can have successful outcomes with certain factors leading to greater risk of poor outcomes when limb salvage is no longer an option.

Future Directions

1. Assess patient-reported outcomes through outcome tools from patients who have undergone transitibial LEA.
2. Identify risk factors for ankle fracture, foot ulcers, and other diabetes-related foot problems.
3. Explore potential methods of mitigating certain risk factors of poor outcomes with diabetic foot disease.

References

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