Research Week 2020

A Case Control Study using Pedal Acceleration Time as a Predictor of Limb Salvage in Patients Undergoing Revascularization Procedures

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Keywords

Revasularization,

Abstract

Background

The most accepted evaluators of lower limb arterial perfusion are arterial duplex ultrasound (DUS), ankle-brachial indices (ABIs), and toe-brachial indices (TBIs). In patients with diabetes or renal failure, ABI and TBIs can be unreliable due to medial wall calcification. DUS Interrogation of the pedal arterial arch is newly proposed method to measure limb perfusion. A previous study has shown a strong correlation (R2 = 0.88) between the Pedal Acceleration Time (PAT) and ABI in patients with no documented diabetes or renal failure. This study seeks to apply PAT as a predictor of the probability of limb salvage in patients with chronic limb-threatening ischemia (CLTI).

Methods

Patients undergoing revascularization procedures were studied (n=73), 14 of these patients required higher level limb amputation. DUS was used to interrogate the pedal arch before and after the procedure and measured PAT in milliseconds (ms). PAT along with comorbidities, demographics, and presence of wound infection were compared to limb amputation events. A multivariate logistic regression model was used to determine the most significant predictors of limb amputation.

Results

Initial analysis showed differences (salvage vs amputation) in PAT after procedure (141 ms vs 213 ms i, $p<0.0001$), proportion of patients with wound infections (0.17 vs 0.5, $p=0.009$), and proportion of patients with chronic kidney disease (CKD) (0.17 vs 0.57, $p=0.006$). PAT along with presence of infection were found to be the two best predictors of the probability of limb amputation in the multivariate logistic regression ($p=0.017$ and 0.033 respectively, pseudo R2 = 0.82).

Conclusions

PAT continues to show promise in its efficacy as an indicator of vascular health in patients with CLTI. The results show that the PAT after the revascularization procedure and presence of infection are strong predictors of the necessity of amputation.