A Case Report of a Unique Revascularization Approach for Diabetic Limb Salvage: Thoracic Aortobifemoral Bypass Tunneled through the Subcutaneous Tissue

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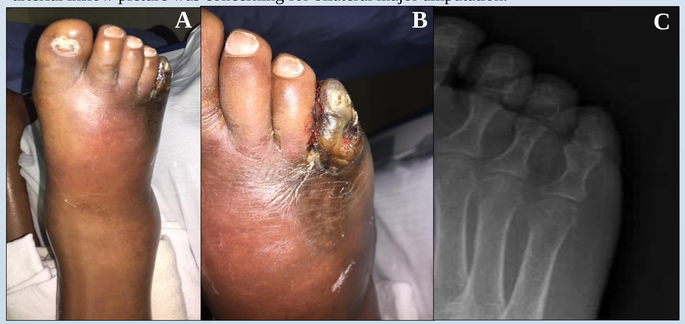
Statement of Purpose and Literature Review

There are many approaches to revascularization of lower extremity ischemia depending on the level of arterial stenosis or occlusion. For aortoiliac occlusion, an aortobifemoral bypass is a common approach, however, alternative considerations must be made in patients who cannot undergo the typical anterior abdominal dissection. Both a thoracic aortobifemoral bypass and an axillobifemoral bypass might be considered as alternatives for patients in which an abdominal approach is contraindicated. The thoracic aortobifemoral bypass was first described in 1956 although is infrequently described in the medical literature [1-2].

The objective of the present case report is to discuss our experience with a patient presenting with relatively minor tissue loss, but who was at risk for bilateral major amputation given the specific pattern of arterial occlusion and her complicated past medical history.

Case Report

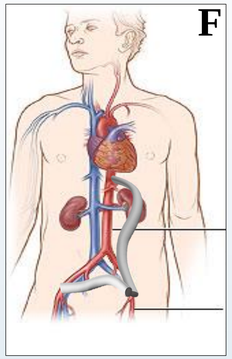
A 41 year old female presented to our limb salvage center with a necrotic right fifth digit and associated cellulitis (Figures A-C). She had a past medical history notable for type I diabetes mellitus, hypertension, dyslipidemia, peripheral arterial disease, and end stage renal disease on hemodialysis. She also had a past surgical history significant for simultaneous pancreas-kidney transplant in 2005; however, the kidney transplant had failed necessitating hemodialysis initiating in 2012. Her non-invasive vascular testing and angiogram demonstrated occluded bilateral iliac arteries with flat-lined waveforms from the thighs to the toes (Figure D). Although this represented relatively minor tissue loss, her arterial inflow picture was concerning for bilateral major amputation.

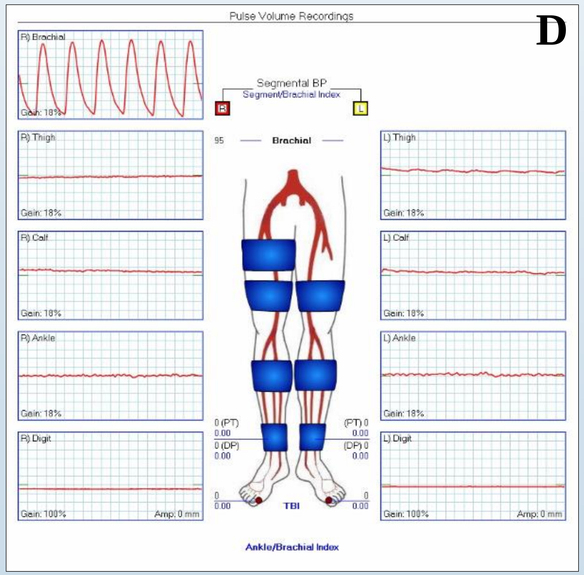


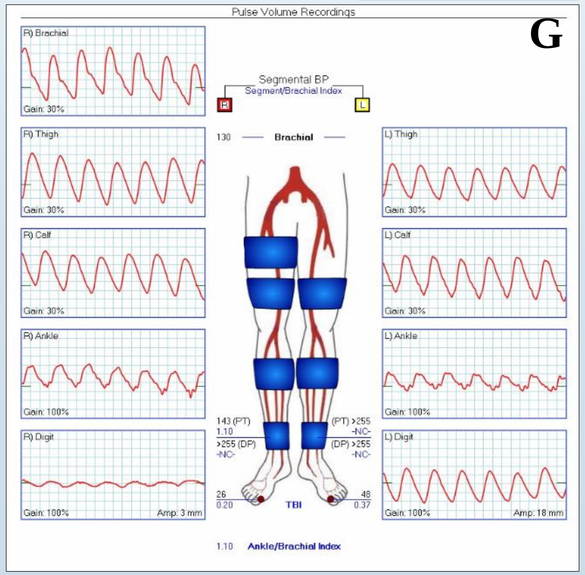
Case Report cont.

The patient was first started on IV antibiotics and underwent an open fifth digit amputation for infection source control (Figure E). When stabilized, she subsequently underwent a thoracic aortobifemoral bypass with an 8-mm polytetrafluoroethylene (PTFE) graft, left femoral endarterectomy, and left femoral to right femoral bypass (also with PTFE). Uniquely however, because of her solid organ transplant history, the graft was tunneled through the subcutaneous tissue as opposed to the abdomen. A thoracotomy was first performed to expose the thoracic aorta and a subcutaneous tunnel was made from the anterior axillary line up the costal margin. After dissection for exposure of femorals, the graft was passed from a tunnel through the diaphragm and through the subcutaneous tunnel from the anterior axillary line to the left groin incision. And end-to-side anastomosis was performed between the two grafts (Figure F). Improvement in non-invasive vascular testing was noted (Figure G).

After she was medically optimized following the bypass, a right partial fifth ray amputation was performed with negative pressure wound therapy application. She has had several setbacks involving serial debridements but remains at the same level of amputation (Figures H and I).







Discussion & Analysis

This case report details a unique situation demonstrating the importance of collaboration and communication between podiatric and vascular surgeons in diabetic limb salvage, a creative approach to revascularization, and a patient at risk for bilateral major amputation despite presentation of relatively minor lower extremity tissue loss. A typical abdominal approach was contraindicated in this patient with bilateral critical limb ischemia due to the history of solid organ transplantation. As an alternative, the graft was novelly tunneled through the subcutaneous tissue down to the level of the groin to allow for bilateral lower limb revascularization prior to completion of a partial fifth ray amputation.

Magnan et al reported on their results of lower extremity revascularization in 69 limbs in 36 patients stemming from the descending thoracic aorta secondary to numerous pathologies. They used a retrorenal tunneling approach with the prosthesis passing dorsal to the kidney within the peritoneum and found patency of 81.8% at 2 years and 72.7% at 5 years [1].

Given the circumstances in the present case, the graft had to be subcutaneously tunneled so as not to disturb the transplanted pancreas in this brittle diabetic with an already failed kidney transplant. However, given the patient's young age and anatomic restrictions, this was thought to be the most favorable approach in order to achieve successful limb salvage.

References

[1] Magnan, P. E., Ede, B., Marchetti, A. A., Rosset, E., Mathieu, J. P., & Branchereau, A. (2000). Results of lower limb revascularization from the descending thoracic aorta. *Annals of vascular surgery*, *14*(6), 567-576.
[2] Ihaya, A., Chiba, Y., Kimura, T., Morioka, K., & Uesaka, T. (2001). Descending thoracic aortobifemoral bypass for aortoiliac occlusive disease. *Asian Cardiovascular and Thoracic Annals*, *9*(2), 97-100.