

Angiosome Based Anteromedial Approach to Total Ankle Replacement: A Retrospective Analysis



Foot & Ankle Specialists of Ohio

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Statement of Purpose

The purpose of this study was to evaluate post operative complication rate of anteromedial angiosome based exposure for total ankle replacement.

Background: Classical anterior approach to total ankle arthroplasty (TAA) have been met with high wound healing complications rates. In modern studies these have varied as high as 36% of wound healing complications. Despite wound healing complication rates total ankle replacement have gained in popularity in the past decade due to advanced surgical technique and improved implant technology. The classic anterior approach allows for excellent visualization and maximal placement of implants. However perforator arteries arising from anterior tibial and dorsalis pedis arteries have to be sacrificed with this approach. We believe using anteromedial approach allows for improved wound healing due to junction created by perforators from anterior tibial and posterior tibial angiosomes.

Method: We retrospectively evaluated medical charts of all patient that underwent anteromedial total ankle arthroplasty approach for any wound complications, co-morbidities, days from initial surgery till range of motion was initiated and infection rate. We found 25 patients who underwent this approach between 2012 and 2017.

Surgical Approach: Patient was placed in supine position and underwent general anesthesia. All patients received popliteal and saphenous nerve block prior to surgery and thigh tourniquet was employed. Doppler examination was performed pre operatively in all patients and perforator vessels were identified and marked. Incision was placed over the medial border of anterior tibialis tendon and curved medially distally. Tibialis anterior tendon sheath was incised and tibialis anterior tendon was retracted medially or laterally as needed. Neurovascular bundle was retracted laterally. The floor of the tibialis anterior tendon was identified and full thickness incision was placed over the ankle joint. Cobb elevator was used to reflect capsular and periosteal fibers and ankle joint was exposed. Ankle arthroplasty with appropriate implant was performed as per the guidelines of the respective implant. Skin closure was performed with absorbable suture for deep and subcutaneous tissue and non-absorbable suture or skin staples were used for skin closure. All patients were placed in a posterior splint with ankle in neutral position

Patient	Age	Co-morbidity	Implant	Active ROM	Wound Dehiscence	Other Complications
1	57	None	star	21	No	None
2	72	GERD	inbone	21	No	Talar subsidence
3	70	HTN	star	27	No	None
4	74	None	star	21	No	None
5	50	None	star	21	No	None
6	59	Type II DM	inbone	13	No	None
7	67	Type II DM	salto?	21	No	None
8			star	21	No	Talar Subsidence
9	83	HTN, HLD	infinity	21	No	None
10	62	None	inbone	21	No	None
11	58	HTN, HLD	infinity	21	No	None
12	55	Depression, Anxiety, PTSD	infinity	21	No	None
13	58	None	infinity	NA	Incision Dehiscence.	None
14	76	HTN, HLD, DM II, DPN	infinity	21	No	None
15	62	None	Infinity	21	No	None
16	59	HTN, HLD, DM II, DPN, COPD	infinity	21	No	None
17	48	HTN, Gout	infinity	21	No	None
18	63	HTN, Depression, Bipolar Disease	Infinity	21	No	None
19	62	HTN, HLD	infinity	21	No	None
20	45	Anxiety	infinity	21	No	None
21	67	HTN, DM, OA	Infinity	28	No	None
22	59	HLD, CAD	Infinity	28	No	None
23	49	Breast Cancer	Infinity	28	No	None
24	68	DM II, CHF, HTN	Infinity	28	No	None
25	61	GERD, PUD, HLD	Infinity	28	No	None
Average	59.36			21.48	1	2

Table 1. Shows patient age, comorbidity, implant used, time when active ankle range of motion was initiated and wound complications.

Results: We found one out of 25 patients who developed wound dehiscence and required repeat surgery for debridement and skin graft. This patient went on to heal the incision after the skin graft procedure. No other incidences of wound complications were noted. We did not find any incidences of superficial or deep infections. Patients were allowed passive range of motion on average at 7.28 days and active ankle range of motion on average at 21.48 except the one patient with wound healing complication. Of note four patients had type 2 diabetes mellitus. Table 1 shows co-morbidities, implant used, days when active and passive ankle range of motion was initiated.



Figure 1. A. Incision marked over the medial border of TA tendon with anterior tibial and posterior tibial perforator vessels marked at 5cm and 10cm proximally from the ankle joint. B,C. Tibialis anterior tendon sheath. D. Floor of the TA tendon. E and F. Exposure of the ankle joint with TA tendon retracted medially and neurovascular bundle retracted laterally. G,H. Postoperative appearance

Discussion: Wound healing complications associated with classical anterocentral approach have been attributed to poor tissue handling, poor patient selection and longer operative time. Many studies have shown diabetes, smoking and increased operative time to be associated with high post-operative complications. Incisional negative pressure wound therapy (NPWT) and compression dressings as well as other novel dressing modalities including continuous external tissue expander have been employed to improve wound healing potential after TAA. However there have not been any retrospective studies to our knowledge that has evaluated effects of perforator arteries in tissue healing for total ankle arthroplasty or ankle arthrodesis.

Ian Taylor and Chris Attinger first described angiosome and blood supply to the ankle. The safest placement of incision is at the junction of two angiosome. Classical anterocentral approach splits the anterior angiosome. Anterocentral ankle joint area is most common region for dehiscence. Our incisional and dissection approach incorporates idea of angiosomes and perforator vessels by placing the incision over the anterior tibial and posterior tibial angiosome junction leading to improved wound healing.

This incision approach can be utilized not only for total ankle replacement but also for any anterior ankle or distal tibial surgery including arthrodesis and pilon fracture specially if tissue is compromised due to previous surgery or poor host.

References

1. Glazebrook MA, Arsenault K, Dunbar M. Evidence-based classification of complications in total ankle arthroplasty. *Foot Ankle Int.* 2009;30(10):945-949.
2. Gougoulas N, Khanna A, Maffulli N. How successful are current ankle replacements? A systematic review of the literature. *Clin Orthop Relat Res.* 2010;468(1):199-208.
3. Myerson MS, Shariff R, Zonno AJ. The management of infection following total ankle replacement: demographics and treatment. *Foot Ankle Int.* 2014;35(9):855-862.
4. Raikin SM, Kane J, Ciminiello ME. Risk factors for incision healing complications following total ankle arthroplasty. *J Bone Joint Surg Am.* 2010;92(12):2150-2155.
5. Whalen JL, Spelsberg SC, Murray P. Wound breakdown after total ankle arthroplasty. *Foot Ankle Int.* 2010;31(4):301-305.
6. Matsumoto T, Parekh SG. Use of Negative Pressure Wound Therapy on Closed Surgical Incision After Total Ankle Arthroplasty. *Foot Ankle Int.* 2015;36(7):787-794.
7. Lampley A, Gross CE, Green CL, DeOrto JK, Easley M, Adams S, Nunley J. Association of Cigarette Use and Complication Rates and Outcomes Following Total Ankle Arthroplasty. *Foot Ankle Int.* 2016;37(10):1052-1059.
8. Avashia Y, Shammass RL, Mirhani SK, Parekh SG. Soft Tissue Reconstruction After Total Ankle Arthroplasty. *Foot Ankle Clin N Am* 22 (2017) 391-404
9. Hsu AR, Franceschina D, Haddad SL. A Novel Method of Postoperative Wound Care Following Total Ankle Arthroplasty. *Foot Ankle Int.* 2015;35(7):719-724.
10. Huh J, Parekh SG. Use of a continuous external tissue expander in total ankle arthroplasty: a novel augment to wound closure. *Foot Ankle Spec* 2016;9(1):43-7.
11. Schipper ON, Hsu AR, Haddad SL. Reduction in wound complications after total ankle arthroplasty using a compression wrap protocol. *Foot Ankle Int* 2015; 36(12):1448-54.
12. Attinger CE, Evans KK, Bulan E, Blume P, Cooper P. Angiosomes of the foot and ankle and clinical implications for limb salvage: reconstruction, incisions, and revascularization. *Plast Reconstr Surg.* 2006 Jun;117(7 Suppl):2615-2935.