



Low Incidence Complication with Anteromedial Angiosome Based Approach to Total Ankle Arthroplasty: A Retrospective Analysis of 27 Cases

Edgardo Rodriguez-Collazo*, Naren Patel, Stephen Frania, Dominic Rizzo, Arshad Khan and Narendra Patel

Department of Surgery, Presence Saint Joseph Hospital, USA

Abstract

Background: Classical anterior approach to total ankle arthroplasty has been associated with high rate of wound healing complications. High complication rates have been due to poor tissue handling by surgeon or poor patient selection. Orthoplastic angiosome based approach would be to place the incision between two angiosomes for ideal wound healing. Here we describe a novel anteromedial orthoplastic dissection approach with low incidence of complications.

Method: We reviewed medical charts of 27 patients who underwent anteromedial total ankle arthroplasty approach. We evaluated charts for wound healing complications, patient age, co-morbidities and when passive and active ankle range of motion initiated from the day of surgery.

Results: We found one out of 27 patients (3.7%) had wound healing complications. This patient required surgery for soft tissue coverage. Five out of the 27 (18.5%) patients were noted to be type II diabetic. We did not observe a correlation between diabetes as co-morbidity and wound complication.

Conclusion: Anteromedial orthoplastic angiosome based dissection approach for total ankle arthroplasty is associated with low wound healing complications. This is very valuable in patients with poor tissue envelope from prior surgery or injuries as well as in patients with co-morbidities such as diabetes and inflammatory pathologies which have been shown to increase post operative complications with total ankle arthroplasty.

Keywords: Total ankle replacement; Anteromedial ankle; Orthoplastic; Total ankle arthroplasty

Introduction

Classical anterior approach to Total Ankle Arthroplasty (TAA) has been met with high wound healing complications rates. In modern studies these have varied as high as 36% of wound healing complications [1-6]. 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 antero-central 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. Incision healing occurs through choke vessels which open up due to retrograde flow when perforator vessels are not functional. Ian Taylor first described foot and ankle angiosomes [7,8]. Figure 1 shows angiosome, perforator vessel and choke vessel anatomy [9]. The safest incision placement is at the junction of two angiosomes which are anterior tibial and posterior tibial angiosomes at the ankle joint level [10,11].

Wound healing complications associated with classical antero-central 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 [12,13]. 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 [14-16]. However there have not been any studies to our knowledge that has evaluated effects of perforator arteries in tissue healing for total ankle arthroplasty or ankle arthrodesis. We hypothesized that leaving perforators intact by anteromedial dissection instead of standard antero-central incision for total ankle arthroplasty will

OPEN ACCESS

*Correspondence:

Edgardo Rodriguez-Collazo,
Department of Surgery, Director
Chicago Foot & Ankle Deformity
Correction Center, Illizarov Correction
& Microsurgical Limb Reconstruction
Presence Saint Joseph Hospital,
Chicago, USA,
E-mail: egodpm@gmail.com

Received Date: 04 Jun 2018

Accepted Date: 21 Jun 2018

Published Date: 28 Jun 2018

Citation:

Rodriguez-Collazo E, Agyen J.
Low Incidence Complication with
Anteromedial Angiosome Based
Approach to Total Ankle Arthroplasty:
A Retrospective Analysis of 27 Cases.
Clin Surg. 2018; 3: 2000.

Copyright © 2018 Edgardo Rodriguez-Collazo. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Table 1: Shows co-morbidities, implant used, days when active and passive ankle range of motion was initiated.

Patient	Age	Co-morbidity	Implant	Passive ROM	Active ROM	Wound Dehiscence	Other Complications	Revision Surgery
1	57	None	star	7	21	No	None	No
2	72	GERD	inbone	7	21	No	Talar subsidence	Yes
3	70	HTN	star	7	27	No	None	No
4	74	None	star	7	21	No	None	No
5	50	None	star	7	21	No	None	No
6	59	Type II DM	inbone	7	13	No	None	No
7	67	Type II DM	salto	7	21	No	None	No
8	60	Type II DM	star	7	21	No	Talar hardware Subsidence	No
9	83	HTN, HLD	infinity	7	21	No	None	No
10	62	None	inbone	7	21	No	None	No
11	58	HTN, HLD	infinity	7	21	No	None	No
12	55	Depression, Anxiety, PTSD	infinity	7	21	No	None	No
13	58	None	infinity	7	NA	Incision Dehiscence.	None	Yes
14	76	HTN, HLD, DM II, DPN	infinity	7	21	No	None	No
15	62	None	Infinity	7	21	No	None	No
16	59	HTN, HLD, DM II, DPN, COPD	infinity	7	21	No	None	No
17	48	HTN, Gout	infinity	7	21	No	None	No
18	63	HTN, Depression, Bipolar Disease	Infinity	7	21	No	None	No
19	62	HTN, HLD	infinity	7	21	No	None	No
20	45	Anxiety	infinity	7	21	No	None	No
21	67	HTN, DM, OA	Infinity	7	28	No	None	No
22	59	HLD, CAD	Infinity	7	28	No	None	NO
23	49	Breast Cancer	Infinity	7	28	No	None	No
24	68	DM II, CHF, HTN	Infinity	14	28	No	None	NO
25	61	GERD, PUD, HLD	Infinity	7	28	No	None	No
26	61	HTN	Infinity	N/A	21	No	None	No
27	72	Hypothyroidism	STAR	3	3	No	None	No
Average	62.3			7.89	20.68	1	2	2

DM II: Diabetes Type II; GERD: Gastroesophageal Reflux Disease; PUD: Peptic Ulcer Disease; HTN: Hypertension; HLD: Hyperlipidemia; CAD: Coronary Artery Disease; CHF: Congestive Heart Failure; DPN: Diabetic Peripheral Neuropathy

result in fewer wound healing complications.

Methods

Chart review

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 28 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 (Figure 2). 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.

Post operative course

All patients were placed in a posterior splint with ankle in neutral position. Patients were kept non weight bearing for six weeks. Patients were transitioned in to Controlled Ankle Motion (CAM) boot at one week. Sutures or staples were removed at two weeks. Passive ankle range of motion was initiated at 1 to 3 weeks post operatively and active range of motion was allowed at 3 to 4 weeks post operatively depending on clinical evaluation. Physical therapy was initiated at approximately 3 weeks post operatively.

Results

We found one out of 27 (3.7%) patients who developed wound

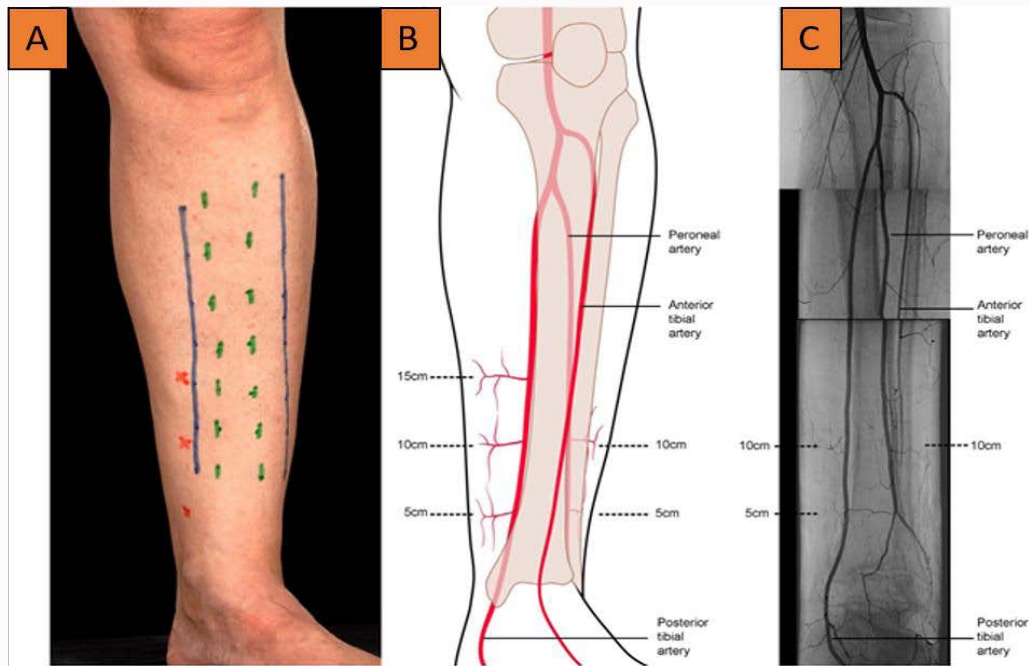


Figure 1: Angiosome, perforator vessel and choke vessel anatomy.



Figure 2: Cobb elevator was used to reflect capsular and periosteal fibers and ankle joint was exposed.

dehiscence and required repeat surgery for debridement and skin graft. One patient with wound complications required free flap with split thickness skin graft. 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 between 1 to 3 weeks with an average of 8 days and active ankle range of motion between 2 to 4 weeks with an average of 21 days except the two patients with wound healing complications. Of note six patients had type 2 diabetes mellitus. Patient age ranged between 45 and 76

years with an average of 62.26 years. We did not see any correlation between co-morbidities such as diabetes and wound complications in our study. Patient with wound complications did not have diabetes mellitus.

Discussion

Classical antero-central approach to ankle arthrodesis, pilon fracture or total ankle arthroplasty allows for excellent visualization of ankle joint however high incidences of wound healing complications have been found in many studies. Many factors dictate wound

healing including patient's co-morbidities such as peripheral artery disease, inflammatory pathologies, smoking and diabetes [5,6,12,13]. Soft tissue healing is greatly compromised in acute trauma such as high energy pilon fracture or history of previous such injury requiring surgery. Surgeon's tissue handling has been attributed to poor wound healing rates. We believe sacrificing perforators during the anterocentral approach is factor leading to such high wound complication rates as choke vessels needed for central incision healing do not readily open up until two to three weeks.

Superficial and minor wounds can be managed with modalities such as compression therapy, negative pressure wound therapy, wound care and split thickness skin graft [12,13]. However avoiding any wound complications is most ideal. Complex wounds arising from anterocentral surgical approach can have devastating consequences for the patient. Soft tissue coverage in this region of the lower extremity remains a challenge for the orthopedic and plastic surgeon to this day. Free flaps and perforator pedicle flaps are the mainstay for achieving wound closure for anterior ankle wounds that are not amenable to local wound care [12].

Detailed knowledge of the angiosome of the foot and ankle is needed for the best surgical technique. Perforators arise from anterior tibial, peroneal and posterior tibial artery at approximately 5 cm, 10 cm and 15 cm from the ankle joint. (Figure 1) [9]. Orthoplastic approach dictates that we respect these vessels not only for best outcomes but also for potential muscle or fasciocutaneous flap that may be needed should the wound complications arise. The safest placement of incision is at two angiosome borders [10]. We believe our anteromedial approach gives us adequate exposure for arthroplasty and implant insertion as well as preserve perforator vessels. This is of great value especially in compromised hosts with multiple co-morbidities.

Limitations of our study include retrospective nature of it and lack of a control group. Prospective randomized studies would give us a better power to conclude if anteromedial approach decreases wound healing complications for total ankle arthroplasty or arthrodesis. This however does not detract from clinical importance of knowledge of perforator and angiosome anatomy for incision planning prior of any major foot and ankle surgery.

References

1. Glazebrook MA, Arsenault K, Dunbar M. Evidence-based classification of complications in total ankle arthroplasty. *Foot Ankle Int.* 2009;30(10):945-9.
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. Matsumoto T, Parekh SG. Use of negative pressure wound therapy on closed surgical incision after total ankle arthroplasty. *Foot Ankle Int.* 2015;36(7):787-94.
4. Myerson MS, Shariff R, Zonno AJ. The management of infection following total ankle replacement: demographics and treatment. *Foot Ankle Int.* 2014;35(9):855-62.
5. Raikin SM, Kane J, Ciminiello ME. Risk factors for incision healing complications following total ankle arthroplasty. *J Bone Joint Surg Am.* 2010;92(12):2150-5.
6. Whalen JL, Spelsberg SC, Murray P. Wound breakdown after total ankle arthroplasty. *Foot Ankle Int.* 2010;31(4):301-5.
7. Taylor GI, Palmer JM. The vascular territories (angiosomes) of the body: experimental study and clinical observations. *Br J Plast Surg.* 1987;40:113-41.
8. Taylor GI, Pan WR. Angiosomes of the leg: anatomic study and clinical implications. *Plast Reconstr Surg.* 1998;102(3):599-616.
9. Nanchahal J, Nayagam S, Khan U, Moran C, Barrett S, Sanderson F, et al. Standards for the management of open fractures of the lower extremity. 2009.
10. Attinger C, Cooper P, Blume P, Bulan E. The safest surgical incisions and amputations applying the angiosome principles and using the Doppler to assess the arterial-arterial connections of the foot and ankle. *Foot Ankle Clin.* 2001;6(4):745-99.
11. 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;117(7):261S-93S.
12. Avashia Y, Shamma RL, Mithani SK, Parekh SG. Soft tissue reconstruction after total ankle arthroplasty. *Foot Ankle Clin.* 2017;22(2):391-404.
13. Lampley A, Gross CE, Green CL, De Orio JK, Easley M, Adams S, et al. Association of cigarette use and complication rates and outcomes following total ankle arthroplasty. *Foot Ankle Int.* 2016;37(10):1052-9.
14. Hsu AR, Franceschina D, Haddad SL. A Novel method of postoperative wound care following total ankle arthroplasty. *Foot Ankle Int.* 2015;35(7):719-24.
15. 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.
16. 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.