

Comparative Analysis of the Drainage Ankle Disarticulation to Guillotine Transtibial Amputation in the Staged Approach to Below Knee Amputation

Medstar Georgetown University Hospital – Center for Wound Healing
 Christopher Kennedy DPM, Kevin Ragothaman DPM, Alissa Myer DPM, Kurtis Bertram DPM, Christopher Attinger MD, Paul Carroll DPM, John Steinberg DPM.

Introduction

The staged approach to below knee amputation has previously been reported as a method to achieve closure of an amputation stump. Transtibial, or “guillotine,” amputations are often employed as the first stage amputation. An alternative approach, ankle joint disarticulation, can be used. This allows for rapid decompression of infection while preserving tissue for reconstruction and minimizing blood loss. This study aims to evaluate outcomes between the groups.

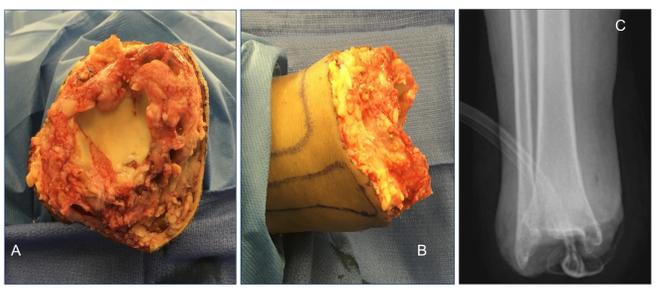
Methods

Following IRB approval, a search of the available electronic medical record at a single academic institution from 2015-2017 was carried out.

INCLUSION CRITERIA

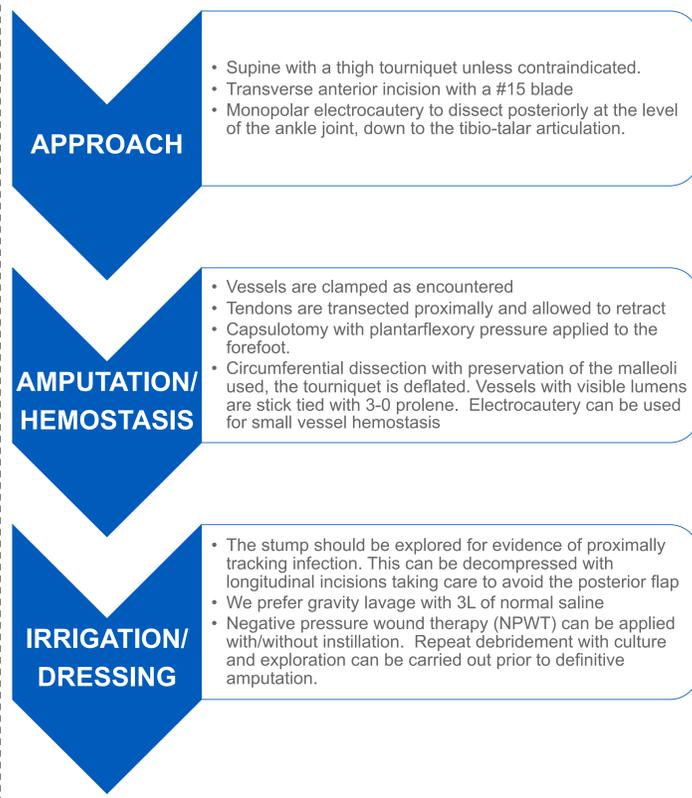
- Ankle Disarticulation
- Guillotin Transtibial Amputation

Two blinded physician reviewers retrospectively evaluated patient records and collected data on demographics, medical history, and a detailed analysis of procedure and outcome. Complications were analyzed and incidence of complication was identified.



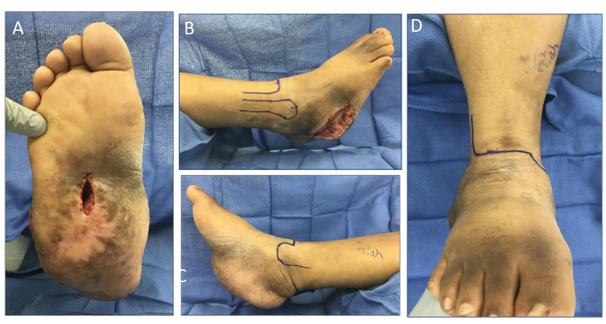
*Soft tissue preservation post disarticulation.

Surgical Technique



Indications

- A. Necrotizing foot infection with need for rapid source control
- B. Tracking infection, crossing proximal to the ankle
- C. Contraindications to general anesthesia
- D. Required soft tissue preservation for functional below knee amputation



*Incision planning and amputation level.

Results

A total of 54 patients were identified. The majority were male (n=39, 72.2%). Diabetes was the most prevalent comorbidity (n=47, 87%). 26 patients (48.2%) underwent guillotine transtibial amputation and 28 (51.9%) with drainage ankle disarticulation. Demographic information can be seen in Table A.

A	Amputation Group					P value	
	Overall		Ankle Disarticulation		Guillotine Transtibial		
	n=54	(%)	n=28	(%)	n=26	(%)	
Female	15	27.9	6	21.4	9	34.6	0.2797
Male	39	72.2	22	78.6	17	65.4	0.2797
DM	47	87	24	85.7	23	88.5	1
HTN	41	75.9	21	75.0	20	76.9	0.8688
CAD	8	14.8	9	10.7	5	19.2	0.4602
CHF	11	20.4	5	17.9	6	23.1	0.6342
HLD	21	38.9	8	28.6	13	50	0.1065
PAD	24	46.3	15	53.6	10	38.5	0.2659
Venous Stasis	19	35.2	12	42.9	7	26.9	0.2205
CKD	24	44.4	10	35.7	14	53.8	0.1803
Anemia	15	27.8	3	10.7	12	46.2	0.0037

There was a significant difference in perioperative anemia between the groups, with less prevalence seen in ankle disarticulations (p=0.0037). This has previously been reported as a predictor of mortality along with PAD post amputation.

B	Ankle Disarticulation		Guillotine Transtibial		P value
	n=28	(%)	n=26	(%)	
Total Post Amp Debridement's	2	7.1	5	19.2	0.1696
Post Amp Revision	6	21.5	5	17.9	0.2531
Progression to AKA	0	0.0	1	3.8	0.4815
Post Amputation Infection	3	10.7	1	3.8	0.6115

Outcome measures are seen in Table B. There was no significant difference in the number of debridement's prior to closure (p=0.1696), need for revision (p=0.2531), progression to proximal amputation (p=0.4815) or the rate of post operative infection following definitive amputation (p=0.6115).

Conclusion

There were no statistically significant outcome discrepancies between the aggregate groups. We continue to believe ankle disarticulation provides many benefits over immediate transtibial guillotine amputation.

- A. Posterior flap preservation:** By technique, ankle disarticulation maintains the posterior compartment allowing for posterior flap advancement and myotenodesis at the terminal amputation. Rapid source control may halt progressive necrosis further maintaining compartment and flap integrity.
- B. Hemostasis:** High volume blood loss is possible after tibial transection especially with the application of NPWT. Ankle disarticulation preserves cortices, decreasing blood loss and allowing for NPWT application.
- C. Local Anesthesia:** Although preference would favor general anesthesia prior to amputation, in emergent cases with a compromised patient, ankle disarticulation could be performed under local anesthesia.

Further work: Subgroup analysis is warranted. Further investigation is especially needed to evaluate the source and outcomes of those with and without anemia. Additional evaluation of amputation history could reveal contributing factors. Prospective analysis may validate findings.

References

- Centers for Disease Control and Prevention. Estimates of Diabetes and Its Burden in the United States. National Diabetes Statistics Report, 2017. Atlanta, GA: Centers for Disease Control and Prevention, US Department of Health and Human Services; 2017.
- Giurato L, Meloni M, Izzo V, Uccioli L. Osteomyelitis in diabetic foot: A comprehensive overview. *World J Diabetes* 2017; 8(4):135-142
- McIntyre, KE., Bailey, SA., Malone, JM., Goldstone, J. Guillotine Amputation in the Treatment of Nonsalvageable Lower-Extremity Infections. *Arch Surg* 1984; 119: 450-453
- Desai, Y., Robbs, J.V., Keenan, J.P. Staged below-knee amputations for septic peripheral lesions due to ischaemia. *Br J Surg* 1986; 73: 392-394
- Fisher, DF., Clagett GP., Fry, RE., Humble TH., Fry, WJ. One-stage versus two-stage amputation for wet gangrene of the lower extremity: A randomized study. *J Vasc Med Biol* 1988; 8: 428-433
- Altindas, M., Kilic, A., Cinar, C., A reliable surgical approach for the two-staged amputation in the unsalvageable limb and the life threatening acute progressive diabetic foot infections: Tibiotalar disarticulation with vertical crural incisions and secondary transtibial amputation. *J Foot Ankle Surg* 2011; 17: 17-18
- Kim PJ, Attinger CE, Steinberg JS, et al. The impact of negative-pressure wound therapy with instillation compared with standard negative-pressure wound therapy: a retrospective, historical, cohort, controlled study. *Plast Reconstr Surg*. 2014;133(3):709-16.
- Madhusudhan VL. Efficacy of 1% acetic acid in the treatment of chronic wounds infected with *Pseudomonas aeruginosa*: prospective randomized controlled clinical trial. *International Wound Journal* 2016; 13(6): 1129-1136
- Keeley, J., Kaji, A., Kim, D., Plurad, D., Putnam, B., Neville, A. Nutritional Status Does Not Correlate with Stump Complications in Two-stage Lower Extremity Amputations. *Am Surg* 2015; 81: 922-926
- Chiodo CP, Stroud DD. Optimal surgical preparation of the residual limb for prosthetic fitting in below-knee amputations. *Orthotics and Prosthetics of the Foot and Ankle* 2001; 6(2):253-264

