

# Conversion of Failed Tibiotalar Fusion to Total Ankle Arthroplasty

Tonda Silva, DPM, AACFAS, Matthew Wilson, DPM, AACFAS, Christopher Juels, DPM, AACFAS, Eric So, DPM, AACFAS, Ryan Scott, DPM, FACFAS

The CORE Institute Foot and Ankle Advanced Reconstruction Fellowship

## Statement of Purpose

Treating a failed ankle arthrodesis remains a challenging problem. Though there have been several publications documenting success with converting failed ankle arthrodesis to a total ankle arthroplasty, this remains a controversial treatment choice. This study is a retrospective review of eight ankles in eight patients who underwent a conversion of a failed ankle arthrodesis to a total ankle arthroplasty between 2012-2017. The purpose of this poster is to present these intermediate term results.

## Methods

We identified all patients who underwent conversion of tibiotalar arthrodesis to total ankle replacement by one of our fellowship trained foot and ankle surgeons from 2012 to 2017. Patients were excluded if follow up time was less than 12 months or if they were less than 18 years old.

## Literature Review

The gold standard for the surgical management of end stage ankle arthritis has been ankle arthrodesis for many decades (1,2). However, recent literature demonstrates comparable results in patient satisfaction and pain relief in the primary total ankle arthroplasty versus the primary ankle arthrodesis group (3-5). Common reasons for ankle arthrodesis failure include non-union, mal-union, adjacent joint arthritis, fracture or infection (5,6). Non-union is the most common reason for failure in the early post-operative period and is reported to occur from 0% to 41% of patients(4-10). Unfortunately, patient satisfaction decreases and adjacent joint arthrosis increases as time progresses from the primary arthrodesis. (10,11) Coester found in patients 20 years out from ankle fusion, a 100% incidence of decreased subtalar joint range of motion with over 90% of patients also having radiographic evidence of moderate to severe subtalar arthritis (10).

There have been numerous techniques reported for the management of a failed ankle arthrodesis including: revision with internal or external fixation, deformity correction with osteotomies, fusion of adjacent joints, or even below knee amputation (2,7,12,13). These revision arthrodesis procedures confer greater limitations on the patient in addition to having a high complication and non-union rates (2,7,12). Revision of a failed ankle arthrodesis to a total ankle arthroplasty has been described as an alternative treatment with improved success of newer generation ankle implants. To our knowledge six papers have looked into total ankle arthroplasty for the treatment of symptomatic failed tibiotalar fusion, with limited number of patients included (2,13-18).

## Tables

Table 1- Individual Patient Data

Patient #	Fusion Hardware	Time to Revision (months)	Reason for Takedown of Fusion	Follow-up from TAR (months)	Reoperations After TAR	TAR Revised
Patient 1	Anterior Plate	9.4	Nonunion, broken hardware	35	0	No
Patient 2	Unknown	125.9	Nonunion, STJ arthritis	30.5	1 (revision)	Yes to TTC Fusion
Patient 3	Anterolateral plate + interfrag screws	13.1	Nonunion	11.9	0	No
Patient 4	Interfrag screws	292.2	STJ and TN arthritis	10.3	0	No
Patient 5	Anterior Plate	36.4	Nonunion	34.9	1 (revision)	Yes to custom TAR system
Patient 6	Staples	182.6	Ankle malunion, STJ and TN arthritis	18.7	1 (revision)	Yes to revision TAR system
Patient 7	Interfrag screws	91.6	Nonunion, Medial mal fx	25.3	1 (gutter clean out)	No
Patient 8	Anterior plate + interfrag screw	11	Chronic pain (emphasis over STJ and TN)	26	1 (calcaneal osteotomy)	No

\* TTC: tibiotalar calcaneal  
\* TAR: total ankle replacement

Table 2 - Concomitant Procedures

Procedure	No. (%)
Gastrocnemius recession	3 (37.5)
Tendo Achilles lengthening	3 (37.5)
Subtalar fusion*	3 (37.5)
Medial malleolar ORIF	2 (25)
Talonavicular fusion	1 (12.5)
Metatarsal osteotomy	1 (12.5)

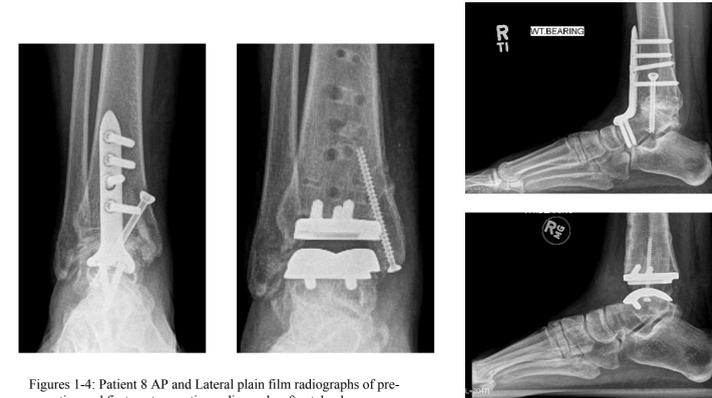
\* One additional patient underwent staged subtalar joint fusion 22 days prior to total ankle arthroplasty

Table 3 - Complications

Complications	No. (%)
Talar Body Collapse with subsidence of implant	2 (25)
Subsidence of tibial component	2 (25)
STJ arthritis	2 (25)
Impingement	2 (25)
Heterotrophic ossification	1 (12.5)
Chronic pain	1 (12.5)
Foot drop	1 (12.5)

## Results

Eight total ankle arthroplasties were performed in patients who previously underwent tibiotalar arthrodesis. All patients were symptomatic and the indications are listed in table 1. The mean preoperative VAS pain score was 7.1. The VAS score at one year postoperative follow-up was 5.6. This improved to 4.1 at the most recent follow-up visit (p = 0.0230). 2 of the 8 patients reported being pain-free at the most recent office visit. Each patient underwent a concomitant procedure at the time of conversion to total ankle arthroplasty (Table 2). Seven of the eight patients reported some level of complication (Table 3). Patients who required explantation of the metallic total ankle implants were deemed failures. Three of the eight patients (37.5%) failed the conversion procedure and no longer retained the original total ankle implant at the time of final follow-up



Figures 1-4: Patient 8 AP and Lateral plain film radiographs of pre-operative and first post-operative radiographs after take down.

## Analysis & Discussion

Our results demonstrate that conversion of a failed ankle arthrodesis to a total ankle arthroplasty is a viable salvage procedure. It is not without complications and does not have the same success rate as a primary ankle arthroplasty. Literature is limited with this procedure, but previous studies have shown good results with the majority of patients being satisfied. Greisberg et al in was the first to report a takedown of a painful ankle fusion to a total ankle replacement. They reported an implant survivability rate of 58 % (11 of 19) at an average of 39 months follow up (13). Our results were slightly better than Greisberg's with 5 of our 8 patients keeping their original implants, an implant survivability rate of 63%. However, our rate is lower than the ankle implant survival rate reported by Hintermann et al., Pellegrini et al., Schubert et al., and Huntington et al. who at intermediate follow-up had rates of 87 %, 87%, 100%, 100% respectively (14,15,16,2). Our small patient population could explain the reduced implant survival rate as well as the revisional nature, but it does still fall within the mean reported for primary total ankle arthroplasty survivability between 51-98.7% after intermediate to long-term follow up (14,19).

All patients in this series had a reduction in their VAS pain scale scores, but only two patients were completely pain free at their last follow up. Consistent with our higher implant failure rate, our mean VAS post-operative score and complete pain free patients were not as favorable compared to the other TAR conversion papers (2,14,15). In addition to reduction in pain, patients also see improved functionally. Atkinson et al presented a case report which showed an increased pace, stride length, cadence, and ankle power following conversion (18).

Seven of our eight patients reported complications. Using the system published by Glazebrook et al. we had three high grade complications and all of these patients had to be revised, two were revised with different TAR implants and one was revised to a TTC nail (19). All patients had concomitant procedures performed during the surgery (Table 2). 6 of the 8 had either a gastrocnemius lengthening or tendoachilles lengthening which would lead you to believe contracture of the posterior soft tissue structures is a specific problem after long standing ankle fusions.

This is a retrospective case series with a small sample size. Additional functional outcome instruments would allow for a more thorough evaluation of patient satisfaction. We believe, conversion of a failed tibiotalar fusion to a total ankle arthroplasty is a viable technique to preserve the limb and to improve pain. However, there is a high risk of complications, additional surgeries, and involves a technically challenging procedure.

## References

- Hendrickx RP, Stufkens SA, de Bruijn EE, et al. Medium-to long-term outcomes of ankle arthrodesis. *Foot Ankle Int* 2011; 32 (10): 940-947.
- Huntington WP, Davis WH, Anderson R. Total Ankle Arthroplasty for the treatment of symptomatic nonunion following tibiotalar fusion. *Foot & Ankle Specialist*. August 2018. Vol.9 No.4, 330-335.
- Daniels TR, Younger AS, Penner M, et al. Intermediate-term results of total ankle replacement and ankle arthrodesis: a COFAS multicenter study. *J Bone Joint Surg AM* 2014; 96 (2): 135-142.
- Haddad SL, Coetzee JC, Estok R, et al. Intermediate and long term outcomes of total ankle arthroplasty and ankle arthrodesis: a systematic review of the literature. *J Bone Joint Surg AM* 2007; 89 (9):1899-1905.
- Lawton CD, Butler BA, Dekker RG, et al. Total ankle arthroplasty versus ankle arthrodesis- a comparison of outcomes over the last decade. *J of Orthopaedic Surgery and Research* 2017;12 (76).
- Morrey BF, Wiedeman GP Jr. Complications and long-term results of ankle arthrodeses following trauma. *J Bone Joint Surg* 62-A:777-784, 1980.
- Easley ME, Montijo HE, Wilson JB, Fitch RD, Nunley JA. Revision tibiotalar arthrodesis. *J Bone Joint Surg Am*. 2008;90:1212-1223.
- Frey C, Halikus NM, Vu-Rose T, Ebrahimzadeh E. A review of ankle arthrodesis: predisposing factors to nonunion. *Foot Ankle Int*. 1994;15:581-4.
- Lynch AF, Bourne RB, Rorabeck CH. The long-term results of ankle arthrodesis. *J Bone Joint Surg* 70-B:113-116, 1988.
- Coester LM, Saltzman CL, Leupold J, Pontarelli W. Long-term results following ankle arthrodesis for post-traumatic arthritis. *J Bone Joint Surg* 83-A:219-228, 2001.
- Fuchs S, Sandmann C, Skwara A, Chylarecki C. Quality of life 20 years after arthrodesis of the ankle: a study of adjacent joints. *J Bone Joint Surg Br* 85B:994-998, 2003.
- Katsenis D, Bhava A, Paley D, Herzenberg JE. Treatment of malunion and nonunion at the site of ankle fusions with the Ilizarov apparatus. *J Bone Joint Surg Am*. 2005;87:302-309.
- Greisberg J, Assal M, Flueckiger G, Hansen ST Jr. Takedown of ankle fusion and conversion to total ankle replacement. *Clin Orthop Relat Res*. 2004 Jul;424:80-8.
- Hintermann B, Barg A, Knupp M, Valderrabano V. Conversion of painful ankle arthrodesis to total ankle arthroplasty. *J Bone Joint Surg Am*. 2009 Apr;91(4):850-8.
- Pellegrini MJ, SchiffAP, AdamsSBJr, QueenRM, DeOrtoJK, NunleyJAII. Conversion of tibiotalar arthrodesis to total ankle arthroplasty. *J Bone Joint Surg Am* 97:2004-2013, 2015.
- Schubert JM, Christensen JC, Seidenstricker C. Takedown of ankle arthrodesis with insufficient fibula: surgical technique and intermediate-term follow-up. *J of Foot and Ankle Surgery* 2018 (216-220)
- Hintermann B, Barg A, Knupp M, Valderrabano V. Conversion of painful ankle arthrodesis to total ankle arthroplasty. Surgical technique. *J Bone Joint Surg Am*. 2010 Mar;92(Suppl 1 Pt 1):55-66.
- Atkinson HDE, Daniels TR, Klejman S, Pinsker E, Houck J, Singer S. Pre- and postoperative gait analysis following conversion of tibiotalar calcaneal fusion to total ankle arthroplasty. *Foot Ankle Int*. 2010;31:927-932.
- Glazebrook MA, Arsenault K, Dunbar M. Evidence-based classification of complications in total ankle arthroplasty. *Foot Ankle Int*. 2009 Oct;30(10):9