

# Outcomes following Arthrodesis of the Lisfranc Joint after Degenerative Joint Disease

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## Purpose

Degenerative joint disease (DJD) of the tarsometatarsal (TMT) complex is a debilitating and painful condition. Much of the literature on surgical management of the TMT complex evaluates treatment outcomes of acute traumatic injuries (Cassebaum 2, Goossens 3, Hardcastle 4, Komenda 6, Rao 9, Watson 10.). There has been less research evaluating the treatment outcomes following surgical management of end-stage DJD of the TMT joint (Jung 5, Nemeč 8, Mann 7). Patients with end-stage arthritis often experience pain, disability, and poor quality of life. The purpose of this study was to evaluate outcomes in patients undergoing surgical management of DJD of the TMT complex.

## Methodology

This study was approved by the Allegheny Singer Research Institute-West Penn Allegheny Health System Institutional Review Board. Inclusion criteria for this study were patients with end-stage arthritis of the TMT complex. Exclusion criteria included any patient with acute TMT injury/dislocation, previous midfoot surgery and neuropathic arthropathy (i.e. Charcot joint). A query search between 2013 and 2016 for CPT codes 28730-28735, arthrodesis of midtarsal or tarsometatarsal joints, identified 62 eligible patients for the study. People were excluded due to Charcot reconstructions, and acute trauma, leaving 17 patients. An AOFAS midfoot score, pain scale, and satisfaction score was obtained from each patient.

## Results

17 patients qualified for this study. Four patients were lost to follow up, which made a final total of 14 feet in 13 patients. There were 2 men (15.4%) and 11 women (84.6%), with a mean age at the time of surgery of  $56.6 \pm 9.3$  years (median, 59.5; range, 38 – 68 years). Mean BMI ( $\text{kg}/\text{m}^2$ ) of the patients was  $31.1 \pm 5.1$  (median, 29.; range, 21.5 – 41.1  $\text{kg}/\text{m}^2$ ). According to the National Heart, Lung, and Blood Institute classification of obesity, 6 (42.9%) of the 14 patients were overweight, 4 (28.6%) were Obesity Class One, 2 (14.3%) were Obesity Class Two, and 1 (7.1%) was Obesity Class Three, Extreme Obesity. One of the 14 patients in the study had diabetes (7.7%) and 2 (14.3%) had hypothyroidism. Four (28%) of the patients were current smokers. Smoking did not increase the chance for complications within our patient population (Table 1). The primary arthrodesis rate was 92.8%, with one patient going onto a delayed union without need for re-operation. There were two major complications requiring operative debridement with two patients requiring reoperation due to infection. Average follow up was 33 months (range 13-56 months). Hardware was removed in 5 of the 14 feet (35.7%). This group included 4 patients who had a concomitant navicular cuneiform arthrodesis. (Table 2). The postoperative AOFAS midfoot score average was 73.6 ( $\pm 19.7$ ), and the mean post-operative pain scale was 2.5. 78.6% (11/14) of the patients were satisfied. 1 patient reported satisfaction with reservation and 2 patients reported unsatisfactory results. The overall satisfaction (satisfied, as well as, satisfied with reservation) rate was 85.7% (12/14) (Table 3).



Figure 1: incision placement



Figure 2 Pin distractor with retracted EDB muscle belly



Figure 3: Joint preparation

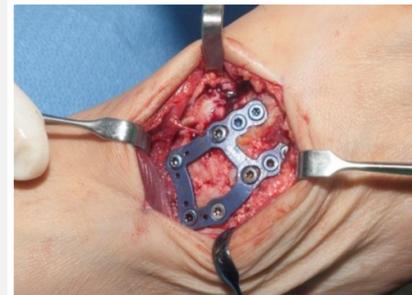


Figure 4: Low profile TMT arthrodesis plate

**Table 1. Characteristics of the study population (n=13 patients with 14 feet)**

Variable	Mean $\pm$ SD or No. (%)
Age in years (n=14)	56.6 $\pm$ 9.3
Gender (n=13)	
Male	2 (15.4)
Female	11 (84.6)
Comorbidities (n=14)	
Diabetes mellitus	1 (7.1)
Hypothyroidism	2 (14.3)
Body mass index ( $\text{kg}/\text{m}^2$ )	31.1 $\pm$ 5.1
Obesity Class	
Normal	1 (7.1)
Overweight	6 (42.9)
Obesity Class 1	4 (28.6)
Obesity Class 2	2 (14.3)
Obesity Class 3 (Extreme Obesity)	1 (7.1)
Current smoker	4 (28.6)

**Table 2. Operative data**

Variable	Mean $\pm$ SD or No. (%)
Operative side	
Right	10 (71.4)
Left	4 (28.6)
Fusion sites	
NC, 1, 2, 3 TMT	1 (7.1)
NC, TMT 1-3	3 (21.4)
TMT 1-3	9 (64.3)
TMT 2-3	1 (7.1)
Fusion	
Primary	13 (92.8)
Delayed Union	1 (7.1)
Post-operative complications	
None	8 (57.1)
Delayed union, osteomyelitis or debridement	1 (7.1)
HWR, wound complication, or debridement	1 (7.1)
Hardware Removal	4 (28.5)



Figure 5: Final construct of TMT arthrodesis

**Table 3. Outcome measures (n=14)**

Variable	Mean $\pm$ SD or No. (%)
Follow Up	33 $\pm$ 13.3
AOFAS Midfoot Score	73.6 $\pm$ 19.7
Pain Scale	Median=1.0; (range, 0 – 8)
Overall Satisfaction with Surgery	
Satisfied	11 (78.6)
Satisfied with reservation	1 (7.1)
Unsatisfied	2(14.3)

## Discussion

The purpose of this study was to evaluate our institution's outcomes following TMT arthrodesis for end-stage arthritis. Additionally, we wanted to assess risk factors for complications. Nemeč showed a fusion rate of 92% with an AOFAS score of 79, a VAS of 2, and an overall satisfaction rate of 90%. Similarly, Jung et al demonstrated an AOFAS score of 84 with a VAS of 2.1 in their study of 67 patients. Our study showed similar results with a primary fusion rate of 92.8%, VAS of 2.5, an AOFAS score of 73.6 and an overall satisfaction rate of 85.7%.

Complications for TMT arthrodesis has been reported as high as 39% (Jung 5). Jung et al. had a significant number of patients with sesamoid pain following surgery. Nemeč et al had an overall complication rate of 15% (4% major and 11% minor). The present study had 2 major complications requiring return to the operating room for debridement of the surgical site. Hardware removal was reported in 9% of Jung's patients and 25% of patients in Nemeč's study. Our study had a higher rate of hardware removal rate at 35.7%. 80% of the patients requiring hardware removal in our study had a concomitant navicular cuneiform arthrodesis at the time of TMT surgery.

Patients with higher BMI in our study had a lower postoperative AOFAS midfoot score. Nemeč et al. stated that patients with BMI greater than 30 had poorer outcomes. This study, while underpowered, also showed that patients with higher BMI tend to do worse with midfoot fusions. Those patients who were unsatisfied with their surgery had a BMI of greater than 30 and the patient with the worst midfoot score had a BMI of 38. On average, patients in our study with a BMI of greater than 30 had an 11 point lower AOFAS midfoot score (68 as compared to 79 with patients with BMI of less than 30).

Nemeč discusses the importance of gastrocnemius contracture and its effects on midfoot and forefoot stresses. The effect of the

## Discussion cont.

Triceps Surae on the foot has been documented (1 Aronow) but no one study has looked at its effects on TMT joint with DJD. In Nemeč's study, 78% of patients had contracture of the gastrocnemius muscle which required lengthening. 93% of the patients in our study required a lengthening of the gastrocnemius muscle.

Limitations to this study are the retrospective nature of the study, small sample size, and the lack of preoperative data. This is a single center study and due to the small sample size this paper is underpowered and the outcomes could be due to chance.

## Conclusion

This study evaluates operative intervention for end-stage DJD involving the tarsometatarsal complex. Patient satisfaction is relatively high, with a high union rate, and complications are minimal with our technique and construct.

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