

## INTRODUCTION

The first metatarsophalangeal joint (MTPJ) is an integral part of the tripod support of the foot during the gait cycle by supporting 40-60% of body weight and eight times the body weight during a running jump (1). First MTPJ degeneration leading to operative intervention has numerous etiologies. Arthrodesis of this joint is gold standard, especially in patients with rheumatoid arthritis (1, 2, 6-8). The development of IPJ arthritis after an arthrodesis of the MTPJ has been established in the literature; however, the significance of this has not. The purpose of this study was two-fold: first, to determine the rate of IPJ degenerative joint disease in patients who underwent first MTPJ fusion by evaluating the degree of IPJ arthritic degeneration (Grades I-IV) through 2 years post-surgery; and secondly, compare radiographic parameters (MTPJ fusion and angles of the HA and HAI) over time among patients with and without degenerative joint disease in order to determine whether non-fusion (less than 50% fusion) or the hallucal position was associated with the subsequent development of degenerative joint disease.

## METHODS

Retrospective clinical and radiographic review of patients who had undergone a first metatarsophalangeal joint arthrodesis was performed. Inclusion criteria were adult patients 18 and older who underwent first MPJ arthrodesis between January 2012 and January 2015 with internal fixation of any type. Patients were excluded if they were under 18 years of age, underwent concomitant procedures that would affect postoperative weight bearing course, suspected or diagnosed with osteomyelitis of the foot, had prior surgical procedures of the MTPJ or IPJ joints, or concomitant hallucal IPJ arthritis or preexisting IPJ fusion. Postoperative radiographs were obtained immediately following surgery and at approximately 6 weeks, 3 months, 6 months, 12 months, and 24 months.

## RESULTS

Ultimately, 103 patients met all the inclusion criteria and none of the exclusion criteria. Four of the 103 patients (3.9%) had undergone bilateral procedures, thus providing 107 surgical procedures. Demographic characteristics can be found on Table 1. The hallux abductus (HA) angle and hallux abductus interphalangeus (HAI) angle were measured preoperatively and postoperatively (Fig. 1-2). The average postoperative follow-up radiograph was taken at 22.9 weeks. The HA angle average preoperatively was 31.4 degrees, which decreased to 11.8 degrees postoperatively. The HAI angle average preoperatively measured 10.8 degrees and increased to 11.9 degrees postoperatively. No patients had symptomatic hallux IPJ postoperatively within the study period. However, 7 patients needed hardware removal and second surgery at an average of 36.3 weeks due to hardware pain and nonunion.

Demographic Characteristics (n=103)	
Female, n (%)	73 (70.9%)
Age at surgery in years, mean (SD)	60.5 (9.4)
Body mass index (BMI), mean (SD)	29.0 (6.5)
Diabetes, n (%)	8 (7.8%)
Tobacco use, n (%)	5 (4.9%)
Rheumatoid arthritis, n (%)	13 (12.6%)
Surgical data (n=107)	
Right side, n (%)	63 (58.9%)
Fixation Type:	
Compression screw and plate, n (%)	105 (98.1%)
Crossing screw, n (%)	1 (0.9%)
Compression plate, n (%)	1 (0.9%)



Figure 1: Preoperative radiograph depicting the HA angle (blue and red lines) and the HAI angle (black and red lines).



Figure 2: Postoperative radiograph taken at 24 months depicting the HA angle (blue and red lines) and the HAI angle (black and red lines).

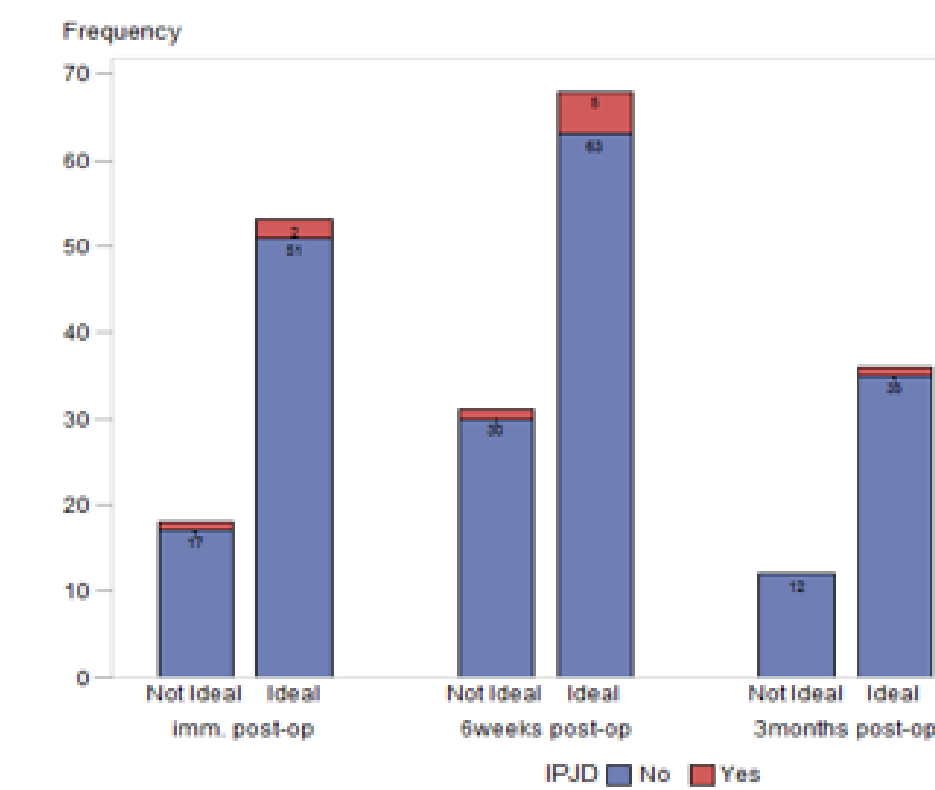


Figure 3 (top): Frequency for Ideal Hallucal Abductus angles by the incidence of IPJD over time.

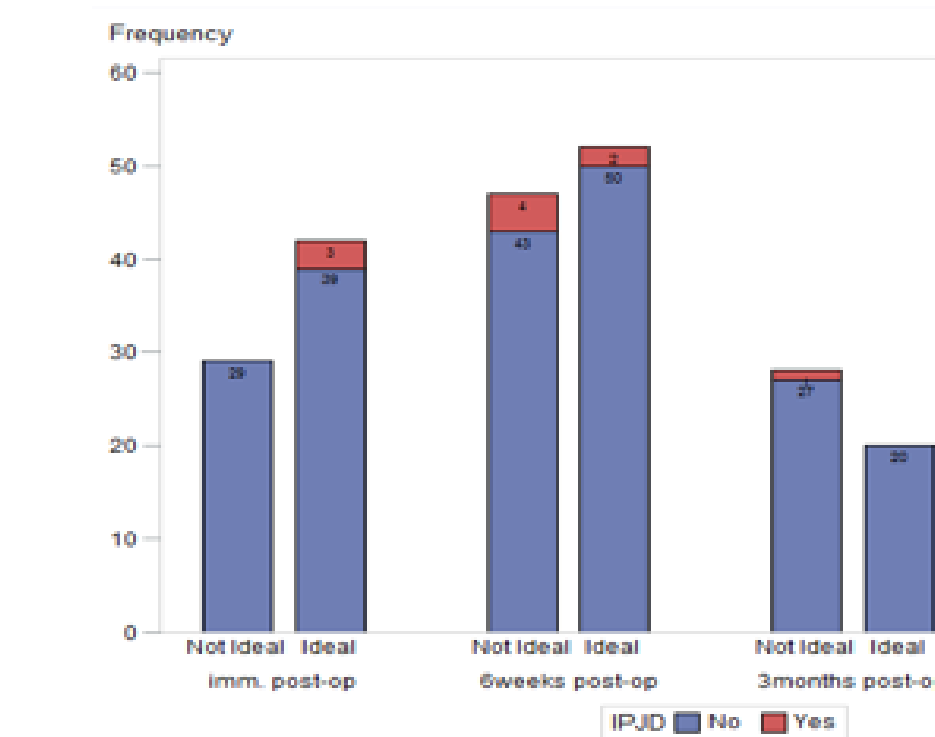


Figure 4 (bottom): Frequency for Ideal Hallucal Interphalangeus angles by the incidence of IPJD over time.

## DISCUSSION

Arthrodesis is often the treatment of choice for first metatarsophalangeal joint pathology, which is most commonly arthritis or severe hallux valgus. Complications of arthrodesis of the first MTPJ, which has been described in the literature, includes degenerative joint disease in the hallux IPJ after arthrodesis of the MTPJ (1-8). Our primary aim was to determine the rate of IPJ degenerative joint disease in patients that underwent first MTPJ fusion. We found the incidence of IPJ arthritis to be lower than the reported literature and unchanged over the postoperative period. Furthermore, no patients reported a symptomatic hallux IPJ within the study period. The second aim of this study was to compare radiographic parameters, specifically hallux abductus and hallux interphalangeus angles, over time in order to determine whether non-fusion (less than 50% fusion) or the hallux position was associated with the subsequent development of degenerative joint disease (Fig. 3-4). We found the HA angle had decreased in the patients postoperatively; however there was a mixed trend with HAI increasing after first metatarsophalangeal fusion. The significance of this trend is unclear, but the increase of the HAI could possibly cause further pain and deterioration of the joint in the future.

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