Post-Operative Complications Following Hallux Interphalangeal Joint Arthrodesis

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Purpose
To determine risk factors for complications following hallux interphalangeal joint (HIPJ) arthrodesis.

Methodology
This was an observational retrospective study. The incidence of complications following HIPJ arthrodesis was calculated. Multiple fixation techniques were included (Fig. 1). Factors associated with infection, reoperation, and clinical and radiographic union outcomes were initially identified using univariate analysis. The goal of HIPJ arthrodesis is to “provide a stable lever arm to compensate for the musculature imbalance between the long and short flexor tendons” [1]. To the knowledge of the authors, no reports of nonunion rates with the use of crossed screws for HIPJ arthrodesis have been published. Furthermore, only one study has reported results from crossed K-wires and no study has compared the two most common techniques; simple intramedullary screw and crossed K-wires (Fig. 1).

Results
We identified a total of 66 HIPJ arthrodesis procedures in 64 patients. Demographic data is shown in Table 1. Frequencies of post-operative complications are shown in Table 2. Additional procedures at the time of HIPJ arthrodesis were performed in 45 of 66 (68%) feet. Primary indications for the procedure were hallux malleus (45), ulcer (16), DIP (12), and other reasons (8). Reoperation occurred in 27 patients. There was lack of agreement between clinical and radiographic union, as seen in Table 3.

Many other methods have been described for stabilization of the hallux interphalangeal joint (HIPJ). These include tendonostomy of the extensor halluces longus to the extensor digitorum brevis, HIPJ arthroplasty with smooth and threaded Kirschner wires (K-wires), and HIPJ arthrodesis with intramedullary screw fixation [6]. External fixation has also been described as a method for HIPJ arthrodesis [7]. Regardless of the technique used, one of the goals of HIPJ arthrodesis is to “provide a stable lever arm to compensate for the musculature imbalance between the long and short flexor tendons” [1]. To the knowledge of the authors, no reports of nonunion rates with the use of crossed screws for HIPJ arthrodesis have been published. Furthermore, only one study has reported results from crossed K-wires and no study has compared the two most common techniques; simple intramedullary screw and crossed K-wires (Fig. 1).

Radiographic nonunions treated by re-operation or clinical nonunion at the last follow up (>6 weeks follow up), or if the patient had a reoperation less than 3 months after HIPJ arthrodesis (OR >0.09, 95% CI <0.105-0.072, p<0.023). All other factors were not significant. No factors were found to be significantly associated with reoperation.

Nonunion rates likely more accurately estimated at 41% when including reoperations that were considered to have a failure of union, and patients with delayed unions. Others have reported nonunion rates from 0-44% (3, 6, 9). Infections and dehiscence rates have been reported to be in the range of 0-15% for hallux IPJ arthrodesis [3, 10, 11]. However, many studies regarding hallux IPJ arthrodesis tend to focus on nonunion rates and do not mention the infection rates [5, 6, 8]. Reoperation can have been reported at 14%-40% [5, 6, 12]. The high complication rates of our study may be due to patient selection. Our population included 21 of 66 feet in patients with diabetes, with ulcerations in 16 feet. Other studies have reported results in patients with pes cavus, hereditary sensory motor neuropathy, spina bifida, cerebral palsy, poliomyelitis, traumatic arthritis, osteoarthritis, systemic arthritides, and hallux abductus interphalangeus deformities, but very few have evaluated the outcomes of hallux IPJ arthrodesis in patients with diabetes [5, 6, 12]. The inclusion of diabetic patients in the current study could increase the complication rates, as poorly controlled and complicated diabetes have been shown to be significant risk factors for postoperative complications [13-15].

In the current study, diabetes was found to be significantly associated with increased infections, wound dehiscence, reoperations, and clinical nonunions in the initial analysis but not in multivariate logistic regression analysis. Peripheral neuropathy was found to be significant with Fisher exact test, but the association disappeared after the logistic regression.

Several limitations of this study may have contributed to the results. First, due to the retrospective nature of our study, fixation choice was determined by the physician. However, following the logistic regression analysis, single screw fixation did retain significance associated with a reduced rate of radiographic nonunions. Second, our sample size might not have been large enough to build a stable model to compare different fixation techniques. Third, our study contained a large number of missing values due to insignificant data to determine if a radiographic union occurred. Although clinical union was included to capture patients with greater than six weeks follow-up, 27% of patients either did not have enough follow-up or clinical documentation was insufficient to determine if union had occurred. Clinical and radiographic data was not combined, which could have increased the subjects with adequate follow-up. However, clinical and radiographic unions are not interchangeable.

Conclusion
This study demonstrates the high post-operative complication rates that are seen with HIPJ arthrodesis when high risk patients, such as DM or PN patients are included. Single intramedullary screw fixation was associated with lower rates of infections. This preliminary study gives a preview of our ongoing larger, multi-center study which is designed to discover additional evidence regarding HIPJ arthrodesis techniques and associated outcomes.

References