**Statement of Purpose**

Our goal was to create a reproducible, minimally invasive surgical procedure to correct hallux abductovalgus in patient populations with connective tissue disorders or complex soft tissue disorders such as Ehlers-Danlos Syndrome, Diabetes Mellitus, and Rheumatoid patient.

**Level of Study**

Level IV, Retrospective Analysis

**Introduction**

The deformity has been cited for years with the now earliest case of hallux abductovalgus reported in a patient with a connective tissue disorder in 1926. Since then, several studies have evaluated the prevalence, natural history, and treatment of hallux abductovalgus in patient populations with connective tissue disorders or complex soft tissue disorders such as Ehlers-Danlos Syndrome, Diabetes Mellitus, and Rheumatoid arthritis. The prevalence of hallux abductovalgus in these patient populations is estimated to be at least 5-10% of the population, with a higher prevalence in women and elderly people.

**Methodology and Procedures**

In total, 61 patients and 68 feet were studied during the exam. No patients were lost to follow up. The average follow up from pre-operative measurement to post-operative measurement was 13.9 months. The surgical procedure included a traditional lateral release, a unicortical bone anchor inserted 1 cm proximal to the proximal phalanx, and a single screw for osteosynthesis. The anchor was chosen for osteosynthesis due to its stability and dependability.

**Results**

Overall, 61 patients and 68 feet were studied with an average follow up of 41.56 weeks. The average intermetatarsal and hallux abduction angles encountered pre-operatively were 13.3° and 19.88°, respectively, with a decrease observed post-operatively to 8.5° and 8.96°, respectively. X-Rays were recorded at previously described intervals with no statistically significant variance in the IMs upon analysis. The average change across the patient IM angles in their first visit follow up from pre-operative measurement was 0.11°. Subjective analysis was also analyzed and revealed an overall improvement in aesthetics, pain, function, and quality of life by patients' standards from pre to post-operatively. Patients were contacted via telephone and surveyed using an adaptation of the ACFAS Score to facilitate telephone data collection. All patients expressed a positive outcome and commented on their desire to have the procedure once more if required.

**Discussion**

The bone anchors were chosen for osteosynthesis due to their stability and dependability. They have been documented to be strong enough to fail at a hip joint with a compressive load of at least 103.8 kg. Their endurance was also tested to show a mean displacement of only 8.4 mm after repetitive stressors under tension at 50 cycles. (5) Traditional anchors may have slightly higher load to failure; however, the anchors chosen are readily available, cheaper, and sufficient for procedures in the lower extremity. The wedge anchors permit reattachment where as those such as barbs have a destructive removal process limiting the surgeon. The anchor strength corresponds with the strength of the medial collateral ligament and has proven effective. A retrospective study was performed in a cadaveric study where the failure to load of the ligament via repetitive force was analyzed across 3 specimens. The failure to load of the medial collateral ligament was approximately 22 kg (6). Binomial recurrence rates were studied and assessed in multiple studies. These findings are consistent in the general population, and they are much more prevalent in patients with connective tissue disorders by our observations. These patients demonstrate higher recurrence rates with increased complications with transfers of instability to adjacent joints. Within each osteotomy or bunecotomy procedure, additional factors are included such as osteosynthesis techniques. These approaches can include osteosynthesis via a K-wire or screw, cerclage wire or no osteosynthesis at all as the Austin bunecotomy has been documented as being inherently stable. A study by Crosby analyzed 6 patients with screw osteosynthesis, 7 with K-Wire, and 6 patients with no osteosynthesis. Upon statistical analysis, the patients undergoing screw osteosynthesis has less complications and higher success rates for healing. Screw osteosynthesis and no osteosynthesis revealed the greatest improvement in IM angles as they decreased by 9.5° and 7.1° respectively. Subjective analysis showed no difference between the groups (7).

Akin procedures have been utilized in the past to aid with correction of the IM in hopes of reducing PASA and the HAV angle. This approach, while helpful, comes at the cost. Surgeon precision must be high in order to maintain the lateral cortex of the proximal phalanx and ensure no breakage of the hinge. Most importantly, an additional osteotomy presents increased risks due to complications and potential bone quality. A retrospective study has reviewed the Akin procedure revealing 65132 patients with complications highlighted by 42 patients who experienced compromise of the lateral hinge intra-operatively. The technique presented avoids any of these complications due to the limited invasion and technical application of the suture anchors. This procedure also allows for surgeons to avoid basic procedures such as a Lapidus which comes with recurrence rates ranging from 2.12% (8). It also eliminates potential complications of sutures arising from the bone stock of patients. While the 14 patients with EDS encountered is a small sample size, the 100% success rate in patients with EDS with no recurrence was a success by achieving one of the main goals of this study in providing aid to those with connective tissue disorder. The subjective analysis score also revealed a successful outcome with respect to treating connective tissue disorders. In addition, our initial failure rate which includes recurrence and complications of 2.9%. Since these results include recurrence rates and complications, our recurrence rate falls significantly lower than previous studies. These findings are consistent with the general population, and they are much more prevalent in patients with connective tissue disorders by our observations. These patients demonstrate higher recurrence rates with increased complications with transfers of instability to adjacent joints. Within each osteotomy or bunecotomy procedure, additional factors are included such as osteosynthesis techniques. These approaches can include osteosynthesis via a K-wire or screw, cerclage wire or no osteosynthesis at all as the Austin bunecotomy has been documented as being inherently stable. A study by Crosby analyzed 6 patients with screw osteosynthesis, 7 with K-Wire, and 6 patients with no osteosynthesis. Upon statistical analysis, the patients undergoing screw osteosynthesis has less complications and higher success rates for healing. Screw osteosynthesis and no osteosynthesis revealed the greatest improvement in IM angles as they decreased by 9.5° and 7.1° respectively. Subjective analysis showed no difference between the groups (7).

Limitations to the study are humbly presented to highlight problems encountered. With the history and prevalence of bunions, this study lacks an extensive follow up period. The procedure and imaging studies performed by one individual also allows for interpretational bias which must be acknowledged. Subjective scoring is positive; however, these results are limited to a single procedure. Patients have no idea how they would have felt with a traditional bunecotomy procedure, and there is no comparable subjective data within this cohort. A more significant limitation is the physical cost and availability of the anchors which are used for the procedure.

**References**


