

Violating the Lateral Hinge during Percutaneous Akin Osteotomy Improves Radiographic Alignment without Affecting Patient Satisfaction

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INTRODUCTION:

The Akin osteotomy is a medial based closing wedge osteotomy of the proximal phalanx widely utilized as an adjunctive procedure for bunion correction. The most common complication of the procedure is intraoperative fracture, or violation, of the lateral cortex at the osteotomy site regardless of the technique employed. Previously, violation of the lateral hinge was believed to result in instability of the osteotomy and increase the risk of displacement of the correction. In a recent study, it was reported that lateral cortex violation did not impede healing or result in loss of correction in a combined cohort of open and percutaneously performed osteotomies. We hypothesize that violation of the lateral hinge will not affect postoperative radiographic alignment and patient-reported outcomes compared to patients with an intact lateral hinge in a fully percutaneous cohort.

METHODS:

A retrospective medical record and radiographic analysis was conducted on patients with symptomatic hallux valgus refractory to at least 6 months of conservative therapy who underwent percutaneous Akin osteotomies between May 2020 and January 2022. All procedures were performed by a single surgeon using the same technique and postoperative protocol.

Patients were stratified based on presence (violated cortex, VC) or absence of intraoperative lateral cortex violation (non-violated cortex, NVC) observed on perioperative fluoroscopy. Patients underwent physical examination and radiographic assessment of the operative foot 2, 6, and 12 weeks, 6 months and 1-year post-operation. Weight-bearing radiographs of the foot were taken to assess healing at every clinic visit. The visual analog score (VAS) and Foot Function Index (FFI) questionnaire were used to assess pain and functional disability and activity restriction. Additionally, patients were surveyed for overall satisfaction.

RESULTS:

A total of 102 patients (89% Female) were included in the analysis with 45 feet in the NVC group and 57 feet in the VC group. The mean age was 48.3 years (range, 18 – 83 years). Seven patients were known diabetics and three had rheumatoid arthritis. Of the included patients, there were 52 associated procedures performed. Six lesser toe metatarsal osteotomies, 42 hammertoe corrections, two 2nd TMT fusions, and two 2-3 TMT fusions we performed.

The mean preoperative VAS score was 7.7 and 7.8, in the NVC and VC groups respectively. Both significantly decreased to 0.6 ($p<0.01$) and 0.7($p<0.01$), respectively. Total FFI improved significantly in both groups. Mean total FFI was 54.3 and 55.9 in the NVC group and VC group and decreased to 18.1 ($p<0.01$) and 17.4 ($p<0.01$), respectively. All categories (pain, disability, activity) significantly decreased postoperatively in both groups. 44/45 patients (97.8%) of the NVC group and 55/57 patients (96.5%) in the VC group reported satisfaction.

Mean first-to-second intermetatarsal angle (IMA) improved from 13.2 (12-21) degrees to 3.6 (2-6) degrees and average HVA (hallux valgus angle) improved from 27.6 (16-42) degrees to 10.9 degrees (4-12) postoperatively in the NVC group.

Mean first-to-second IMA improved from 13.4 (11-22) degrees to 3.9 (1-6) degrees, and mean HVA improved from 29.6 (19-39) degrees to 7.2 (4-12) degrees postoperatively in the VC group.

The preoperative IMA and HVA differences between the VC and NVC group were not significant ($p=0.13$). Postoperatively, there was not a significant difference in IMA between groups ($p=0.21$). However, the postoperative HVA was significantly lower in the VC group compared to the NVC group (7.2 vs. 10.9 degrees)($p<0.05$).

Two complications secondary to the procedure were identified in 2 feet (1.9%). One complication was a superficial wound dehiscence and the second complication was a delayed union of a metatarsal osteotomy.

DISCUSSION AND CONCLUSION:

Minimally invasive techniques for the Akin osteotomy have been shown to be effective, however, intraoperative fracture of the lateral cortex of the proximal phalanx is a common complication. It was previously thought lateral cortex violation was detrimental to surgical outcomes, however, recent literature suggests it does not affect healing or correction. Our study shows in an exclusively percutaneous surgical cohort, violation of the lateral cortex actually improves postoperative radiological alignment without detriment to patient-reported outcomes.

Table 1. Radiographic outcomes

	Non-cortex violation		Cortex violation	
	Pre-operation	Post-operation	Pre-operation	Post-operation
Hallux valgus angle	27.6° (16-42°)	10.9° (4-12°) **	29.6° (19-39°)	7.2° (4-12°)*
1 st -2 nd Inter-metatarsal angle	13.2° (12-21°)	3.6° (2-6°)*	13.4° (11-22°)	3.9° (1-6°) *

*indicates p<0.05 within groups and **indicates p<0.05 between groups