Comminuted Suprasyndesmotic Ankle Fractures are Associated with a High Rate of Anterolateral Plafond Involvement

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INTRODUCTION: There is a well-established association between Lauge-Hansen supination-adduction (SAD) ankle fractures and anteromedial plafond impaction. This association is critical to recognize as plafond impaction often necessitates direct visualization and anatomic reduction. Despite several studies investigating the relationship between SAD injuries and anteromedial plafond impaction, less attention has been directed towards the mechanism's mirror counterpart, pronation-abduction (PAB) injuries, and their association with anterolateral plafond involvement. A recent study demonstrated that larger fractures of the anterolateral plafond are frequently due to a PAB mechanism, which can impart more axial rather than torsional loading on the lateral ankle structures and commonly result in a comminuted suprasyndesmotic fibula fracture (AO/OTA 44C2) on the compression side of the injury. There is no existing literature describing the rate at which the anterolateral plafond is involved in patients with AO/OTA 44C2 ankle fractures and what affect this may have on clinical outcomes. The aim of this study was to analyze the association between AO/OTA 44C2 ankle fractures and anterolateral plafond involvement, as well as the affect anterolateral plafond involvement has on reoperation rate, development of osteoarthritis, and patient reported outcome measures (PROMs).

METHODS: An IRB-approved retrospective review was conducted of 491 surgically managed suprasyndesmotic ankle fractures (AO/OTA 44C) treated at a single academic Level 1 trauma center between January 2005 and December 2021. Injury x-rays were reviewed to identify 140 patients (29%) with suprasyndesmotic multi-fragmentary or comminuted fibula fractures (AO/OTA 44C2), which are frequently seen in pronation-abduction ankle injuries. Of these, 38% (53 of 140) had preoperative computed tomography (CT) scans available which were reviewed for the presence of anterolateral plafond impaction or a displaced Tillaux-Chaput anterolateral plafond fragment. Patients with a minimum follow-up of 6 months were included in further analysis of postoperative outcomes. The primary outcome measure was the prevalence of anterolateral plafond impaction or a displaced Tillaux-Chaput fracture. Secondary outcome measures included reoperation rate (excluding hardware removal), rate of new-onset ankle osteoarthritis (Kellgren-Lawrence (KL) grade 3 or 4), Single Assessment Numeric Evaluation (SANE) score, and the Olerud Molander Ankle Score (OMAS).

RESULTS:

The anterolateral plafond was involved in 26 of 53 patients (49%), with anterolateral plafond impaction in 11 patients (21%) and a displaced Tillaux-Chaput fragment in 15 patients (28%). Only 19% of these patients (5 of 26) received independent fixation of the anterolateral plafond. Thirty-eight patients (72%) had clinical follow-up of at least 6 months. Patients with anterolateral plafond impaction had a higher reoperation rate compared to those without any anterolateral plafond involvement (HR = 8.3, 95% CI: 1.4-15.3, p=0.022) as well as a higher rate of new-onset ankle osteoarthritis (83% vs 23%, p=0.013). There were no significant differences in the rate of new onset osteoarthritis between patients with anterolateral plafond impaction and patients with a Tillaux-Chaput fragment (83% vs 63%, p=0.580) or patients with a Tillaux-Chaput fragment and patients with no anterolateral plafond involvement (63% vs 23%, p=0.078). There were no differences in SANE or OMAS score across all groups.

DISCUSSION AND CONCLUSION: CT evaluation is recommended in patients with comminuted suprasyndesmotic fibula fractures (AO/OTA 44C2) given their high association with anterolateral plafond impaction and Tillaux-Chaput fracture. Patients with anterolateral plafond impaction have a higher rate of reoperation and new-onset ankle osteoarthritis compared to those without anterolateral plafond involvement. Surgeons should be aware of the relationship between comminuted suprasyndesmotic fibula fractures and anterolateral plafond involvement and take this into consideration during surgical planning.

Postoperative Outcomes by Anterolateral Plafond Involvement, N=38

	AL Plafond Impaction (N=6)	Tillaux-Chaput Fragment (N=9)	No Involvement (N=23)	p-value
Reoperations	3	1	2	
Reoperation hazard	8.3	1.5	ref.	
New-onset osteoarthritis	n=6	n=8	n=22	
	5 (83%)	5 (63%)	5 (23%)	0.010
PROMs	n=3	n=4	n=11	
SANE	75 (25)	78 (16)	85 (22)	0.661
OMAS	70 (28)	69 (19)	81 (23)	0.517

SANE – Single Assessment Numerical Evaluation, OMAS – Olerud Molander Ankle Score