

# Higher 5-Year Reoperations following Ankle Fractures in Patients with Concomitant Ankle Arthroscopic Procedures: A National Analysis of 59,142 Patients

Benjamin Farley, Amil Raj Agarwal, Alex Gu<sup>1</sup>, Thomas Fraychineaud, Marc David Chodos, John Thompson<sup>2</sup>, James R Ficke<sup>3</sup>

<sup>1</sup>George Washington University School of Medicine An, <sup>2</sup>Johns Hopkins Orthopaedic and Spine Surgery, <sup>3</sup>Johns Hopkins, Ortho

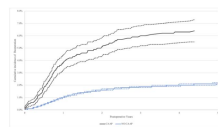
**INTRODUCTION:** Concomitant ankle arthroscopy has increased in utilization for treating ankle fractures over the past decade. Arthroscopy allows the surgeon to evaluate and treat the intra-articular pathology sustained during rotational ankle fractures, which would otherwise be diagnosed and treated at a later time. Prior studies did not find a difference in 5-year reoperation rates following ankle fracture in patients with and without concomitant ankle arthroscopic procedures (CAAP). However, many of these studies were limited in power and thus may be missing a potential association. Therefore, we utilized a large database to evaluate the 5-year reoperation rate in ankle fractures treated with CAAPs.

**METHODS:** A retrospective cohort analysis of 59,142 patients from 2015 to 2021 was conducted, with 3,396 (1.65%) undergoing CAAP. The change in utilization of CAAP from 2015 to 2021 was first observed for the whole population, and stratified based on fracture type (lateral malleolus, medial malleolus, bimalleolar and trimalleolar ankle fractures). Additionally, the change in type of CAAP (bone marrow stimulation, debridement, synovectomy, and unspecified cartilage procedure) was observed during this period. Lastly, the incidence and risk of two-year and five-year reoperations (repeat arthroscopy, arthrodesis, autologous autograft, and arthroplasty) and posttraumatic arthritis was observed using Kaplan Meier analysis and Cox Proportional Hazard Ratio analysis.

**RESULTS:** Utilization of CAAP across all types of ankle fractures increased from 2015 to 2021. Debridement was the most common procedure performed during the CAAP. The risk of reoperation within two-year (Hazard Ratio [HR]: 2.91; 95% Confidence Interval [CI]: 1.98-4.12) and five-year (HR: 3.27; 95% CI: 2.85-3.75; p<0.001) following ankle fracture was higher in those who underwent CAAP compared to those without. The risk of posttraumatic arthritis within two-year (HR: 1.89; 95% CI: 1.22-2.03; p<0.001) and five-year (HR: 3.27; 95% CI: 2.12-4.33; p<0.001) following ankle fracture was also higher in those who underwent CAAP compared to those without. Regarding reoperation etiology, only the risk of arthroscopic reoperation was higher in the CAAP cohort within 2-years (HR: 3.23; 95% CI: 2.24-3.78; p<0.001) and 5-years (HR: 3.89; 95% CI: 2.12-4.33; p<0.001) following ankle fracture when compared to the non-CAAP cohort, with no difference in risk of arthrodesis, autologous autograft, and arthroplasty (p>0.05 for all).

**DISCUSSION AND CONCLUSION:** Our data shows that at both two and five years following ankle fracture and CAAP, total reoperation rates, namely those arthroscopic reoperations, were higher in the CAAP cohort. Interestingly, it also showed rates of posttraumatic arthritis at both timepoints were higher in the CAAP group. Additional studies are needed to further guide foot and ankle surgeons in utilizing arthroscopy during the treatment of ankle fractures to better optimize our patient outcomes.

Figure 1. Cumulative Incidence of 5-Year Reoperation following Ankle Fracture for those with and without Concomitant Ankle Arthroscopy Procedures



CAAP: Concomitant Ankle Arthroscopy Procedure

Table 1. Total Demographics: 59,152 Patients

Age	Total	Percent
<50	23,451	39.65
50-59	12,305	20.81
60-69	12,239	20.69
70+	11,133	18.82
Gender		
Female	38,698	65.43
Male	20,430	34.54
CCI		
0	28,542	48.26
1	12,804	21.65
2	6,647	11.24
3+	11,135	18.83
Concomitant Ankle Procedure	3,396	1.65

CCI: Charlson Comorbidity Index

Table 2. Trends in Percent Utilization of Concomitant Ankle Arthroscopy Procedure by Ankle Fracture Types

Category	Total	2015	2016	2017	2018	2019	2020	2021
Total	1,65	0.96	1.18	1.40	1.75	1.87	1.90	2.14
Lateral	2,27	1.29	1.43	2.13	2.38	2.41	2.61	2.17
Medial	2,59	1.22	2.42	2.12	2.93	3.03	3.14	3.49
Bimalleolar	1,98	0.87	0.83	0.75	1.03	1.18	1.32	1.74
Trimalleolar	1,30	0.43	0.48	1.08	1.35	1.52	1.47	2.07

Table 3. Trends in Percent Utilization of Concomitant Ankle Arthroscopy Procedure Arthroscopy Procedures

Category	Total	2015	2016	2017	2018	2019	2020	2021
Bone Marrow	6,975	18.08	19.76	19.75	16.46	18.12	14.93	14.24
Debridement	81,48	37.46	75.81	37.08	82.03	83.51	83.44	84.29
Synovectomy	53,19	31.29	20.85	16.31	12.60	11.29	11.46	11.11
Unspecified Cartilage Procedure	3,42	3.32	6.60	3.91	3.23	2.80	3.82	2.37

Table 4. 2 Year and 5 Year Cumulative Incidence and Risk of Reoperation following Ankle Fracture

CATEGORY	2 Year	CAAP/IB	NO CAAP/IB	HR	95% CI	P VALUE
Total Reoperation	0.005	0.005	0.005	1.697	1.497-1.930	<0.001
Arthroscopic	0.015	0.009	0.003	6.616	4.616-9.517	<0.001
Arthroscopy Procedures	0.005	0.005	0.005	1.222	1.042-1.432	<0.001
Arthrodesis	0%	0%	0%	0%	0%	0%
Autologous Autograft	0%	0%	0%	0%	0%	0%
Total Ankle Arthroplasty	0.015	0.009	0.006	2.243	1.924-2.617	<0.001
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Arthrodesis	0.015	0.009	0.006	2.243	1.924-2.617	<0.001
Autologous Autograft	0.015	0%	0.003	0.003	0.003-0.003	0.957
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CAAP: Concomitant Ankle Arthroscopy Procedure; HR: Hazard Ratio; CI: Confidence Interval