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Prospective Evaluation of Glenoid Bone Loss after First-time Posterior Glenohumeral Instability Events

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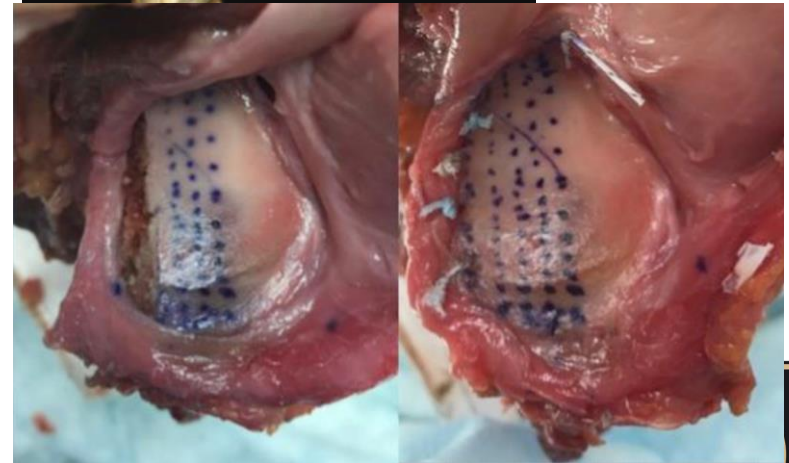




- The importance of posterior GBL with respect to surgical management of posterior instability is not completely understood
- Wolfe et al AJSM 2020: reoperation rate 44.4% after capsulolabral repair if posterior GBL >13.5%
- Biomechanical model suggest bony augmentation would be necessary if posterior GBL >20% (Nacca et al 2018 AJSM)



Dekker et al 2019
AJSM



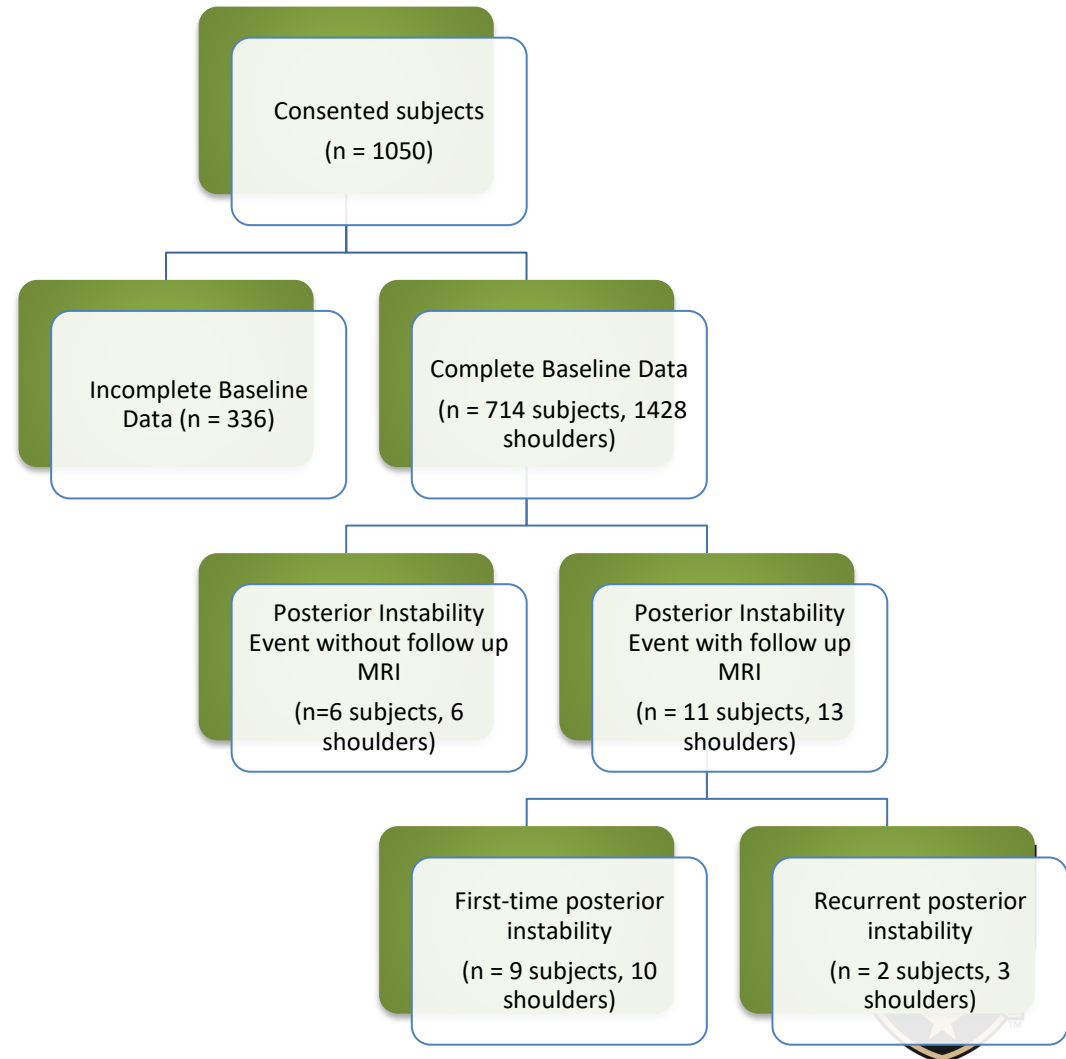
Nacca et al 2018. AJSM.

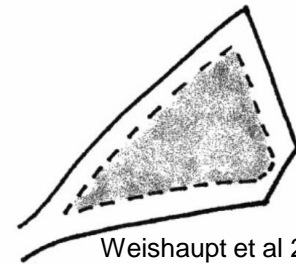
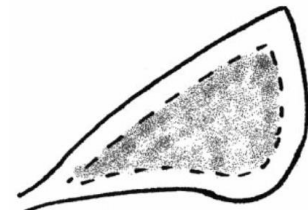
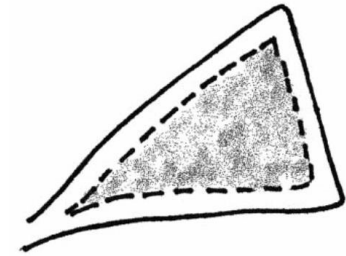
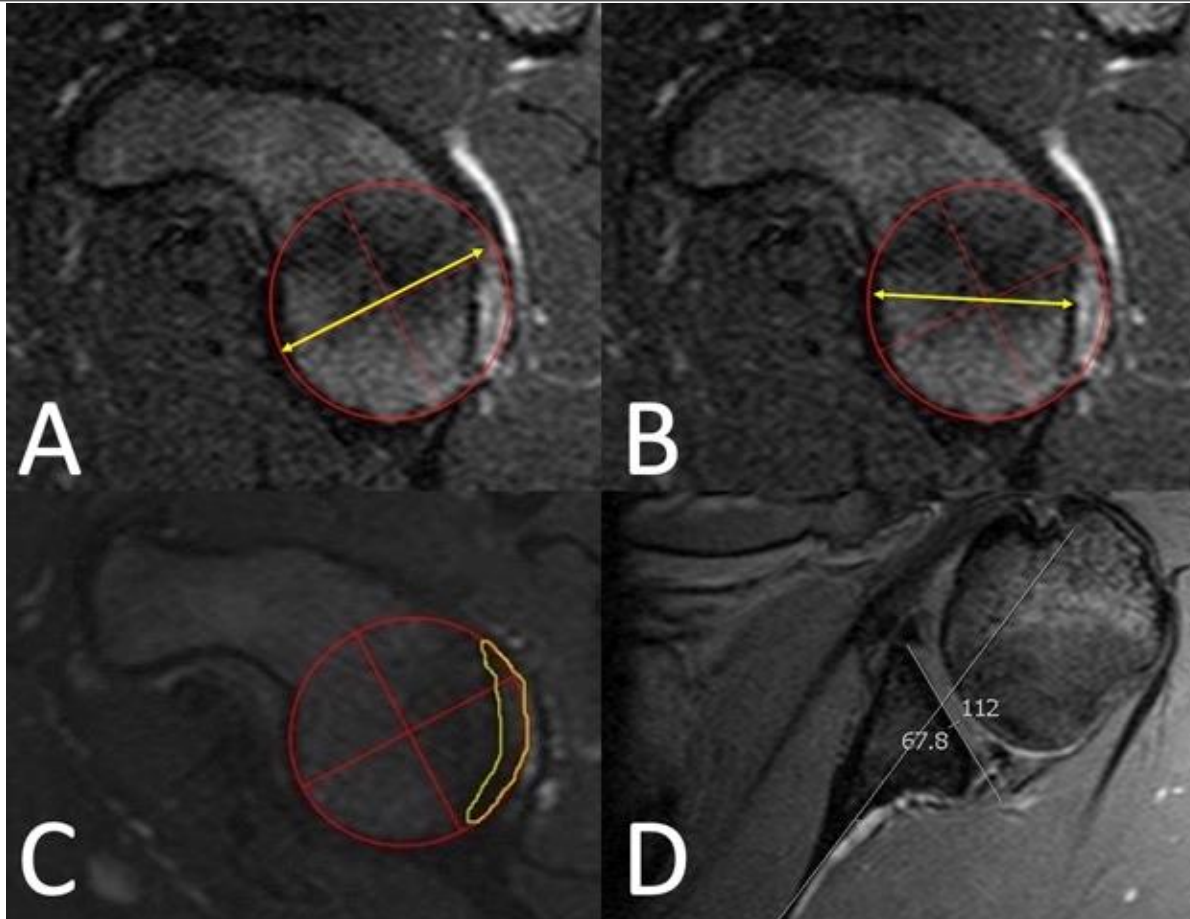
Purpose: To define glenoid bone loss after posterior instability events in patients with and without a prior history of instability





- Design: Prospective cohort study
- Population: Young athletes (West Point Class of 2010)
- Data obtained at enrollment:
 - Baseline MRI of bilateral shoulders at enrollment
 - Shoulder instability-specific H&P
- Surveillance: EMR follow up through 2017
 - Post-injury MRI obtained in patients with instability event and compared to pre-instability MRI





Weishaupt et al 2000
Skeletal radiology

- Primary outcome: Glenoid bone loss in after posterior instability event
 - First time versus recurrent
- Secondary outcomes: change in glenoid morphology, effect of baseline dysplasia/versic on GBL





Results: Demographics



Table 1. Baseline demographics

	Instability type		Total
	First-time	Recurrent	
Shoulders, n (patients, n)	10 (9)	3 (2)	13 (11)
Age, mean \pm SEM	22.6 \pm 1.0	20.8 \pm 0.7	22.2 \pm 0.8
Gender, M:F	8:1	2:0	10:1
Baseline physical exam			
Sulcus	2	0	2
Posterior translation	0	0	0
Beighton, mean \pm SEM	0.3 \pm 0.16	1 \pm 0*	0.5 \pm 0.14

* $p=0.040$ for comparison between first-time and recurrent instability





Table 2. Baseline MRI characteristics

Variable	Instability type		Total
	First-time	Recurrent	
Glenoid version (mean \pm SEM)	10.7 \pm 1.7	16.8 \pm 0.8 [^]	12.1 \pm 1.5
Dysplasia			
Pointed	1	1	2
Delta	6	2	8
Lazy-J	3	0	3
Glenoid bone loss			
Linear bone loss at equator, mean % \pm SEM	3.9 \pm 1.1	6.3 \pm 1.2	4.5 \pm 1.0
Linear bone loss along greatest axis, mean % \pm SEM	5.3 \pm 1.6	9.1 \pm 0.2*	6.2 \pm 1.3
Total area bone loss, mean % \pm SEM	3.0 \pm 0.9	4.1 \pm 0.7	3.2 \pm 0.7

- Small amount of bone loss, dysplasia at baseline
 - Baseline GBL greater in patients with a history of posterior instability





Results: Posterior GBL First time vs Recurrent



Instability group	Number of shoulders, n	Δ Linear bone loss at equator, mean % ± SEM	Δ Linear bone loss along greatest axis, mean % ± SEM	Δ Total area bone loss, mean % ± SEM	Absolute linear bone loss at equator, mean % ± SEM	Absolute linear bone loss along greatest axis, mean % ± SEM	Absolute total area bone loss, mean % ± SEM
First-time	10	3.7 ± 1.0	4.7 ± 0.9	3.7 ± 0.7	7.6 ± 1.5	10.0 ± 1.5	6.6 ± 1.1
Recurrent	3	7.0 ± 0.5[†]	7.6 ± 1.2	5.8 ± 0.7	13.3 ± 1.4[^]	16.8 ± 1.1[*]	9.9 ± 1.0
Total	13	4.5 ± 0.9	5.4 ± 0.8	4.2 ± 0.6	9.0 ± 1.4	11.6 ± 1.4	7.4 ± 1.0

[†] p=0.013 for comparison between recurrent and first-time instability

[^] p=0.027 for comparison between recurrent and first-time instability

^{*} p=0.005 for comparison between recurrent and first-time instability

- Each posterior instability event was associated with 4-5% GBL
- Patients with recurrent instability reached a greater absolute GBL and had a greater change in linear GBL than first-time instability

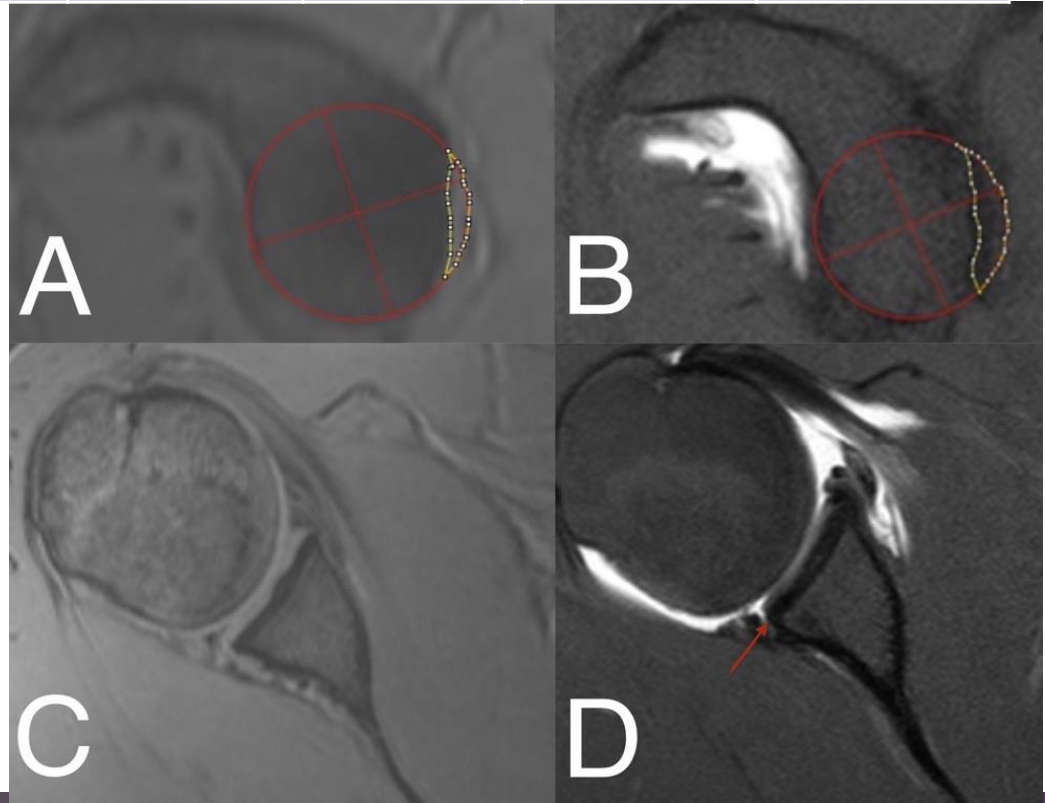




Table 4. Post-hoc subgroup analysis for the effect of baseline variables on subsequent glenoid bone loss.

	Number (n)	Linear bone loss along greatest axis, mean % ± SEM	Linear bone loss at equator, mean % ± SEM	Total area bone loss, mean % ± SEM
Age >21 years	8	8.6 ± 1.5 [†]	6.1 ± 1.5 [†]	5.2 ± 0.8 [†]
Age <21 years	5	16.3 ± 0.7	13.5 ± 1.0	10.8 ± 1.0
Retroversion >10 degrees	8	13.5 ± 2.0 [*]	10.8 ± 1.9	8.9 ± 1.3 [^]
Retroversion <10 degrees	5	8.5 ± 0.8	6.0 ± 1.2	5.0 ± 0.5
Glenoid morphology				
Pointed	2	11.4 ± 4.5	8.6 ± 4.7	7.5 ± 3.0
Delta	8	12.5 ± 1.3	9.9 ± 1.1	7.8 ± 1.0
Lazy J	3	9.3 ± 3.8	6.8 ± 3.8	6.2 ± 2.7
Dysplasia >1/3 axial cuts	5	12.7 ± 2.4	10.9 ± 2.1	8.7 ± 1.8
Dysplasia <1/3 axial cuts	8	10.8 ± 1.7	7.7 ± 1.7	6.5 ± 1.0

[†]p=0.003, 0.004, and 0.001 for comparisons between retroversion age >21 years and age <21 years for bone loss along the greatest axis, at the equator, and total area, respectively.

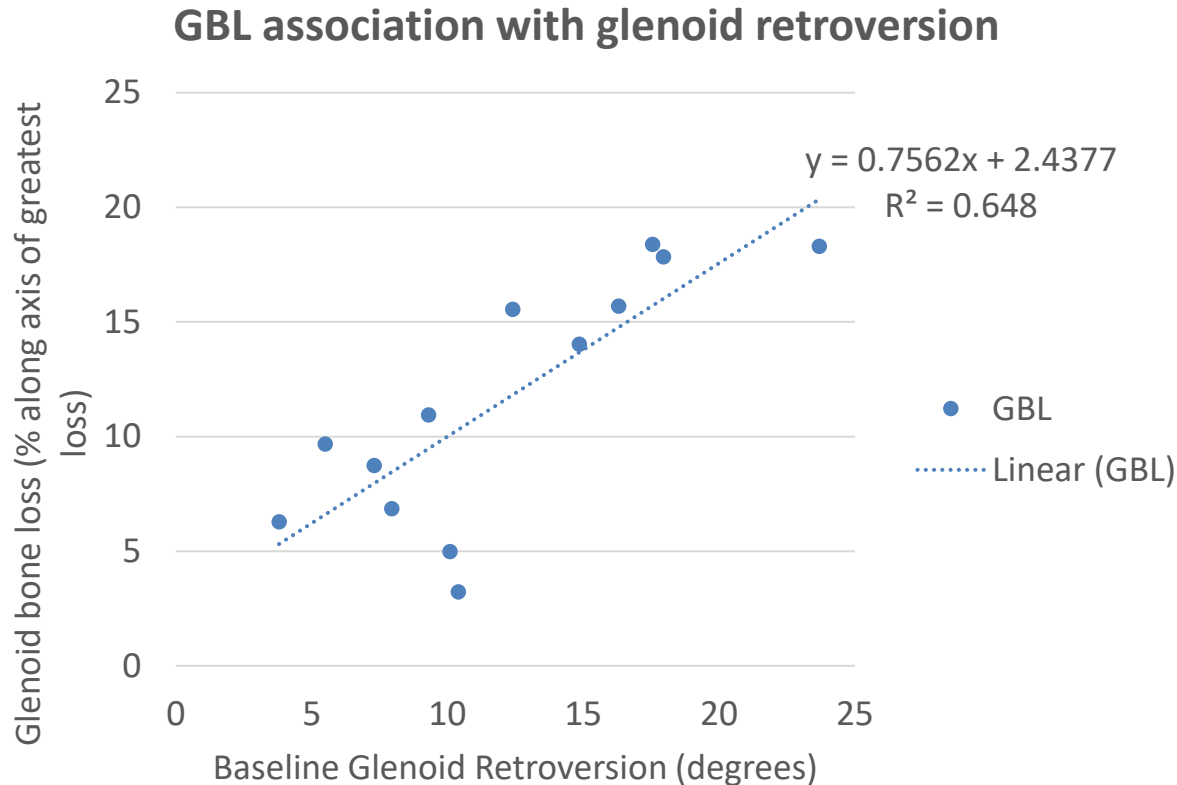
^{*}p=0.045 for comparison between retroversion >10 degrees and <10 degrees

[^]p=0.021 for comparison between retroversion >10 degrees and <10 degrees





Results: Effect of Glenoid version on GBL



- For every degree of retroversion, %GBL increased by 0.76%
 - 95% CI 0.39-1.13%,
 - $p < 0.001$



Conclusion



- Posterior instability events are associated with 5% pGBL
- Recurrent posterior instability events are associated with more GBL than first-time instability
- Glenoid retroversion $>10\text{deg}$ and age <21 years are associated with a greater amount of pGBL after posterior instability event





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THANK YOU

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