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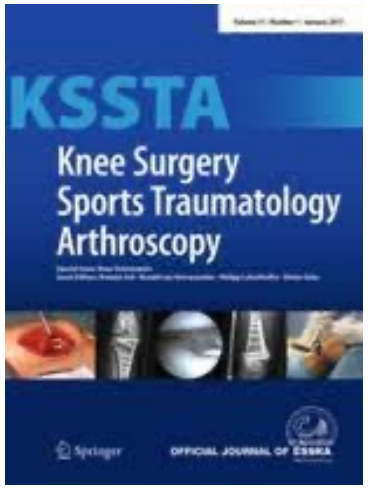
Why to treat off-track Hill-Sachs lesions with remplissage?

Giuseppe Milano

COI disclosure

- *Arthrex: consultant, research*
- *CONMED: consultant*
- *Stryker: consultant*
- *GreenBone: research*
- *Medacta: research*
- *FGP: research*

Rutgers C, Verweij LPE, Priester-Vink S, et al.
Recurrence in traumatic anterior shoulder dislocations increases the prevalence of Hill-Sachs and Bankart lesions: a systematic review and meta-analysis.
Knee Surg Sports Traumatol Arthrosc. 2022 Jun;30(6):2130-2140



- LOE IV
- 22 studies: 1920 shoulders

Prevalence of bony lesions

	Studies (*n*)	Shoulder (*n*)	Prevalence (%)	Range (%)
Hill–Sachs	20	1731	69	13–100
Bony glenoid	10	983	37	6–86
Loose body	7	566	15	9–44
Bony Bankart	8	889	13	0–43

HSL first-time dislocation (71%, range 58–83%)

HSL recurrent dislocation (85%, range 70–95%)

Zhang M, Liu J, Jia Y, et al.
Risk factors for recurrence after Bankart repair: a systematic review and meta-analysis.
J Orthop Surg Res. 2022 Feb 20;17(1):113

- LOE IV
- 19 studies: 2922 shoulders

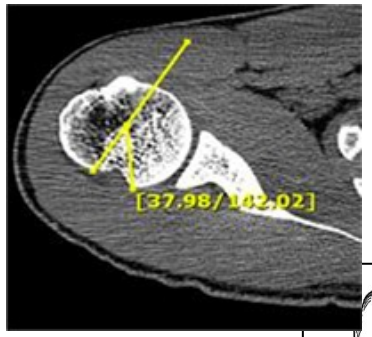
PREDICTOR	OR
Age ≤ 20 years	4.24
Hill-Sachs lesion	3.61
Off-track lesion	5.53
Glenoid bone loss	2.8
Shoulder hyperlaxity	4.55
Contact sports	1.54
Male sex	1.6

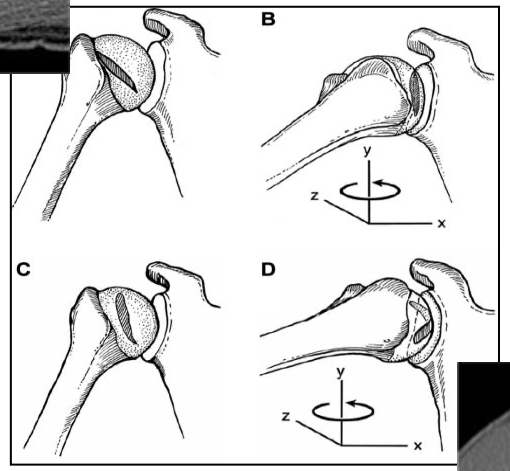
Issue#1

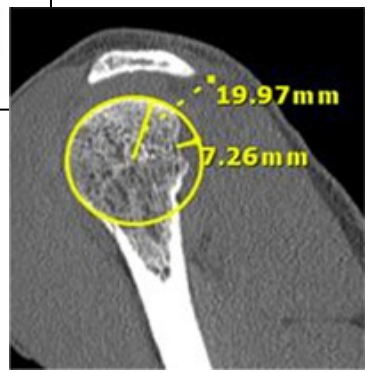
How to evaluate the Hill-Sachs lesion?

What does it matter?

- *Location?*
- *Orientation?*
- *Engagement?*
- *Depth?*
- *Volume?*







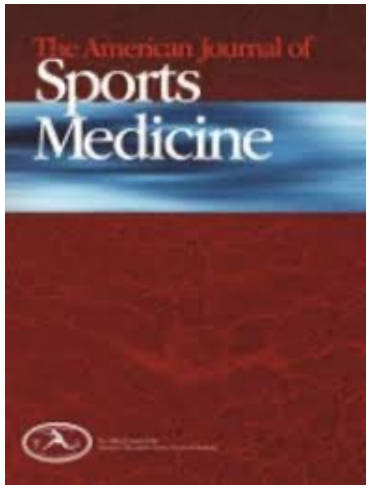
Critical size????

No universally accepted method to quantify the lesion!!!

Gowd AK, Liu JN, Cabarcas BC, et al.

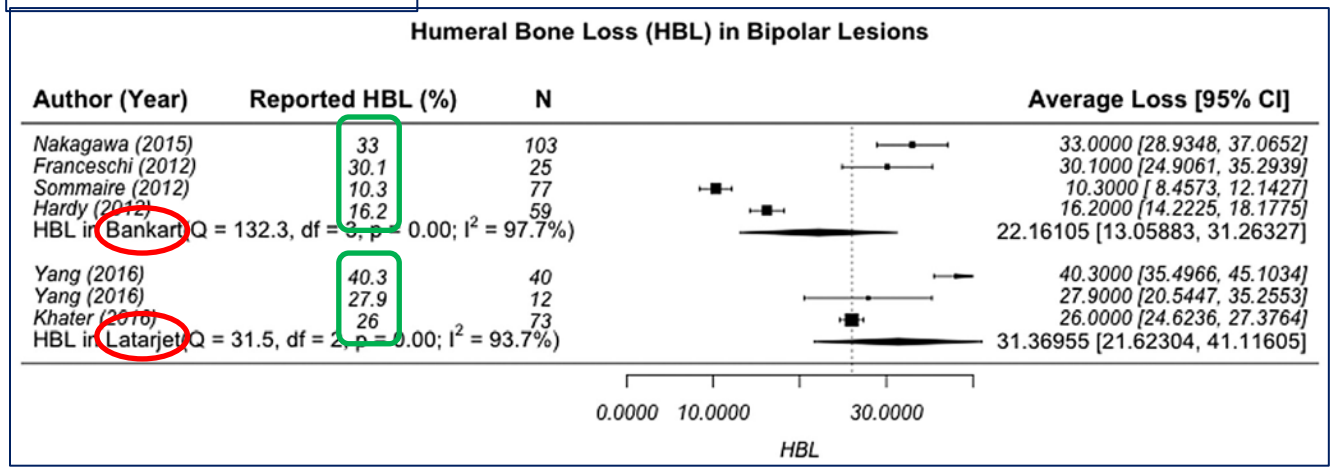
Management of Recurrent Anterior Shoulder Instability With Bipolar Bone Loss: A Systematic Review to Assess Critical Bone Loss Amounts.

Am J Sports Med. 2019 Aug;47(10):2484-2493

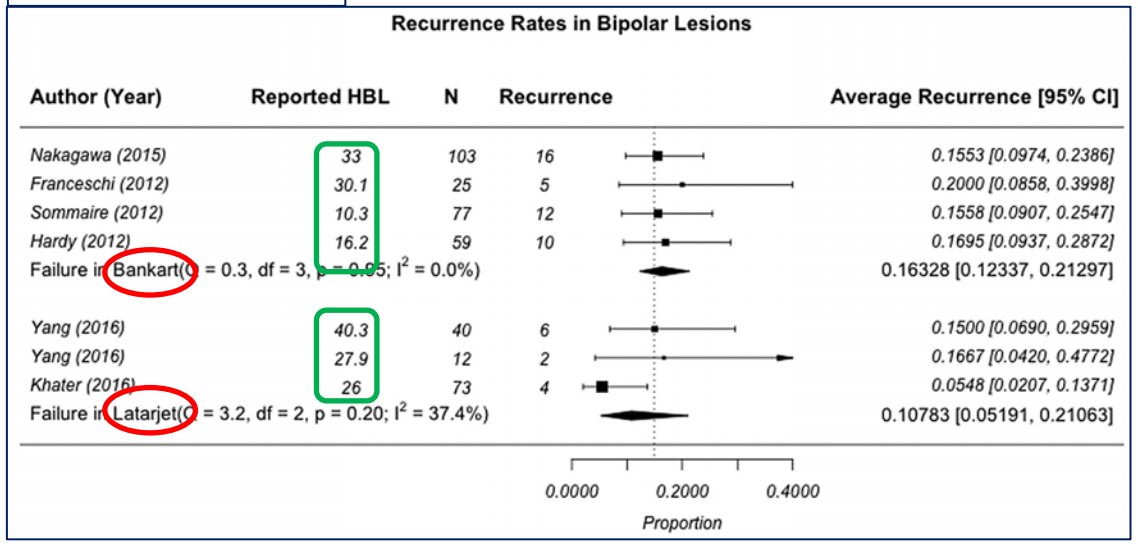


- LOE IV
- 13 studies: 778 patients

HBL by percentage



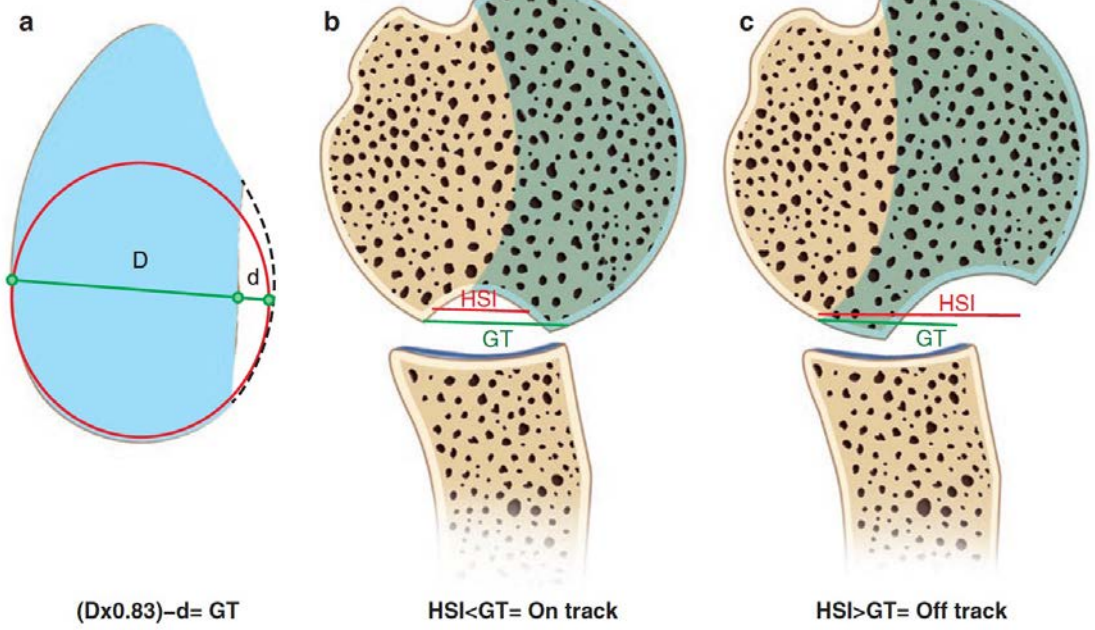
HBL by volume



There was **no difference** in humeral bone loss

between Bankart repairs and Latarjet procedures

On-track/Off-track concept

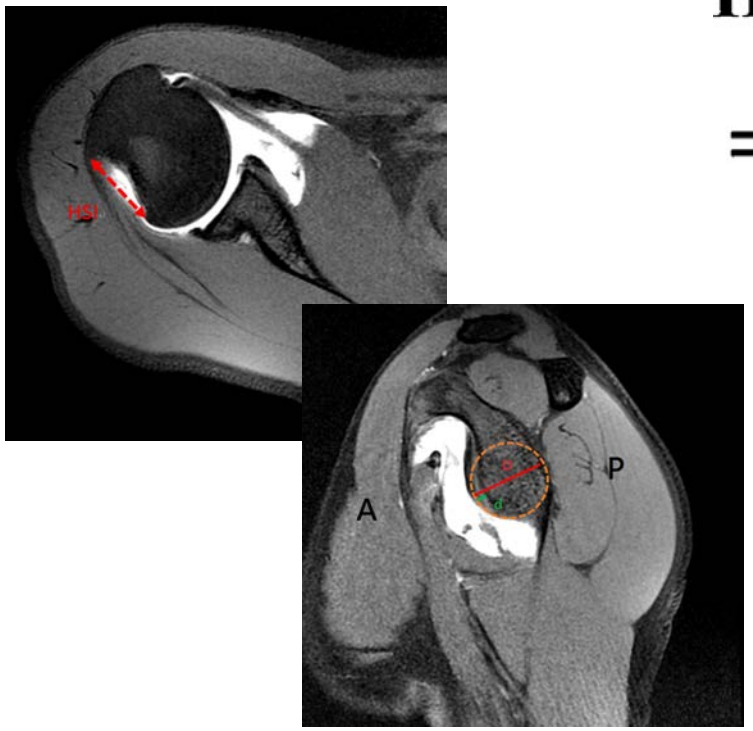


Off-track lesion is an outcome predictor

Reliability: CONTROVERSIAL ➡ ***mainly due to HSL measurements!***

Schneider 2017, Kawakami 2019, Funakoshi 2019, Hasegawa 2019, Chalmers 2020

Yang TC, Chen KH, Chiang ER, et al.
Using the "Hill-Sachs interval to glenoid track width ratio" for prediction of recurrent instability after arthroscopic Bankart repair.
Orthop Traumatol Surg Res. 2018 Oct;104(6):797-801.



$$\text{H/G ratio} = \frac{\text{Hill-Sachs interval}}{(0.83\ D - d)}$$

D: diameter of the inferior glenoid
d: width of the anterior glenoid bone loss

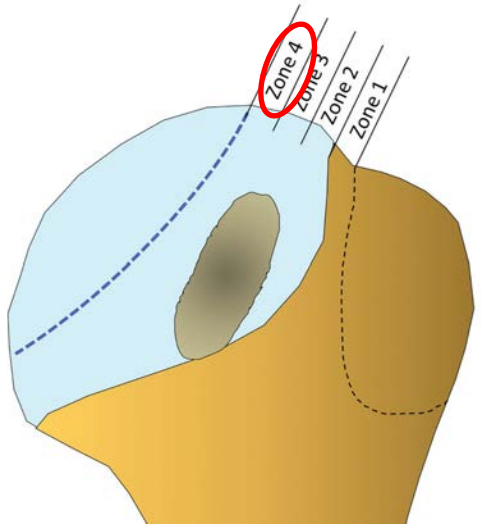
≥ 0.7: recurrent instability!

Yamamoto N, Shinagawa K, Hatta T, Itoi E
Peripheral-Track and Central-Track Hill-Sachs Lesions: A New Concept of Assessing an On-Track Lesion
Am J Sports Med. 2020 Jan;48(1):33-38

"Peripheral-track" lesion: a **Hill-Sachs** lesion

with a medial margin located between 75% and

100% of the glenoid track width



Peripheral track lesions

- 40 pts: On-track lesions; Bankart repair
  - Group 1 (H/G ratio <0.7): 20 pts
  - Group 2 (H/G ratio ≥0.7): 20 pts
- Follow-up (months):
  - Group 1: 54.6 ± 30.7
  - Group 2: 51.0 ± 34.7

Outcomes		Group 1 (H/G < 0.7)	Group 2 (H/G ≥ 0.7)	*p*
Recurrent instability	No	20 (100%)	18 (90%)	0.147
	Yes	0 (0%)	2 (10%)	
Quick-DASH		2.38 ± 3.16	6.82 ± 11.69	0.1
Work-DASH		0.74 ± 2.09	0.90 ± 2.29	0.84
Sport-DASH		8.23 ± 14.30	11.82 ± 20.11	0.53
ASES		78.5 ± 3.29	78.83 ± 5.38	0.81
WOSI		91.23 ± 9.55	84.58 ± 22.74	0.24

Only the articular part of HSL matters!!!

Peripheral track lesions

- 40 pts, bilateral CT scan
- M1: [(Vol healthy HH – Vol affected HH / Vol healthy HH)x100]
- M2: [(Vol virtual fragment / Vol healthy HH) x 100]

Reliability	*Method*	*ICC*	*95% CI*	
			Low	*Upp*
Intra-observer	M1	0.99	0.98	1.00
	M2	0.99	0.98	0.99
Inter-observer	M1	0.93	0.88	0.96
	M2	0.85	0.73	0.92

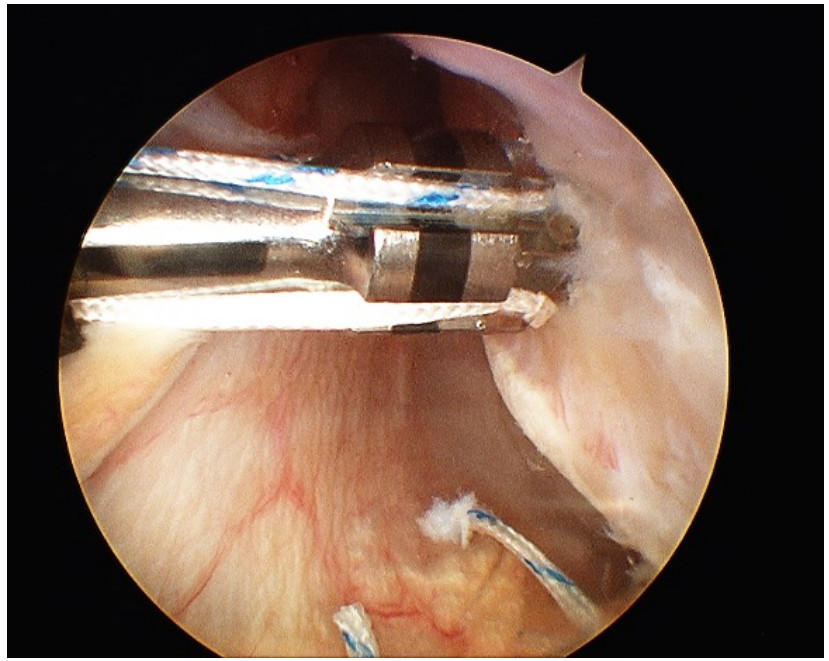
	Measure	Mean size (%)	SD
Method 2	Rater 1 - Measure 1	1.8	1.4
	Rater 1 - Measure 2	1.7	1.3
	Rater 2	1.7	1.6

Articular part of HSL is often very small!!!

Issue#2

Why to treat

with a remplissage?



Hurley ET, Toale JP, Davey MS, et al.
Remplissage for anterior shoulder instability with Hill-Sachs lesions: a systematic review and meta-analysis
J Shoulder Elbow Surg. 2020 Dec;29(12):2487-2494

- 8 studies (LOE II-III)
- 361 patients

Outcomes	ABR	ABR + R	*p*
Recurrent instability	16.8%	3.2%	0.001
Revision surgery	8.5%	1.7%	0.06
Rowe score	84.2	91.3	<0.01

In patients with Hill-Sachs lesions and subcritical glenoid bone loss,

***ABR with remplissage** resulted in **lower recurrence rate** compared with ABR alone*

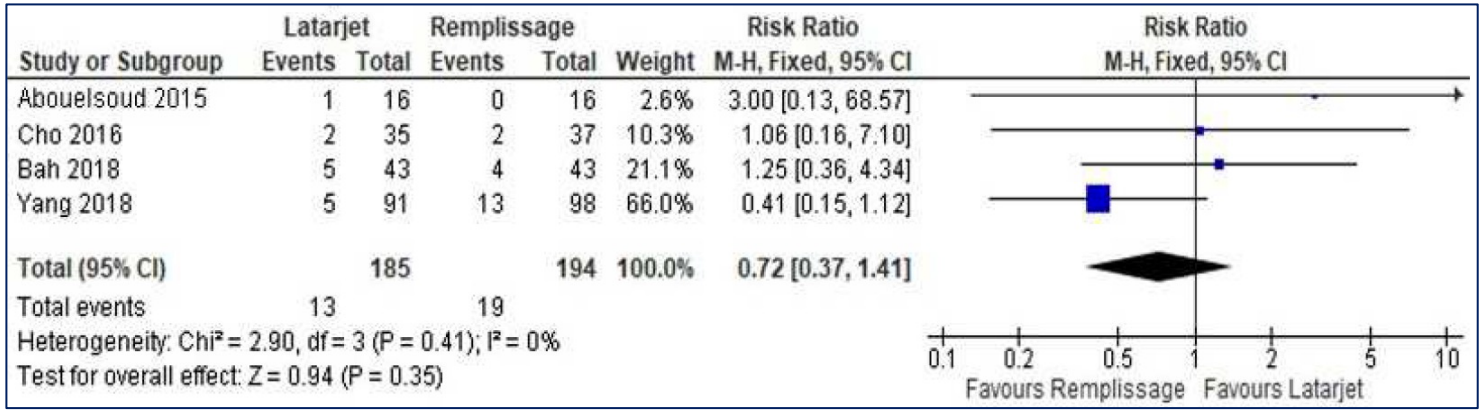
Haroun HK, Sobhy MH, Abdelrahman AA

Arthroscopic Bankart with Remplissage versus Latarjet Procedure for Management of Engaging Hill-Sachs Lesions with Subcritical Glenoid Bone Loss in Traumatic Anterior Shoulder Instability: A Systematic Review and Meta-analysis

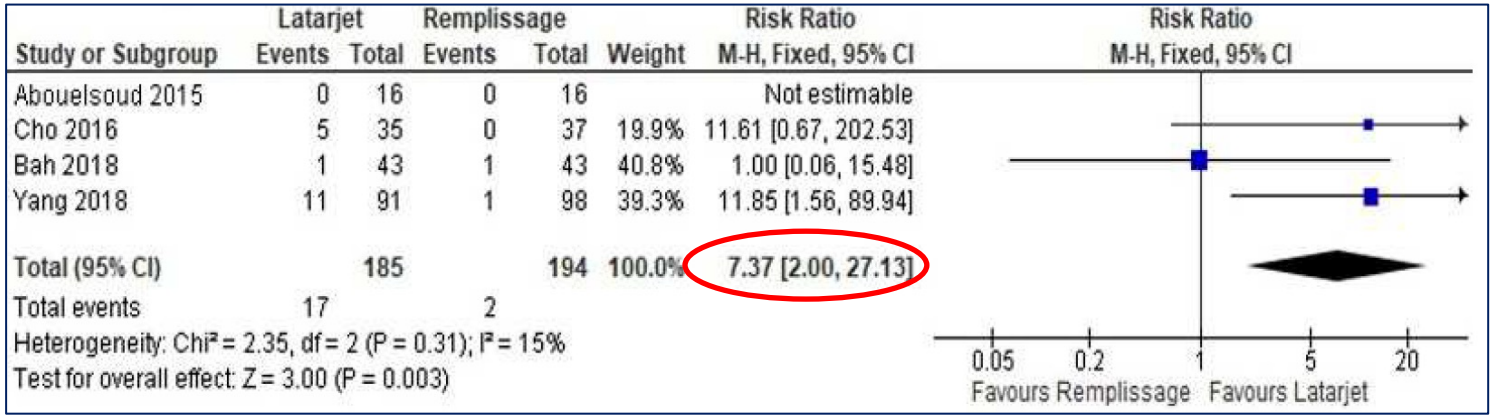
J Shoulder Elbow Surg 2020 Oct;29(10):2163-2174

- 4 studies (LOE II-III)
- 379 patients

Recurrence



Other complications



Due to the fewer overall postoperative complications, remplissage may be safer!

Issue#3

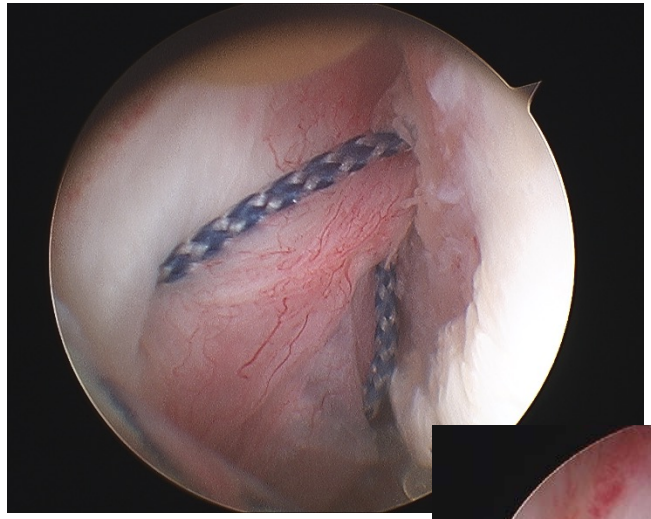
Why NOT to treat

With remplissage?

Downsides…

- Non anatomic

- Limited ER



➢ *Controversial* effect in long term functional outcome

Frantz TL, Everhart JS, Cvetanovich GL, Neviaser A, Jones GL, Hettrich CM, Wolf BR; MOON Shoulder Group, Bishop J, Miller B, Brophy RH, Ma CB, Cox CL, Baumgarten KM, Feeley BT, Zhang AL, McCarty EC, Kuhn JE

What Are the Effects of Remplissage on 6-Month Strength and Range of Motion After Arthroscopic Bankart Repair? A Multicenter Cohort Study

Orthop J Sports Med. 2020 Feb 27;8(2):2325967120903283. doi: 10.1177/2325967120903283

- Prospective study (LOE II)
- 6-month F-U

Independent Predictors of ER Weakness at 6 Months

	Conditional Odds Ratio (95% CI)	*P* Value
Preoperative ER weakness	13.20 (1.10-1.72)	.04
Remplissage	3.28 (0.41-26.30)	.26

Independent Predictors of Range of Motion Deficit ≥20° in ER With Elbow at 90° of Abduction[a]

	Conditional Odds Ratio (95% CI)	*P* Value
Remplissage	4.69 (1.41-15.60)	.01
≥20° ER deficit with elbow at 90° of abduction at baseline	4.21 (1.27-14.00)	.02
Beighton score per point increase	0.59 (0.36-0.97)	.04

ABR+R did not result in significant strength deficits

but increased the risk of ER stiffness in abduction compared with ABR-R

Randelli PS, Compagnoni R, Radaelli S, Gallazzi MB, Tassi A, Menon A

Arthroscopic remplissage is safe and effective: clinical and magnetic resonance results at a minimum 3 years of follow-up

J Orthop Traumatol. 2022 Jan 8;23(1):5

- Prospective study (LOE III)
- 3-year F-U

Groups	Affected shoulder	Healthy contralateral shoulder	*p*-value
No. patients (no. of shoulders)	12 (12)	12 (12)	
ROM ER1, degrees	75.00 [70.00–75.00]	85.00 [80.75–85.00]	0.0005
ROM ER2, degrees	80.00 [80.00–80.00]	90.00 [85.75–90.00]	0.0010
Strength ER1, lbs	12.08 (±3.13)	12.84 (±3.11)	0.2375 (n.s.)
Strength ER2, lbs	9.43 [8.44–14.91]	12.70 (±4.05)	0.0342

The low risk of recurrence was associated with an objective limitation on active ER, but this did not influence the patients' daily or sports activities

Pulatkan A, Kapicioglu M, Ucan V, Masai MN, Ozdemir B, Akpinar S, Bilsel K

Do Techniques for Hill-Sachs Remplissage Matter in Terms of Functional and Radiological Outcomes?

Orthop J Sports Med. 2021 Jun 28;9(6):23259671211008152. doi: 10.1177/23259671211008152

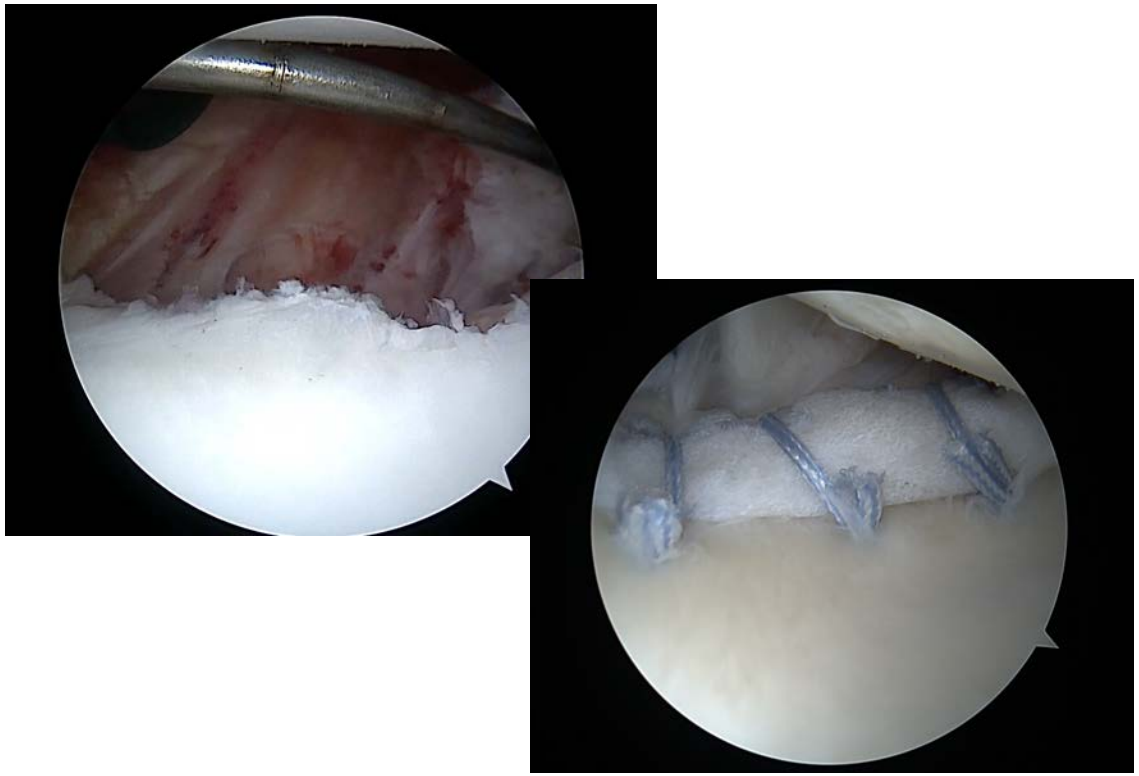
- Cohort study (LOE III)
- 3.5-year F-U

	Group SA (n = 20)	Group DA (n = 21)	*P* Value
Follow-up, mo	44.9 ± 12.9 (47; 28-65)	41.7 ± 6.5 (42; 30-56)	.48[b]
Forward flexion loss, deg	3.8 ± 7.0 (0; 0-30)	1.2 ± 2.2 (0; 0-5)	.185[b]
ER loss in neutral position, deg	9.0 ± 3.1 (10; 5-15)	11.9 ± 2.5 (10; 10-15)	**.003**[b]
ER loss at 90° of abduction, deg	8.0 ± 3.4 (8; 5-15)	11.0 ± 3.0 (10; 5-15)	**.006**[b]
Internal rotation loss	0.4 ± 0.8 (0; 0-2)	0.3 ± 0.7 (0; 0-2)	.631[b]
Rowe score	88.3 ± 4.7 (90; 80-95)	90.2 ± 4.6 (90; 80-95)	.182[b]
Walch-Duplay score	86.3 ± 6.9 (90; 65-95)	91.0 ± 4.6 (90; 80-95)	**.012**[b]
ASES score	88.8 ± 3.2 (90; 80-95)	91.9 ± 3.7 (95; 85-95)	**.005**[b]
FISOR grade	5.8 ± 1.3 (6; 3-8)	6.8 ± 1.3 (7; 3-8)	**.015**[b]
Recurrence, n (%)	1 (5)	2 (10)	≥.999[c]

Double-pulley technique provided better filling of the lesion and improvement in functional scores, but ER was limited compared with the mattress suture technique

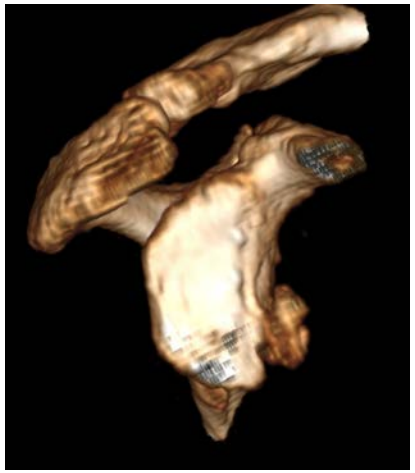
Remplissage is not a solution for every bone loss!

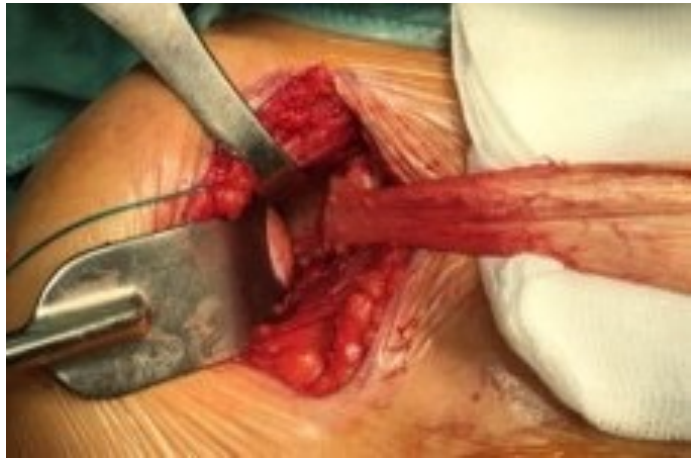
- Subcritical glenoid bone loss + subcritical HSL



Latarjet is not a solution for every bone loss!

- Massive defects
  - *Glenoid bone loss >20% + off-track HSL*





My way…

Glenoid BL	*HSL*	*Treatment*
< 13%	HGR < 0.7	Arthroscopic Bankart repair (alone)
< 13%	HGR ≥ 0.7	ABR + remplissage
13-20%	HGR ≥ 0.7	Glenoid augmentation + HH bone graft
13-20%	HGR ≥ 1	Latarjet
> 20%	HGR ≥ 0.7	Latarjet
> 20%	HGR ≥ 1	Glenoid bone graft + HH bone graft

Conclusions

- Remplissage is a safe, well-known and effective procedure in **subcritical glenoid bone loss** and **off-track Hill Sachs lesions**

NON ANATOMIC!

Anatomy restoration should always be the main goal!!!

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Thank you!!