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Radiological factors to predict subacromial notching that may occur after lateralized RSA

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Conflict of Interests

- ✓ All authors have nothing to disclose related to this study.

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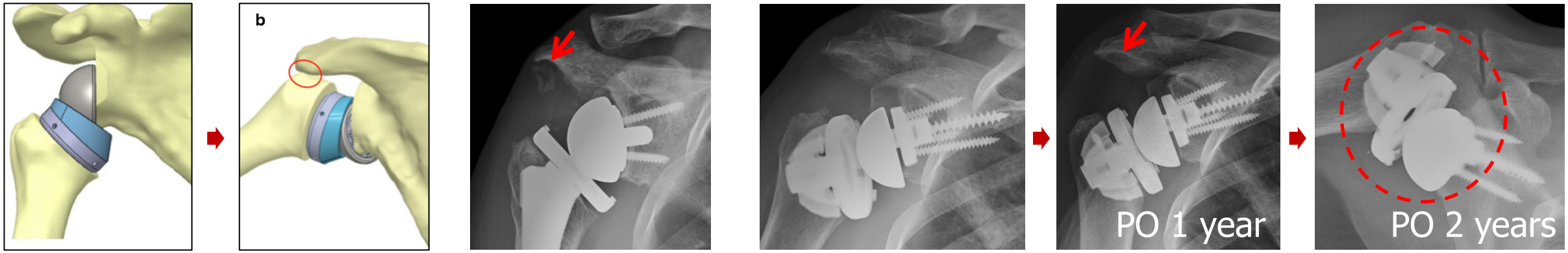
Introduction

Subacromial notching after lateralized RSA



- **Bony impingement** between the **GT** and the **acromion** during abduction increases in **lateralized RSA**.

Lädermann et al, Int Orthop, 2015

- **Repeated subacromial impingement** not only causes pain and range of motion (ROM) limitations, but also could provoke the severe complications including **subacromial notching** and **tray failure**.

Oh Jh, et al, JSES, in-press, 2023

Hypothesis & Purpose

- **Hypothesis**
  - ✓ Probability of subacromial notching (SaN) will vary depending on the **patient's native anatomy** or **postoperative implant position** in patients with RSA.

- **Purpose**
  - ✓ To find **the risk factors** of **subacromial notching**
  - ✓ To evaluate their contributions to effectively prevent subacromial notching that may occur after RSA

Materials & Methods

Patient enrollment

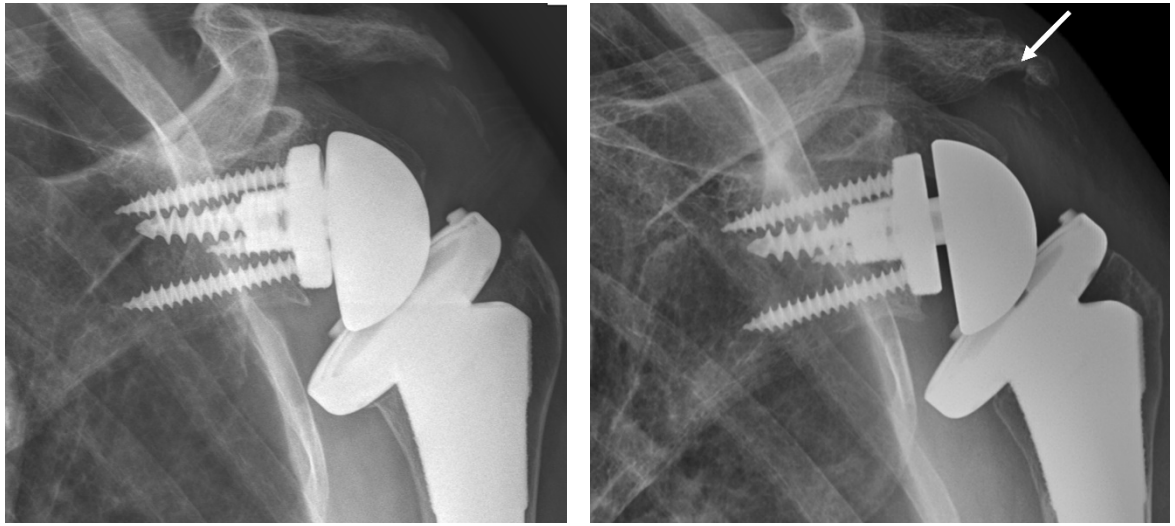
- Study period
  - ✓ March 2014 ~May 2017
- Inclusion criteria
  - ✓ Single type of **lateralized humerus** & **lateralized glenoid** RSA (n=185, Zimmer-Biomet Comprehensive® system, Warsaw, IN)
  - ✓ Minimal 2 years F/U
- Exclusion criteria
  - ✓ Revision arthroplasty (n = 2)
  - ✓ Consequences of septic shoulder (n = 5)
  - ✓ Sequelae of proximal humerus fracture (n = 14)
  - ✓ Other type of RSA (n = 26)
  - ✓ Follow-up period less than 2 years (n = 13)

❖ **Final enrollment: 125 of 185 patients**

Materials & Methods

Radiologic assessment

- To evaluate whether abduction notching occurred, the **presence of SaN** was **confirmed** by comparing the true AP X-ray at preoperative work-up, postoperative 3 months, and the final follow-up



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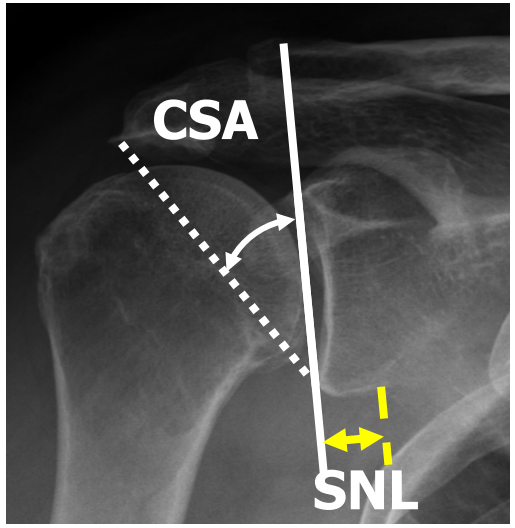
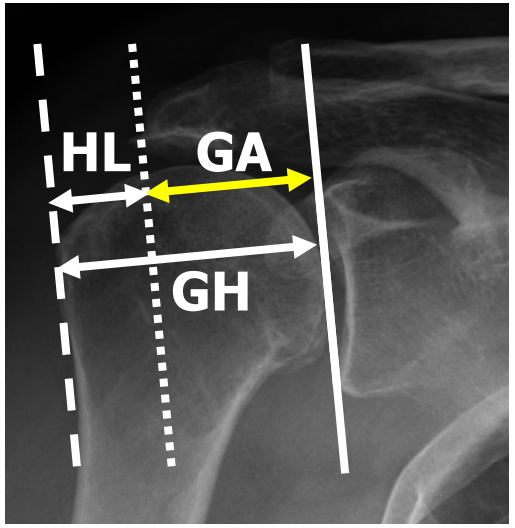
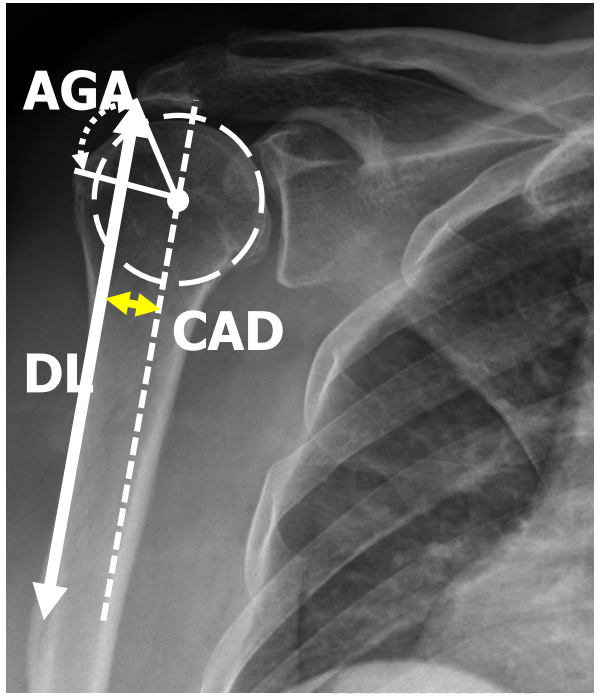
Materials & Methods

- Preoperative radiologic variables
  - ✓ Critical shoulder angle (CSA)
  - ✓ Scapular neck length (SNL)
  - ✓ Glenoid-Humerus offset (GH)
  - ✓ Glenoid-Acromial offset (GA)
  - ✓ Humerus lateralization offset (HL)
  - ✓ Acromial index (AI): GA/GH
  - ✓ Acromion-GT angle (AGA)
  - ✓ Center of rotation to acromion distance (CAD)
  - ✓ Deltoid length (DL)







Materials & Methods

- Postoperative radiologic variables
  - ✓ Glenoid-Humerus offset (GH)
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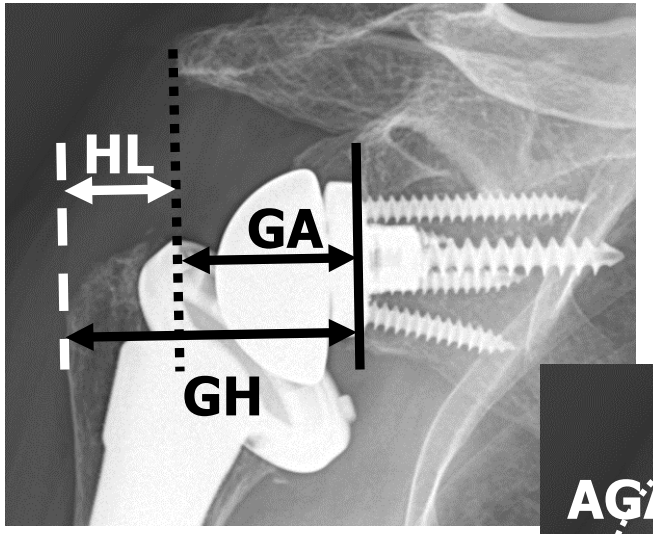
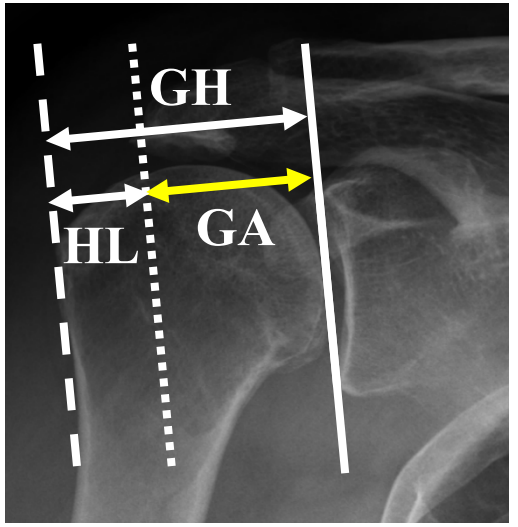
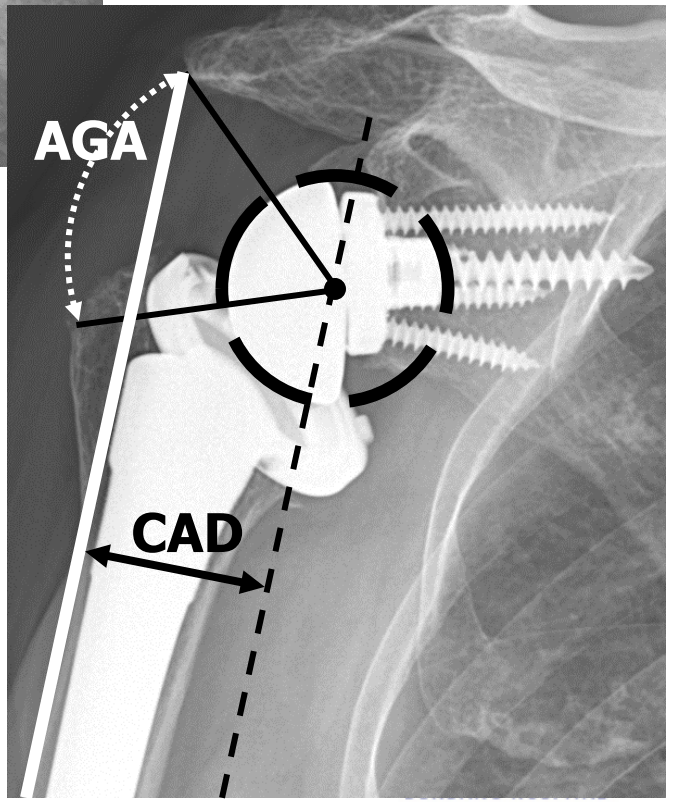






Results

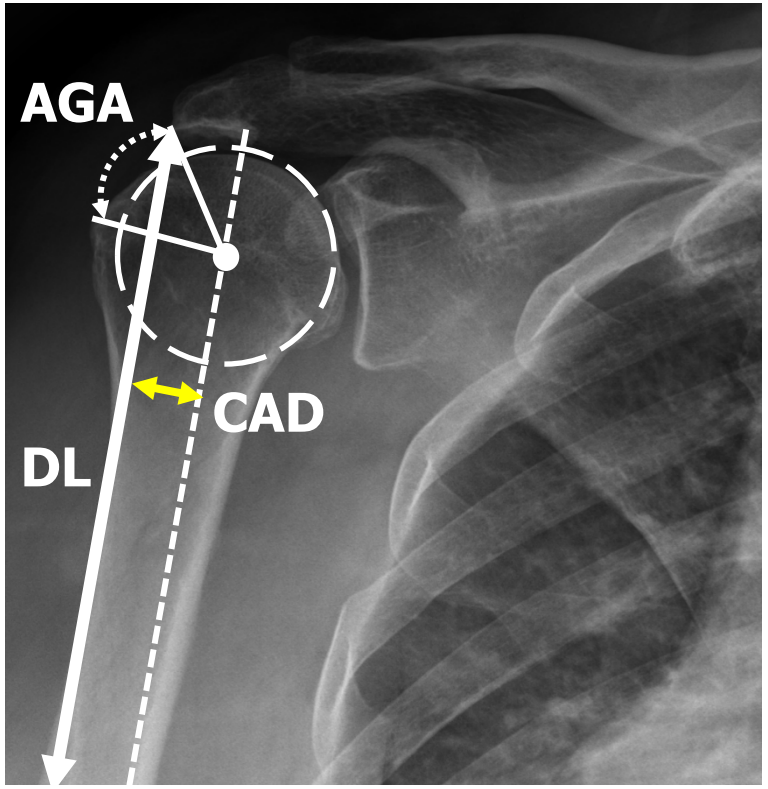
	SaN (+) n = 16 (12.8%)	SaN (-) n = 109 (87.2%)	P-value
Age, years	71.3 ± 7.1	71.8 ± 6.6	0.793
Sex, Male:Female	2:14	22:87	0.735
Hand dominance, Yes:No	10:6	87:22	0.194
Bone mineral density	-1.7 ± 1.4	-2.2 ± 1.2	0.176
Follow-up duration, months	59.8 ± 16.2	49.4 ± 16.2	0.051

- **Subacromial notching** was occurred in **16/125 (12.8%)** of the patients.
- **Demographics** were **not** significantly **different** according to the occurrence of SaN.

Results

Preoperative radiologic variables

	SaN (+)	SaN (-)	P value
CSA, °	35.0 ± 4.4	35.1 ± 4.1	0.924
SNL, mm	10.6 ± 1.0	10.9 ± 1.0	0.754
AI, %	69.8 ± 8.0	74.4 ± 13.6	0.079
GH, mm	48.4 ± 4.1	47.4 ± 5.9	0.331
GA, mm	33.6 ± 3.2	35.1 ± 2.9	0.069
HL, mm	14.8 ± 4.4	12.2 ± 6.5	0.088
DL, mm	163.0 ± 10.3	167.5 ± 9.2	0.079
CAD, mm	16.3 ± 4.2	13.3 ± 2.0	**< 0.001**
AGA, °	32.2 ± 13.5	41.2 ± 12.2	**0.010**



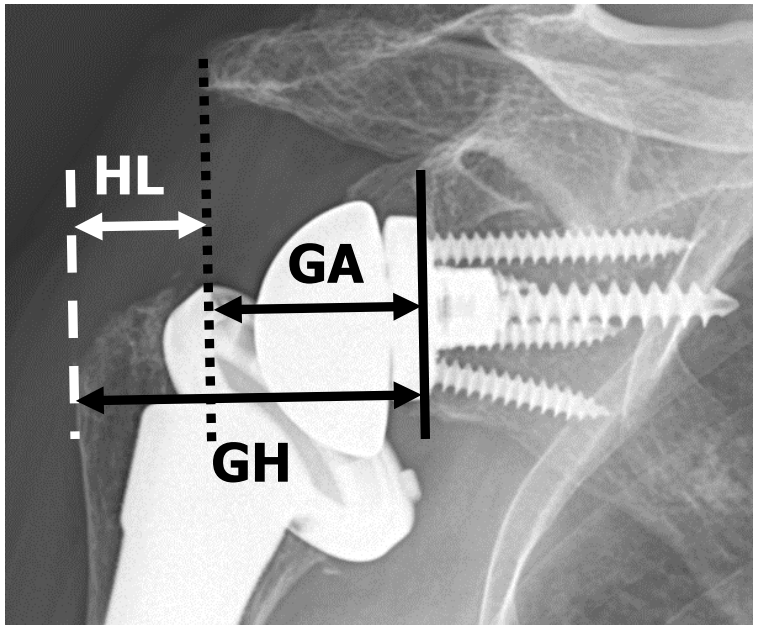
- **CAD ↑ = Lateralized humeral head**
- **AGA ↓ = Elevated humeral head**

} **Subacromial notching ↑**

Results

Postoperative radiologic variables

	SaN (+)	SaN (-)	P-value
AI, %	62.9 ± 8.9	71.2 ± 8.5	**0.001**
GH, mm	55.3 ± 4.7	54.1 ± 4.4	0.290
GA, mm	34.7 ± 4.2	38.3 ± 4.2	**0.004**
HL, mm	20.7 ± 5.6	15.8 ± 5.4	**0.001**
DL, mm	179.9 ± 11.2	178.8 ± 21.3	0.766
CAD, mm	39.4 ± 4.5	38.8 ± 4.3	0.642
AGA, °	52.6 ± 5.4	51.2 ± 5.9	0.394



- **AI↓ HL↑ GA ↓ = More Lateralization**
  → Subacromial notching ↑

Results

Final follow-up	SaN (+)	SaN (-)	P-value
Pain, VAS	1.8 ± 2.1	0.6 ± 1.3	**0.010**
ASES score	80.4 ± 15.3	89.5 ± 14.3	**0.040**

- **Predictors of subacromial notching**
  - ✓ Preoperative CAD > 14.0 mm (p = 0.009)
    - *OR 8.8 (Sen. 81.2%, Spe. 67.1%)*
  - ✓ Postoperative HL > 19.0 mm (p = 0.003)
    - *OR 6.5 (Sen. 68.8%, Spe. 74.7%)*
  - ✓ In both pre- & post-operative X-ray, **more lateralization** was found to be related with **subacromial notching**.

- **Functional outcomes** were **worse** in **SaN (+)** group.

Conclusion

- To prevent subacromial notching, surgeons should consider the **risk factors before surgery** and try **not** to become **too much lateralization**.
  - ✓ Preoperative center of rotation to acromion distance > **14 mm**
  - ✓ **Too much lateralization** during **RTSA** (postoperative humerus lateralization offset > **19 mm**)
- **Functional outcomes** at final follow-up were significantly **worse** in patients with **subacromial notching**.

This study was accepted in JSES.

Thank you very much for your attention!!