


Instability: The Challenge of the RSA?

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Oostende

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Introduction



- ▶ History
- ▶ Epidemiology
- ▶ Biomechanics
- ▶ Glenoid implants
- ▶ Humeral implants
- ▶ Exposure
- ▶ Subscapularis repair
- ▶ Conclusions

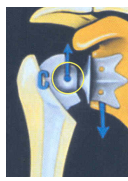


History






History

Stanmore

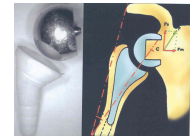




Constraint ++
Torque



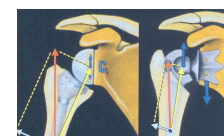
History

Grammont







History

Grammont



Medialized COR
Potentialization of deltoid

History

- ▶ Growing indications:
 - OA
 - Massive tears
 - Fractures
 - Instability
- ▶ USA:
 - 2004-2011: 1/3 of shoulder arthroplasties
- ▶ Instability: most common complication 1,5 - 30%

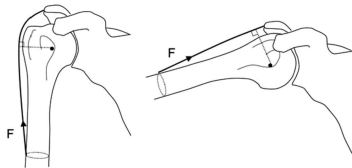


Epidemiology

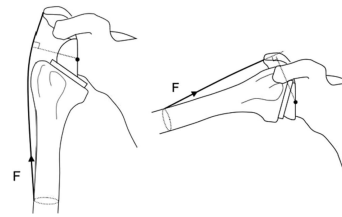
- ▶ Male gender
 - Chalmers & al., 2014; Cheung et al 2018; Trappay et al. 2011 ; Chae et al. 2018
- ▶ BMI>30
 - Chalmers et al. 2014
- ▶ Prior open procedures - soft tissues?
 - Chalmers & al., 2014; Cheung et al 2018;
- ▶ Fracture sequelae
 - Tuberosity nonunion!!
 - Cheung et al 2018
- ▶ Subscapularis status



Biomechanics



Biomechanics



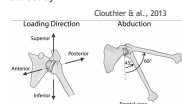
Chae et al 2018, Bertiner et al. 2015



Biomechanics - Instability?

Factors affecting the stability of RSA: a biomechanical study

Detroid loading
Actively increasing abduction



Cloathier & al., 2013

→ Early active rehabilitation?



Glenoid component

Glenoid Size

Larger sphere increase external rotation and strenght in abduction

Muller et al., 2018

Effect on stability?

Biomechanically and clinically no difference

Cloathier et al 2013, Langhor et al., 2015, Mollon et al., 2016, Muller et al., 2018



Glenoid component

Offset - glenosphere eccentricity

Increase adduction and decrease notching

Nyffeler et al., 2005

Glenoid component

Offset - glenosphere eccentricity

Effect on stability?

- 17% force to dislocate
- > Increase deltoid tension and avoid impingement

Clouthier et al. 2013

Glenoid component

Inferior tilt

Highest compressive forces

Gutierrez et al. 2007

10° tilt reduce risk of instability

Randelli et al. 2014

Glenoid component

Lateralization

Increase joint load

Increase torque → glenoid loosening

Heminger et al. 2012

Glenoid component

Lateralization

BioRSA?

- 6% Dislocation with medialised COR
- No dislocation with BioRSA

Boileau et al. 2006; Boileau et al. 2011

Increase Deltoid Tension → deltoid pain, acromial fracture...?

Humeral design

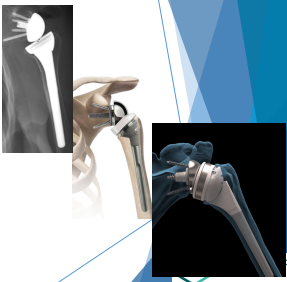
- Buried in the humerus
- In-line with the cut
- Medialized

- Outside of the humerus
- Lateralized

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Humeral Neck Shaft Angle

- 155°:
 - ✓ Covers less than the half of the glenosphere
 - ✓ Humeral lowering and deltoid tensioning
 - ✓ Medialisation of the center of rotation
 - ✓ Stability?
- 135-145°:
 - ✓ Reduce the adduction deficit and thus the notching



Lidemann et al. International Orthopaedics 2015

Can a functional difference be detected in reverse arthroplasty with 135° versus 155° prosthesis for the treatment of rotator cuff arthropathy: a prospective randomized study.

Gobezie R¹, Shishani Y², Lidemann E³, Denard P⁴.

- ✓ Prospective randomized study
- ✓ 135° vs 155°, neutral glenosphere
- ✓ Evaluation of ROM, complication rate and functionals scores

Conclusions:

- No differences regarding the ROM
- Notching 21% (135°); 59% (155°)

	135°	155°	P value
FF	132° ± 19°	135° ± 17°	.321
ER	22° ± 10°	30° ± 14°	.116
VAS	2 ± 2.9	1 ± 1.3	.267
ASES	74 ± 26.6	78 ± 15.1	.444
SANE	74 ± 25.4	78 ± 16.8	.482
SST	8 ± 3.0	7 ± 2.2	.598

ASES, American Shoulder and Elbow Surgeons; ER, external rotation; FF, forward flexion; SST, Single Shoulder Test; SANE, single assessment numeric evaluation; VAS, visual analog scale.

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Humeral Version

J Shoulder Elbow Surg. 2010 Jun;19(4):550-6. doi: 10.1016/j.jse.2009.11.044. Epub 2010 Mar 23.

The effect of component positioning on intrinsic stability of the reverse shoulder arthroplasty.

Favre P¹, Sussemann PS, Gerber C.


- ✓ Biomechanical study
- ✓ Evaluation of the RSA stability on a machine
- ✓ Humeral version:
 - Retroversion: 10 and 20°
 - Neutral
 - Anteversion: 10 and 20°
- ✓ Conclusion: neutral version or slight anteversion improve the stability by 21%

Favre et al. JSES 2010

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Approach: Delto-pectoral vs antero-superior deltoid splitting

- ✓ Delto-pectoral:
 - Deltoid preservation
 - Glenoid exposure
 - Glenoid implant positioning
 - Compromise the subscapularis
- ✓ Antero-superior:
 - Subscapularis preservation
 - Enhance the stability
 - Humeral cut 155°
 - Superior tilt of the glenosphere
 - Deltoid damage



Ackland et al. J. Orthopaedic Surgery and Research 2015
Male et al. COOR 2011


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Bru Clin Orthop Relat Res. 2007 Oct;316 Suppl:37-64.

[Excentered scapulohumeral osteoarthritis].

(Article in French)
Molé D¹, Favard L.

- ✓ Multicenter study, prospective, SOFCOT
- ✓ 527 RSA, FU 2 years
- ✓ Delto pectoral (n=300) vs antero superior (n=227)
- ✓ Instability:
 - DP: 5,1%
 - AS: 0,8%



SOFCOT

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Orthop Relat Res. 2011 Sep;469(9):2461-8. doi: 10.1007/s11999-011-1861-7.

Surgical technique: the anterosuperior approach for reverse shoulder arthroplasty.

Molé D¹, Wein F, Dézaki C, Valenti P, Sinvaux F.

- ✓ Review
- ✓ Comparison between DP and AS approach
- ✓ DP: 1,7 to 9%
- ✓ AS: 0%

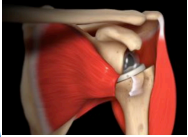
Study	Approach	Number of patients	Followup (months)	Instability	Notch
Bolau et al. [2]	DP	21	40	4.8%	
Simonich et al. [18]	DP	77	44		44%
Werner et al. [20]	DP	37	38	5.4%	
Frankle et al. [8]	DP	60	33	1.7%	0%
Nové-Josserand [17]	DP	92	49	9%	
Lévigne [12]	DP	92	49		46%
Nové-Josserand [17]	AS	37	49	0%	
Lévigne [12]	AS	37	49		66%
Young et al. [21]	AS	45	38	0%	24%

DP = deltopectoral; AS = anterosuperior.

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The role of the subscapularis: controversial

- ▶ Is the repair mandatory?
- ▶ Improve the stability?
- ▶ External rotation deficit?



J Shoulder Elbow Surg. 2019 Feb 28; 28(2):e1958-2146(18)30932-7. doi: 10.1016/j.jse.2018.11.009. (Epub ahead of print)

The effect of subscapularis repair on dislocation rates in reverse shoulder arthroplasty: a meta-analysis and systematic review.

Mathiessen G¹, Koozer S², Kneipisz A³, Lutter J⁴, Old J⁵, MacDonald E⁶.

- ▶ Meta-analysis, 7 studies, 1306 patients
 - ▶ Stability with or without Subscapularis repaired
 - ▶ Medialized vs lateralized design
- ▶ Results:
1. Less dislocation with subscapularis repair
 2. No difference between lateralized and medialized arthroplasty when the subscap was repaired
 3. If the subscap isn't repaired, lateralized arthroplasty offers a better stability

Tips & Tricks

1. Reduction test: not too loose, not too tight
2. Piston test: a small or no space between the insert and the glenosphere
3. Came effect: Lateralization, 135°/145°

J Shoulder Elbow Surg. 2019 Apr 27; 28(4):e1118. doi: 10.1016/j.jse.2017.08.031. Epub 2017 Nov 23.

Classification of instability after reverse shoulder arthroplasty guides surgical management and outcomes.

AbdelFattah A¹, Otto RL², Simon P³, Christman KN³, Tanner G¹, LaMartina J 2nd¹, Levy JC⁴, Cluff DJ⁵, Michal MA¹, Franke MA⁶.

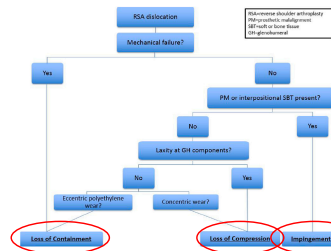


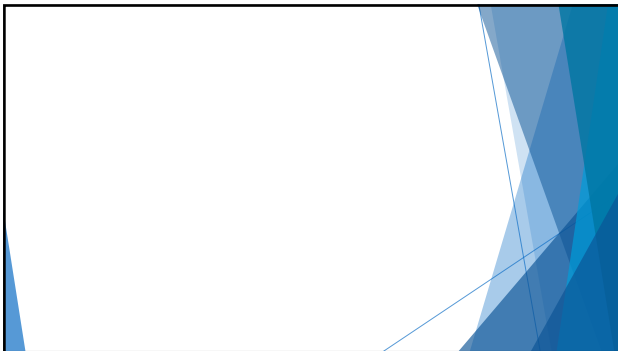
Figure 6 Reverse shoulder arthroplasty instability diagnostic algorithm.

Conclusions

1. Male and BMI > 30
2. Fracture - Tuberosities non union
3. Glenoid factors influencing stability
 - ✓ Inferior offset
 - ✓ Inferior tilt
 - ✓ Lateralization
4. Humeral design and Neck Shaft Angle don't affect the stability
5. Neutral version improves the stability
6. Antero-superior approach
7. Subscapularis repair or preservation

Thank You !





J Shoulder Elbow Surg. 2017 Apr;26(4):662-668. doi: 10.1016/j.jse.2016.08.027. Epub 2016 Oct 27.

Comparison of reverse total shoulder arthroplasty outcomes with and without subscapularis repair.

Friedman RA¹, Elzubi PH², Wright IV³, Zuckerman JD⁴, Rooshe CP⁵.


- ▶ Retrospective study, FU 2 years, Onlay prosthesis (Exactact RSA)
- ▶ Comparison between RSA with a subscap repair (N=340) and RSA without repair (N=251)
- ▶ Is there a difference regarding the functional scores, the pain, the ROM and the complications?
- ▶ Results:
 1. No difference between the two groups regarding the functional scores, the pain and the ROM
 2. 3/251 dislocation for the non-repaired group
 3. 0/340 for the repaired group

	SS†	UKA	ASES	Constant	SPAD	Active abduction, °	Active flexion, °	Internal rotation, °	Active external rotation, °	Passive external rotation, °	Maximum weight, kg
Repair	7.1 ± 3.3	10.7 ± 5.4	41.7 ± 18.5	39.3 ± 16.3	63.2 ± 28.3	41 ± 38	59 ± 46	14.8 ± 13	22 ± 26	22 ± 22	3.3 ± 8.2
No repair	6.1 ± 3.5	17.0 ± 8.1	46.4 ± 22.2	32.7 ± 17.8	58.5 ± 30.4	40 ± 42	51 ± 44	12.2 ± 11	16 ± 18	19 ± 25	2.1 ± 2.2
P-value	.0001*	.010	.002	.0002*	.148	.264	.369	.0007*	.004*	.063	<.0001*

Data are presented in mean ± standard deviation. ASES, American Shoulder and Elbow Surgeons; RSA, reverse total shoulder arthroplasty; SPAD, Shoulder Pain and Disability Index; SS, Simple Shoulder Test; UKA, University of California, Los Angeles. * Statistically significant.

1. Instabilité

- ✓ Causes pas tout à fait claire:
 - ▶ Insuffisance de longueur
 - ▶ Taille de la glénosphère
 - ▶ Reliquat Susépineux
 - ▶ Tubérosités mal repositionnées en cas de fracture
 - ▶ Infection
 - ▶ Voie d'abord?
 - ▶ Lésion ou sacrifice du Sousscapulaire?
- ✓ Facteurs de risque:
 - ▶ Obésité
 - ▶ Révision



Padegimas et al., AJQ 2016

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1. Epidemiology
2. Biomechanics
3. Retroversion
4. Implant design
5. 155° vs 145° vs 135°
6. Approach
7. Subscapularis matter

Positionnement de l'humérus
Allongement ?
Latéralisation ?
Tige 135? 145? 155?
Voie d'abord
Technique chirurgicale (tissu mou - libération?)
Rôle du sous scapulaire?
Conclusions

1. Introduction
2. Epidémiologie
3. Biomécanique
4. Positionnement de la glène
5. Positionnement de l'humérus
 1. Allongement ?
 2. Latéralisation ?
6. Tige 135? 145? 155?
7. Voie d'abord
 1. Libération tissu mou
8. Rôle du sous scapulaire?
9. Conclusions

1. Positionnement de l'humérus
 1. Allongement ?
 2. Latéralisation ?
2. Tige 135? 145? 155?
3. Voie d'abord
 1. Libération tissu mou
4. Rôle du sous scapulaire?
5. Conclusions

Humeral positioning

1. Lengthening
2. Lateralization
3. Retroversion
4. Insert

Humeral positioning

1. Lengthening
2. Lateralization
3. Retroversion
4. Insert

► Summary:

- Male and BMI > 30
- Fracture - Tuberosity non union
- Glenoid factors influencing stability
 - Inferior offset
 - Tilt
 - Lateralization