

Univers Revers™ System Scientific Update

A Review of Design Rationale, Techniques, and Outcomes



Gobezie R,
Shishani Y,
Lederman E,
Denard PJ

Erickson BJ,
Frank RM,
Harris JD,
Mall N,
Romeo AA

Launched in 2012, the versatile Univers Revers total shoulder system includes an enhanced feature set that optimizes joint mechanics.

To access detailed study information, click on the journal title.

Clinical Articles

[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.](#) *J Shoulder Elbow Surg.* 2019;28(5):813-818. doi:10.1016/j.jse.2018.11.06

- Randomized controlled trial on 100 primary RSAs performed with a humeral inclination of 135° or 155°
- Neutral glenosphere was used in all cases
- No difference in postoperative forward flexion or external rotation between the 135° and 155° groups
- Scapular notching occurred in 21% of the 135° group and 59% of the 155° group

Takeaway

- **Early data suggested that a 155° humeral inclination angle leads to improved forward flexion compared to a 135° humeral inclination angle. This study refutes that claim as scapular notching was higher in the 155° group.**

[The influence of humeral head inclination in reverse total shoulder arthroplasty: a systematic review.](#) *J Shoulder Elbow Surg.* 2015;24(6):988-993. doi:10.1016/j.jse.2015.01.00

- Systematic review of 38 studies (2222 shoulders) comparing a 155° inclination and a 135° inclination with a lateralized glenosphere
- Rate of scapular notching was 2.83% in the 135° group compared to 16.80% in the 155° group
- Rate of dislocation was 1.74% in the 135° group compared to 2.33% in the 155° group
- The 135° group demonstrated significantly more postoperative external rotation than the 155° group
- Forward elevation did not differ between the groups

Takeaway

- **Paired with a lateralized glenosphere, a 135° inclination angle is effective at reducing scapular notching and improving external rotation. Furthermore, the 135° group was not at greater risk for dislocation.**



Ascione F,
Kilian CM,
Laughlin MS,
et al

[Increased scapular spine fractures after reverse shoulder arthroplasty with a humeral onlay short stem: an analysis of 485 consecutive cases.](#) *J Shoulder Elbow Surg.* 2018;27(12):2183-2190. doi:10.1016/j.jse.2018.06.007

- Consecutive series of 485 RSAs (Aequalis Ascend Flex stem)
- Patients who presented with a scapular spine fracture were matched with nonfracture control patients
- Unable to determine any clear preoperative risk factors
- 4.3% incidence of scapular spine fracture with this onlay device
 - Of these reported fractures, 57.1% occurred at the distal tip of the superior screw

Takeaway

- **Use of a lateralized onlay design resulted in an increased incidence of scapular spine fractures compared to the original Grammont design. Scapular spine fractures lead to inferior clinical results. Onlay RSA design may result in increased humeral lengthening and consequent stresses on the deltoid.**

Haidamous G,
Lädemann A,
Frankle MA,
Gorman RA 2nd,
Denard PJ

[The risk of postoperative scapular spine fracture following reverse shoulder arthroplasty is increased with an onlay humeral stem.](#) *J Shoulder Elbow Surg.* 2020;29(12):2556-2563. doi:10.1016/j.jse.2020.03.036

- Retrospective review of 426 RSA patients who received three different implant systems
- 6.1% (26) of patients were diagnosed with a scapular spine fracture (SSF)
 - All type III fractures occurred adjacent to or at the tip of the one of the baseplate screws
- 2 inlay designs had a SSF incidence of 4.7%
- 1 onlay design had a SSF incidence of 11.9%

Takeaway

- **Distalization was higher in the SSF group. Moreover, the incidence of SSF was 2.5 times higher with an onlay stem compared to an inlay stem.**

Denard PJ,
Lederman E,
Parsons BO,
Romeo AA

[Finite element analysis of glenoid-sided lateralization in reverse shoulder arthroplasty.](#) *J Orthop Res.* 2017;35(7):1548-1555. doi:10.1002/jor.23394

- Finite element analysis (FEA) that evaluated glenoid-sided lateralization
- Stress and displacement were lowest with a 10° inferiorly tilted baseplate
- Stress was lowest with 10° divergent peripheral screws
- Stress and displacement were both lower with prosthetic lateralization compared to bony lateralization
- Minimal difference between lateralization with the glenosphere or the baseplate

Takeaways

- **This FEA model supports the conclusion that prosthetic lateralization leads to less stress and displacement compared to bony lateralization. Prosthetic lateralization offers the advantage of precise control of lateralization. Consideration should be given to the fact that lateralization via bone graft has shown positive healing rates in the literature.**



Gutiérrez S,
Walker M,
Willis M,
Pupello DR,
Frankle MA

[Effects of tilt and glenosphere eccentricity on baseplate/bone interface forces in a computational model, validated by a mechanical model, of reverse shoulder arthroplasty.](#) *J Shoulder Elbow Surg.* 2011;20(5):732-739. doi:10.1016/j.jse.2010.10.035

- Validated computer model used to compare glenosphere center of rotation (concentric, lateral eccentric, and inferior eccentric) and baseplate tilt (15° superior, neutral, and 15° inferior)
- For lateral and concentric glenospheres, the baseplate forces were more evenly distributed under inferior tilt
- For an inferior eccentric glenosphere, the baseplate forces were more evenly distributed under neutral tilt

Takeaway

- **Knowing the force distribution at the baseplate-bone interface for various glenosphere offsets and tilts provides value when defining surgical strategies to avoid mechanical failure of the baseplate.**

Keener JD,
Patterson BM,
Orvets N,
Aleem AW,
Chamberlain AM

[Optimizing reverse shoulder arthroplasty component position in the setting of advanced arthritis with posterior glenoid erosion: a computer-enhanced range of motion analysis.](#) *J Shoulder Elbow Surg.* 2018;27(2):339-349. doi:10.1016/j.jse.2017.09.011

- Retrospective diagnostic study of ten selected shoulders with advanced glenoid bone deformity
- “9.7 mm of anterior glenoid reaming was needed to obtain adequate bone support of the baseplate at 0° of version.”
- External rotation ROM decreased with greater degrees of retroversion
- Increased glenoid lateralization resulted in significantly greater ROM
- ROM in all directions was significantly greater with a more varus angle of inclination (ie, 135°), except for abduction

Takeaway

- **The most lateral offset studied in this article likely restored the baseplate only to a neutral joint line, given the degree of reaming performed. In the setting of bone deformity, the optimal ROM is achieved with 10 mm baseplate lateralization and neutral to 5° retroversion partnered with a humeral implant with a varus (135°) inclination angle.**



Stephens BF,
Hebert CT,
Azar FM,
Mihalko WM,
Throckmorton TW

[Optimal baseplate rotational alignment for locking-screw fixation in reverse total shoulder arthroplasty: a three-dimensional computer-aided design study.](#) *J Shoulder Elbow Surg.* 2015;24(9):1367-1371. doi:10.1016/j.jse.2015.01.012

- 73 arthritic scapulae were reconstructed from CT images
- “11° of baseplate internal rotation from the 12 o’clock position offer maximal fixation with fixed-angle locking screws.”
- 100% of coracoid screws achieved full purchase
- 99% of inferior pillar screws achieved full purchase
- 78% of scapular spine screws could not be placed without an in-out-in configuration
- “The average length of screw in the position of maximal fixation (ie, ideal rotation) was more than 30 mm in all 3 scapular pillars.”

Takeaway

- **Rotating a baseplate with fixed-angle locking screws into 11° of internal rotation (ie, superior screw towards the base of the coracoid) can aid in increasing baseplate screw length. The authors infer this leads to an increase in stability of the baseplate-glenoid interface.**

Humphrey CS,
Kelly JD 2nd,
Norris TR

[Optimizing glenosphere position and fixation in reverse shoulder arthroplasty, part two: the three-column concept.](#) *J Shoulder Elbow Surg.* 2008;17(4):595-601. doi:10.1016/j.jse.2008.05.038

- 10 scapulae specimens were implanted with 2 types of baseplates (variable angle and fixed angle)
- Average screw length for the superior hole was 36 mm for variable angle and 33 mm for fixed angle
- Average screw length for the inferior hole was 47 mm for variable angle and 43 mm for fixed angle
- “Use of a fixed-angle baseplate instead of a variable-angle baseplate made only a small difference in final length of the screw.”

Takeaway

- **Excellent screw purchase can be achieved with both variable-angle and fixed-angle baseplates**



Schwyzler HK,
Marzel A,
Wirth B,
et al

Short-term safety, function, and quality of life in patients treated with Unvers Revers prosthesis: a multicenter 2-year follow-up case series. *J Shoulder Elbow Surg.* 2020;29(11):2282-2291. doi:10.1016/j.jse.2020.01.090

- For 98% of the cases (183 of 187 patients), the implant neck-shaft angle was 135°
- Glenosphere offset was lateral (+4 mm lateral) in 82% of cases
- Of the 10.6% of patients who showed signs of notching, 89.5% were grades I and II
 - “The rate of scapular notching is substantially lower than previously reported incidences ranging from 44% to 96%.”
- Clinically meaningful and statistically significant improvements occurred in all 3 shoulder functional outcome measures
- Clinically meaningful and statistically significant improvements occurred in all ROM tests (flexion, abduction, and internal rotation)
- Significant improvement in quality-of-life measures during the follow-up period were also observed

Takeaway

- **The Unvers Revers shoulder prosthesis showed an overall good short-term safety profile, which is associated with satisfying improvement in function and quality of life during the first 2 postoperative years.**

Werner BS,
Chaoui J,
Walch G

The influence of humeral neck shaft angle and glenoid lateralization on range of motion in reverse shoulder arthroplasty. *J Shoulder Elbow Surg.* 2017;26(10):1726-1731. doi:10.1016/j.jse.2017.03.032

- Analysis of 20 CT scans from patients for concentric OA (Walch A1)
- Compared 135° and 145° humeral neck-shaft angles with 0 mm and 5 mm of glenoid lateralization
- Changing the humeral neck angle from 145° to 135° demonstrated the most important influence on impingement-free adduction, extension, internal and external rotation, and global ROM
- Glenoid lateralization was the most important parameter for impingement-free abduction and forward flexion
- Adding lateralization of the glenoid baseplate to a 135° configuration improved abduction by an average of 8°

Takeaway

- **“The 135° model with 5 mm of glenoid lateralization was the best compromise in impingement-free adduction and global function.”**



Gutiérrez S,
Comiskey CA 4th,
Luo ZP,
Pupello DR,
Frankle MA

[Range of impingement-free abduction and adduction deficit after reverse shoulder arthroplasty. Hierarchy of surgical and implant-design-related factors. *J Bone Joint Surg Am.* 2008;90\(12\):2606-2615. doi:10.2106/JBJS.H.00012](#)

- Virtual simulation of abduction/adduction motion using a computer model
- Tested 5 independent factors that simulated 243 different combinations
- “The largest effect on the range of impingement-free abduction motion was produced by lateral offset of the center of rotation.”
- “The primary factor affecting the adduction deficit was the humeral neck-shaft angle.”

Takeaway

- **Use of a glenosphere that has a lateral COR and inferior placement on the glenoid provides greater ROM. The adduction deficit (ie, scapular notching) can be improved by selecting a more varus humeral neck-shaft angle (130° in this simulation) and by placing the glenosphere low on the glenoid.**

Virani NA,
Cabezas A,
Gutiérrez S,
Santoni BG,
Otto R,
Frankle M

[Reverse shoulder arthroplasty components and surgical techniques that restore glenohumeral motion. *J Shoulder Elbow Surg.* 2013;22\(2\):179-187. doi:10.1016/j.jse.2012.02.004](#)

- Virtual 3D model simulation of 216 unique RSAs
- Investigated combinations of RSA components and glenosphere/baseplate placements to determine which combination had the greatest effect on impingement-free arc of motion (AOM) in abduction, flexion/extension, and internal/external rotation
- Parameters:
 - Humeral implant type (inset/onset)
 - Glenosphere diameter (30 mm, 36 mm, and 42 mm)
 - Glenosphere placement (neutral/inferior)
 - Glenosphere COR offset (0 mm, 5 mm, and 10 mm)
 - Humeral neck-shaft angle (130° and 150°)
 - Humeral polyethylene socket offset (0 mm, 5 mm, and 10 mm)
- Flexion/extension
 - Greatest AOM was in the inset-36-inferior-10-130-five construct (146°)
- Internal/external rotation
 - Greatest AOM was in the inset-42-inferior-10-130-ten construct (121°)
- Glenosphere diameter “was the 2nd most predictive factor at affording IR/ER AOM”
- “The 130° humeral neck-shaft angle had 33% fewer constructs with resting impingement interactions compared with the 150° humeral neck-shaft angle.”

Takeaway

- **Use of a more varus (135°) humeral neck-shaft angle may lead to increased flexion and extension. Inferior glenoid component positioning may lead to increased internal and external rotation. Finally, a glenoid with a lateralized COR provides a scenario with the greatest degree of motion in all planes.**



Stephens BC,
Simon P,
Clark RE,
et al

[Revision for a failed reverse: a 12-year review of a lateralized implant.](#) *J Shoulder Elbow Surg.* 2016;25(5):e115-e124. doi:10.1016/j.jse.2015.09.027

- Retrospective review of 1418 patients who underwent RSA
- Overall revision rate was 6%
- RSA for failed HA had the highest revision rate at 10%
- After revision RSA, 18% of patients required a subsequent revision
- “Larger glenospheres (40 mm and 44 mm) had a greater incidence of dissociation than smaller glenosphere (32 mm and 36 mm)”

Takeaway

- **After modifying the implants used in this study, significant declines in baseplate failure (increased peripheral screw diameter), humeral dissociation, and glenosphere dissociation (added a central hole/screw to confirm taper engagement) were observed.**

Schairer WW,
Nwachukwu BU,
Lyman S,
Craig EV,
Gulotta LV

[National utilization of reverse total shoulder arthroplasty in the United States.](#) *J Shoulder Elbow Surg.* 2015;24(1):91-97. doi:10.1016/j.jse.2014.08.026

- An estimated 66,485 shoulder arthroplasty procedures (performed in the US in 2011) were identified
 - 44% anatomic total shoulder arthroplasty (TSA)
 - 33% reverse shoulder arthroplasty (RSA)
 - 23% hemiarthroplasty
- One quarter of proximal humerus fractures are treated with RSA
- “For both RSA and hemiarthroplasty, patients were more likely to be female.”
- Hospital charges and costs were significantly higher for RSA patients
- Overall length of stay was 2.5 days
- “Increasing hospital volume of RSA procedures was associated with a decrease in the length of hospital stays.”

Takeaway

- **RSA has gained acceptance within the orthopedic community since 2004. As this study indicated, RSA accounts for roughly one third of all shoulder arthroplasty procedures in the US. Finally, as a facility sees an increase in RSA cases, they see a decrease inpatients’ length of stay.**