Univers Revers™ System Scientific Update

A Review of Design Rationale, Techniques, and Outcomes

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

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Clinical Articles

Pak T, Ardebol J, Menendez ME, et al

Robert H. Cofield, MD, Award for Best Oral Presentation 2023: Up to 8 mm of glenoid-sided lateralization does not increase the risk of acromial or scapular spine stress fracture following reverse shoulder arthroplasty with a 135° inlay humeral component. *J Shoulder Elbow Surg.* 2024;33(6S):S1-S8. doi:10.1016/j.jse.2023.11.018

- 470 rTSA patients from the ShARC registry were reviewed for the presence of acromial thinning, acromiohumeral distance, and inclination
- 26 of the 470 shoulders (5.5%) had acromial or scapular spine fractures
- Glenoid lateralization was not associated with increased risk for acromial spine fracture, and incidence of fracture did not vary based on the amount of lateralization
- For every 1 cm increase in the difference between pre- and postoperative acromiohumeral distance, there was a 121% increased risk for fracture
- For every 1 mm increase in inferior glenosphere overhang, there was a 19% increased risk for fracture

Takeaway

Up to 8 mm of glenoid-sided metallic lateralization does not increase the risk of acromial stress fracture. However, there is an increased risk of acromial stress fracture with increased humeral distalization, and inferior glenoid overhang.

Pak T, Menendez ME, Gobezie R, et al

Rates of subacromial notching are low following reverse shoulder arthroplasty with a 135° inlay humeral component and a lateralized glenoid. *JSES Int.* 2024;8(3):522-527. doi:10.1016/j.jseint.2024.02.006

- 442 rTSA patients from the ShARC registry were assessed for the presence of subacromial notching (SaN)
- SaN was present in 13 shoulders (2.9%)
- Neither glenoid nor humeral lateralization was associated with risk for SaN
- Presence of SaN had no effect on patient-reported outcomes or range of motion

Takeaway

Risk for SaN is low for a 135° inlay humeral component, and when present, SaN had no effect on patient outcomes or range of motion.

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Klosterman EL,
Tagliero AJ,
Lenters TR,
et al

The subcoracoid distance is correlated with pain and internal rotation after reverse shoulder arthroplasty. *JSES Int.* 2024;8(3):528-534. doi:10.1016/j. jseint.2024.01.009

- 217 rTSA patients from the ShARC registry with 2+ years follow-up were analyzed primarily for subcoracoid distance (SCD), which is the distance between the posterior aspect of the coracoid and the anterior glenosphere
- There was a statistically significant relationship between SCD and Visual Analog Scale pain scores, and internal rotation (IR)
- Metallic lateralization was also positively associated with improving IR, while increasing body mass index was negatively associated with IR

Takeaway
For an rTSA with a 135° implant and lateralized glenoid, decreasing SCD was associated with increased pain, and decreased IR.

Pak T,
Ardebol J,
Kilic AI,
et al

Posteroinferior glenosphere positioning is associated with improved range of motion following reverse shoulder arthroplasty with a 135° inlay humeral component and lateralized glenoid. *J Shoulder Elbow Surg.* 2024;S1058-2746(24)00219-2. doi:10.1016/j.jse.2024.02.019

- 136 rTSA patients from the ShARC registry were assessed to evaluate any association between the position of the center of rotation (COR) relative to bony landmarks on the coracoid and acromion with functional outcomes
- The COR-to-coracoid distance had the broadest association with range of motion (ROM)
- No distances had any effect on patient outcome scores

Takeaway
Posteroinferior glenosphere position may improve ROM when using a 135° inlay humeral component with a lateralized glenosphere.

Shah A,
Werner B,
Gobezie R,
et al

Quantifying bone loss and lateralization with standardized baseplate vs augmented baseplates. *JSES Int.* 2024;S2666-6383(24)00119-1. doi:10.1016/j.jseint.2024.04.014

- 4 fellowship-trained surgeons virtually placed a neutral baseplate and an augmented baseplate on the glenoid using the VIP™ portal on 21 patients presenting for shoulder arthroplasty
- Baseplate position, a minimum of 80% backside seating, glenosphere size, a glenoid inclination neutral or less, and correction of retroversion to less than 10° was standardized
- Significantly less bone was reamed when using an augmented baseplate
- Use of a 10° full-wedge augment resulted in an average of 2.4 mm of additional glenoid lateralization in comparison to a neutral baseplate

Takeaway
When using a 10° augmented baseplate, there is approximately 50% less bone removal and an additional 2.4 mm of true lateralization in comparison to a standard baseplate.

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Werner BC, Lin A, Lenters TR, et al

Influence of backside seating parameters and augmented baseplate components in virtual planning for reverse shoulder arthroplasty. *J Shoulder Elbow Surg.* 2024;33(6):1352-1359. doi:10.1016/j.jse.2023.10.024

- 9 surgeons virtually planned 30 rTSA cases across a spectrum of glenoid deformity
- In phase 1, the surgeons were blinded to backside seating and could not use augmented baseplates. In phase 2, the surgeons were shown backside seating. In phase 3, surgeons were given the option of using augmented baseplates
- Version and inclination were similar across all phases, but lower in phase 3
- Phase 3 had lower cancellous and total reamed bone volumes
- Phase 3 had the largest cortical contact area, lowest cancellous contact area, and largest total contact area
- Phase 3 had greater glenoid lateralization

Takeaway

The use of a full-wedge augmented baseplate resulted in statistically significantly greater correction of glenoid deformity, with greater total backside seating, less reamed bone, and greater glenoid lateralization.

Erickson BJ, Denard PJ, Griffin JW, et al

A 135° short inlay humeral stem leads to comparable radiographic and clinical outcomes compared with a standard-length stem for reverse shoulder arthroplasty. *JSES Int.* 2022;6(5):802-808. doi:10.1016/j.jseint.2022.05.003

- In a multicenter retrospective review 220 patients with a short-stem and 357 patients with a standard-length stem for rTSA with minimum 2-year follow-up were assessed for radiographic findings and clinical outcomes
- No difference in function between the two groups
- Patients in the short-stem group had greater ASES scores (84.6 vs 80.8), forward flexion (139° vs 132°), internal rotation (43° vs 32°), and metaphyseal and diaphyseal fill ratios
- No difference between the groups in postoperative alignment, radiographic loosening, or revision rates for loosening

Takeaway

A short stem leads to comparable radiographic findings and survivorship.

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Erickson BJ, Denard PJ, Griffin JW, Gobezie R, Lederman E, Werner BC

Initial and 1-year radiographic comparison of reverse total shoulder arthroplasty with a short versus standard length stem. *J Am Acad Orthop Surg.* 2022;30(14):e968-e978. doi:10.5435/JAAOS-D-21-01032

- Multicenter retrospective review with 137 short-length and 139 standard-length stems used
- Statistically higher percentage of short stems were placed in neutral alignment (95.6% vs 89.2%)
- Groups had similar metaphyseal filling ratios, but the short-stem group had a significantly higher diaphyseal filling ratio (57% vs 34%)
- Less calcar osteolysis (2.2% vs 12.9%) and radiographic changes (0.7% vs 5%) were seen in the short-stem group

Takeaway

Short-stem humeral implants in rTSA were shown to improve radiographic outcomes, and have less loosening, subsidence, and calcar osteolysis after 1 year in comparison to standard-length stems.

Bercik MJ, Werner BC, Sears BW, Gobezie R, Lederman E, Denard PJ

A comparison of central screw versus post for glenoid baseplate fixation in reverse shoulder arthroplasty using a lateralized glenoid design. *J Clin Med.* 2022;11(13):3763. doi:10.3390/jcm11133763

- Multicenter retrospective study with minimum 2-year follow-up of 209 patients, mean age 68.2 years, and 54.7% male, who received a baseplate with either a central post or a central screw
- Similar functional outcomes between the two groups
- Low revision rates in both groups; no significant difference

Takeaway

Both a central post and a central screw baseplate fixation provide good clinical outcomes and survivorship.

Erickson BJ, Werner BC, Griffin JW, et al

A comprehensive evaluation of the association of radiographic measures of lateralization on clinical outcomes following reverse total shoulder arthroplasty. *J Shoulder Elbow Surg.* 2022;31(5):963-970. doi:10.1016/j.jse.2021.10.010

- Multicenter retrospective study of 203 patients who underwent rTSA with a 135° humeral neck-shaft angle
- Greater lateralization shoulder angle (LSA), more glenoid lateralization, and a greater acromion to greater tuberosity distance were associated with improved internal rotation

Takeaway

Of the radiographic measures, LSA is the most significantly associated with outcomes, including internal rotation, forward flexion, and ASES scores.

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Burrus MT, Denard PJ, Lederman E, Gobezie R, Werner BC

Reverse total shoulder arthroplasty for patients with preserved active elevation and moderate-to-severe pain: a matched cohort study. *JSES Int.* 2022;6(1):1-6. doi:10.1016/j.jseint.2021.10.004

- Multicenter retrospective cohort comparison with 27 in the study cohort with preserved preoperative forward elevation, and a control cohort with restricted motion and less than 140° of preoperative FE
- At 2 years postoperation, both cohorts had similar PROs, strength, and ROM, and similar satisfaction ratings
- The restricted cohort had a significantly larger increase in forward flexion

Takeaway
Patients with preserved FE have similar clinical outcomes to those with limited FE preoperatively, and experience similar satisfaction despite the preserved group losing an average of 13° of FE postoperatively.

Harmsen SM, Robaina J, Campbell D, Denard PJ, Gobezie R, Lederman ES

Does lateralizing the glenosphere center of rotation by 4 mm decrease scapular notching in reverse shoulder arthroplasty with a 135° humeral component? *JSES Int.* 2022 Jan 25;6(3):442-446. doi: 10.1016/j.jseint.2021.12.005

- Multicenter retrospective study of 82 patients with CTA; all underwent RSA with a 135° humeral neck-shaft angle; half had glenosphere COR lateralization of 0 mm, and half had 4 mm
- 22% total incidence of scapular notching; no difference between the two groups
- No difference in clinical outcomes
- Scapular notching had no significant effect on clinical outcomes

Takeaway
Lateralization of the glenosphere by 4 mm had no effect on the rate of scapular notching or clinical outcomes.

Goodloe JB, Denard PJ, Lederman E, Gobezie R, Werner BC

No difference in range of motion in reverse total shoulder arthroplasty using standard or constrained liners: a matched cohort study. *JSES Int.* 2022 Jan 25;6(6):929-934. doi:10.1016/j.jseint.2022.07.004

- 22 patients who underwent rTSA with a constrained humeral liner were matched and compared to 44 patients who underwent rTSA with a standard humeral liner for improvement in patient reported outcomes (PROs) and range of motion (ROM)
- There was no difference in demographics, baseline PROS, or ROM between the groups
- Both groups saw improved PROs at 2 year follow-up with no statistical difference between them
- No difference in ROM in any measure (forward flexion, external rotation, internal rotation)

Takeaway
For an inlay humeral prosthesis with a 135° neck shaft angle, there is no significant difference in ROM or PROs between patients treated with a standard or a constrained humeral liner.

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Werner BC, Lederman E, Gobezie R, Denard PJ

Glenoid lateralization influences active internal rotation after reverse shoulder arthroplasty. *J Shoulder Elbow Surg.* 2021;30(11):2498-2505. doi:10.1016/j.jse.2021.02.021

- Multicenter retrospective study of 455 patients with mean age of 69, 48% male, underwent rTSA and were labeled into one of 4 groups, 0-2 mm, 4 mm, 6 mm, or 8 mm of lateralization
- Patients with 8 mm of lateralization had the most improvement in internal rotation, followed by the group with 6 mm
- No significant difference between groups in respect to secondary outcomes or PROs

Takeaway

Patients with 6-8 mm of lateralization had improved IR at 1 year compared to the lower lateralization groups.

Cirino CM, Cagle PJ, Gobezie RB, Lederman ES, Denard PJ, Parsons BO

The impact of subscapularis integrity on functional outcome in reverse total shoulder arthroplasty utilizing a 135° stem. *Semin Arthroplasty.* 2021;31(4):721-729. doi:10.1053/j.sart.2021.04.010

- Multicenter prospectively collected registry of 75 patients who had undergone rTSA with 135° inclination assessed subscapularis integrity
- Subscapularis was repaired in 60 cases, of which healing was evident in 56.7%
- No significant outcome score differences were seen between patients who had and who had not had their subscapularis repaired
- Significantly greater passive external rotation was seen in patients with an unrepaired subscapularis
- A significant increase in passive forward flexion was seen in patients with healed subscapularis
- No difference in active range of motion was observed

Takeaway

When the subscapularis was repaired, there was a healing rate of 57%, but there were no significant outcome changes regardless of the status of repaired/unrepaired, healed/unhealed.

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Otto A, Baldino JB, Mehl J, et al

Clinical and radiological outcomes in reverse total shoulder arthroplasty by inclination angle with a modular prosthesis. *Orthopedics*. 2021;44(4):e527-e533. doi:10.3928/01477447-20210618-12

- 121 patients with mean age 69.7 underwent rTSA, 80.2% with a 135° humeral neck-shaft angle, the remaining with a 155° angle
- No significant difference in clinical outcome scores
- Forward elevation and abduction were significantly higher in the 155° group
- No significant differences in complication rates or humeral radiolucency
- Significantly more scapular notching in the 155° group

Takeaway
There was no difference in clinical outcomes according to neck shaft angle, but there was a significantly higher rate of scapular notching in the 155° group.

Schmalzl J, Jessen M, Holschen M, et al

Tuberosity healing improves functional outcome following primary reverse shoulder arthroplasty for proximal humeral fractures with a 135° prosthesis. *Eur J Orthop Surg Traumatol.* 2020;30(5):909-916. doi:10.1007/s00590-020-02649-8

- Multicenter retrospective study including 64 patients with a mean age of 76 who underwent rTSA with 135° inclination
- Mean-adjusted Constant score was 72%
- Greater tuberosity healing was achieved 77% of the time, which resulted in improved forward flexion, external rotation, and Constant score
- Greater tuberosity healing was 86% with neutral, 70% with lateralized, and 3% with inferior eccentric glenosphere
- Lesser tuberosity healing was achieved 79% of the time

Takeaway
rTSA for fracture with a 135° humeral inclination leads to good functional outcomes and rates of tuberosity healing, which in turn lead to improved ROM and functional outcomes.

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Denard PJ, Haidamous G, Gobezie R, Romeo AA, Lederman E

Short-term evaluation of humeral stress shielding following reverse shoulder arthroplasty using press-fit fixation compared with cemented fixation. *J Shoulder Elbow Surg.* 2020;29(5):906-912. doi:10.1016/j.jse.2019.09.042

- Multicenter retrospective review comparing standard length stems used in rTSA, 93 being press-fit and 26 cemented
- No significant difference between the postoperative range of motion between the two groups
- Calcar osteolysis was seen in 43% of press-fit stems and 58% of cemented stems
- Proximal lateral stress shielding was seen in 68% of press-fit stems and 25% of cemented stems, but adaptive changes remained low in 97% of press-fit stems
- No signs of humeral loosening or shifting were seen in either group

Takeaway
Functional outcomes and stem loosening are not affected by whether a stem is implanted with press-fit fixation or cemented fixation. Stress shielding increased in press-fit fixation, but in this short-term follow up case, overall changes as a result remained low.

Erickson BJ, Shishani Y, Bishop ME, et al

Subscapularis repair during reverse total shoulder arthroplasty using a stem-based double-row repair: sonographic and clinical outcomes. *Orthop J Sports Med.* 2020;8(3):2325967120906806. doi:10.1177/2325967120906806

- Case series of 48 patients, 65% male, mean age 68.9, where all patients underwent a through-implant double-row suture technique for subscapularis repair
- Subscapularis was intact in 83.3% of patients after 1 year
- Both ASES and SANE scores significantly improved
- Forward flexion and external rotation significantly improved
- No difference observed in clinical outcomes or ROM between patients with torn and intact subscapularis

Takeaway
Using a stem-based double-row repair technique for subscapularis repair resulted in a 83.3% healing rate, but integrity of the subscapularis had no effect on clinical outcomes.

Haidamous G, Lädermann 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.

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Schwyzer HK, Marzel A, Wirth B, et al

Short-term safety, function, and quality of life in patients treated with Univers 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 Univers 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.

Gobezie R, Shishani Y, Lederman E, Denard PJ

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.

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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.

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.

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

Takeaway

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.

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.”

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

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.

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.

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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.

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.

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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.

The Shoulder Arthroplasty Research Committee (ShARC) was established to collect clinical data on Arthrex arthroplasty implants for outcomes analysis that supports the advancement of patient care and quality of life, implant surveillance, and refinement of procedural techniques, and to increase generalized medical knowledge through peer-reviewed journal articles related to the advancement of shoulder arthroplasty.

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