CORIOGRAPH◊ Pre-Op Planning and Modeling Services is the first TSA planner to assess impingement risk during ADLs, accounting for scapulothoracic mechanics[1–6]

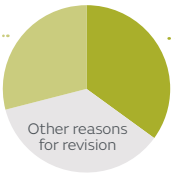
Key points

- **New evidence:** Full-body motion simulation studies highlight activities of daily living (ADLs) and scapulothoracic mechanics as clinically relevant considerations for total shoulder arthroplasty (TSA) pre-operative planning[7,8]
- **Current gap:** Most TSA planners do not consider these factors, focusing only on glenohumeral motion[9] and therefore risking an incomplete view of impingement risk
- **Addressing the need:** CORIOGRAPH Pre-Op Planning and Modeling Services is the first TSA planner to assess impingement risk during ADLs, accounting for scapulothoracic mechanics[1–6]

Impingement contributes to two leading causes of TSA revision: instability and glenoid loosening[10–12]

Impingement can lead to instability in reverse TSA[10] and contribute to eccentric loading that may **accelerate glenoid loosening** in anatomic TSA[11]

16–29% of revisions are due to **loosening*[12]**



22–35% of revisions are due to **instability*[12]**

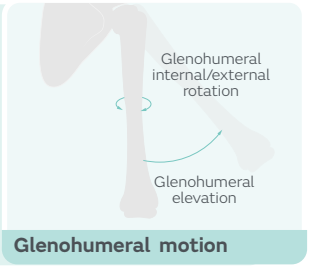
*Across anatomic and reverse TSA

Current pre-operative planning tools do not consider the motion required for ADLs

3D pre-operative planning has advanced TSA by enabling precise analysis of patients' bony architecture.[13] However, **current systems may provide a partial picture of post-op impingement risk as they do not consider all shoulder motion required for ADLs.**

Most current planners:[9]

- Only consider glenohumeral motion for reverse TSA
- Do not consider the contributions of scapulothoracic mechanics (orientation and motion)
- Do not consider impingement in the context of ADLs



Glenohumeral motion

Evidence from two studies using full-body motion simulation highlights the importance of ADLs and scapulothoracic mechanics for TSA planning[7,8]

One study used virtual plans from 22 reverse TSA patients' CT scans and simulated scapular plane elevation.[8] It aimed to estimate maximum humeral elevation before impingement and its correlation with anatomical and surgical parameters, including scapular orientation (scapular protraction angle*), and found:

Greater scapular protraction angle was associated with impingement at lower humeral elevation

(significant correlation between protraction angle and humeral elevation, r = -0.5, p=0.017)[8]

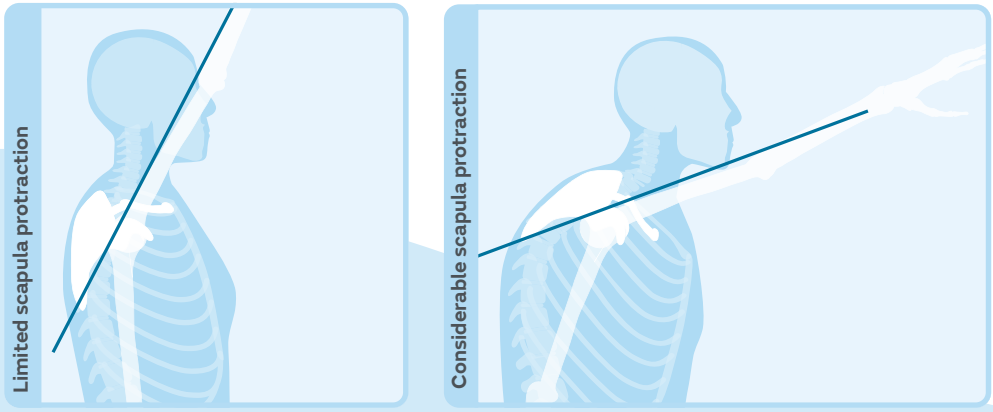


Figure representing hypothetical impingement-free range of motion for a patient with limited versus considerable scapular protraction

*Protraction angle measured relative to the CT coronal plane

Evidence from two studies using full-body motion simulation highlights the importance of ADLs and scapulothoracic mechanics for TSA pre-operative planning (continued)[7,8]

A second study used CT scans from 10 patients to analyse 20 virtual plans (10 anatomic and 10 reverse TSA) through 240 ADL simulations, to determine trends in impingement for anatomic and reverse TSA.[7] It found:

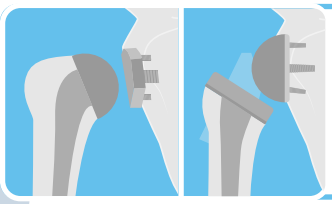
No clear trends. Impingement risk for anatomic and reverse TSA was impacted differently by common patient ADLs.[7]

Implications for TSA planning: ADLs and scapulothoracic mechanics are clinically relevant considerations for minimizing impingement risk for patients undergoing anatomic and reverse TSA

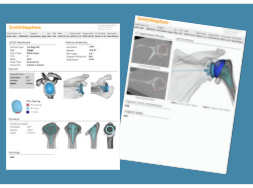
CORIOGRAPH◊ Pre-Op Planning and Modeling Services for TSA: Addressing the gap

CORIOGRAPH Pre-Op Planning and Modeling Services:

Uses advanced biomechanical simulation to **account for scapulothoracic mechanics and simulate ADLs**[1–6]



Supports a **broad spectrum of TSA cases** (anatomic and reverse TSA)[4]



Generates TSA plans customized to **surgeon-specific preferences,** supported by advanced planning tools for **patient-level personalization**

Abbreviations: ADL = activities of daily living, CT = computed tomography scan, TSA = total shoulder arthroplasty.

1. Smith+Nephew 2025. 10152295 REVA. Shoulder Modeler TR - Session Management & Notifications/Warnings/Errors. **2.** Smith+Nephew 2025. 10152290 REVA. Shoulder Modeler TR - CORIOGRAPH Plan Page. **3.** Smith+Nephew 2025. 10152289 REVA. Shoulder Modeler TR - General Features **4.** Smith+Nephew 2025. 10152294 REVA. Shoulder Modeler TR - Report Page. **5.** Smith+Nephew 2025. 10152293 REVA. Shoulder Modeler TR - Implant Planning. **6.** Smith+Nephew 2025. 10152196 REVB. CORIOGRAPH Modeler Unit Test Execution Report. **7.** Navacchia A, Tuli N, Kaper B, O'Brien M, Freehill MT, Klifto C. How do impingement mechanisms during activities of daily living differ between anatomic and reverse TSA? Presentation at: ISTA 2025 The 36th International Congress. September 18–21, 2025; Rome, Italy. **8.** Navacchia A, Kaper B, O'Brien M, Freehill MT, Klifto C. What anatomical and surgical parameters increase elevation range of motion in reverse TSA? A simulation study. Presentation at: ISTA 2025 The 36th International Congress. September 18–21, 2025; Rome, Italy. **9.** Smith+Nephew 2025. CORIOGRAPH shoulder competitor information. December 2025. **10.** Abdelfattah A, Otto RJ, Simon P, Christmas KN, Tanner G, LaMartina J II, et al. *J Shoulder Elbow Surg.* 2018;27:e107–e118. **11.** Favre P, Moor B, Snedeker JG, Gerber C. *Clin Biomech.* 2008;23:175–183. **12.** Australian Orthopaedic Association National Joint Replacement Registry (AOANJRR) Hip, Knee & Shoulder Arthroplasty: 2025 Annual Report Adelaide; AOA, 2025:1–729. Available here. Accessed October 1, 2025. **13.** Kolac UC, Paksoy A, Akgun D. *EFORT Open Rev.* 2024;9:517–527.

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