celito

Robotic Technology for Shoulder Arthroplasty

Celito enhances shoulder arthroplasty by combining real-time patient data and robotic precision to create a patient-specific guide (PSG) in 4 minutes - whatever the implant. By achieving accurate and precise guidewire positioning, Celito promotes optimal implant placement and patient outcomes, setting a new standard in shoulder arthroplasty.

How does Celito empower surgeons?

Instant: Generates a PSG intraoperatively, eliminating weeks of delay and logistical concerns.

Implant-agnostic: Combines the best of robotics and PSI technology, without being tied to an implant provider.

Integrative: Fits seamlessly into conventional workflows.

Flexible: Allow plan adjustments, and a reduction in surgery cancellations due to outdated scans.

How does Celito enhance surgery?

Superior: Unparalleled accuracy and precision, outperforming PSI and freehand methods.

Real-Time: Uses live anatomical data, eliminating fitting errors associated with PSI.

Less Invasive: Avoids risks related to invasive pins and markers required by alternative systems.

Streamlined: Reduces complexity and variability compared with other methods.

POSITIONAL ERROR

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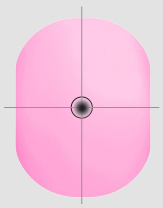
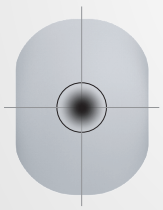


0.8mm

Freehand / PSI



2 - 3mm

ANGULAR ERROR

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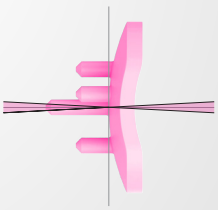
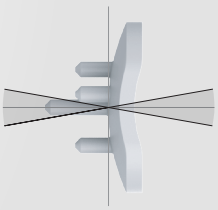


2.3 degrees

Freehand / PSI



6 - 11 degrees

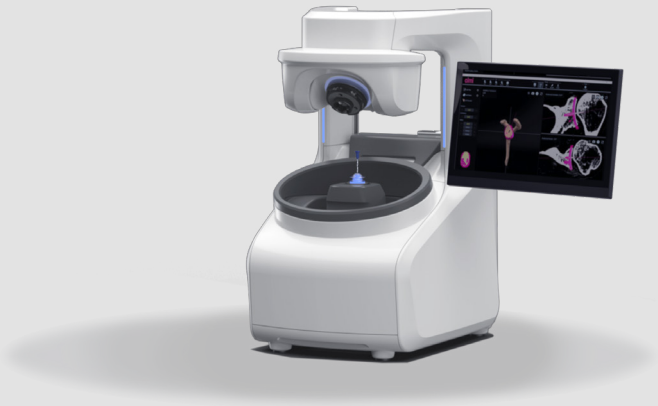
COMPARING CELITO

	Freehand[1]	PSI[1]	Navigation[2, 3, 4]	Celito[5 & 6]
Implant compatibility	-	Implant-specific	Implant-specific	Any implant
Planning/set-up time	-	2-6 weeks before case	Lengthy set-up time	At surgeon's convenience
Anatomy registration time	-	N/A	6+ minutes	1 minute
Navigation markers	-	None	Required	None
Learning curve	-	N/A	8+ cases	1 case
Positional (mm) ± SD	3 ± 2	2 ± 1	1.5 ± 1.0	0.8 ± 0.4
Total angular error (°)	10.6	5.8	3.4	2.3
Retroversion (°) ± SD	8 ± 8.2	5 ± 4.8	1.9 ± 1.9	1.7 ± 1.2
Inclination (°) ± SD	7 ± 7.9	3 ± 4.3	2.4 ± 2.5	1.6 ± 1.4

Request a demo at
www.celito.co.uk

deSoutter MEDICAL

celito Summary of Studies



De Soutter Medical have conducted two cadaveric studies demonstrating improved accuracy and less outliers, compared to PSI and freehand surgery. This offers a compelling narrative about the tangible benefits of using Celito in shoulder arthroplasty.

Study 1: Imperial College, London (2021)

This study, published in JSES[5] , introduced and evaluated Celito in enhancing prosthesis placement accuracy in shoulder arthroplasty by producing low-cost, patient-specific guides intraoperatively. Key aspects of the study include:

- Across two phases, Celito demonstrated high accuracy, with Phase 1 showing 1.6 degrees in inclination, 2.2 degrees in version, and 1.2 mm in wire insertion point accuracy. Phase 2 yielded slightly improved results with 1.2 degrees in inclination, 1.9 degrees in version and 1.1 mm in wire insertion point accuracy.
- The results indicated comparable or superior accuracy to current 3D-printed PSI guides in similar ex vivo studies. The novel platform achieved this accuracy without the occurrence of outliers, defined as deviations greater than 10 degrees in inclination or version or more than 4 mm from the planned insertion point.
- Other guidance technologies can suffer from logistical challenges, and sometimes inaccurate fit due to the reliance on preoperative imaging data, which may not perfectly reflect intraoperative anatomy.
- Requires minimal training for effective use, smoothly integrates into existing surgical workflows, and supports intraoperative adjustments, offering flexibility not available with premanufactured PSI guides.

Study 2: Evelyn Centre, Cambridge (2022)[6]

The study evaluated Celito for anatomical total shoulder arthroplasty, comparing its performance to standard instrumentation (STDI) and patient-specific instrumentation (PSI). Key findings included:

- The study involved 16 surgeons placing three guide-wires in cadaver specimens, aiming for a precise alignment in a superior-to-inferior line. Surgeons achieved an average end-to-end error of 0.8mm and 2.3 degrees for central guide-wires, demonstrating high precision with Celito.
- Celito outperformed both STDI and PSI in terms of positional accuracy, retroversion, and inclination, significantly reducing errors. For instance, compared to Throckmorton et al.[1], Celito showed improvements in average positional accuracy by up to 72%, and in retroversion and inclination by up to 79%.
- The study also delved into error types, such as device and registration errors, and discussed data quality. Despite potential complications from cadaveric specimens, such as excess cartilage, Celito maintained low error rates, demonstrating reproducibility and reliability across different surgeons.
- Notably, Celito had no outliers based on predetermined thresholds for positional and angular errors, indicating consistent performance within acceptable limits.
- Analysis suggested that the minimal training done on the day itself was adequate as the use of Celito led to good initial results. This did not significantly improve with further surgeries, indicating a low learning curve and strong starting performance.

[1] Throckmorton, T. W., Gulotta, L. V., Bonnarens, F. O., Wright, S. A., Hartzell, J. L., Rozzi, W. B., et al. (2015). Patient-specific targeting guides compared with traditional instrumentation for glenoid component placement in shoulder arthroplasty: A multisurgeon study in 70 arthritic cadaver specimens. J Shoulder Elbow Surg, 24(6), 965–971.

[2] Greene, A., Hamilton, M., Polakovic, S., et al. (2019). Navigated versus non-navigated results of a CT-based computer-assisted shoulder arthroplasty system in 30 cadavers. Orthop Procs, 101-B(SUPP_5), 23-23. doi:10.1302/1358-992X.2019.5.023.

[3] Barrett, I., Ramakrishnan, A., Cheung, E. (2019). Safety and efficacy of intraoperative computer-navigated versus non-navigated shoulder arthroplasty at a tertiary referral. Orthop Clin North Am, 50(01), 95–101.

[4] Wang, A. W., Hayes, A., Gibbons, R., Mackie, K. E. (2020). Computer navigation of the glenoid component in reverse total shoulder arthroplasty: A clinical trial to evaluate the learning curve. J Shoulder Elbow Surg, 29(3), 617-623. doi: 10.1016/j.jse.2019.08.012.

[5] Darwood, A., Hurst, S. A., Villatte, G., Tatti, F., El Daou, H., Reilly, P., Rodriguez Y. Baena, F., Majed, A., & Emery, R. (2022). Novel robotic technology for the rapid intraoperative manufacture of patient-specific instrumentation allowing for improved glenoid component accuracy in shoulder arthroplasty: A cadaveric study. J Shoulder Elbow Surg, 31(2), 561–570.

[6] De Soutter Medical. (2022). Cadaveric Evaluation of the Celito System for Anatomical Total Shoulder Arthroplasty. Evelyn Centre, Cambridge.