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Intra- and inter-operator reliability assessment of a novel extramedullary accelerometer-based smart cutting guide for total knee arthroplasty: an in vivo study

STEFANO ZAFFAGNINI[1]

Domenico Alesi[1], Arcangelo Russo[2], Mirco Lo Presti[1], Iacopo Sassoli[1], Matteo La Verde[1], Giulio Maria Marcheggiani Muccioli[1]

1: 2nd Orthopedic Clinic, IRCCS Rizzoli ORrthopedic Institute, Bologna, Italy
2: Orthopaedic and Traumatologic Unit, Umberto I Hospital, Azienda Sanitaria Provinciale Di Enna, Enna, Italy

SERVIZIO SANITARIO REGIONALE
EMILIA - ROMAGNA
Istituto Ortopedico Rizzoli di Bologna
Istituto di Ricovero e Cura a Carattere Scientifico

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ORIGINAL PAPER

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Giulio Maria Marcheggiani Muccioli[1,2] · Domenico Alesi[1] · Arcangelo Russo[3] · Mirco Lo Presti[1] · Iacopo Sassoli[1] · Matteo La Verde[1] · Stefano Zaffagnini[1,2]

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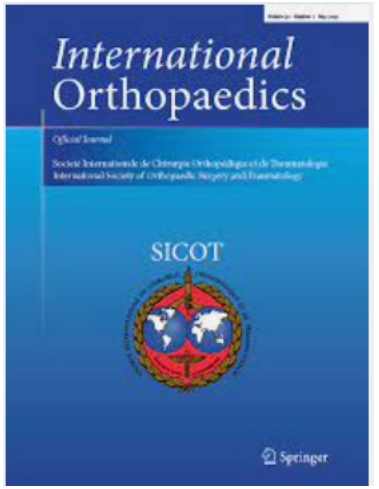


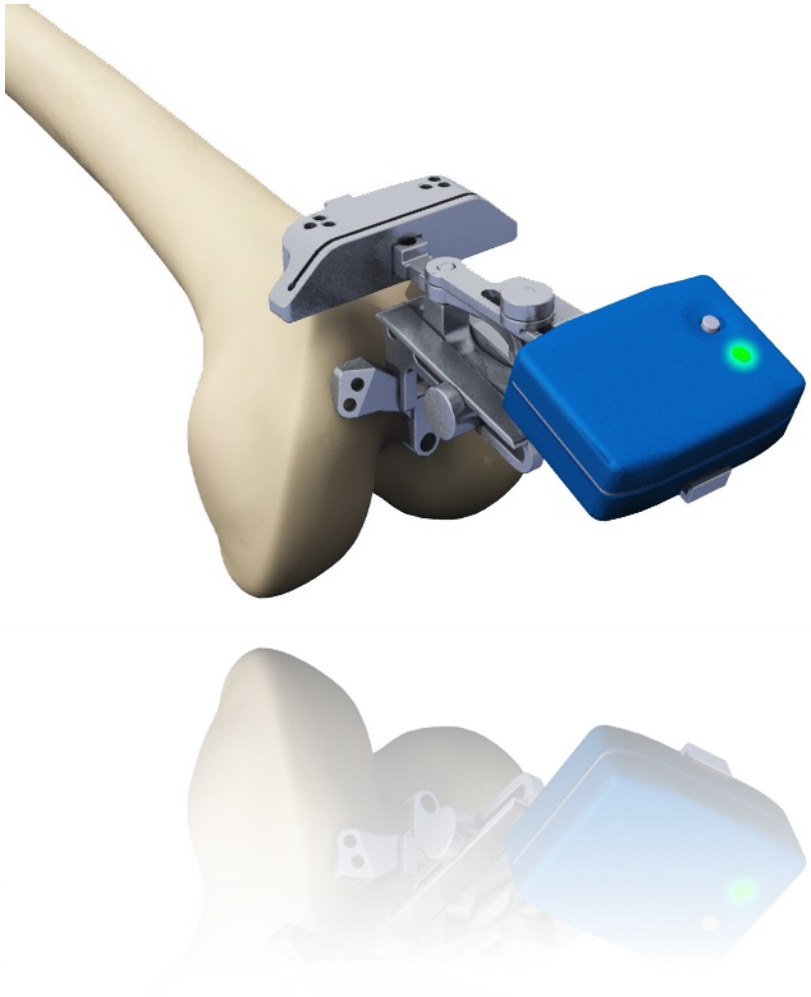
2 ITALIAN CENTERS

25 PATIENTS

HYPOTHESIS: GOOD CORRELATION BETWEEN DIFFERENT OPERATORS WITH A DIFFERENCE BETWEEN REPEATED MEASUREMENTS OF LESS THAN 1°

PERSEUS: An inertial sensors cutting guide

- ✓ **NO ENDOMEDULLARY GUIDE**
- ✓ **REDUCES SURGICAL TIME**
- ✓ **SAME PRECISION VS NAVIGATOR**
- ✓ **LOWER COSTS AND COMPLEXITY VS NAVIGATOR OR CUSTOM**
- ✓ **LIVE FEEDBACK ON BONE RESECTION ORIENTATION**



PERSEUS

This technology has been proven to be safe and reliable

author	type	NR subj	goal	HKA*	FEM$^{\alpha}$		Tib$^{\alpha}$		adverse events
					VV	AP	VV	AP	
Nam	vivo	47	comparison to manual	89%	-	-	97%	95%	none
Nam	cad	5	repeated measurement	-	100%	100%	-	-	none
Nam	vivo	80	retrospecive evaluation	93%	95%	-	96%	-	none
Nam	cad	5	verify retrospectively	-	-	-	95%	95%	none
Nam	vivo	151	verify retrospectively	97%	-	-	95%	96%	none
Nam	vivo	42	verifi retrospectively	-	-	-	98%	96%	none
Goh	vivo	38	comparison with CAS	92%	92%	-	84%	-	none
Huang	vivo	53	verify retrospectively	83%	87%	-	96%	94%	none
Bugbee	vivo	90	verify retrospectively	-	-	-	93%	96%	None
Iorio	vivo	53	verify retrospectively	100%	-	-	96%	94%	none
Nam	vivo	48	verify retrospectively	94%	96%	-	96%	-	none
Scuderi	vivo	14	verify retrospectively	-	100%	100%	80%	100%	none
Fujimoto	vivo	109	verify retrospectively	84%	92%	89%	97%	90%	1

Nam D,et al. Extramedullary Guides Versus Portable, Accelerometer-Based Navigation for Tibial Alignment in Total Knee Arthroplasty: A Randomized, Controlled Trial: Winner of the 2013 HAP PAUL Award. J Arthroplasty. 2013 Jul 19.
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Alignment validation:

- ✓ **PRECISION OF 0.2°**
- ✓ **ACCURACY OF 0.8°**

Usability validation:

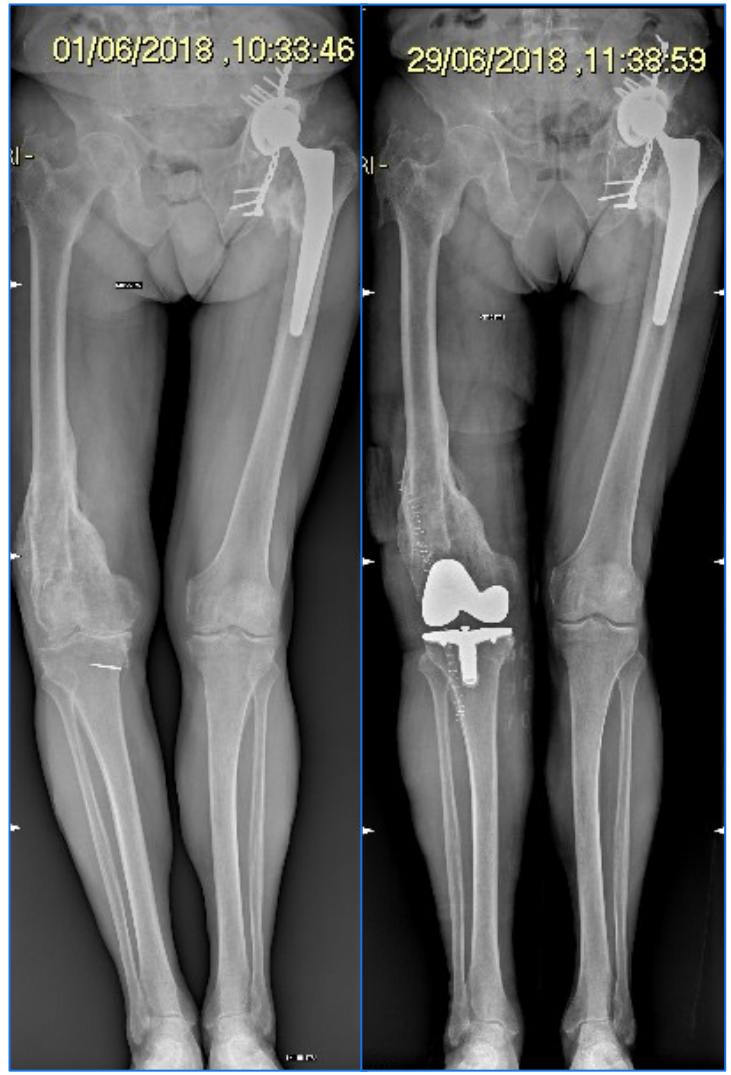
- ✓ **LOW USAGE TIME**
- ✓ **1 CASE LEARNING TIME**

ADVANTAGES

PERSEUS

Perseus is helpful in cases like:

- ✓ **EXTRA ARTICULAR BONE DEFORMITIES**
- ✓ **ENDOMEDULLARY SCLEROSIS**
- ✓ **LONG STEM THA**
- ✓ **NON-REMOVABLE INTRAMEDULLARY HARDWARES**

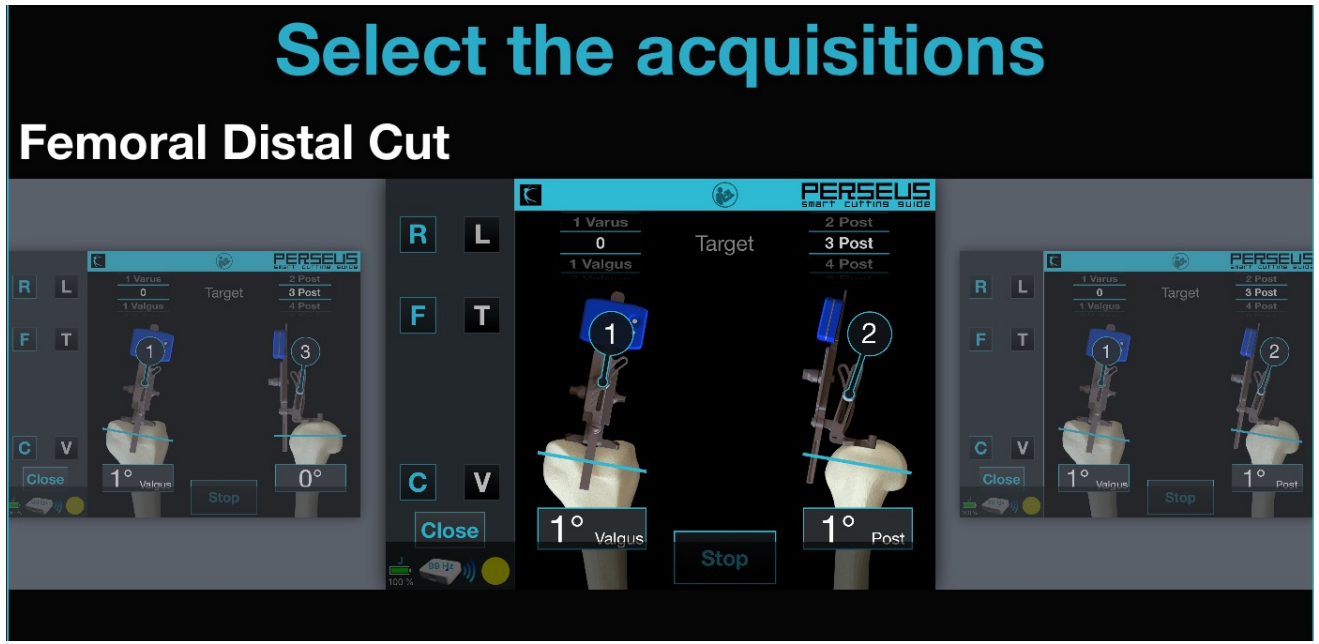


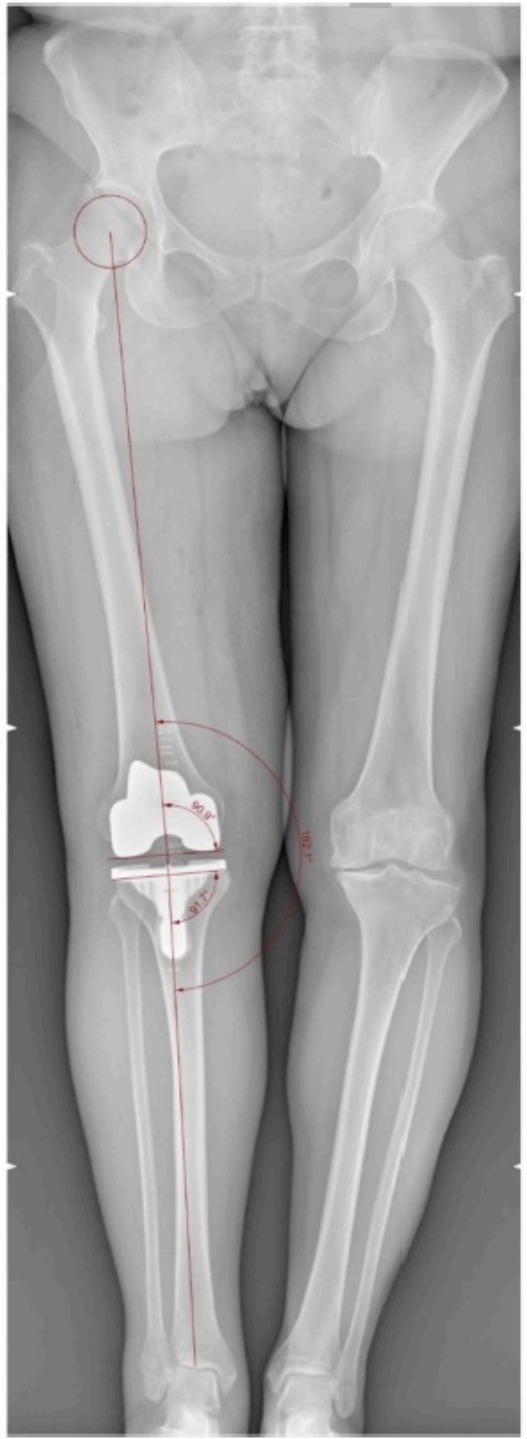
METHODS

MAIN SURGEON AND ASSISANT MADE 3 REPEATED TESTS.

RESULT WAS RECORDED FOR EACH TEST

THEN FINAL RESECTION WAS VERIFIED WITH PANORAMIC X-RAY



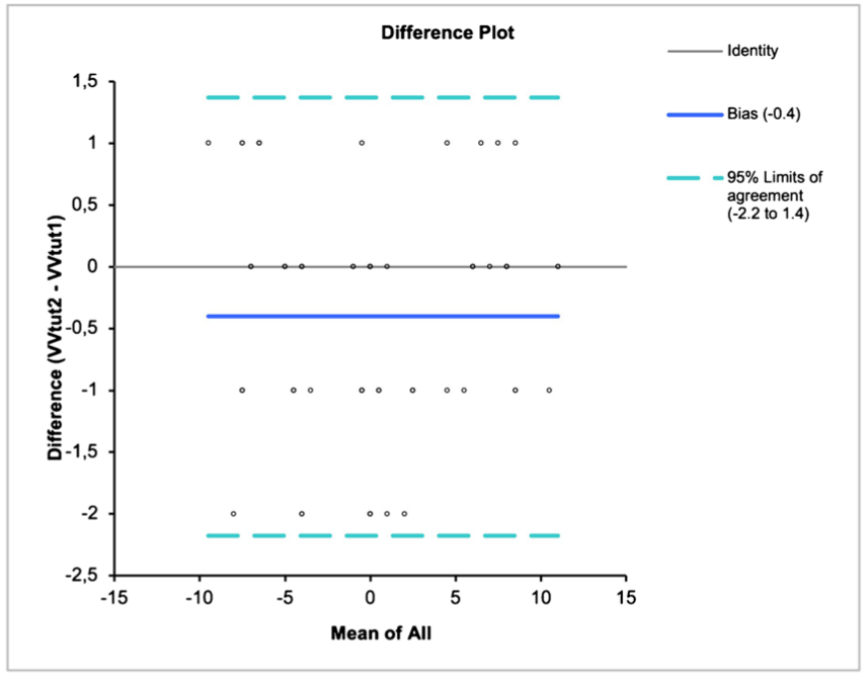


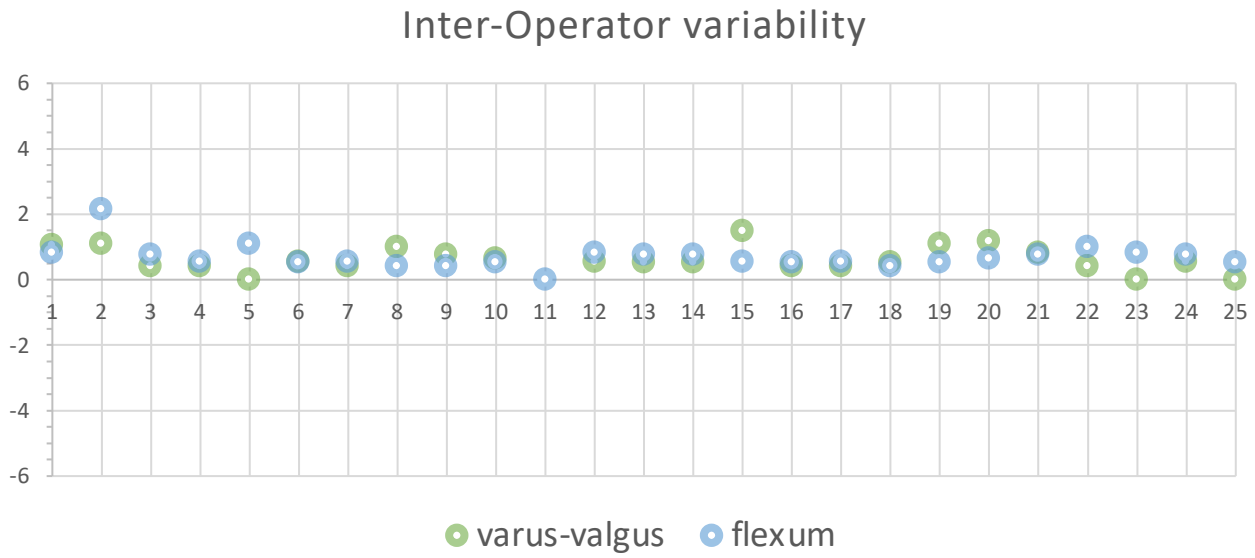
RESULTS

INTER-OPERATOR RELIABILITY

AGREEMENT BETWEEN THE TWO OPERATORS WAS STATISTICALLY SIGNIFICANT (P < 0.05) WITH A BIAS OF – 0.4° (95% CI – 0.6° TO – 0.2°)

Varus-valgus	0.8° (0 – 1.5°)
Flexum	0.9° (0 – 2.1 °)

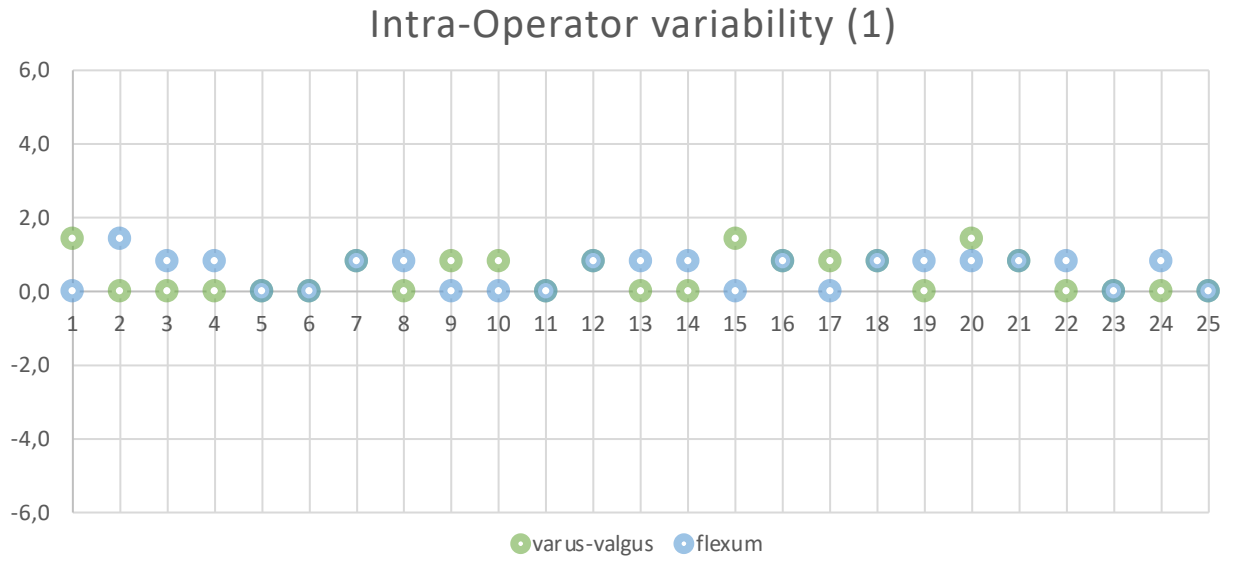


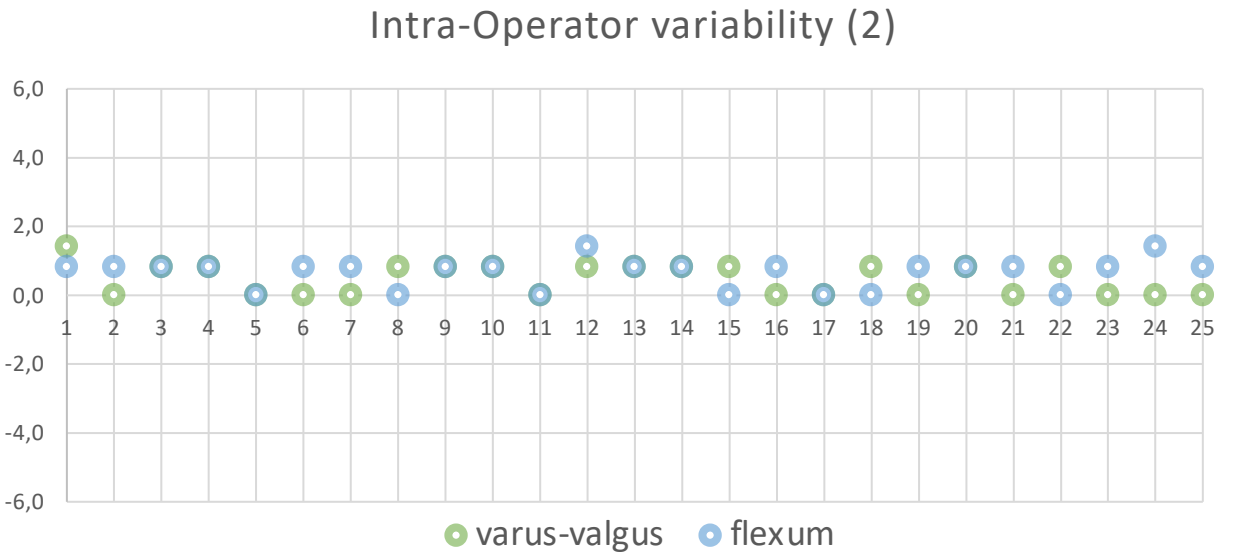


RESULTS

INTRA-OPERATOR RELIABILITY

	Operator 1	Operator 2
Varus-valgus	0.4° (0 – 1.4 °)	0.4° (0 – 1.4 °)
Flexum	0.5° (0 – 1.4 °)	0.6° (0 – 1.4 °)





ACCURACY

AVERAGE DIFFERENCE BETWEEN CUT ORIENTATION MEASURED WITH DEVICE AND FINAL IMPLANT POSITION, MEASURED ON X-RAYS, WAS 0.2° (95% CI – 1.5° TO 1.7°)

CONCLUSIONS

ANATOMICAL REFERENCES AND MECHANICAL METHODS

- ✓ BASED ON PATIENTS' ANATOMY AND ON SURGEON EXPERIENCE
- ✓ RISK OF MALALIGNMENT > +/-3°

NAVIGATION

- ✓ HIGH ALIGNMENT PRECISION
- ✓ INTEROPERATOR REPRODUCIBILITY
- ✓ HIGH COSTS AND LONGER SURGICAL TIMES

SENSORS

- ✓ BETTER USABILITY
- ✓ LOWER COSTS
- ✓ SAME ACCURACY RESPECT TO CAS

TKA IS ALWAYS A GOOD COMPROMISE
FURTHER RESEARCH IS NEEDED WITH LONG-TERM FOLLOW-UP

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- Marcheggiani Muccioli GM, Alesi D, Russo A, Lo Presti M, Sassoli I, La Verde M, Zaffagnini S. Intra- and inter-operator reliability assessment of a novel extramedullary accelerometer-based smart cutting guide for total knee arthroplasty: an in vivo study. Int Orthop. 2023 Jan;47(1):83-87