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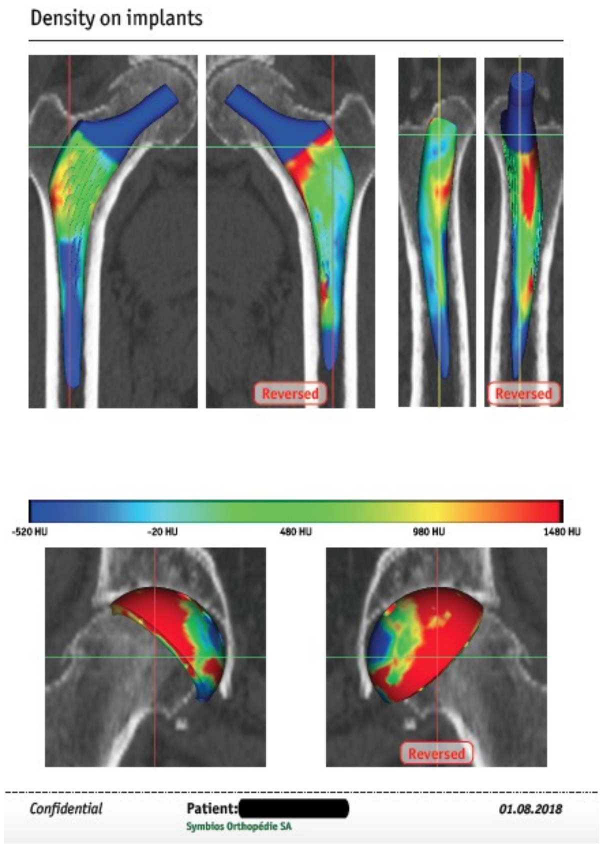
Planification 3D PTH



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Reinbacher *et al.*
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ORIGINAL ARTICLE Open Access

Pre-operative templating in THA using a short stem system: precision and accuracy of 2D versus 3D planning method

Patrick Reinbacher, Maria Anna Smolle*, Joerg Friesenbichler, Alexander Draschl, Andreas Leithner and Werner Maurer-Ertl

Table 1 Paired *t*-tests for 2D- and 3D-planned implants compared with definitively used implant components

	Implanted	2D		3D	
		Size	*p*-Value	Size	*p*-Value
Cup	54.3 ± 4.0	53.1 ± 3.9	**< 0.0001**	53.8 ± 4.0	**0.012**
Stem	6.1 ± 1.8	5.6 ± 1.8	**< 0.0001**	6.0 ± 1.8	0.181

Significant values are in bold

Table 2 Paired *t*-test comparing the absolute difference of 2D-based planning and definitively implanted size compared with 3D-based planning of component size and definitive implant

	2D	3D	*p*-Value
	Size	Size	
Cup	1.7 ± 1.8	1.1 ± 1.4	**0.007**
Stem	0.7 ± 0.7	0.3 ± 0.6	**< 0.0001**

Significant values are in bold

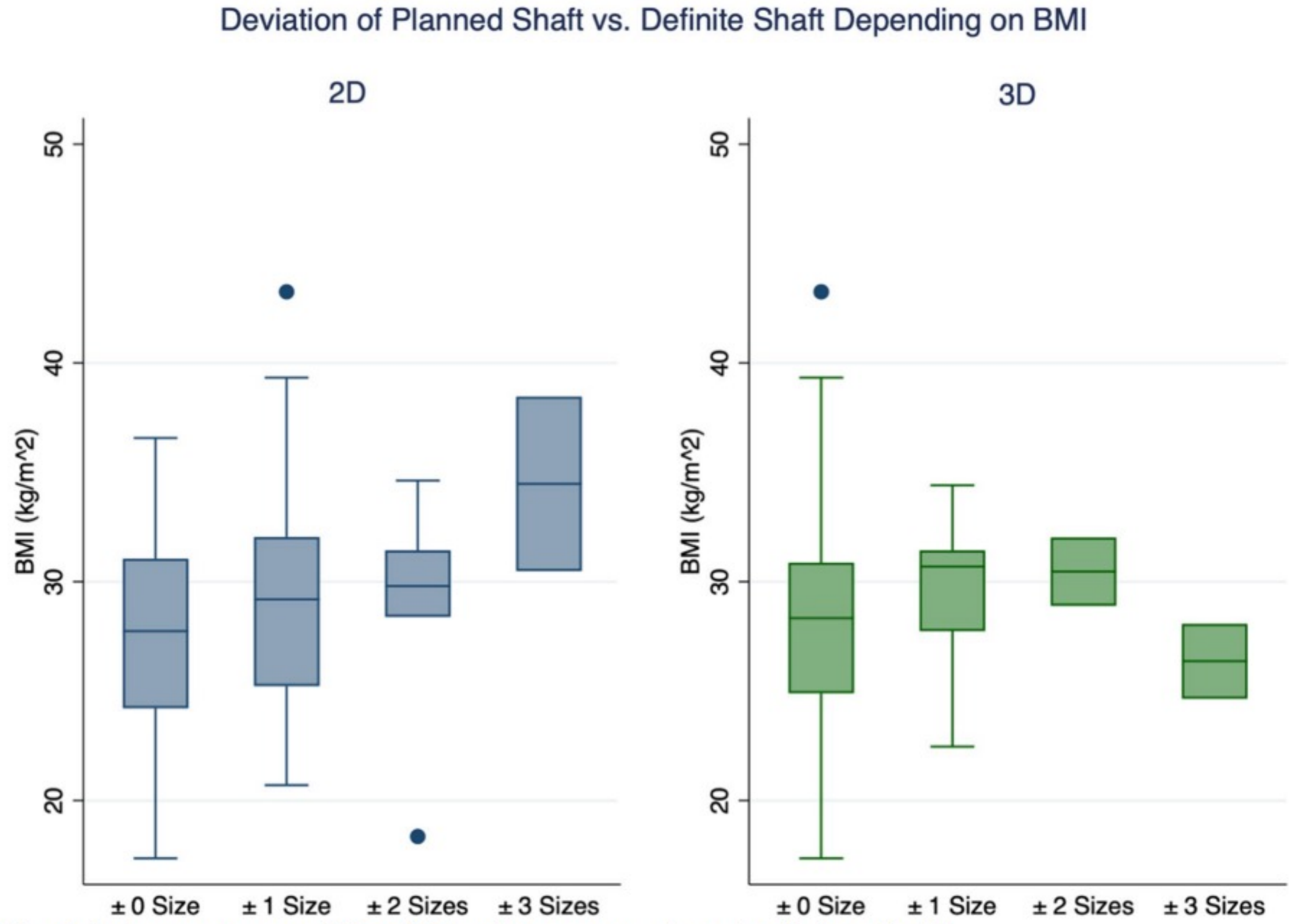

Fig. 2 Correlation between accuracy of 2D- and 3D-based measurement of stem size with increasing BMI

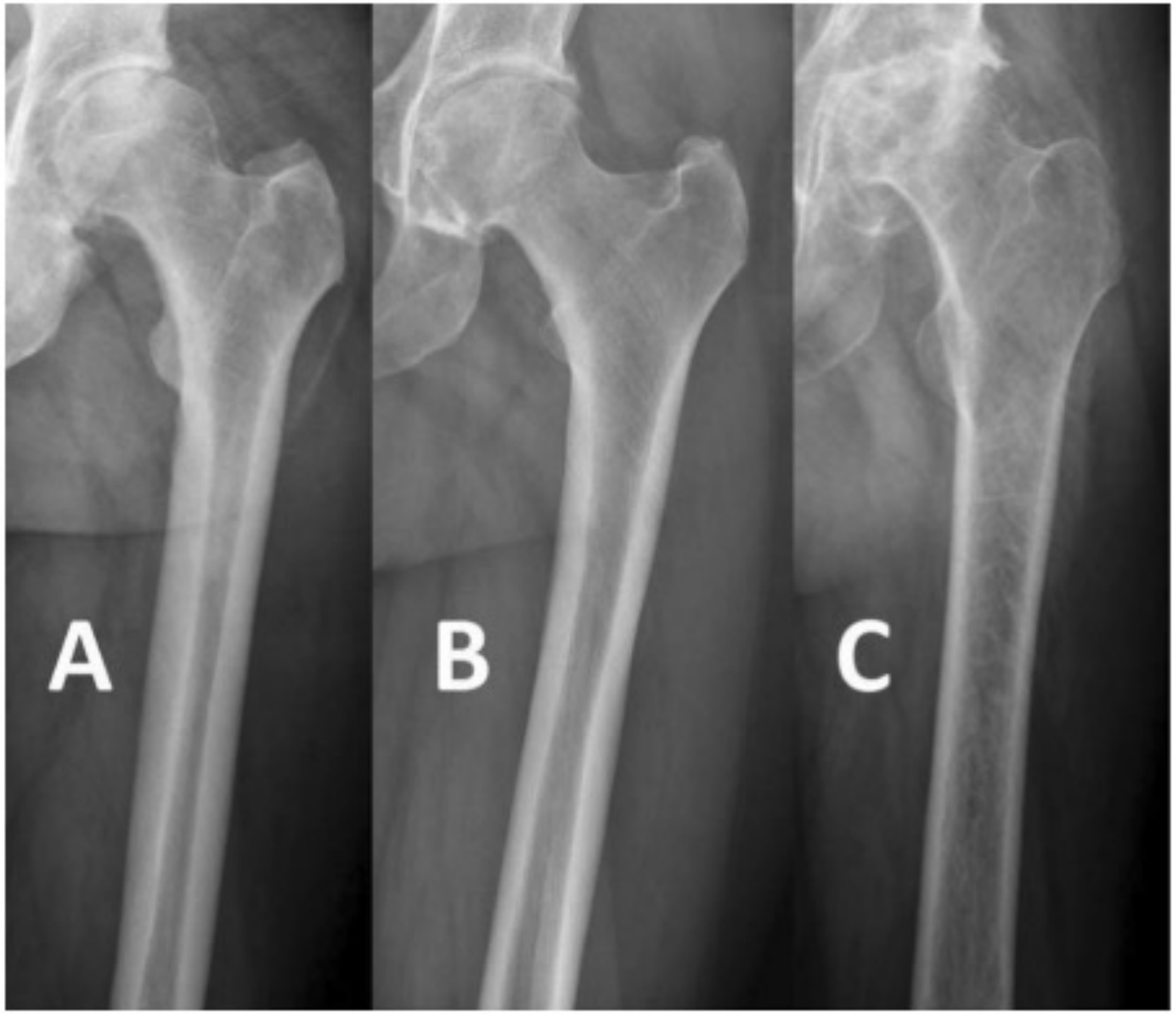

Fig. 1 Morphological types described by Dorr

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ORIGINAL ARTICLE

Accuracy of the preoperative planning for cementless total hip arthroplasty. A randomised comparison between three-dimensional computerised planning and conventional templating

E. Sariali*, R. Mauprivez, F. Khiami, H. Pascal-Mousselard, Y. Catonné

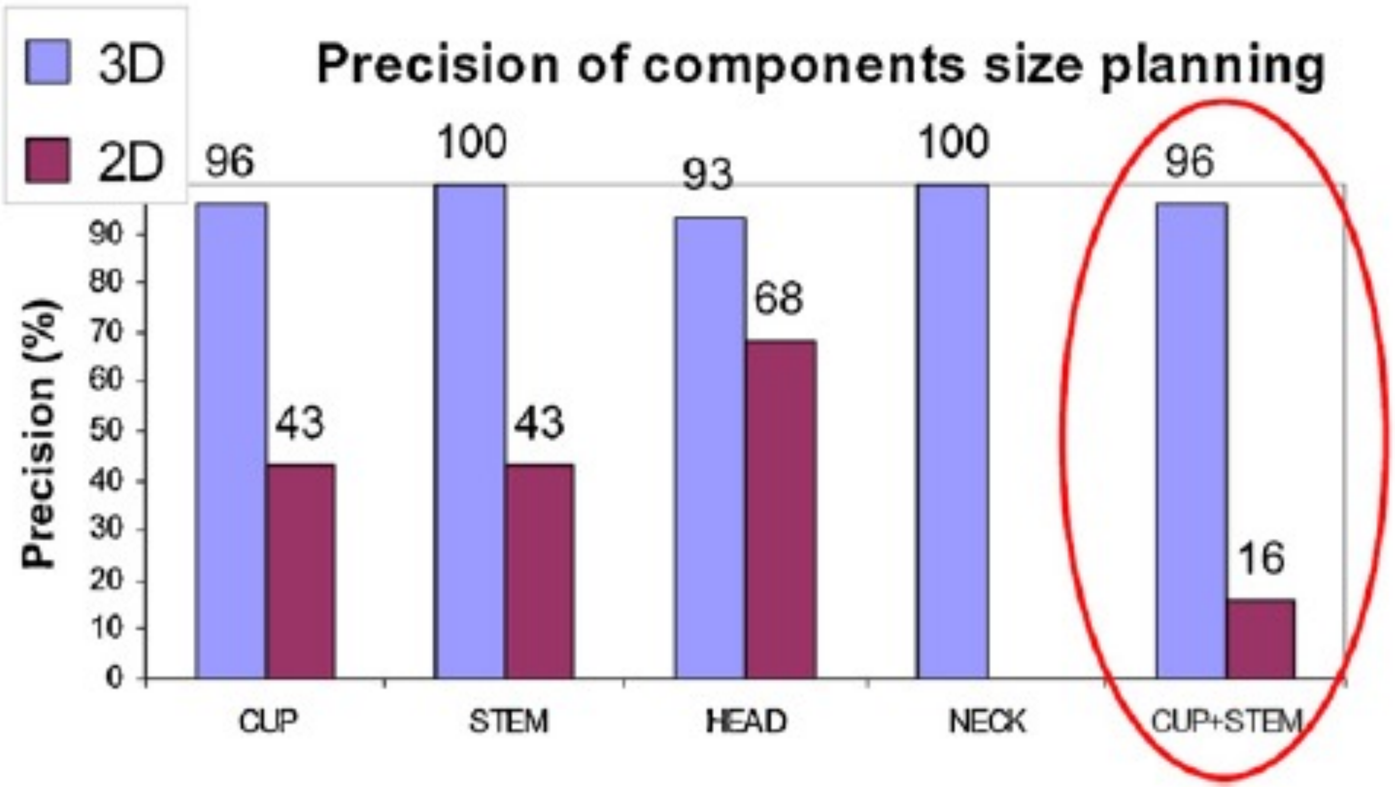

Figure 6 In the 3D group the accuracy was twice higher with 96% for the cup, 100% for the stem and 93% for the head.

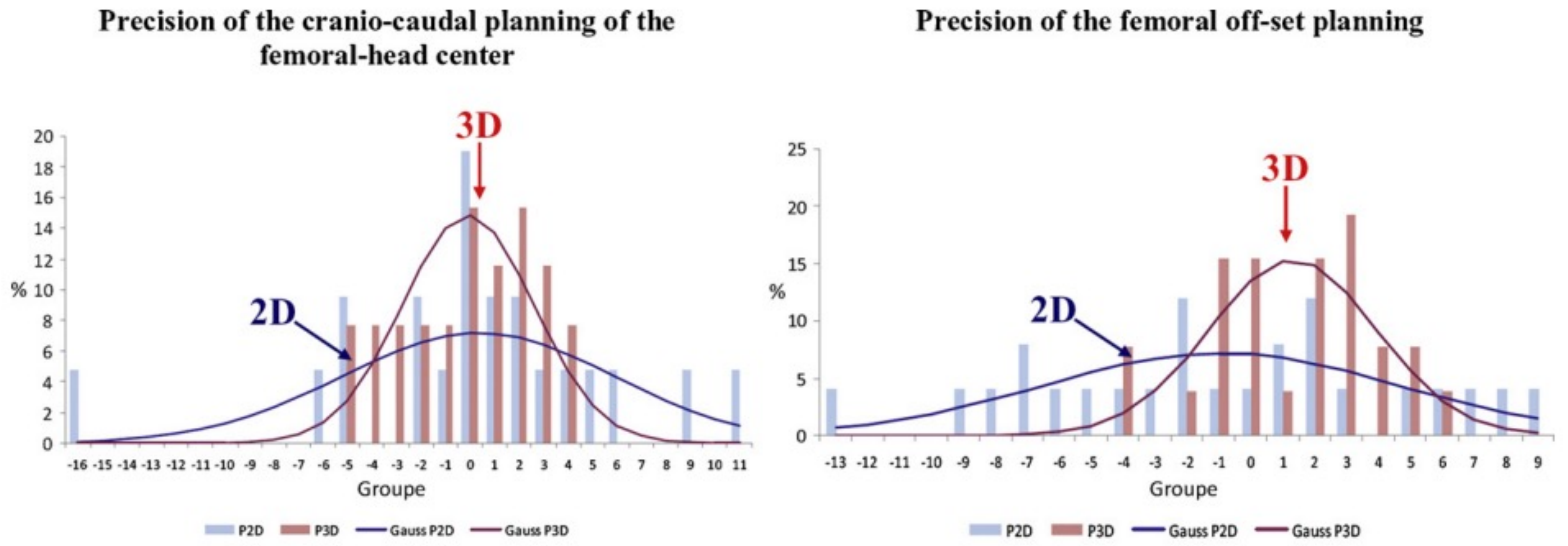

Figure 7 Accuracy of the femoral head centre planning: height from the top of the greater trochanter and femoral offset.

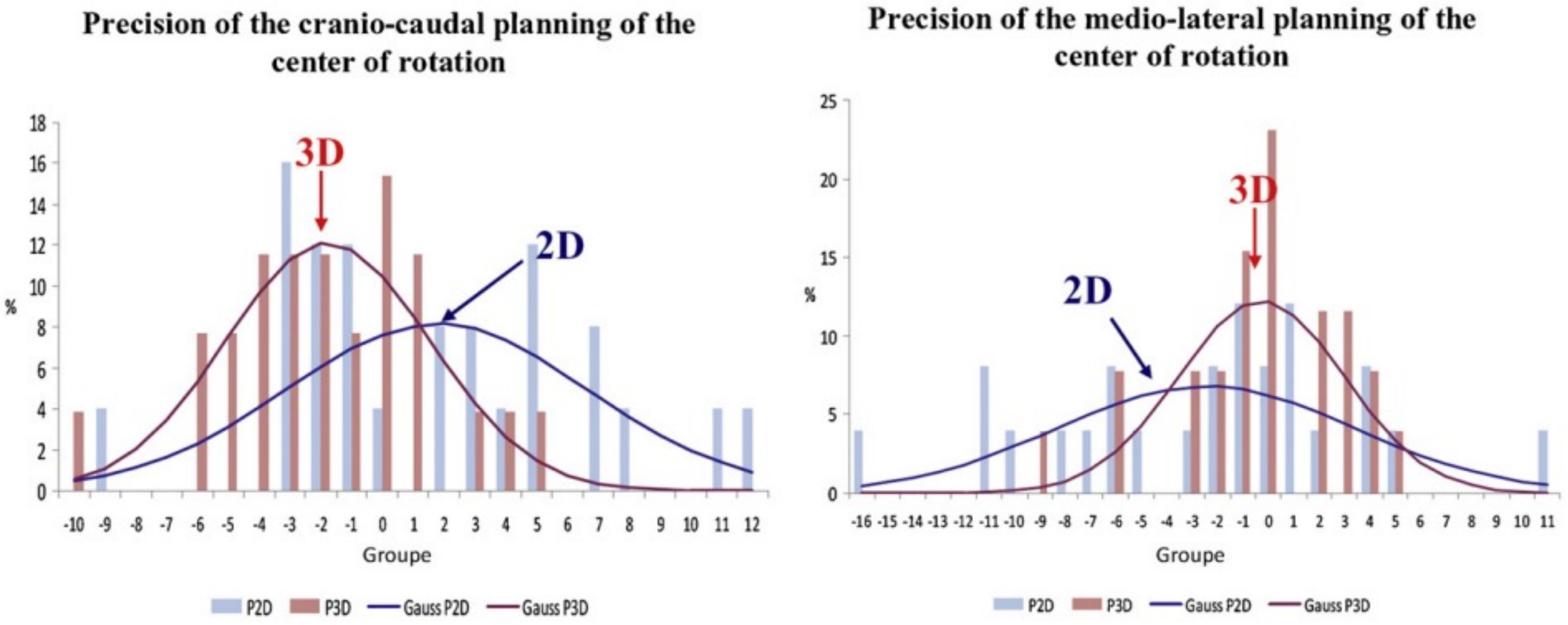

Figure 8 Accuracy of the hip rotation centre planning, in the cranio-caudal and the medio-lateral directions.

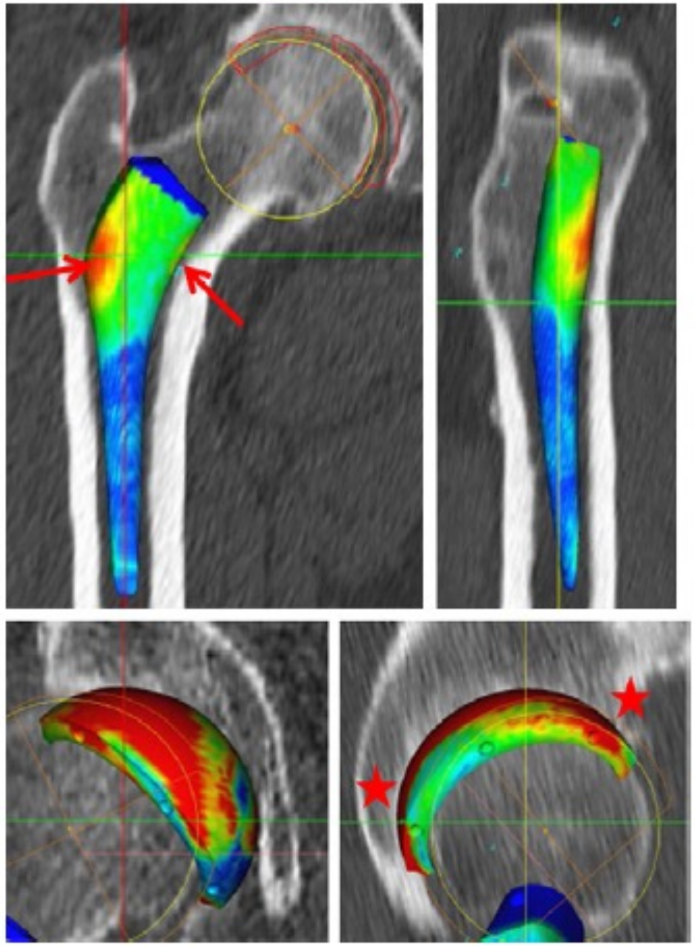

Figure 2 The 3D preoperative planning. To achieve a good primary mechanical stability, authors assumed that the stem should be in contact with a highly dense bone at least on the stem lateral flare and the calcar (arrow) and that the cup should be in contact with a highly dense bone at least on both anterior and posterior horns (stars).

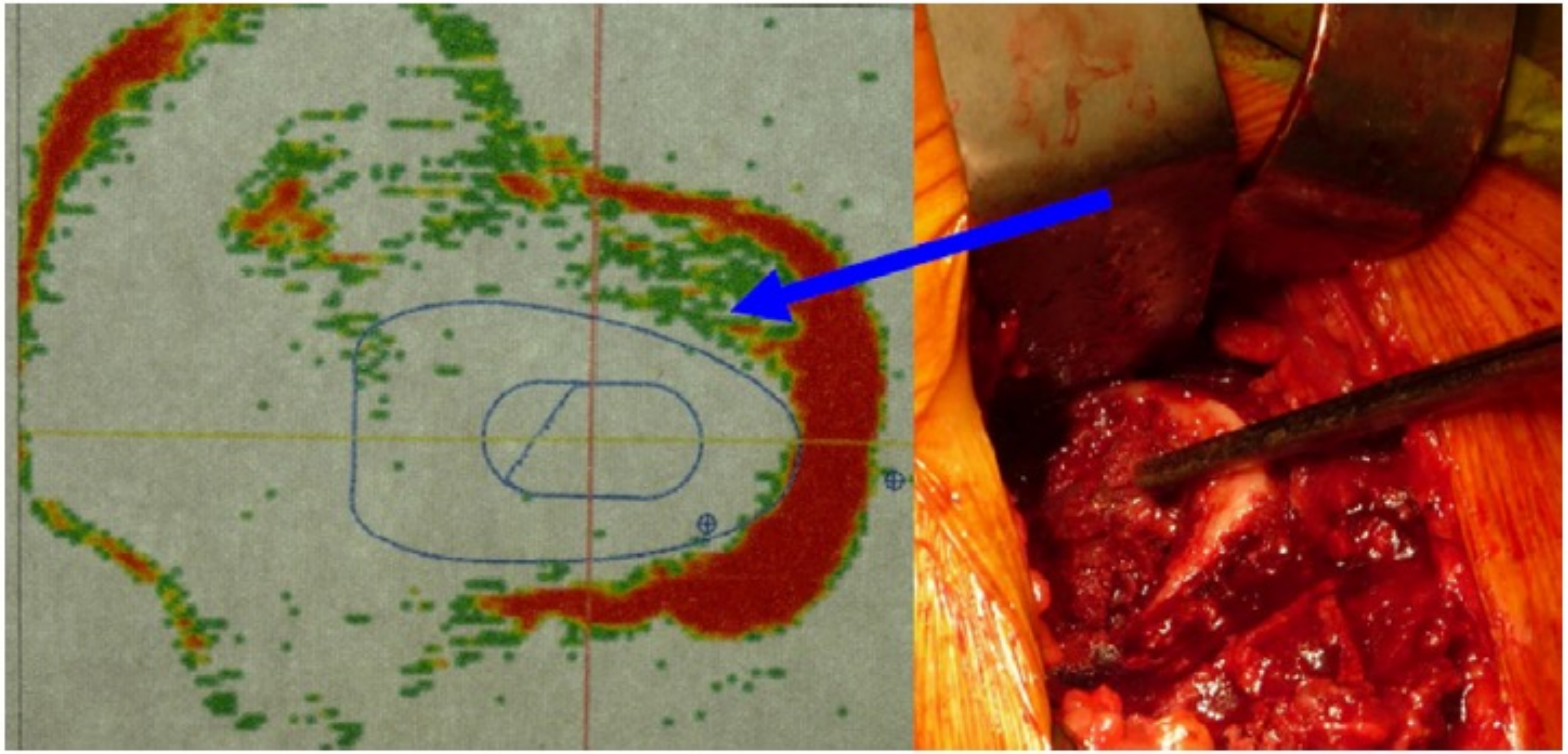

Figure 4 A view of the neck-osteotomy plane was given to the surgeon in order to visually control the position of the stem during the rasping procedure and to determine the supportive cancellous (blue arrow) to keep in order to achieve good rotational stem stability and to check the final femoral anteversion.

EFORT open reviews

HIP 7:1 70–83

Comparison of the accuracy of 2D and 3D templating methods for planning primary total hip replacement: a systematic review and meta-analysis

Habeeb Bishi, Joshua B V Smith, Vipin Asopa, Richard E Field, Chao Wang and David H Sochart

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Table 4 Study characteristics and level of evidence.

Reference	Year	Study design	Country	Number of		Indication for surgery	LOE
				Hips	Patients		
Brenneis *et al.* (12)	2021	RCT	Germany	51	51	Unilateral hip OA	II
Hassani *et al.* (18)	2014	CS	Switzerland	50	50	Not reported	IV
Huo *et al.* (19)	2021	CS	China	59	53	DDH: 16; OA: 16; Osteonecrosis: 16; Ankylosing spondylitis: 9; RA: 2	IV
Inoue *et al.* (20)	2015	CS	Japan	65	57	DDH	IV
Knafo *et al.* (21)	2019	CS	France	33	33	Primary OA	IV
Mainard *et al.* (22)	2017	CC	France	31	31	Primary OA: 30; Trauma: 1	III
Sariali *et al.* (23)	2012	LPPRT	France	60*	60	Primary OA	III
Schiffner *et al.* (10)	2019	CS	Germany	116	116	Primary OA	II
Viceconti *et al.* (24)	2003	CS	Italy	29	29	CDH: 19; Primary OA: 6; Post-traumatic OA: 2; Secondary OA/Perthes: 1; Revision: 1	IV
Wako *et al.* (25)	2018	CS	Japan	60	46	OA:36; Osteonecrosis : 24	IV
Wu *et al.* (26)	2018	CS	China	49	41	DDH	IV
Zeng *et al.* (27)	2014	CS	China	20	20	DDH	IV

*2 x 30.
OA, osteoarthritis; CDH, Congenital dysplasia of the hip; DDH, Developmental dysplasia of the hip; RA, Rheumatoid arthritis; RCT, randomized control trial; CC, case-control; CS, case series; LPPRT, Low-powered prospective randomised trial; LOE, level of evidence.

Table 5 Patient demographics, pre-operative diagnosis and implants used.

Reference	Number of		Age, mean (SD/range)	Sex		Indication for surgery	Fixation	Implants used	
	Hips	Patients		Male	Female			Cup	Stem
Brenneis *et al.* (12)	51	51	3D group: 60.2 (10.7) 2D group: 63.5 (10.0)	26	25	Unilateral hip OA: 51 hips	Uncemented	Cementless pressfit Allofit cup: 51 hips	Short stem: Optimys stem (26 hips); Straight stem: Alloclassic Zweymüller stem (25 hips)
Hassani *et al.* (18)	50	50	64.0 (36–82)	20	30	Not reported	Uncemented	Not reported	SPS family (Symbios) including 36 stems with modular neck (50 hips)
Huo *et al.* (19)	59	53	57.4 (27–79)	29	24	DDH: 16; Primary OA: 16; Osteonecrosis: 16; Ankylosing spondylitis: 9; RA: 2	Uncemented	PInnacle cup (Depuy): 59 hips	Summit stem (Depuy): 43 hips; Corail stem (Depuy): 16 hips
Inoue *et al.* (20)	65	57	60.3 (40–76)	5	52	DDH: 65 hips	Uncemented	Trilogy acetabular cup (Zimmer, Inc.): 65 hips	APS Natural-Hip™ System (Zimmer, Inc): 65 hips
Knafo *et al.* (21)	33	33	65.0 (32-84)	14	19	Primary OA : :hips: 33	Uncemented	Plasmacup SC (B Braun): 33 hips	Excia Hip Stem System (B Braun): 33 hips
Mainard *et al.* (22)	31	31	66.0 (49-86)	10	21	Primary OA: 30 hips; Post-traumatic: 1 hip – only stem implanted	Not reported	Plasmacup SC (Aesculap Orthopaedics): 31 hips	Excia Hip Stem System (Aesculap Orthopaedics): 31 hips
Sariali *et al.* (23)	60	60	3D group: 60.0 (23-87) 2D group: 57.2 (27-77)	44	16	Primary OA: 60 hips	Uncemented	Not reported	3D templating: SPS modular component (Symbios) – 30 hips; 2D templating: Global stem (Ceramconcept) – 30 hips
Schiffner *et al.* (10)	116	116	69.2 (50-91)	40	76	Primary OA: 116 hips (39 patients with flexion contracture)	Uncemented	Allofit pressfit cup (Zimmer): 116 hips	Fitmore short stem (Zimmer) SPP II anatomical stem (LINK) MIA stem (Smith & Nephew) Alloclassic stem (Zimmer); Avenir stem (Zimmer)
Viceconti *et al.* (24)	29	29	48.4 (31-77)	6	23	CDH: 19 hips; Primary OA: 6 hips; Post traumatic OA: 2 hips; Secondary OA/Perthes: 1 hip; Revision surgery of septic stem: 1 hip	Uncemented	AnCAFit system (Cremascoli-Wright): 29 hips	AnCAFit system (Cremascoli- Wright): 29 hips
Wako *et al.* (25)	60	46	61.0 (29-84)	14	32	OA- DDH: 36 hips; Osteonecrosis: 24 hips	Uncemented	Continuum (Zimmer)	Profemur Z (Microport Orthopedics)
Wu *et al.* (26)	49	41	58.3 (31-78)	9	32	DDH: 49 hips	Uncemented	Pinnacle cup (Depuy): 49 hips	Not reported
Zeng *et al.* (27)	20	20	45.0 (26-60)	4	16	DDH: 20 hips	Uncemented	Pinnacle cup (Depuy): 20 hips	Not reported

RA, Rheumatoid arthritis; OA, osteoarthritis; CDH, Congenital dysplasia of the hip; DDH, Developmental dysplasia of the hip.

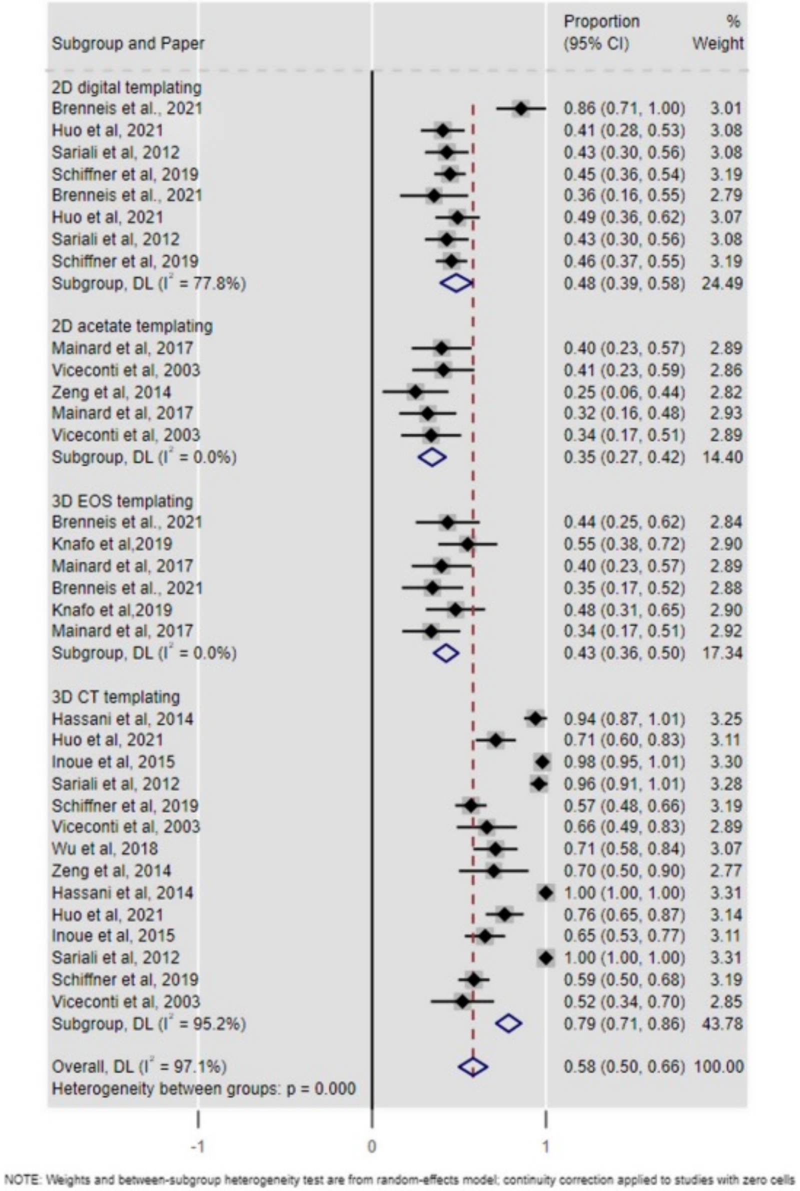

Figure 2

Forest plot comparing exact implant size prediction using 2D and 3D templating methods.

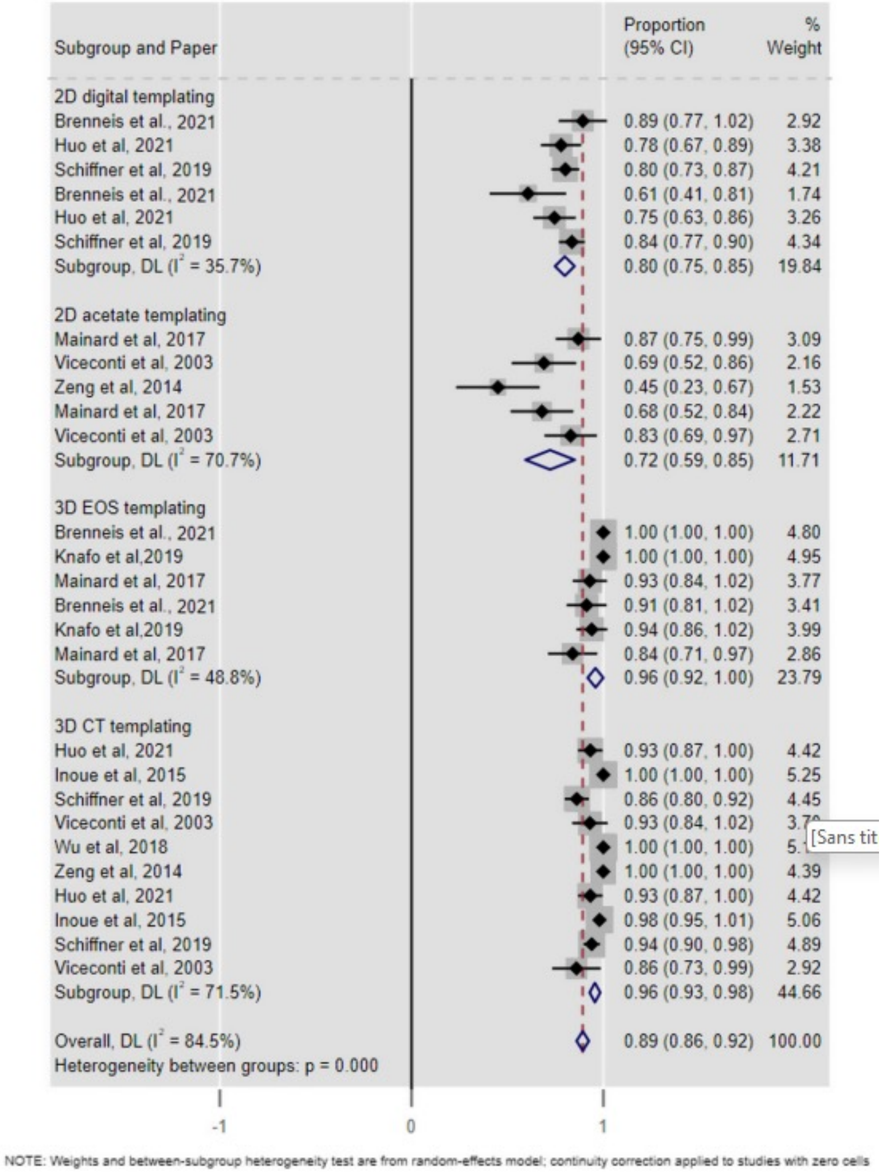

Figure 3

Forest plot comparing implant size prediction within one size using 2D and 3D templating methods.

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Conclusion

Despite the increased accuracy associated with 3D templating, there is not yet sufficient evidence to suggest that using 3D templating has any benefit on clinical outcomes. One of the main reasons for this is that increased accuracy in size prediction does not, per se, optimize the position and orientation of implant components. Furthermore, the multifactorial nature of how good outcomes are achieved in total hip arthroplasty means that the clinical benefit solely attributable to the use of 3D templating is something that is difficult to quantify.

More evidence regarding the effect of the increased accuracy of 3D templating is therefore needed to justify its widespread use for planning primary THA, and long-term clinical studies of large patient numbers would be required to ascertain whether this increased accuracy is of clinical relevance. Until this information is available, it is reasonable that 2D templating should remain the standard for non-complex primary total hip arthroplasty, whilst 3D templating is reserved for more complex cases with acetabular or femoral deformities where a greater appreciation of the 3D structure of the hip is required.

Et maintenant

Démonstration live planification 2D et 3D