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Supplementary TABLE I. Brief Pain Inventory (BPI) score

	Subsidence <2 mm	Subsidence ≥2 mm	P value*
Pain severity [§]			
Preop.	7.0 (6.3, 7.7)	7.0 (6.2, 7.8)	0.775
3 Mo	2.2 (1.5, 2.9)	3.4 (2.4, 4.3)	0.359
5 Mo	2.3 (1.7, 2.9)	2.9 (1.9, 3.8)	0.199
11 Mo	3.1 (2.1, 4.1)	3.5 (2.5, 4.6)	0.092
24 Mo	2.6 (1.6, 3.5)	4.2 (3.2, 5.3)	0.280
Interference with activity [§]			
Preop.	6.8 (6.0, 7.7)	5.5 (4.7, 6.4)	0.038
3 Mo	1.8 (1.0, 2.6)	2.4 (1.4, 3.5)	0.741
5 Mo	1.7 (1.1, 2.3)	2.0 (1.1, 3.0)	0.517
11 Mo	2.5 (1.5, 3.5)	2.4 (1.6, 3.2)	0.710
24 Mo	1.3 (0.7, 2.0)	3.3 (2.2, 4.4)	0.001

* Statistical comparison of subjects with <2 mm or ≥2 mm stem subsidence conducted using the chi-square t-test of score frequency tables

§ Scores on a scale of 0 to 10 are given as the median and the 95% confidence interval is presented in parentheses

Supplementary TABLE II. Percentage of patients achieving minimum clinically important improvement at 2 years

	Subsidence <2 mm	Subsidence ≥2 mm	P value*	Outliers	P value**
HHS					
(MCII ≥18 points) [§]	76.7%	67.9%	0.453	57.1%	0.527
WOMAC					
Pain	76.7%	53.8%	0.072	14.3%	0.008
(MCII ≥33.13) [†]					
Stiffness	60.0%	26.9%	0.013	14.3%	0.124
(MCII ≥25.93) [†]					
Function	76.7%	61.5%	0.219	14.3%	0.050
(MCII ≥33.20) [†]					
Rand-36					
Physical function	82.8%	57.1%	0.035	42.9%	0.146
(MCII ≥17.9) ^{††}					
Role limitations/physical	55.2%	35.7%	0.140	28.6%	0.391
(MCII ≥31.1) ^{††}					
Bodily pain	82.8%	50.0%	0.009	42.9%	0.215
(MCII ≥16.8) ^{††}					
General health perceptions	65.5%	71.4%	0.631	71.4%	0.871
(MCII ≥6.37) [†]					
Social functioning	62.1%	39.3%	0.085	14.3%	0.067
(MCII ≥22.0) ^{††}					
Role limitations/emotional	62.1%	35.7%	0.047	14.3%	0.081
(MCII ≥20.83) [†]					
Vitality/energy	62.1%	46.4%	0.236	14.3%	0.045
(MCII ≥14.51) [†]					
Emotional well-being	31.0%	21.4%	0.410	0.0%	0.121
(MCII ≥16.15) [†]					
BPI					
Pain severity	76.7%	44.4%	0.013	42.9%	0.346
(MID >2 points) ^{†††}					
Interference with activity	80.0%	63.0%	0.153	42.9%	0.117
(MID >2 points) ^{†††}					
Walking speed					
(≥1.32 m/s)	40.0%	17.9%	0.064	14.3%	0.401

*Statistical comparison of subjects with <2 mm or ≥2 mm stem subsidence was conducted using the independent-sample 2-tailed t-test

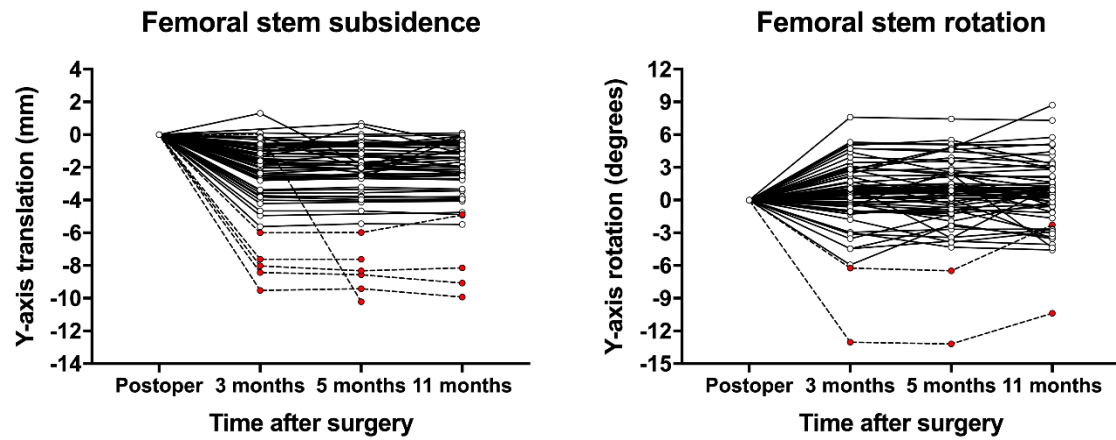
**Statistical comparison of outliers with non-outliers (subjects with stem subsidence of <2 mm or ≥2 mm) was conducted using the independent-samples Mann-Whitney U-test

[§] Singh et al. 2016, [†] Quintana et al. 2005, ^{††}Keurentjes et al. 2014, ^{†††} Gjeilo et al. 2007

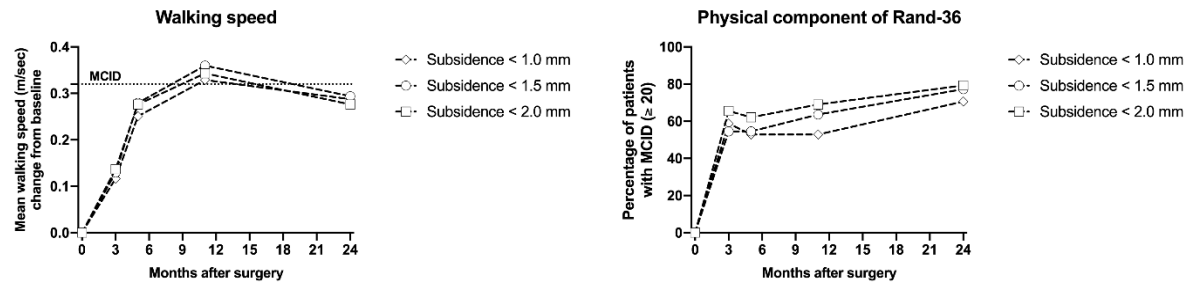
MCII = Minimum Clinically Important Improvement, MID = Minimum Important Difference

Supplementary TABLE III. Clinical characteristics of outliers

	Preoper	3 Mo	5 Mo	11 Mo	24 Mo
HHS					
Mean	50.9	62.7	63.3	61.6	72.6
(95% CI)	(39.2, 62.5)	(50.7, 74.7)	(39.8, 86.7)	(40.3, 82.8)	(53.6, 91.5)
WOMAC Total					
Mean	45.9	23.7	26.1	11.3	22.9
(95% CI)	(27.9, 63.8)	(9.9, 37.6)	(8.5, 43.8)	(1.1, 21.5)	(2.6, 43.1)
Rand-36 PC					
Mean	35.1	42.9	46.6	40.7	51.9
(95% CI)	(18.3, 51.9)	(27.5, 58.1)	(22.8, 70.4)	(18.4, 63.0)	(27.6, 76.1)
Rand-36 MC					
Mean	52.7	45.1	46.1	44.3	49.6
(95% CI)	(38.2, 67.3)	(31.8, 58.5)	(26.6, 65.7)	(29.0, 59.7)	(31.2, 68.0)
BPI Pain severity					
Mean	5.0	2.5	2.6	3.1	2.9
(95% CI)	(3.2, 6.8)	(0.9, 4.1)	(0.3, 4.9)	(0.4, 5.8)	(1.2, 4.7)
BPI Interference					
Mean	5.7	3.3	3.3	2.8	2.4
(95% CI)	(4.1, 7.2)	(1.2, 5.5)	(0.6, 6.0)	(-0.1, 5.8)	(0.7, 4.2)
Walking speed (m/s)					
Mean	1.10	0.81	0.96	1.12	1.18
(95% CI)	(0.97, 1.24)	(0.60, 1.03)	(0.76, 1.17)	(0.93, 1.31)	(1.08, 1.28)
Stride length (m)					
Mean	1.11	0.91	1.00	1.13	1.17
(95% CI)	(1.06, 1.17)	(0.72, 1.10)	(0.84, 1.16)	(1.00, 1.27)	(1.05, 1.29)
Cadence (steps/min)					
Mean	115.8	105.8	116.4	112.4	118.5
(95% CI)	(105.1, 126.6)	(84.8, 126.7)	(104.5, 128.3)	(99.8, 124.9)	(108.9, 128.1)
Walking activity (steps/day)					
Mean	3698	2994	2845	2939	NA
(95% CI)	(2353, 5043)	(1143, 4845)	(1814, 3877)	(1928, 3950)	



Supplementary Fig. 1 Individual femoral stem subsidence (y-axis translation) (left) and y-axis rotation (right) during the first 11 postoperative months; outlier values are shown as broken lines. Positive sign of y-axis rotation refers for internal rotation (retroversion) and negative sign refers for external rotation (anteversion).



Supplementary Fig. 2 Mean walking speed change from baseline (left) as well as achievement of minimum clinically important difference (MCID) of the Rand-36 physical component (right) among subjects categorized according to initial stem subsidence thresholds of <1.0 mm, <1.5 mm or <2.0 mm.