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**Supplementary TABLE I. Brief Pain Inventory (BPI) score**

	Subsidence <2 mm	Subsidence ≥2 mm	P value*
<b>Pain severity<sup>§</sup></b>			
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
<b>Interference with activity<sup>§</sup></b>			
Preop.	6.8 (6.0, 7.7)	5.5 (4.7, 6.4)	<b>0.038</b>
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)	<b>0.001</b>

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

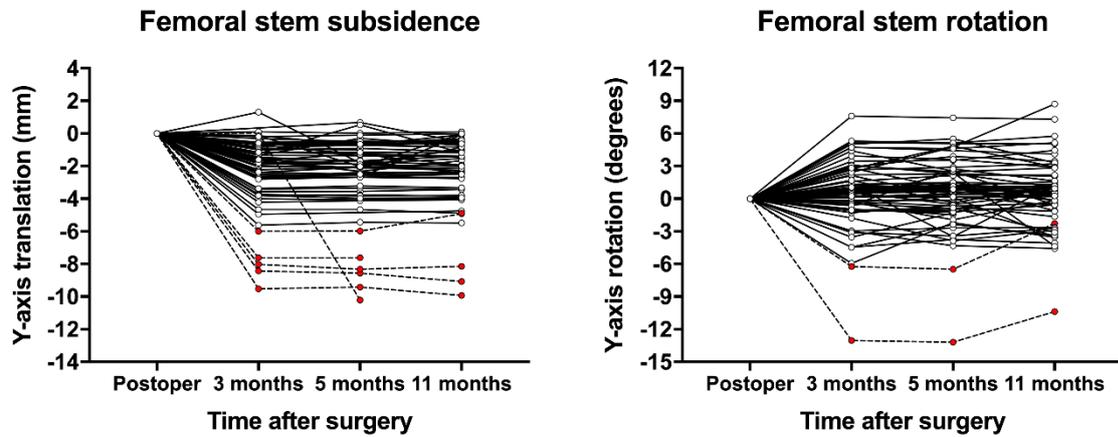
\*\*Statistical comparison of outliers with non-outliers (subjects with stem subsidence of <2 mm or ≥2 mm) was conducted using the independent-samples Mann-Whitney U-test

<sup>§</sup> Singh et al. 2016, <sup>†</sup> Quintana et al. 2005, <sup>††</sup>Keurentjes et al. 2014, <sup>†††</sup> Gjeilo et al. 2007

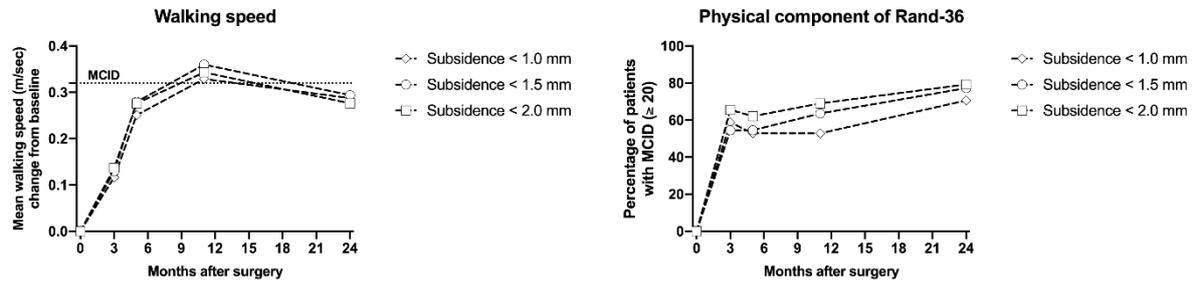
MCII = Minimum Clinically Important Improvement, MID = Minimum Important Difference

**Supplementary TABLE III. Clinical characteristics of outliers**

	<b>Preoper</b>	<b>3 Mo</b>	<b>5 Mo</b>	<b>11 Mo</b>	<b>24 Mo</b>
<b>HHS</b>					
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)
<b>WOMAC Total</b>					
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)
<b>Rand-36 PC</b>					
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)
<b>Rand-36 MC</b>					
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)
<b>BPI Pain severity</b>					
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)
<b>BPI Interference</b>					
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)
<b>Walking speed (m/s)</b>					
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)
<b>Stride length (m)</b>					
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)
<b>Cadence (steps/min)</b>					
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)
<b>Walking activity (steps/day)</b>					
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.