SUPPLEMENTARY DATA

Appendix A: search strategy

PubMed

((“Photogrammetry”[Mesh:NoExp] OR Radiostereometric Analysis [Mesh] OR “roentgen stereophotogrammetric analysis”[tiab] OR “RSA” [tiab] OR “Radiostereometric” [tiab] OR “Radiostereometrics” [tiab] OR “stereophotogrammetric” [tiab] OR “stereophotogrammetrics” [tiab] OR “stereophotogram-metry” [tiab] OR “stereo-photogrammetric” [tiab] OR “stereophotogrammetrics” [tiab] OR “stereophotogrammetry” [tiab] OR “Photofluorography” [Mesh] OR “roentgen fluoroscopic”[tiab] OR “roentgen fluoroscopics”[tiab] OR “roentgen fluoroscopy”[tiab]))

AND

((“Joint Prosthesis”[Mesh:NoExp] OR “Hip Prosthesis”[Mesh] OR “hip prosthesis”[tiab] OR “hip prostheses”[tiab] OR “prosthetic hip”[tiab] OR “THA”[tiab] OR “THR”[tiab] OR “TKR”[tiab] OR “joint replacement”[tiab] OR “Arthroplasty, Replacement”[mesh:NoExp] OR “total hip replacement”[tiab] OR “total hip arthroplasty”[tiab] OR “Arthroplasty, Replacement, Hip”[Mesh]))

February 22, 2024 => 731 hits

Web of Science

TS=(“Photogrammetr*” OR “RSA” OR “radiostereometr*” OR “radio-stereometr*” OR “stereophotogram-metr*” OR “stereo-photogrammetr*” OR “roentgen fluoroscop*” OR “Photofluorograph*” OR “Photo-flu-orograph*”)

AND

TS=(“Joint Prosthe*” OR “hip prosthe*” OR THA OR THR OR “hip arthroplast*” OR “hip replacement*”)

February 22, 2024 => 613 hits

Of which 401 unique imported

Cochrane database

(“Photogrammetr*” OR “RSA” OR “radiostereometr*” OR “radio-stereometr*” OR “stereophotogram-metr*” OR “stereo-photogrammetr*” OR “roentgen fluoroscop*” OR “Photofluorograph*” OR “Photo-fluorograph*”):ti,ab,kw

AND

(“Joint Prosthe*” OR “hip prosthe*” OR THA OR THR OR “hip arthroplast*” OR “hip replacement*”):ti,ab,kw

February 22, 2024 => 116 hits

Of which 65 unique imported

Embase

(Stereophotogrammetry/ OR exp radiostereometric analysis/ OR “RSA”.ti,ab. OR “Radiostereometr*”.ti,ab. OR “Radio-stereometr*”.ti,ab. OR “stereophotogrammetr*”.ti,ab. OR “stereo-photogrammetr*”.ti,ab. OR exp fluorography/ OR “Photofluorograph*”.ti,ab. OR “Photo-fluorograph*”.ti,ab. OR “roentgen fluoroscop*”.ti,ab.)

AND

(joint prosthesis/ OR exp hip prosthesis/ OR “hip prosthe*”.ti,ab. OR “hip arthroplast*”.ti,ab. OR “hip replacement*”.ti,ab. OR “prosthetic hip*”.ti,ab. OR “THA”.ti,ab. OR “THR”.ti,ab. OR “joint replacement*”.ti,ab. OR replacement arthroplasty/ OR exp hip replacement/) NOT (conference OR conference abstract OR “conference review”).pt.

February 22, 2024 => 581 hits

Of which 314 unique imported

Total hits without de-doubling February 22, 2024 = 731 + 613 + 116 + 581 = 2041

Total hits with de-doubling February 22, 2024 = 731 + 401 + 65 + 314 = 1511

After de-doubling within Endnote another 154 were removed => 1357

Appendix B: Included studies

1. Acklin YP, Jenni R, Bereiter H, Thalmann C, Stoffel K. Prospective clinical and radiostereometric analysis of the Fitmore short-stem total hip arthroplasty. Arch Orthop Trauma Surg. 2016; 136(2): 277-84. doi: 10.1007/s00402-015-2401-9

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12. Christiansen JD, Ejaz A, Nielsen PT, Laursen M. An ultra-short femoral neck-preserving hip prosthesis: A 2-year follow-up study with radiostereometric analysis and dual x-ray absorptiometry in a stepwise introduction. J Bone Joint Surg Am. 2020; 102(2): 128-36. doi: 10.2106/jbjs.19.00104

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Appendix C: Extra Tables and Figures

Table C1. Pooled mean and confidence interval of the 2-year follow-up subsidence and retroversion per stem subgroup.

	Subsidence (mm)			*Retroversion (degrees)*		
	mean	***CI***	***cohorts***	***mean***	***CI***	***cohorts***
Coating						
HA-coated stems	0.26	0.13 to 0.40	54	0.51	0.22 to 0.80	42

Porous coated stems	0.56	0.29 to 0.82	30	1.32	0.67 to 1.97	20
Uncoated stems	0.37	0.03 to 0.70	11	0.69	0.36 to 1.02	11
Stem type						
Flat-taper stems	0.29	0.06 to 0.52	16	0.68	0.09 to 1.27	9
Quadrangular taper stems	0.43	0.07 to 0.80	15	0.81	-0.17 to 1.79	10
Fit-and-Fill stems	0.41	0.24 to 0.59	49	0.85	0.49 to 1.21	42
Cylindrical stems	-0.01	-0.57 to 0.56	2	1.26	-0.41 to 2.93	2
Conical stems	0.47	-0.36 to 1.31	3	0.81	-1.60 to 3.22	1
Ultra-short neck-preserving stems	0.12	-0.03 to 0.27	9	0.50	0.32 to 0.68	8
Other stems	0.08	-0.15 to 0.31	5	0.14	-0.90 to 1.18	3
Inclusion period						
1980s	0.53	0.12 to 0.94	8	2.60	1.64 to 3.56	1
1990s	0.05	-0.10 to 0.19	10	0.51	0.31 to 0.71	7
2000s	0.36	0.16 to 0.55	37	0.48	0.21 to 0.75	34
2010s	0.37	0.20 to 0.54	44	0.81	0.45 to 1.16	33
Surgical approach						
Direct anterior approach	1.04	0.53 to 1.55	3	1.52	1.08 to 1.95	3
Anterolateral approach	0.11	-0.03 to 0.25	15	0.51	0.33 to 0.68	15
Direct lateral approach	0.36	0.08 to 0.64	20	0.20	-0.23 to 0.64	11
Posterior approach	0.32	0.16 to 0.47	39	1.03	0.54 to 1.53	32
Mixed approach	0.18	-0.06 to 0.42	15	0.95	0.23 to 1.67	9
RSA technique						
Marker-based RSA	0.29	0.15 to 0.42	57	0.62	0.35 to 0.89	40
Model-based RSA	0.37	0.19 to 0.54	40	0.81	0.43 to 1.18	33
Randomization						
Randomized	0.19	0.09 to 0.29	68	0.69	0.45 to 0.93	53
Non-randomized	0.38	0.19 to 0.57	31	0.78	0.24 to 1.33	22
Weight-bearing						
Weight-bearing studies	0.20	0.09 to 0.30	62	0.76	0.43 to 1.09	46
Non-weight-bearing studies	0.58	0.26 to 0.91	18	1.01	0.38 to 1.63	15
baseline measurement						
Overall mean incl. delayed baseline	0.28	0.18 to 0.38	105	0.66	0.44 to 0.88	79
Overall mean excl. delayed baseline	0.32	0.21 to 0.43	99	0.70	0.48 to 0.93	75
Mean of delayed baseline studies	0.01	-0.08 to 0.10	6	0.04	-0.68 to 0.75	4

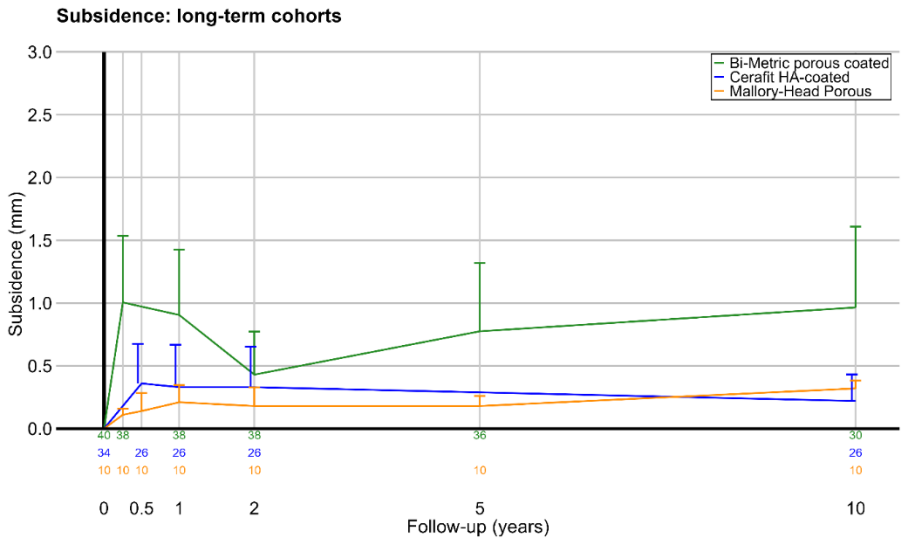


Figure C1. Long-term mean subsidence pattern of Bi-Metric porous coated stems, Cerafit HA-coated stems, and Mallory-Head Porous stems (with mixed coating). The error bars represent the upper limit of the 95% confidence intervals, and the numbers below the graph indicate the number of hips per group at each follow-up.

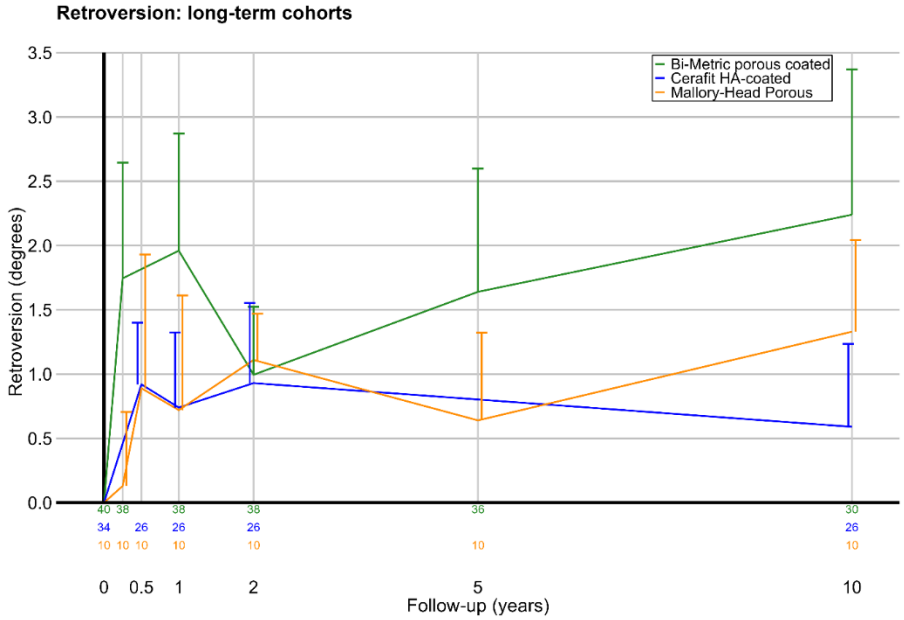
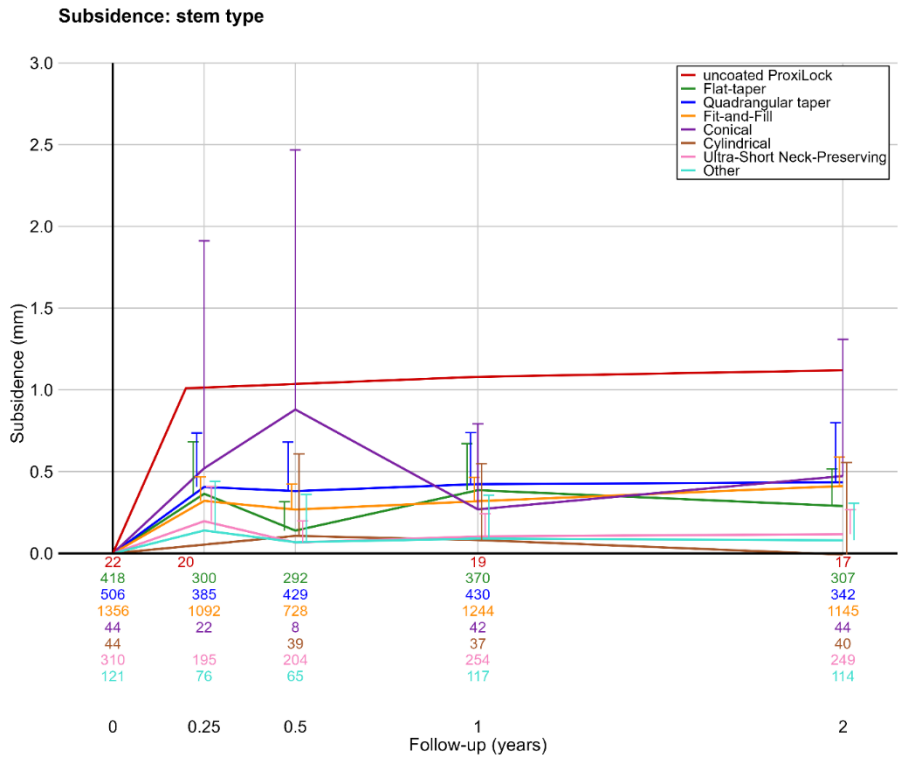


Figure C2. Long-term mean retroversion patterns of Bi-Metric porous coated stems, Cerafit HA-coated stems, and Mallory-Head Porous stems (with mixed coating). The error bars represent the upper limit of the 95% confidence intervals, and the numbers below the graph indicate the number of hips per group at each follow-up.

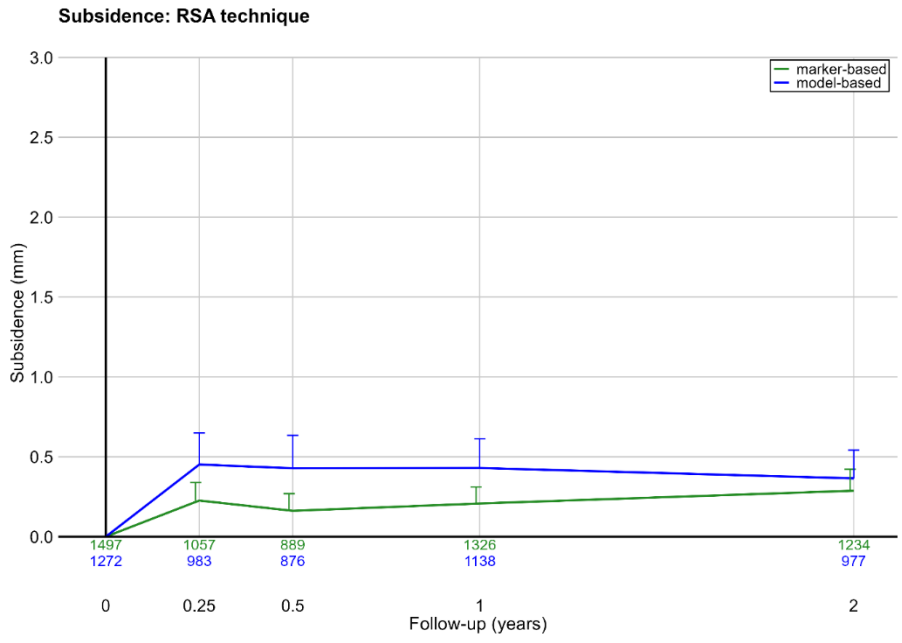


308

309 *Figure C3. Pooled mean subsidence during the first 2 years per stem type, with the known failure uncoated ProxiLock for*

310 *reference (8). The error bars represent the upper 95% confidence intervals, and the numbers below the graph indicate the*

311 *number of hips per group at each follow-up.*

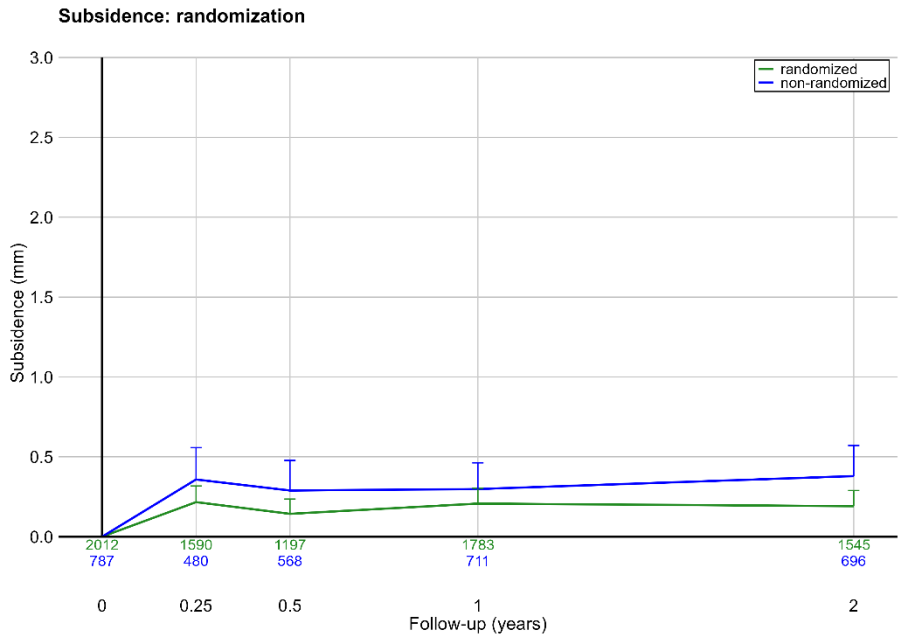


312

313 *Figure C4. Pooled mean subsidence during the first 2 years for marker- and model-based RSA studies. The error bars*

314 *represent the upper 95% confidence intervals, and the numbers below the graph indicate the number of hips per group at*

315 *each follow-up.*

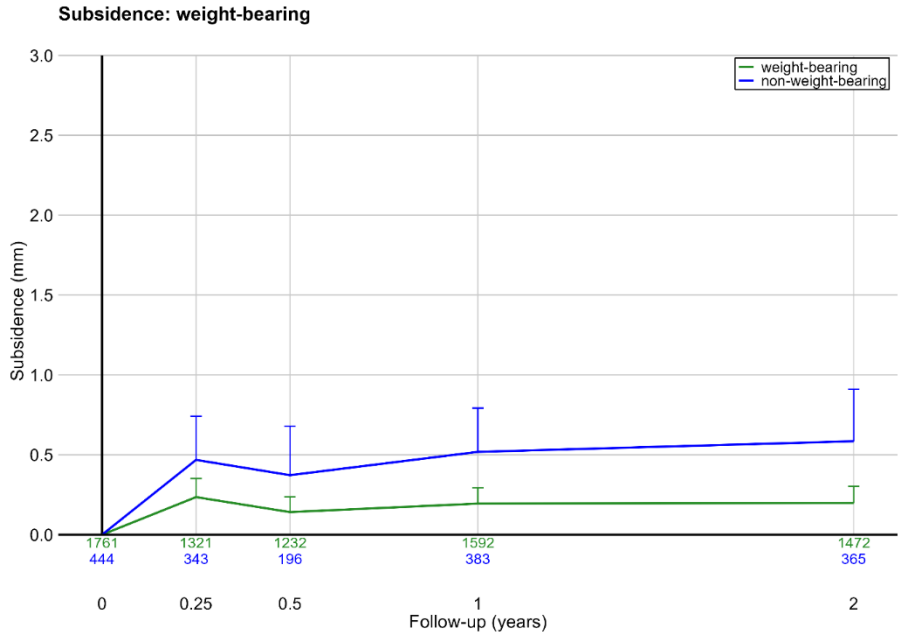


316

317 *Figure C5. Pooled mean subsidence during the first 2 years for randomized and non-randomized studies. The error bars*

318 *represent the upper 95% confidence intervals, and the numbers below the graph indicate the number of hips per group at*

319 *each follow-up.*



320

321 *Figure C6. Pooled mean subsidence during the first 2 years for weight-bearing and non-weight-bearing cohorts. The error*

322 *bars represent the upper 95% confidence intervals, and the numbers below the graph indicate the number of hips per group*

323 *at each follow-up.*

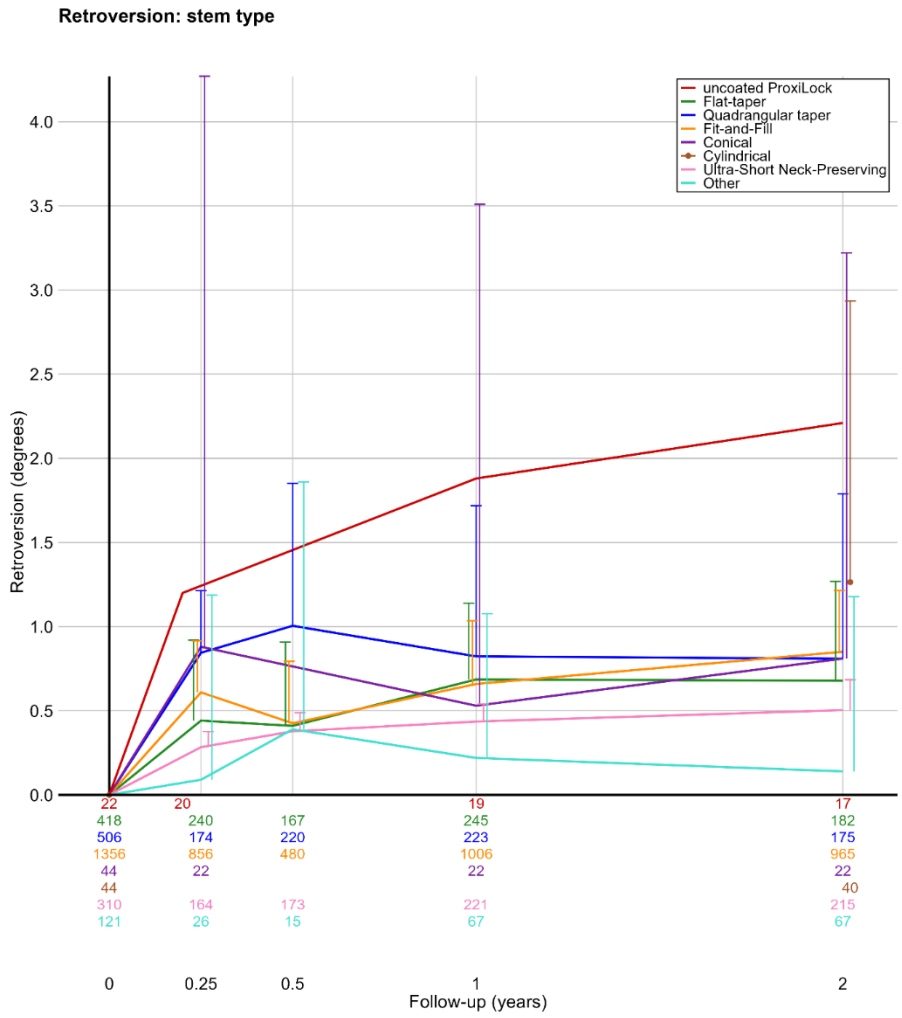


Figure C7. Pooled mean retroversion during the first 2 years per stem type, with the known failure uncoated ProxiLock for reference (8). For the Cylindrical stems there was no retroversion pattern available, so just the 2-year retroversion result is presented. The error bars represent the upper 95% confidence intervals, and the numbers below the graph indicate the number of hips per group at each follow-up.

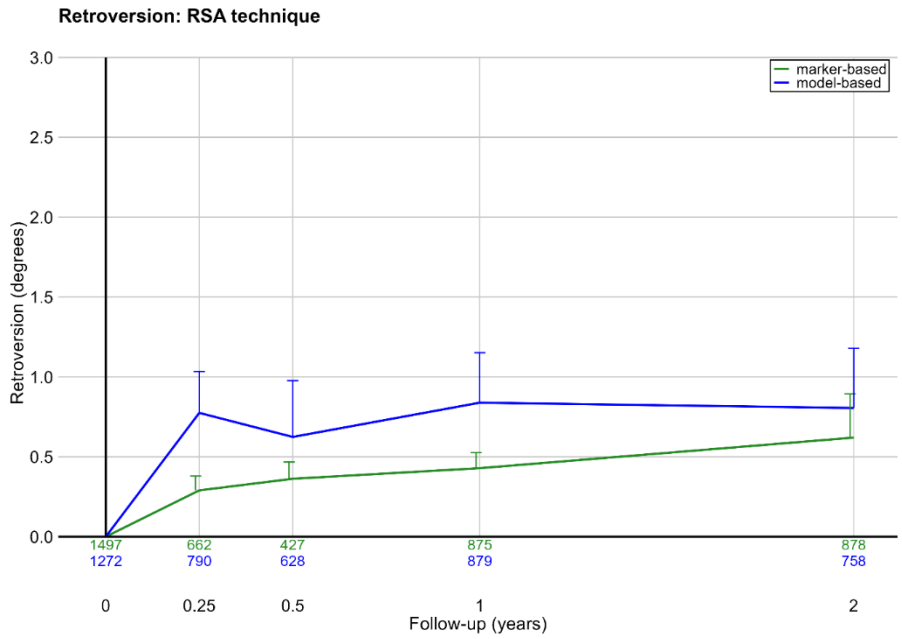


Figure C8. Pooled mean retroversion during the first 2 years for marker- and model-based RSA studies. The error bars represent the upper 95% confidence intervals, and the numbers below the graph indicate the number of hips per group at each follow-up.

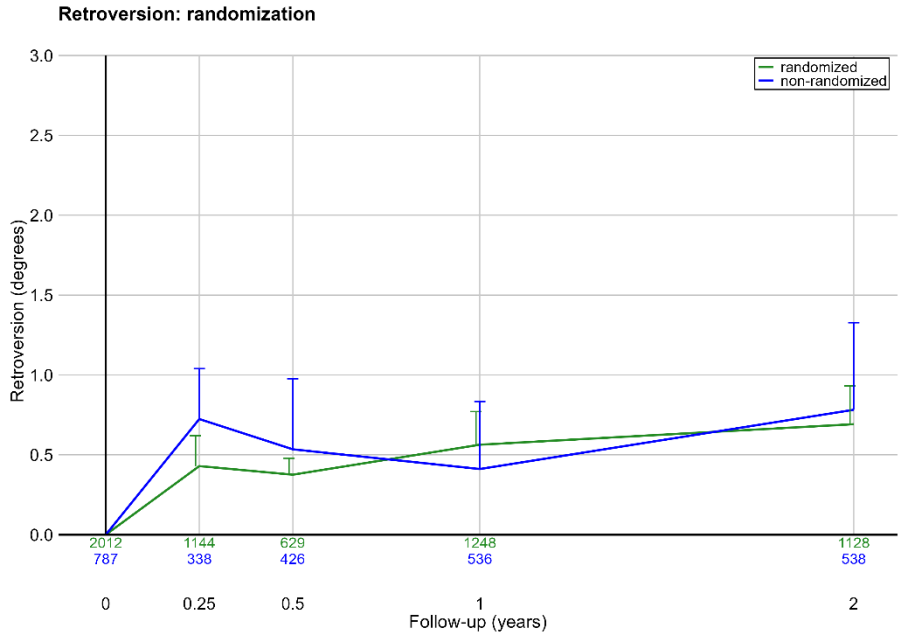


Figure C9. Pooled mean retroversion during the first 2 years for randomized and non-randomized studies. The error bars represent the upper 95% confidence intervals, and the numbers below the graph indicate the number of hips per group at each follow-up.

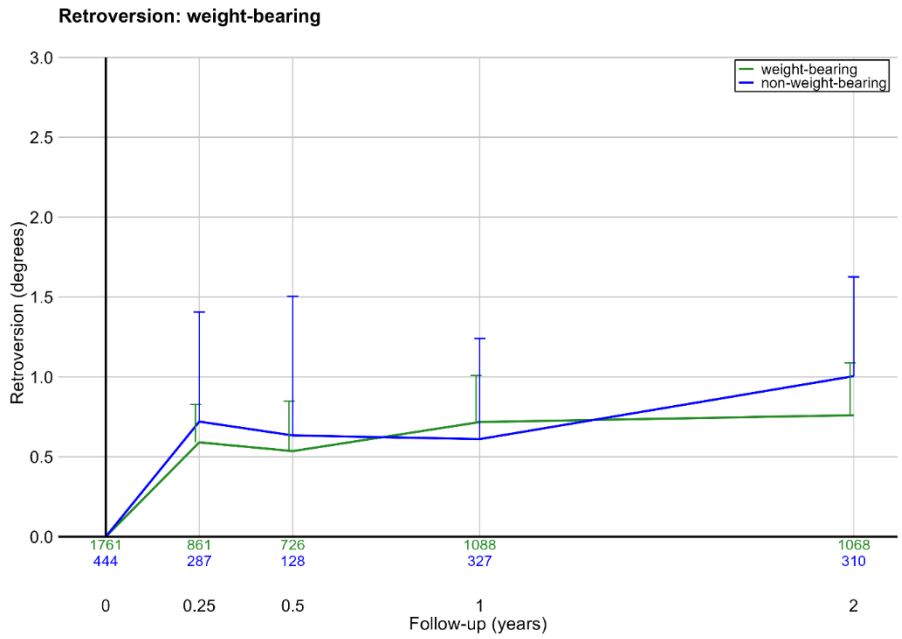


Figure C10. Pooled mean retroversion during the first 2 years for weight-bearing and non-weight-bearing cohorts. The error bars represent the upper 95% confidence intervals, and the numbers below the graph indicate the number of hips per group at each follow-up.

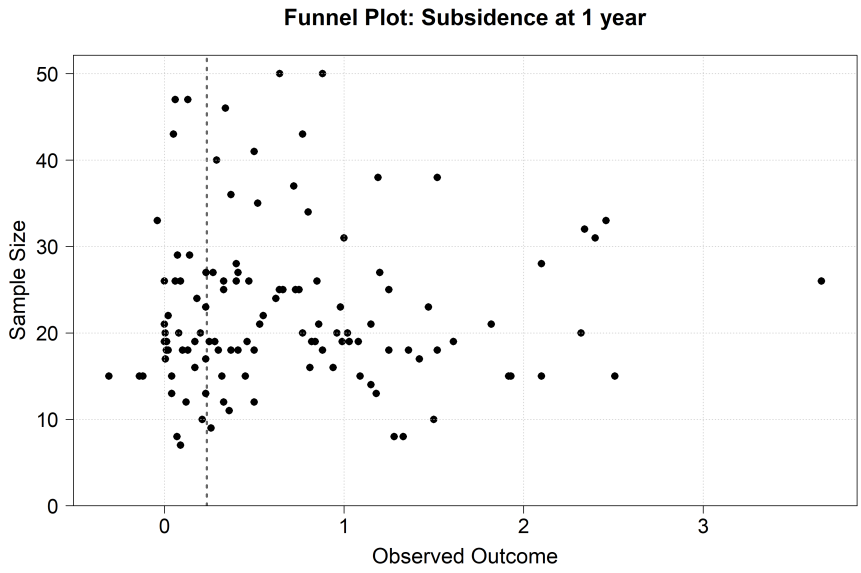
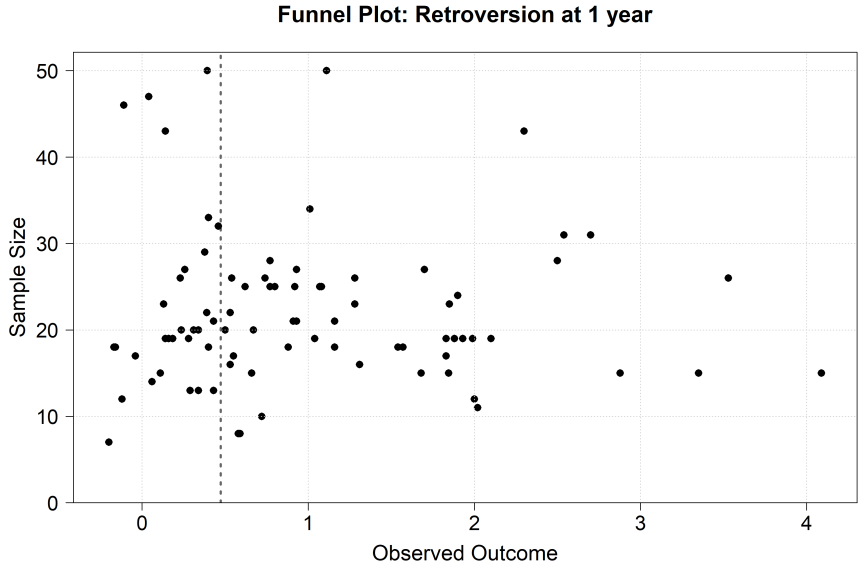


Figure C11. Funnel plot with subsidence on the x-axis and sample size on the y-axis.



343

344 *Figure C12. Funnel plot with subsidence on the x-axis and sample size on the y-axis.*

Forest Plot – Subsidence at 3 Months

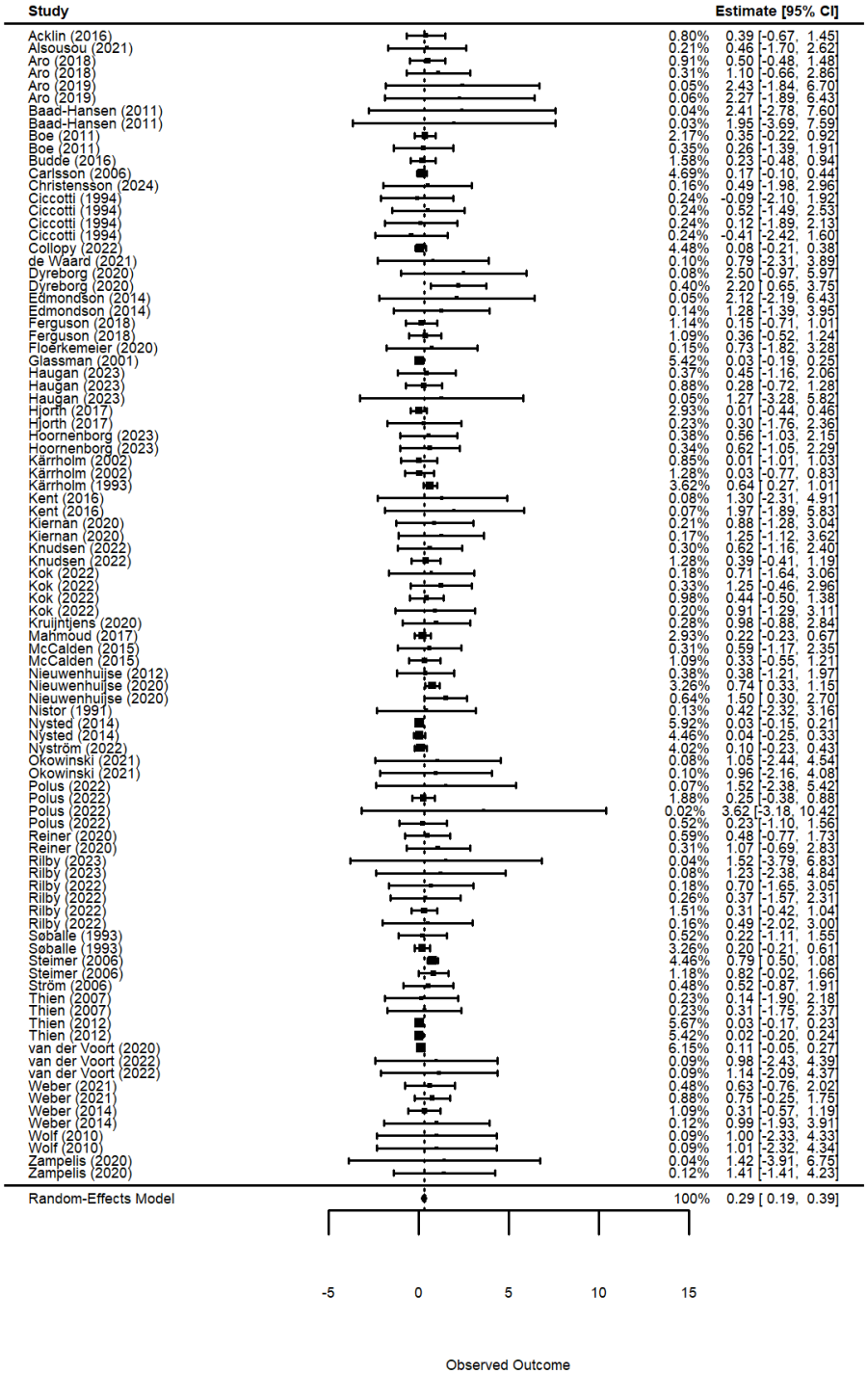


Figure C13. Forest plot of subsidence at 3 months.

Forest Plot – Subsidence at 2 Years

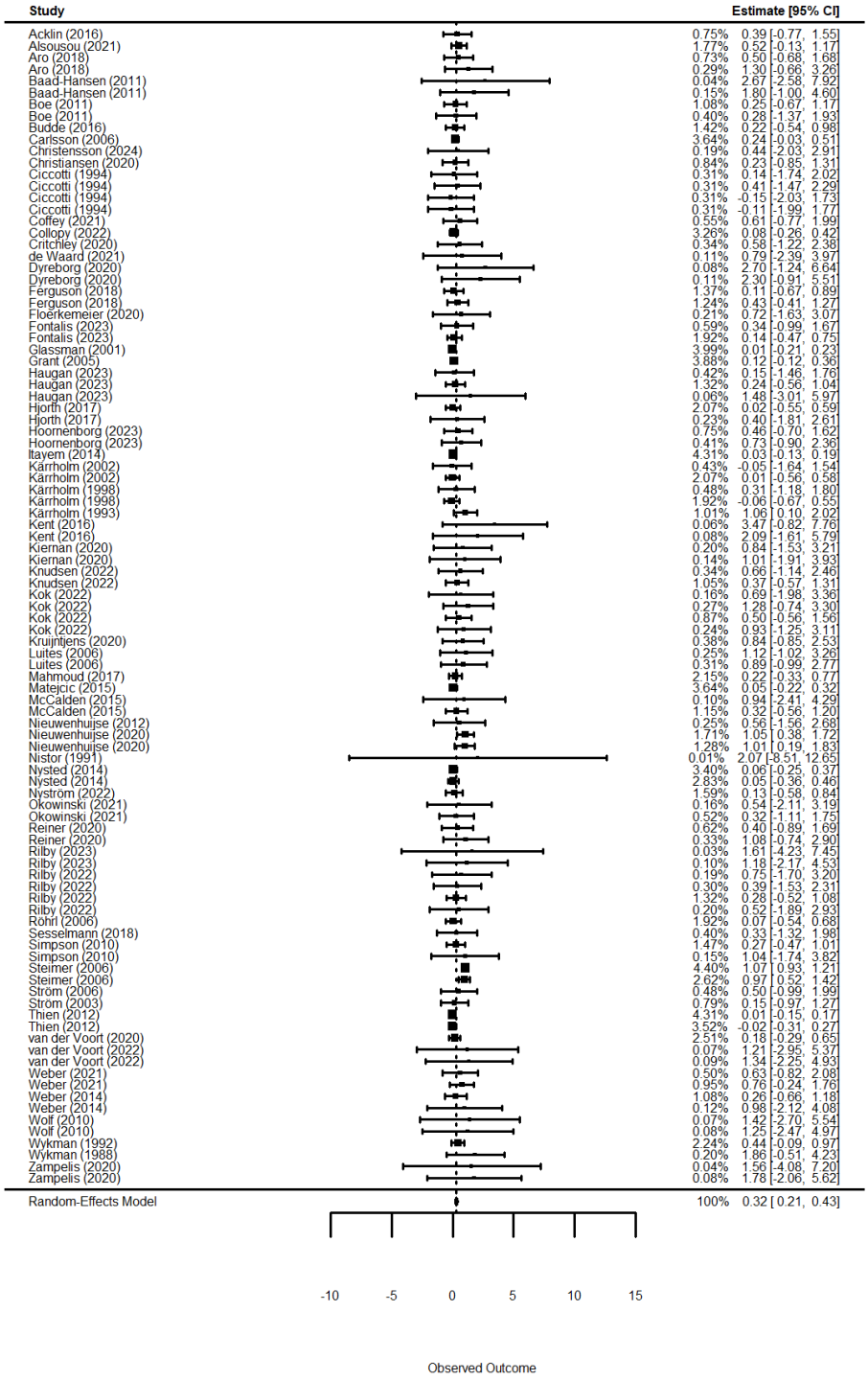


Figure C14. Forest plot of subsidence at 2 years.

Forest Plot – Retroversion at 3 Months

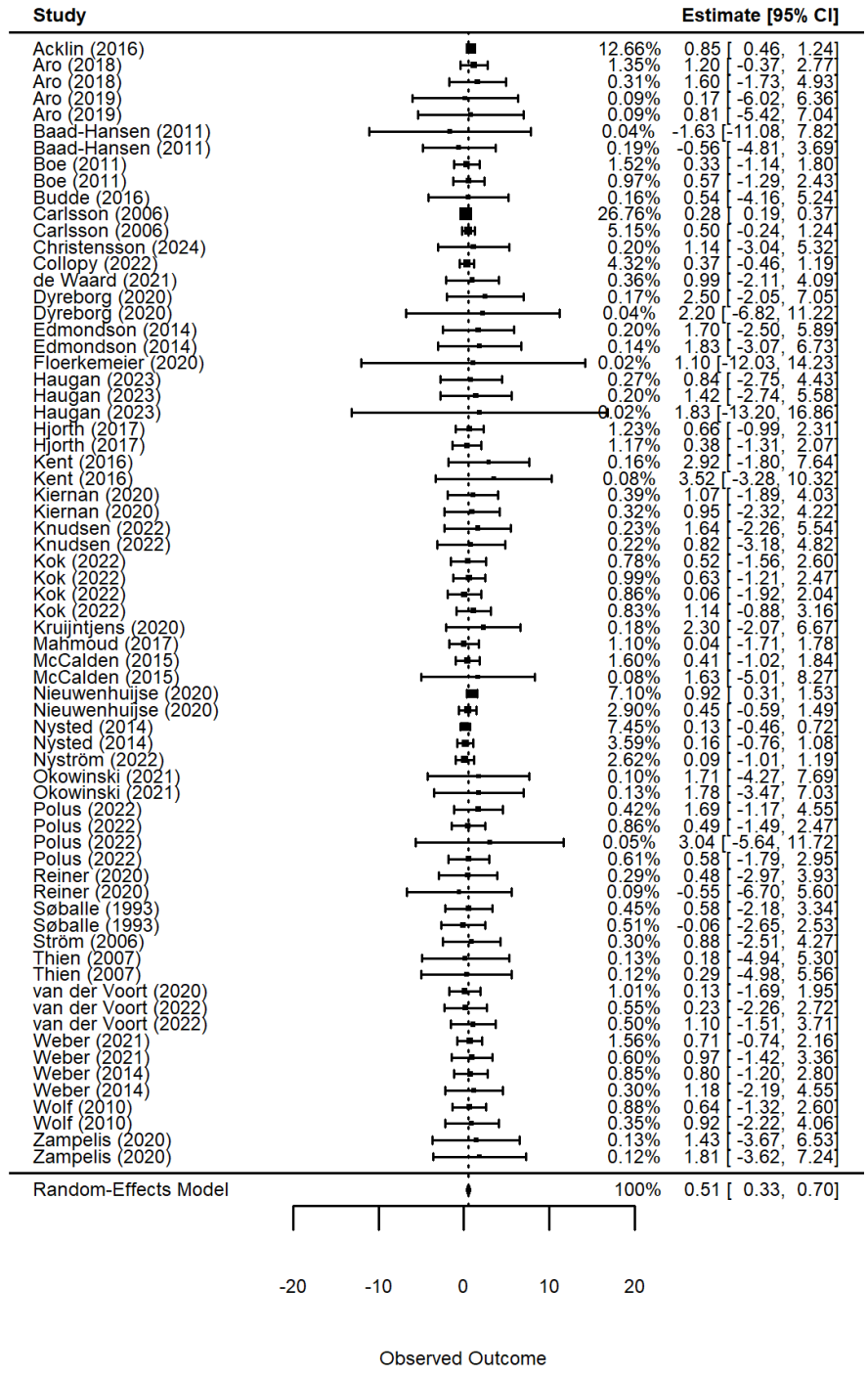


Figure C15. Forest plot of retroversion at 3 months.

Forest Plot – Retroversion at 2 Years

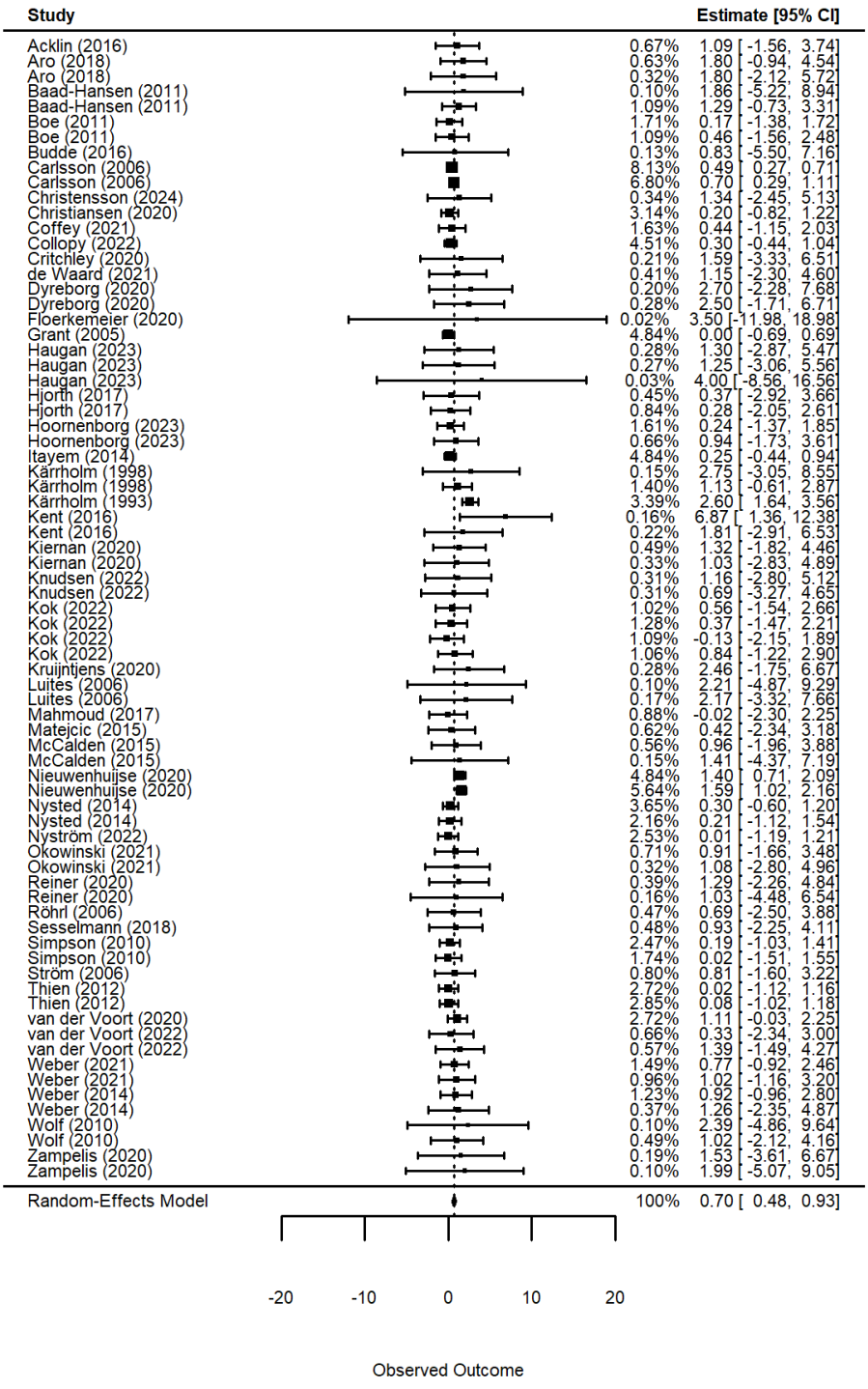


Figure C16. Forest plot of retroversion at 2 years.