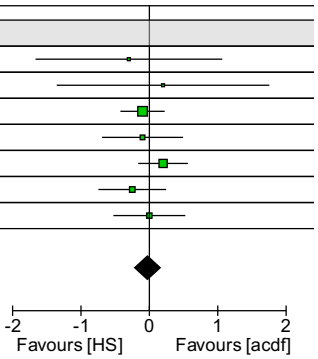
Supplementary Material (6)

Sensitivity Analyses

1-VAS score

(1a)

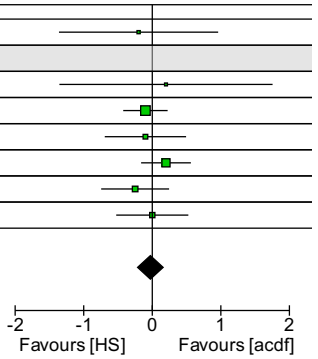
Study or Subgroup	HS Mean	HS SD	HS Total	ACDF Mean	ACDF SD	ACDF Total	Weight	Mean difference IV, Random, 95% CI
× Kang 2013	2.4	1.4	12	2.6	1.5	12	0.0%	-0.20 [-1.36 , 0.96]
✓ Grasso 2015	10.4	2.3	20	10.7	2.1	20	1.9%	-0.30 [-1.66 , 1.06]
✓ Ji 2017	2	2.7	20	1.8	2.3	20	1.4%	0.20 [-1.35 , 1.75]
✓ Jang 2017	1.6	0.6	19	1.7	0.5	30	33.3%	-0.10 [-0.42 , 0.22]
✓ Wang 2018	1.7	1.1	30	1.8	1.3	33	9.9%	-0.10 [-0.69 , 0.49]
✓ Xiong 2018	0.65	0.67	20	0.45	0.51	22	26.5%	0.20 [-0.16 , 0.56]
✓ Hung 2018	0.17	0.51	22	0.42	1.02	20	14.2%	-0.25 [-0.75 , 0.25]
✓ Tabanli 2024	2.1	1.2	40	2.1	1.2	40	12.6%	0.00 [-0.53 , 0.53]
Total (Wald[a])			**171**			**185**	**100.0%**	**-0.03 [-0.22 , 0.16]**



Test for overall effect: Z = 0.30 (P = 0.76)
Test for subgroup differences: Not applicable
Heterogeneity: Tau² (DL[b]) = 0.00; Chi² = 2.78, df = 6 (P = 0.84); I² = 0%

(1b)

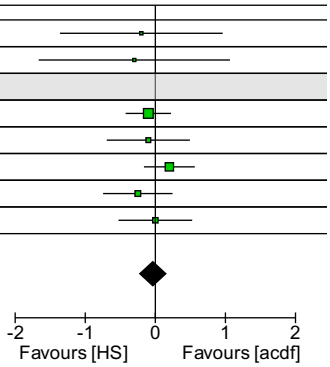
Study or Subgroup	HS Mean	HS SD	HS Total	ACDF Mean	ACDF SD	ACDF Total	Weight	Mean difference IV, Random, 95% CI
✓ Kang 2013	2.4	1.4	12	2.6	1.5	12	2.6%	-0.20 [-1.36 , 0.96]
× Grasso 2015	10.4	2.3	20	10.7	2.1	20	0.0%	-0.30 [-1.66 , 1.06]
✓ Ji 2017	2	2.7	20	1.8	2.3	20	1.4%	0.20 [-1.35 , 1.75]
✓ Jang 2017	1.6	0.6	19	1.7	0.5	30	33.1%	-0.10 [-0.42 , 0.22]
✓ Wang 2018	1.7	1.1	30	1.8	1.3	33	9.9%	-0.10 [-0.69 , 0.49]
✓ Xiong 2018	0.65	0.67	20	0.45	0.51	22	26.3%	0.20 [-0.16 , 0.56]
✓ Hung 2018	0.17	0.51	22	0.42	1.02	20	14.1%	-0.25 [-0.75 , 0.25]
✓ Tabanli 2024	2.1	1.2	40	2.1	1.2	40	12.5%	0.00 [-0.53 , 0.53]
Total (Wald[a])			**163**			**177**	**100.0%**	**-0.03 [-0.21 , 0.16]**



Test for overall effect: Z = 0.29 (P = 0.77)
Test for subgroup differences: Not applicable
Heterogeneity: Tau² (DL[b]) = 0.00; Chi² = 2.71, df = 6 (P = 0.84); I² = 0%

(1c)

Study or Subgroup	HS Mean	HS SD	HS Total	ACDF Mean	ACDF SD	ACDF Total	Weight	Mean difference IV, Random, 95% CI
✓ Kang 2013	2.4	1.4	12	2.6	1.5	12	2.6%	-0.20 [-1.36 , 0.96]
✓ Grasso 2015	10.4	2.3	20	10.7	2.1	20	1.9%	-0.30 [-1.66 , 1.06]
× Ji 2017	2	2.7	20	1.8	2.3	20	0.0%	0.20 [-1.35 , 1.75]
✓ Jang 2017	1.6	0.6	19	1.7	0.5	30	33.0%	-0.10 [-0.42 , 0.22]
✓ Wang 2018	1.7	1.1	30	1.8	1.3	33	9.8%	-0.10 [-0.69 , 0.49]
✓ Xiong 2018	0.65	0.67	20	0.45	0.51	22	26.2%	0.20 [-0.16 , 0.56]
✓ Hung 2018	0.17	0.51	22	0.42	1.02	20	14.1%	-0.25 [-0.75 , 0.25]
✓ Tabanli 2024	2.1	1.2	40	2.1	1.2	40	12.5%	0.00 [-0.53 , 0.53]
Total (Wald[a])			**163**			**177**	**100.0%**	**-0.04 [-0.22 , 0.15]**

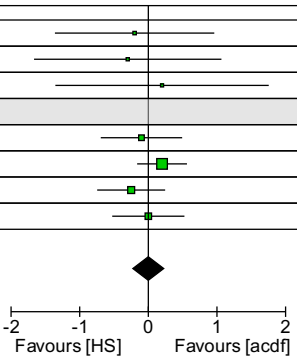


Test for overall effect: Z = 0.38 (P = 0.70)
Test for subgroup differences: Not applicable
Heterogeneity: Tau² (DL[b]) = 0.00; Chi² = 2.78, df = 6 (P = 0.84); I² = 0%

(1d)

Study or Subgroup	HS Mean	HS SD	HS Total	ACDF Mean	ACDF SD	ACDF Total	Weight	Mean difference IV, Random, 95% CI
✓ Kang 2013	2.4	1.4	12	2.6	1.5	12	3.7%	-0.20 [-1.36 , 0.96]
✓ Grasso 2015	10.4	2.3	20	10.7	2.1	20	2.7%	-0.30 [-1.66 , 1.06]
✓ Ji 2017	2	2.7	20	1.8	2.3	20	2.1%	0.20 [-1.35 , 1.75]
× Jang 2017	1.6	0.6	19	1.7	0.5	30	0.0%	-0.10 [-0.42 , 0.22]
✓ Wang 2018	1.7	1.1	30	1.8	1.3	33	14.3%	-0.10 [-0.69 , 0.49]
✓ Xiong 2018	0.65	0.67	20	0.45	0.51	22	38.3%	0.20 [-0.16 , 0.56]
✓ Hung 2018	0.17	0.51	22	0.42	1.02	20	20.6%	-0.25 [-0.75 , 0.25]
✓ Tabanli 2024	2.1	1.2	40	2.1	1.2	40	18.2%	0.00 [-0.53 , 0.53]
Total (Wald[a])			**164**			**167**	**100.0%**	**-0.00 [-0.23 , 0.22]**

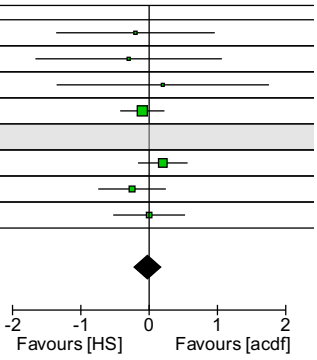
Test for overall effect: Z = 0.00 (P = 1.00)
Test for subgroup differences: Not applicable
Heterogeneity: Tau² (DL[b]) = 0.00; Chi² = 2.62, df = 6 (P = 0.85); I² = 0%



(1e)

Study or Subgroup	HS Mean	HS SD	HS Total	ACDF Mean	ACDF SD	ACDF Total	Weight	Mean difference IV, Random, 95% CI
✓ Kang 2013	2.4	1.4	12	2.6	1.5	12	2.8%	-0.20 [-1.36 , 0.96]
✓ Grasso 2015	10.4	2.3	20	10.7	2.1	20	2.0%	-0.30 [-1.66 , 1.06]
✓ Ji 2017	2	2.7	20	1.8	2.3	20	1.6%	0.20 [-1.35 , 1.75]
✓ Jang 2017	1.6	0.6	19	1.7	0.5	30	36.0%	-0.10 [-0.42 , 0.22]
× Wang 2018	1.7	1.1	30	1.8	1.3	33	0.0%	-0.10 [-0.69 , 0.49]
✓ Xiong 2018	0.65	0.67	20	0.45	0.51	22	28.6%	0.20 [-0.16 , 0.56]
✓ Hung 2018	0.17	0.51	22	0.42	1.02	20	15.4%	-0.25 [-0.75 , 0.25]
✓ Tabanli 2024	2.1	1.2	40	2.1	1.2	40	13.6%	0.00 [-0.53 , 0.53]
Total (Wald[a])			**153**			**164**	**100.0%**	**-0.03 [-0.22 , 0.17]**

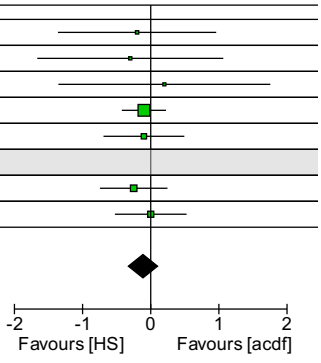
Test for overall effect: Z = 0.26 (P = 0.80)
Test for subgroup differences: Not applicable
Heterogeneity: Tau² (DL[b]) = 0.00; Chi² = 2.81, df = 6 (P = 0.83); I² = 0%



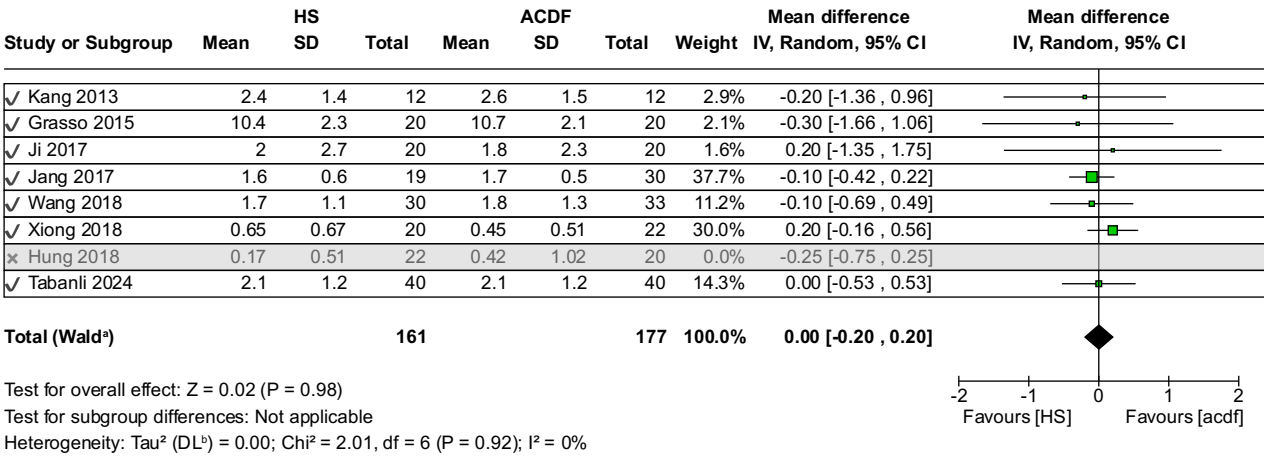
(1f)

Study or Subgroup	HS Mean	HS SD	HS Total	ACDF Mean	ACDF SD	ACDF Total	Weight	Mean difference IV, Random, 95% CI
✓ Kang 2013	2.4	1.4	12	2.6	1.5	12	3.4%	-0.20 [-1.36 , 0.96]
✓ Grasso 2015	10.4	2.3	20	10.7	2.1	20	2.5%	-0.30 [-1.66 , 1.06]
✓ Ji 2017	2	2.7	20	1.8	2.3	20	1.9%	0.20 [-1.35 , 1.75]
✓ Jang 2017	1.6	0.6	19	1.7	0.5	30	43.8%	-0.10 [-0.42 , 0.22]
✓ Wang 2018	1.7	1.1	30	1.8	1.3	33	13.1%	-0.10 [-0.69 , 0.49]
× Xiong 2018	0.65	0.67	20	0.45	0.51	22	0.0%	0.20 [-0.16 , 0.56]
✓ Hung 2018	0.17	0.51	22	0.42	1.02	20	18.7%	-0.25 [-0.75 , 0.25]
✓ Tabanli 2024	2.1	1.2	40	2.1	1.2	40	16.6%	0.00 [-0.53 , 0.53]
Total (Wald[a])			**163**			**175**	**100.0%**	**-0.11 [-0.33 , 0.10]**

Test for overall effect: Z = 1.04 (P = 0.30)
Test for subgroup differences: Not applicable
Heterogeneity: Tau² (DL[b]) = 0.00; Chi² = 0.73, df = 6 (P = 0.99); I² = 0%

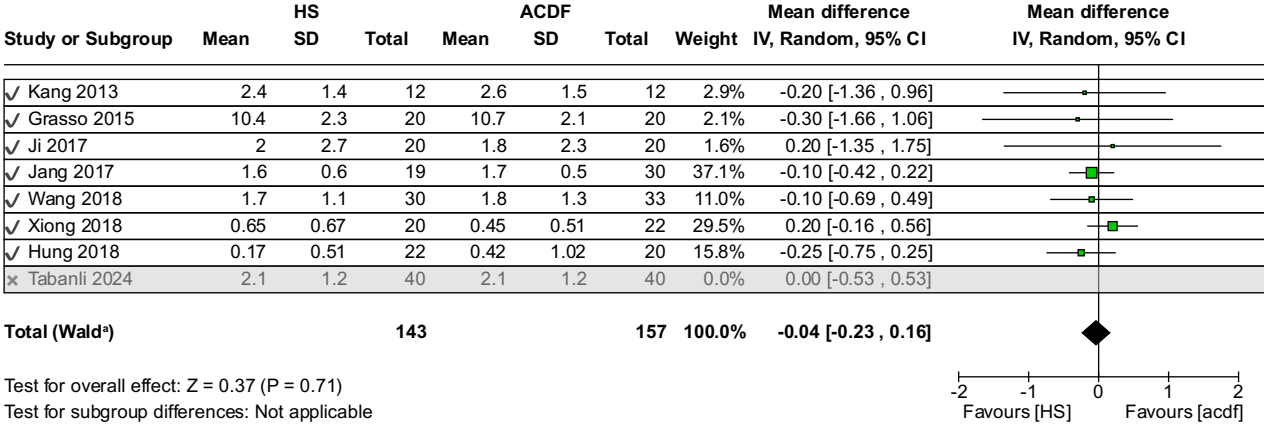


(1g)



Test for overall effect: Z = 0.02 (P = 0.98)
Test for subgroup differences: Not applicable
Heterogeneity: Tau² (DL[b]) = 0.00; Chi² = 2.01, df = 6 (P = 0.92); I² = 0%

(1h)



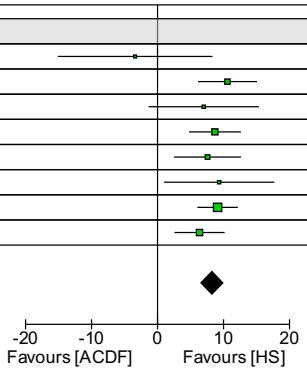
Test for overall effect: Z = 0.37 (P = 0.71)
Test for subgroup differences: Not applicable
Heterogeneity: Tau² (DL[b]) = 0.00; Chi² = 2.85, df = 6 (P = 0.83); I² = 0%

Figures 1a to 1h. Sensitivity analysis of VAS scores by sequential exclusion of studies.

2-C2-C7 ROM

(2a)

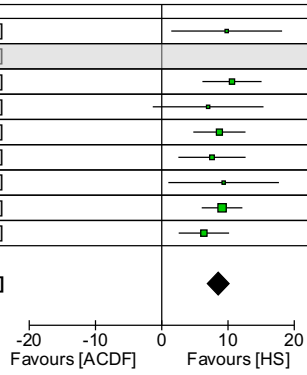
Study or Subgroup	HS Mean	HS SD	HS Total	ACDF Mean	ACDF SD	ACDF Total	Weight	Mean difference IV, Random, 95% CI
× Kang 2013	45.9	11.8	12	36.1	8.9	12	0.0%	9.80 [1.44 , 18.16]
✓ Hey 2013	34.4	8.85	7	37.8	13.11	7	2.0%	-3.40 [-15.12 , 8.32]
✓ Grasso 2015	47.1	7.1	20	36.5	7.3	20	13.8%	10.60 [6.14 , 15.06]
✓ Ji 2017	51.6	12.5	20	44.6	14.4	20	3.9%	7.00 [-1.36 , 15.36]
✓ Jang 2017	41.1	8.3	19	32.4	3.5	30	17.7%	8.70 [4.76 , 12.64]
✓ Hung 2018	28.98	10.61	22	21.4	5.62	20	10.7%	7.58 [2.51 , 12.65]
✓ Xiong 2018	36.16	14.09	20	26.82	13.43	22	3.9%	9.34 [1.00 , 17.68]
✓ Wang 2018	37.4	6.3	30	28.3	6.1	33	29.1%	9.10 [6.03 , 12.17]
✓ Tabanli 2024	27.18	10.89	40	20.82	5.66	40	18.9%	6.36 [2.56 , 10.16]
Total (Wald[a])			**178**			**192**	**100.0%**	**8.23 [6.58 , 9.89]**



Test for overall effect: Z = 9.75 (P < 0.00001)
Test for subgroup differences: Not applicable
Heterogeneity: Tau² (DL[b]) = 0.00; Chi² = 6.37, df = 7 (P = 0.50); I² = 0%

(2b)

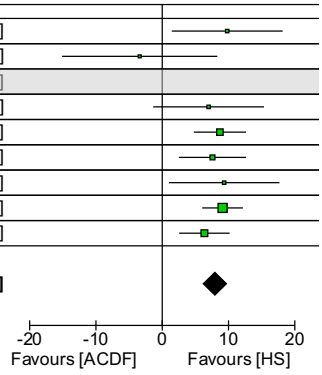
Study or Subgroup	HS Mean	HS SD	HS Total	ACDF Mean	ACDF SD	ACDF Total	Weight	Mean difference IV, Random, 95% CI
✓ Kang 2013	45.9	11.8	12	36.1	8.9	12	3.8%	9.80 [1.44 , 18.16]
× Hey 2013	34.4	8.85	7	37.8	13.11	7	0.0%	-3.40 [-15.12 , 8.32]
✓ Grasso 2015	47.1	7.1	20	36.5	7.3	20	13.5%	10.60 [6.14 , 15.06]
✓ Ji 2017	51.6	12.5	20	44.6	14.4	20	3.8%	7.00 [-1.36 , 15.36]
✓ Jang 2017	41.1	8.3	19	32.4	3.5	30	17.3%	8.70 [4.76 , 12.64]
✓ Hung 2018	28.98	10.61	22	21.4	5.62	20	10.5%	7.58 [2.51 , 12.65]
✓ Xiong 2018	36.16	14.09	20	26.82	13.43	22	3.9%	9.34 [1.00 , 17.68]
✓ Wang 2018	37.4	6.3	30	28.3	6.1	33	28.6%	9.10 [6.03 , 12.17]
✓ Tabanli 2024	27.18	10.89	40	20.82	5.66	40	18.6%	6.36 [2.56 , 10.16]
Total (Wald[a])			**183**			**197**	**100.0%**	**8.52 [6.88 , 10.16]**



Test for overall effect: Z = 10.18 (P < 0.00001)
Test for subgroup differences: Not applicable
Heterogeneity: Tau² (DL[b]) = 0.00; Chi² = 2.60, df = 7 (P = 0.92); I² = 0%

(2c)

Study or Subgroup	HS Mean	HS SD	HS Total	ACDF Mean	ACDF SD	ACDF Total	Weight	Mean difference IV, Random, 95% CI
✓ Kang 2013	45.9	11.8	12	36.1	8.9	12	4.3%	9.80 [1.44 , 18.16]
✓ Hey 2013	34.4	8.85	7	37.8	13.11	7	2.2%	-3.40 [-15.12 , 8.32]
× Grasso 2015	47.1	7.1	20	36.5	7.3	20	0.0%	10.60 [6.14 , 15.06]
✓ Ji 2017	51.6	12.5	20	44.6	14.4	20	4.4%	7.00 [-1.36 , 15.36]
✓ Jang 2017	41.1	8.3	19	32.4	3.5	30	19.6%	8.70 [4.76 , 12.64]
✓ Hung 2018	28.98	10.61	22	21.4	5.62	20	11.8%	7.58 [2.51 , 12.65]
✓ Xiong 2018	36.16	14.09	20	26.82	13.43	22	4.4%	9.34 [1.00 , 17.68]
✓ Wang 2018	37.4	6.3	30	28.3	6.1	33	32.3%	9.10 [6.03 , 12.17]
✓ Tabanli 2024	27.18	10.89	40	20.82	5.66	40	21.0%	6.36 [2.56 , 10.16]
Total (Wald[a])			**170**			**184**	**100.0%**	**7.94 [6.20 , 9.68]**

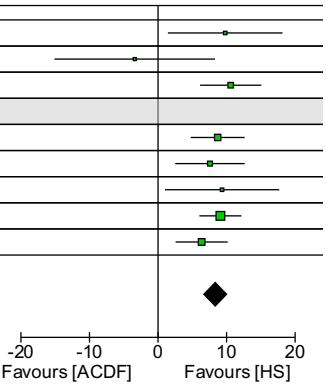


Test for overall effect: Z = 8.93 (P < 0.00001)
Test for subgroup differences: Not applicable
Heterogeneity: Tau² (DL[b]) = 0.00; Chi² = 5.32, df = 7 (P = 0.62); I² = 0%

(2d)

Study or Subgroup	HS Mean	HS SD	HS Total	ACDF Mean	ACDF SD	ACDF Total	Weight	Mean difference IV, Random, 95% CI
✓ Kang 2013	45.9	11.8	12	36.1	8.9	12	3.9%	9.80 [1.44 , 18.16]
✓ Hey 2013	34.4	8.85	7	37.8	13.11	7	2.0%	-3.40 [-15.12 , 8.32]
✓ Grasso 2015	47.1	7.1	20	36.5	7.3	20	13.8%	10.60 [6.14 , 15.06]
× Ji 2017	51.6	12.5	20	44.6	14.4	20	0.0%	7.00 [-1.36 , 15.36]
✓ Jang 2017	41.1	8.3	19	32.4	3.5	30	17.7%	8.70 [4.76 , 12.64]
✓ Hung 2018	28.98	10.61	22	21.4	5.62	20	10.7%	7.58 [2.51 , 12.65]
✓ Xiong 2018	36.16	14.09	20	26.82	13.43	22	3.9%	9.34 [1.00 , 17.68]
✓ Wang 2018	37.4	6.3	30	28.3	6.1	33	29.1%	9.10 [6.03 , 12.17]
✓ Tabanli 2024	27.18	10.89	40	20.82	5.66	40	18.9%	6.36 [2.56 , 10.16]
Total (Wald[a])			**170**			**184**	**100.0%**	**8.34 [6.69 , 10.00]**

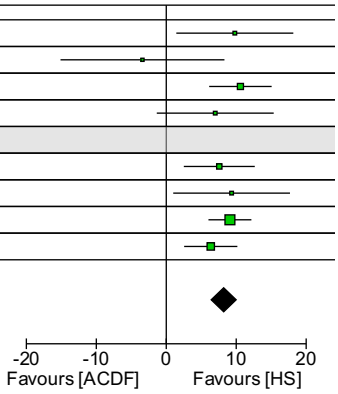
Test for overall effect: Z = 9.88 (P < 0.00001)
Test for subgroup differences: Not applicable
Heterogeneity: Tau² (DL[b]) = 0.00; Chi² = 6.41, df = 7 (P = 0.49); I² = 0%



(2e)

Study or Subgroup	HS Mean	HS SD	HS Total	ACDF Mean	ACDF SD	ACDF Total	Weight	Mean difference IV, Random, 95% CI
✓ Kang 2013	45.9	11.8	12	36.1	8.9	12	4.5%	9.80 [1.44 , 18.16]
✓ Hey 2013	34.4	8.85	7	37.8	13.11	7	2.3%	-3.40 [-15.12 , 8.32]
✓ Grasso 2015	47.1	7.1	20	36.5	7.3	20	16.0%	10.60 [6.14 , 15.06]
✓ Ji 2017	51.6	12.5	20	44.6	14.4	20	4.5%	7.00 [-1.36 , 15.36]
× Jang 2017	41.1	8.3	19	32.4	3.5	30	0.0%	8.70 [4.76 , 12.64]
✓ Hung 2018	28.98	10.61	22	21.4	5.62	20	12.4%	7.58 [2.51 , 12.65]
✓ Xiong 2018	36.16	14.09	20	26.82	13.43	22	4.6%	9.34 [1.00 , 17.68]
✓ Wang 2018	37.4	6.3	30	28.3	6.1	33	33.8%	9.10 [6.03 , 12.17]
✓ Tabanli 2024	27.18	10.89	40	20.82	5.66	40	22.0%	6.36 [2.56 , 10.16]
Total (Wald[a])			**171**			**174**	**100.0%**	**8.21 [6.42 , 9.99]**

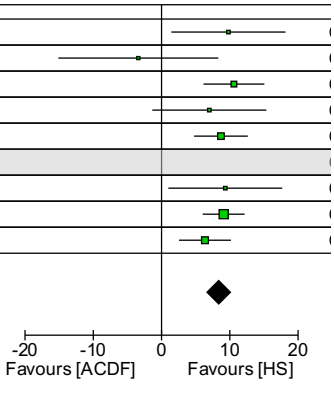
Test for overall effect: Z = 9.02 (P < 0.00001)
Test for subgroup differences: Not applicable
Heterogeneity: Tau² (DL[b]) = 0.00; Chi² = 6.45, df = 7 (P = 0.49); I² = 0%



(2f)

Study or Subgroup	HS Mean	HS SD	HS Total	ACDF Mean	ACDF SD	ACDF Total	Weight	Mean difference IV, Random, 95% CI
✓ Kang 2013	45.9	11.8	12	36.1	8.9	12	4.2%	9.80 [1.44 , 18.16]
✓ Hey 2013	34.4	8.85	7	37.8	13.11	7	2.1%	-3.40 [-15.12 , 8.32]
✓ Grasso 2015	47.1	7.1	20	36.5	7.3	20	14.8%	10.60 [6.14 , 15.06]
✓ Ji 2017	51.6	12.5	20	44.6	14.4	20	4.2%	7.00 [-1.36 , 15.36]
✓ Jang 2017	41.1	8.3	19	32.4	3.5	30	19.0%	8.70 [4.76 , 12.64]
× Hung 2018	28.98	10.61	22	21.4	5.62	20	0.0%	7.58 [2.51 , 12.65]
✓ Xiong 2018	36.16	14.09	20	26.82	13.43	22	4.2%	9.34 [1.00 , 17.68]
✓ Wang 2018	37.4	6.3	30	28.3	6.1	33	31.2%	9.10 [6.03 , 12.17]
✓ Tabanli 2024	27.18	10.89	40	20.82	5.66	40	20.3%	6.36 [2.56 , 10.16]
Total (Wald[a])			**168**			**184**	**100.0%**	**8.37 [6.66 , 10.09]**

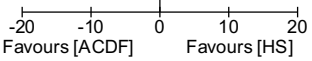
Test for overall effect: Z = 9.57 (P < 0.00001)
Test for subgroup differences: Not applicable
Heterogeneity: Tau² (DL[b]) = 0.00; Chi² = 6.42, df = 7 (P = 0.49); I² = 0%



(2g)

Study or Subgroup	HS Mean	HS SD	HS Total	ACDF Mean	ACDF SD	ACDF Total	Weight	Mean difference IV, Random, 95% CI
✓ Kang 2013	45.9	11.8	12	36.1	8.9	12	3.9%	9.80 [1.44 , 18.16]
✓ Hey 2013	34.4	8.85	7	37.8	13.11	7	2.0%	-3.40 [-15.12 , 8.32]
✓ Grasso 2015	47.1	7.1	20	36.5	7.3	20	13.8%	10.60 [6.14 , 15.06]
✓ Ji 2017	51.6	12.5	20	44.6	14.4	20	3.9%	7.00 [-1.36 , 15.36]
✓ Jang 2017	41.1	8.3	19	32.4	3.5	30	17.7%	8.70 [4.76 , 12.64]
✓ Hung 2018	28.98	10.61	22	21.4	5.62	20	10.7%	7.58 [2.51 , 12.65]
× Xiong 2018	36.16	14.09	20	26.82	13.43	22	0.0%	9.34 [1.00 , 17.68]
✓ Wang 2018	37.4	6.3	30	28.3	6.1	33	29.1%	9.10 [6.03 , 12.17]
✓ Tabanli 2024	27.18	10.89	40	20.82	5.66	40	18.9%	6.36 [2.56 , 10.16]
Total (Wald[a])			**170**			**182**	**100.0%**	**8.25 [6.59 , 9.91]**

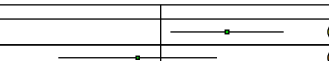
Test for overall effect: Z = 9.77 (P < 0.00001)
Test for subgroup differences: Not applicable
Heterogeneity: Tau² (DL[b]) = 0.00; Chi² = 6.44, df = 7 (P = 0.49); I² = 0%



(2h)

Study or Subgroup	HS Mean	HS SD	HS Total	ACDF Mean	ACDF SD	ACDF Total	Weight	Mean difference IV, Random, 95% CI
✓ Kang 2013	45.9	11.8	12	36.1	8.9	12	5.2%	9.80 [1.44 , 18.16]
✓ Hey 2013	34.4	8.85	7	37.8	13.11	7	2.7%	-3.40 [-15.12 , 8.32]
✓ Grasso 2015	47.1	7.1	20	36.5	7.3	20	18.4%	10.60 [6.14 , 15.06]
✓ Ji 2017	51.6	12.5	20	44.6	14.4	20	5.2%	7.00 [-1.36 , 15.36]
✓ Jang 2017	41.1	8.3	19	32.4	3.5	30	23.6%	8.70 [4.76 , 12.64]
✓ Hung 2018	28.98	10.61	22	21.4	5.62	20	14.2%	7.58 [2.51 , 12.65]
✓ Xiong 2018	36.16	14.09	20	26.82	13.43	22	5.3%	9.34 [1.00 , 17.68]
× Wang 2018	37.4	6.3	30	28.3	6.1	33	0.0%	9.10 [6.03 , 12.17]
✓ Tabanli 2024	27.18	10.89	40	20.82	5.66	40	25.3%	6.36 [2.56 , 10.16]
Total (Wald[a])			**160**			**171**	**100.0%**	**7.98 [6.06 , 9.89]**

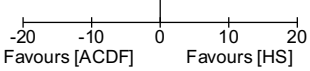
Test for overall effect: Z = 8.17 (P < 0.00001)
Test for subgroup differences: Not applicable
Heterogeneity: Tau² (DL[b]) = 0.00; Chi² = 6.13, df = 7 (P = 0.52); I² = 0%



(2i)

Study or Subgroup	HS Mean	HS SD	HS Total	ACDF Mean	ACDF SD	ACDF Total	Weight	Mean difference IV, Random, 95% CI
✓ Kang 2013	45.9	11.8	12	36.1	8.9	12	4.6%	9.80 [1.44 , 18.16]
✓ Hey 2013	34.4	8.85	7	37.8	13.11	7	2.3%	-3.40 [-15.12 , 8.32]
✓ Grasso 2015	47.1	7.1	20	36.5	7.3	20	16.2%	10.60 [6.14 , 15.06]
✓ Ji 2017	51.6	12.5	20	44.6	14.4	20	4.6%	7.00 [-1.36 , 15.36]
✓ Jang 2017	41.1	8.3	19	32.4	3.5	30	20.8%	8.70 [4.76 , 12.64]
✓ Hung 2018	28.98	10.61	22	21.4	5.62	20	12.5%	7.58 [2.51 , 12.65]
✓ Xiong 2018	36.16	14.09	20	26.82	13.43	22	4.6%	9.34 [1.00 , 17.68]
✓ Wang 2018	37.4	6.3	30	28.3	6.1	33	34.3%	9.10 [6.03 , 12.17]
× Tabanli 2024	27.18	10.89	40	20.82	5.66	40	0.0%	6.36 [2.56 , 10.16]
Total (Wald[a])			**150**			**164**	**100.0%**	**8.72 [6.93 , 10.52]**

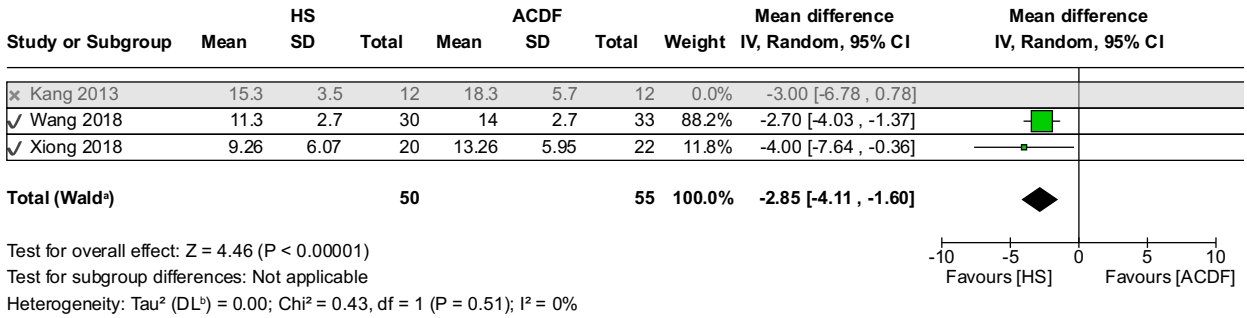
Test for overall effect: Z = 9.52 (P < 0.00001)
Test for subgroup differences: Not applicable
Heterogeneity: Tau² (DL[b]) = 0.00; Chi² = 5.29, df = 7 (P = 0.62); I² = 0%



Figures 2a to 2i. Sensitivity analysis of C2-C7 ROM by sequential exclusion of studies.

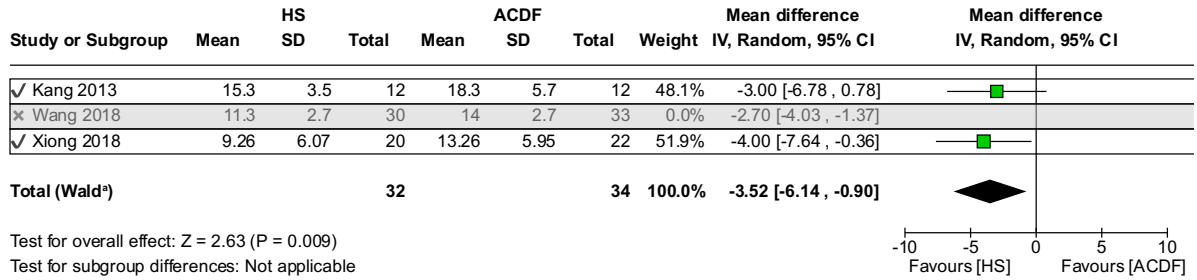
3-SUPERIOR ADJACENT SEGMENT ROM

(3a)



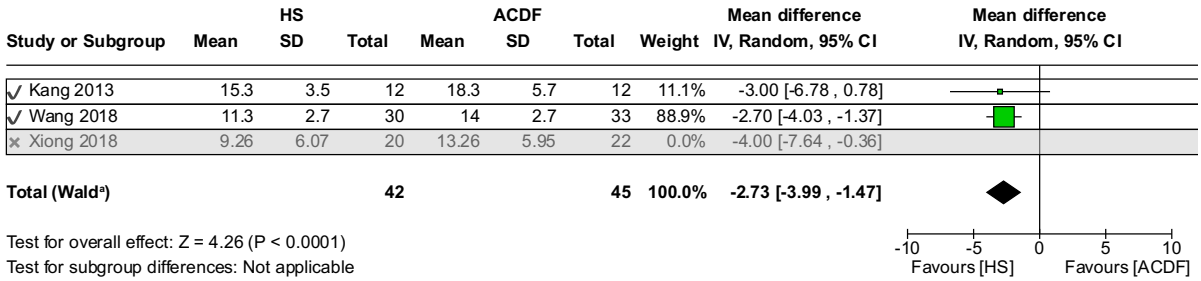
Test for overall effect: Z = 4.46 (P < 0.00001)
Test for subgroup differences: Not applicable
Heterogeneity: Tau² (DL[b]) = 0.00; Chi² = 0.43, df = 1 (P = 0.51); I² = 0%

(3b)



Test for overall effect: Z = 2.63 (P = 0.009)
Test for subgroup differences: Not applicable
Heterogeneity: Tau² (DL[b]) = 0.00; Chi² = 0.14, df = 1 (P = 0.71); I² = 0%

(3c)

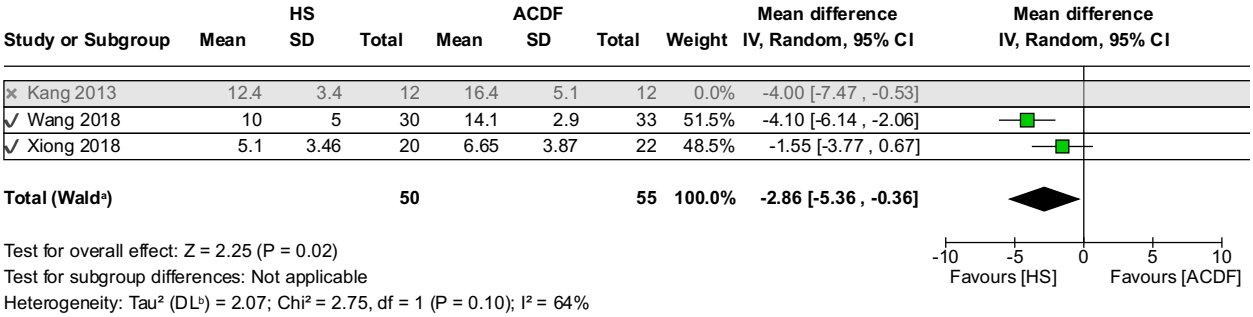


Test for overall effect: Z = 4.26 (P < 0.0001)
Test for subgroup differences: Not applicable
Heterogeneity: Tau² (DL[b]) = 0.00; Chi² = 0.02, df = 1 (P = 0.88); I² = 0%

Figures 3a to 3c. Sensitivity analysis of superior adjacent segment ROM by sequential exclusion of studies.

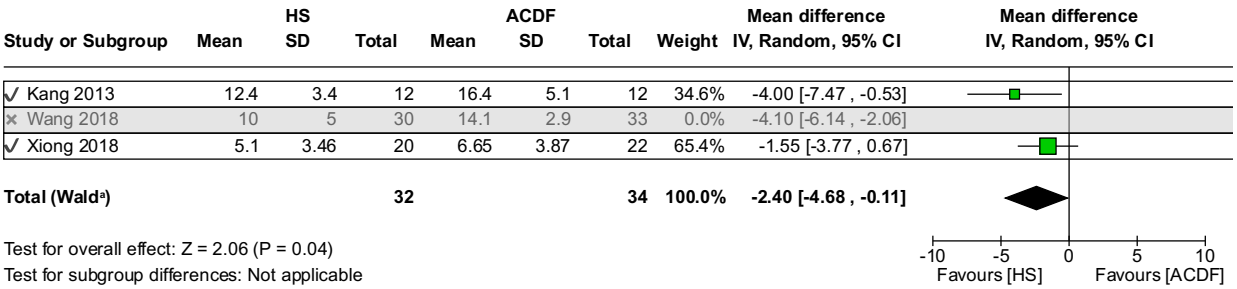
4-INFERIOR ADJACENT SEGMENT ROM

(4a)



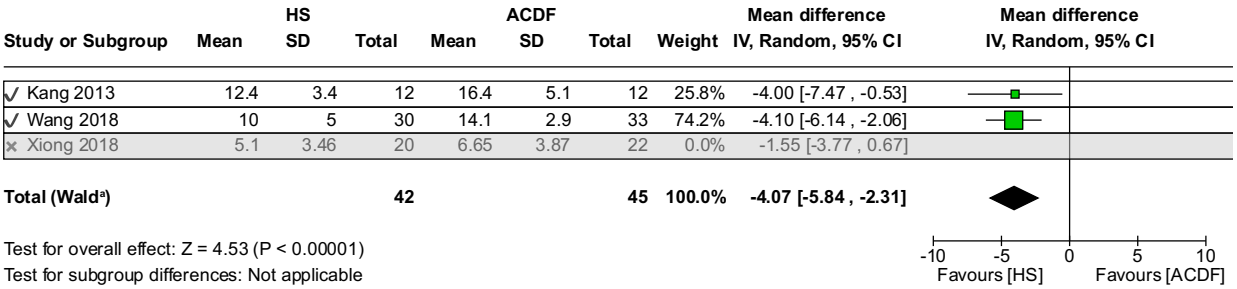
Test for overall effect: Z = 2.25 (P = 0.02)
Test for subgroup differences: Not applicable
Heterogeneity: Tau² (DL[b]) = 2.07; Chi² = 2.75, df = 1 (P = 0.10); I² = 64%

(4b)



Test for overall effect: Z = 2.06 (P = 0.04)
Test for subgroup differences: Not applicable
Heterogeneity: Tau² (DL[b]) = 0.80; Chi² = 1.36, df = 1 (P = 0.24); I² = 27%

(4c)

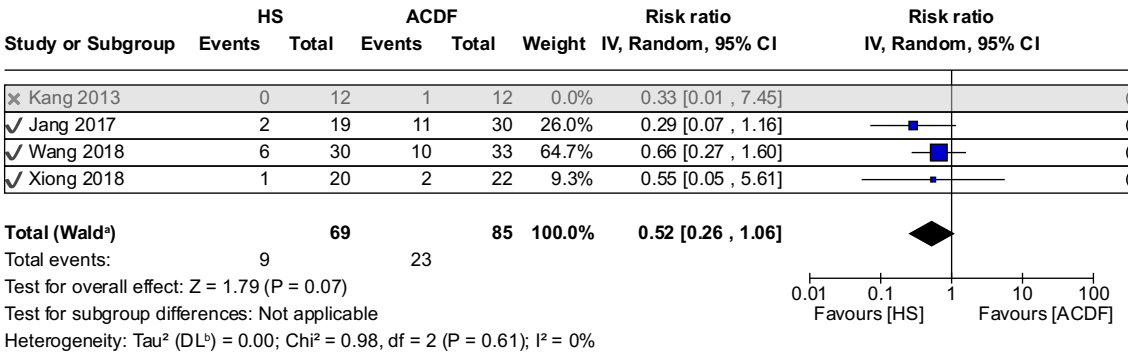


Test for overall effect: Z = 4.53 (P < 0.00001)
Test for subgroup differences: Not applicable
Heterogeneity: Tau² (DL[b]) = 0.00; Chi² = 0.00, df = 1 (P = 0.96); I² = 0%

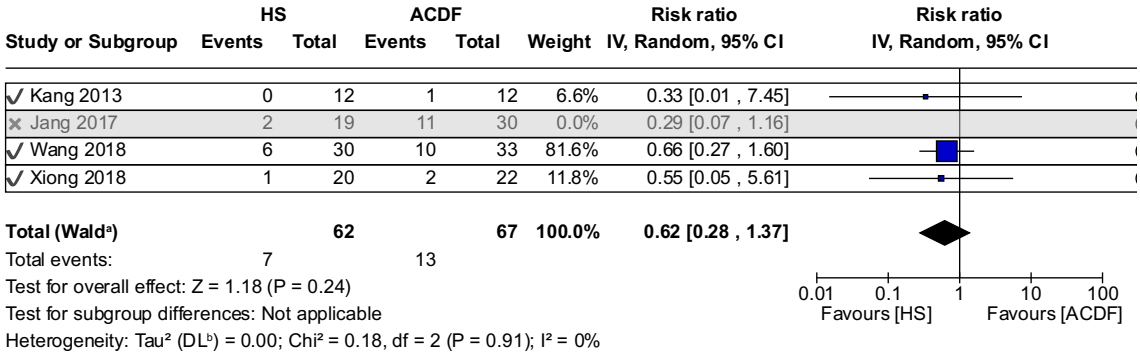
Figures 4a to 4c. Sensitivity analysis of inferior adjacent segment ROM by sequential exclusion of studies.

5-ADJACENT SAGMENT DEGENERATION (ASD)

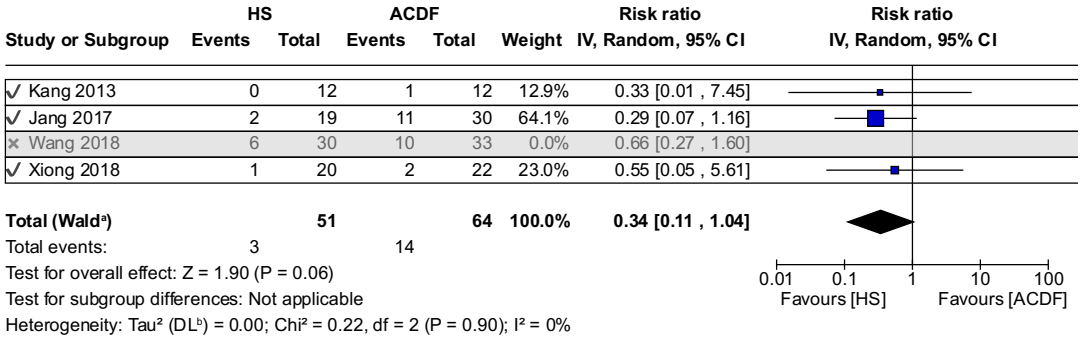
(5a)



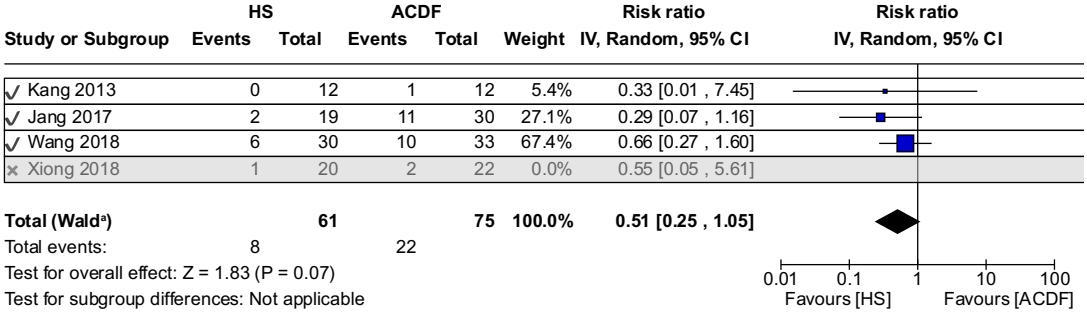
(5b)



(5c)



(5d)



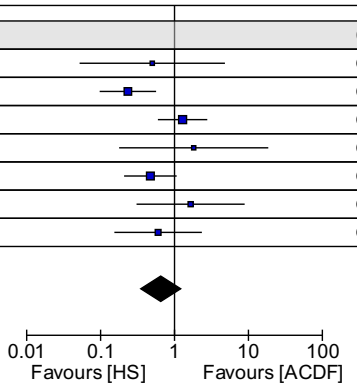
Figures 5a to 5d. Sensitivity analysis of adjacent segment degeneration (ASD) by sequential exclusion of studies.

6-OVERALL COMPLICATIONS

(6a)

Study or Subgroup	HS Events	HS Total	ACDF Events	ACDF Total	Weight	Risk ratio M-H, Random, 95% CI
✗ Hey 2013	2	7	1	7	0.0%	2.00 [0.23 , 17.34]
✓ Kang 2013	1	12	2	12	6.2%	0.50 [0.05 , 4.81]
✓ Jang 2017	4	19	27	30	20.6%	0.23 [0.10 , 0.56]
✓ Ji 2017	9	20	7	20	22.8%	1.29 [0.60 , 2.77]
✓ Hung 2018	2	22	1	20	5.9%	1.82 [0.18 , 18.55]
✓ Wang 2018	6	30	14	33	21.7%	0.47 [0.21 , 1.07]
✓ Xiong 2018	3	20	2	22	9.8%	1.65 [0.31 , 8.89]
✓ Tabanli 2024	3	40	5	40	13.0%	0.60 [0.15 , 2.34]
Total (Wald[a])		**163**		**177**	**100.0%**	**0.65 [0.35 , 1.21]**
Total events:	28		58			

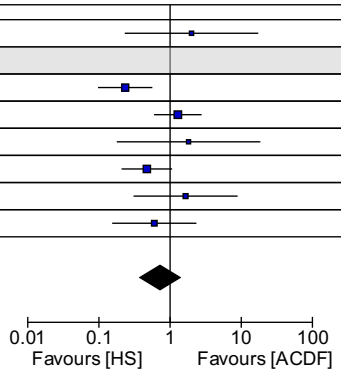
Test for overall effect: Z = 1.36 (P = 0.17)
Test for subgroup differences: Not applicable
Heterogeneity: Tau² (DL[b]) = 0.29; Chi² = 10.95, df = 6 (P = 0.09); I² = 45%



(6b)

Study or Subgroup	HS Events	HS Total	ACDF Events	ACDF Total	Weight	Risk ratio M-H, Random, 95% CI
✓ Hey 2013	2	7	1	7	7.0%	2.00 [0.23 , 17.34]
✗ Kang 2013	1	12	2	12	0.0%	0.50 [0.05 , 4.81]
✓ Jang 2017	4	19	27	30	20.1%	0.23 [0.10 , 0.56]
✓ Ji 2017	9	20	7	20	22.0%	1.29 [0.60 , 2.77]
✓ Hung 2018	2	22	1	20	6.3%	1.82 [0.18 , 18.55]
✓ Wang 2018	6	30	14	33	21.2%	0.47 [0.21 , 1.07]
✓ Xiong 2018	3	20	2	22	10.1%	1.65 [0.31 , 8.89]
✓ Tabanli 2024	3	40	5	40	13.3%	0.60 [0.15 , 2.34]
Total (Wald[a])		**158**		**172**	**100.0%**	**0.72 [0.38 , 1.38]**
Total events:	29		57			

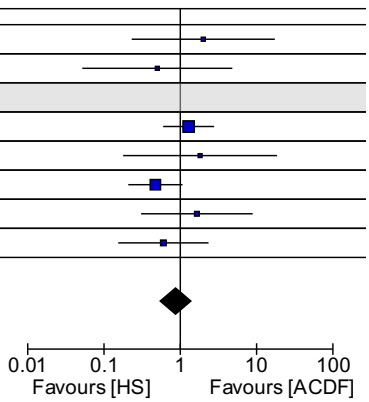
Test for overall effect: Z = 0.99 (P = 0.32)
Test for subgroup differences: Not applicable
Heterogeneity: Tau² (DL[b]) = 0.34; Chi² = 11.96, df = 6 (P = 0.06); I² = 50%



(6c)

Study or Subgroup	HS Events	HS Total	ACDF Events	ACDF Total	Weight	Risk ratio M-H, Random, 95% CI
✓ Hey 2013	2	7	1	7	4.6%	2.00 [0.23 , 17.34]
✓ Kang 2013	1	12	2	12	4.2%	0.50 [0.05 , 4.81]
✗ Jang 2017	4	19	27	30	0.0%	0.23 [0.10 , 0.56]
✓ Ji 2017	9	20	7	20	36.2%	1.29 [0.60 , 2.77]
✓ Hung 2018	2	22	1	20	4.0%	1.82 [0.18 , 18.55]
✓ Wang 2018	6	30	14	33	32.0%	0.47 [0.21 , 1.07]
✓ Xiong 2018	3	20	2	22	7.6%	1.65 [0.31 , 8.89]
✓ Tabanli 2024	3	40	5	40	11.5%	0.60 [0.15 , 2.34]
Total (Wald[a])		**151**		**154**	**100.0%**	**0.87 [0.55 , 1.38]**
Total events:	26		32			

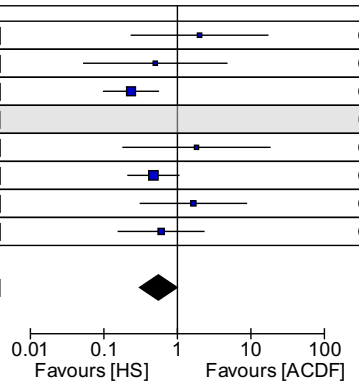
Test for overall effect: Z = 0.61 (P = 0.54)
Test for subgroup differences: Not applicable
Heterogeneity: Tau² (DL[b]) = 0.00; Chi² = 5.19, df = 6 (P = 0.52); I² = 0%



(6d)

Study or Subgroup	HS Events	HS Total	ACDF Events	ACDF Total	Weight	Risk ratio M-H, Random, 95% CI
✓ Hey 2013	2	7	1	7	6.7%	2.00 [0.23 , 17.34]
✓ Kang 2013	1	12	2	12	6.2%	0.50 [0.05 , 4.81]
✓ Jang 2017	4	19	27	30	27.0%	0.23 [0.10 , 0.56]
× Ji 2017	9	20	7	20	0.0%	1.29 [0.60 , 2.77]
✓ Hung 2018	2	22	1	20	5.9%	1.82 [0.18 , 18.55]
✓ Wang 2018	6	30	14	33	29.3%	0.47 [0.21 , 1.07]
✓ Xiong 2018	3	20	2	22	10.4%	1.65 [0.31 , 8.89]
✓ Tabanli 2024	3	40	5	40	14.6%	0.60 [0.15 , 2.34]
Total (Wald[a])		**150**		**164**	**100.0%**	**0.55 [0.31 , 0.99]**
Total events:	21		52			

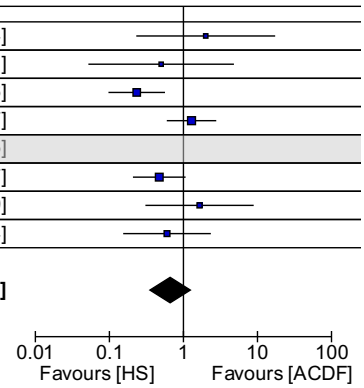
Test for overall effect: Z = 1.98 (P = 0.05)
Test for subgroup differences: Not applicable
Heterogeneity: Tau² (DL[b]) = 0.13; Chi² = 7.66, df = 6 (P = 0.26); I² = 22%



(6e)

Study or Subgroup	HS Events	HS Total	ACDF Events	ACDF Total	Weight	Risk ratio M-H, Random, 95% CI
✓ Hey 2013	2	7	1	7	6.8%	2.00 [0.23 , 17.34]
✓ Kang 2013	1	12	2	12	6.3%	0.50 [0.05 , 4.81]
✓ Jang 2017	4	19	27	30	20.3%	0.23 [0.10 , 0.56]
✓ Ji 2017	9	20	7	20	22.4%	1.29 [0.60 , 2.77]
× Hung 2018	2	22	1	20	0.0%	1.82 [0.18 , 18.55]
✓ Wang 2018	6	30	14	33	21.4%	0.47 [0.21 , 1.07]
✓ Xiong 2018	3	20	2	22	9.8%	1.65 [0.31 , 8.89]
✓ Tabanli 2024	3	40	5	40	13.0%	0.60 [0.15 , 2.34]
Total (Wald[a])		**148**		**164**	**100.0%**	**0.66 [0.35 , 1.24]**
Total events:	28		58			

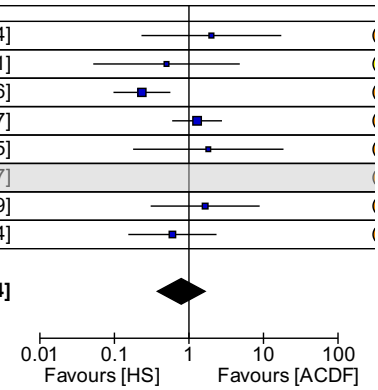
Test for overall effect: Z = 1.29 (P = 0.20)
Test for subgroup differences: Not applicable
Heterogeneity: Tau² (DL[b]) = 0.30; Chi² = 11.27, df = 6 (P = 0.08); I² = 47%



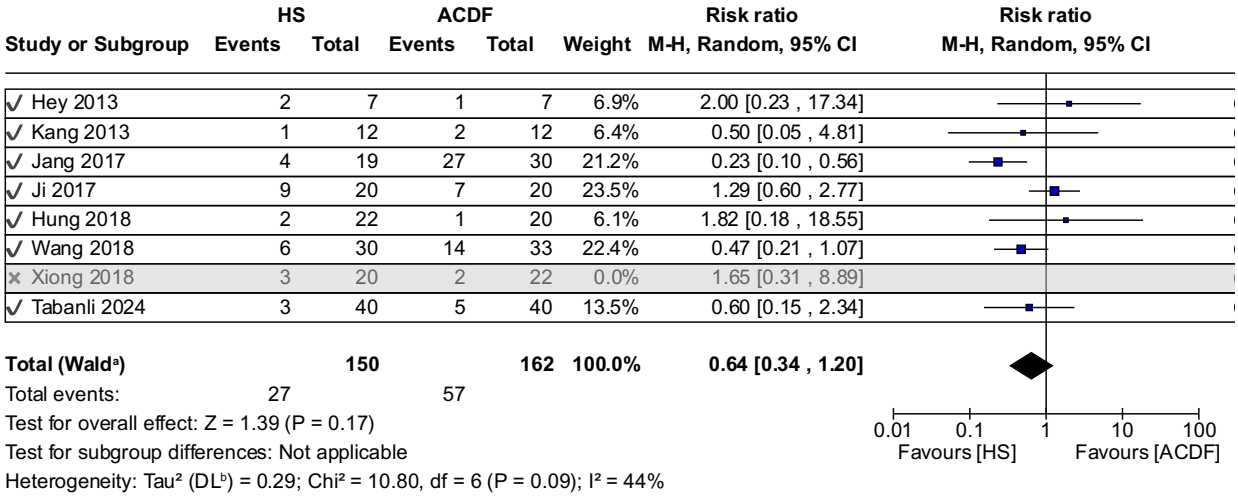
(6f)

Study or Subgroup	HS Events	HS Total	ACDF Events	ACDF Total	Weight	Risk ratio M-H, Random, 95% CI
✓ Hey 2013	2	7	1	7	8.6%	2.00 [0.23 , 17.34]
✓ Kang 2013	1	12	2	12	8.1%	0.50 [0.05 , 4.81]
✓ Jang 2017	4	19	27	30	22.9%	0.23 [0.10 , 0.56]
✓ Ji 2017	9	20	7	20	24.8%	1.29 [0.60 , 2.77]
✓ Hung 2018	2	22	1	20	7.7%	1.82 [0.18 , 18.55]
× Wang 2018	6	30	14	33	0.0%	0.47 [0.21 , 1.07]
✓ Xiong 2018	3	20	2	22	12.2%	1.65 [0.31 , 8.89]
✓ Tabanli 2024	3	40	5	40	15.7%	0.60 [0.15 , 2.34]
Total (Wald[a])		**140**		**151**	**100.0%**	**0.79 [0.38 , 1.64]**
Total events:	24		45			

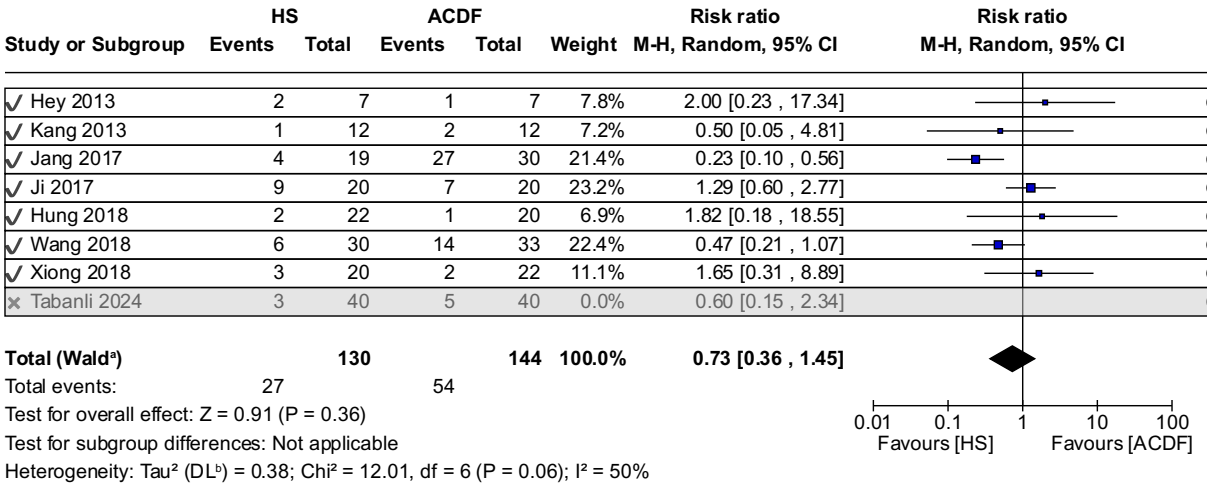
Test for overall effect: Z = 0.64 (P = 0.52)
Test for subgroup differences: Not applicable
Heterogeneity: Tau² (DL[b]) = 0.41; Chi² = 11.30, df = 6 (P = 0.08); I² = 47%



(6g)



(6h)



Figures 6a to 6h. Sensitivity analysis of overall complications sequential exclusion of studies.