

Table S1 Search strategy

No.	Ovid-MEDLINE(R) Ovid MEDLINE(R) 1946 ~ current	Ovid-EMBASE 1974 to 2022. March
1	exp Carcinoma, Hepatocellular/	exp liver cancer/ OR exp liver cell carcinoma/
2	((hepat* or liver) adj5 (neoplas* or cancer* or carcin* or tumo?* or malignan*)).ti,ab.	((hepat* or liver) adj5 (neoplas* or cancer* or carcin* or tumo?* or malignan*)).ti,ab.
3	1 or 2	
4	exp Aged/	exp Aged/
5	(advanced years or ageing or aging or aged or elder* or old* or frail* or geriatric* or gerontolog* or oncogeriat* or senior adult* or senium or octogenari* or septuagenari*).ti,ab.	(advanced years or ageing or aging or aged or elder* or old* or frail* or geriatric* or gerontolog* or oncogeriat* or senior adult* or senium or octogenari* or septuagenari*).ti,ab.
6	4 or 5	
7	3 and 6	
8	exp Hepatectomy/	exp liver resection/ OR exp segmentectomy/
9	(liver or hepat* or segment*) adj5 (surgical or surger* or resect* or trans?ection* or operat* or excis* or extirpate* or segmentectom*).ti,ab.	(liver or hepat* or segment*) adj5 (surgical or surger* or resect* or trans?ection* or operat* or excis* or extirpate* or segmentectom*).ti,ab.
10	hepatectom*.ti,ab.	hepatectom*.ti,ab.
11	or/8-10	
12	7 and 11	
13	Animals/	Animals/
14	Human/	Human/
15	13 not 14	
16	12 not 15	
17	(Randomized Controlled Trials as Topic/ or randomized controlled trial/ or Random Allocation/ or Double Blind Method/ or Single Blind Method/ or clinical trial/ or clinical trial, phase i.pt. or clinical trial, phase ii.pt. or clinical trial, phase iii.pt. or clinical trial, phase iv.pt. or controlled clinical trial.pt. or randomized controlled trial.pt. or multicenter study.pt. or clinical trial.pt. or exp Clinical Trials as topic/ or (clinical adj trial\$.tw. or ((singl\$ or doubl\$ or treb\$ or tripl\$) adj (blind\$3 or mask\$3)).tw. or PLACEBOS/ or placebo\$.tw. or randomly allocated.tw. or (allocated adj2 random\$.tw.) not (case report. tw. or letter/ or historical article/)	(Clinical Trial/ OR Randomized Controlled Trial/ OR controlled clinical trial/ OR multicenter study/ OR Phase 3 clinical trial/ OR Phase 4 clinical trial/ OR exp RANDOMIZATION/ OR Single Blind Procedure/ OR Double Blind Procedure/ OR Crossover Procedure/ OR PLACEBO/ OR randomi?ed controlled trial\$.tw. OR rct.tw. OR (random\$ adj2 allocat\$.tw. OR single blind\$.tw. OR double blind\$.tw. OR ((treble or triple) adj blind\$.tw. OR placebo\$.tw. OR Prospective Study/) not (Case Study/ OR case report. tw. OR abstract report/ or letter/ OR Conference proceeding.pt. OR Conference abstract.pt. OR Editorial.pt. OR Letter.pt. OR Note.pt.)
18	Epidemiologic Studies/ or exp Case Control Studies/ or exp Cohort Studies/ or Case-control.tw. or (cohort adj (study or studies)).tw. or Cohort analy\$.tw. or (Follow up adj (study or studies)).tw. or (observational adj (study or studies)).tw. or Longitudinal.tw. or Retrospective.tw.or Cross sectional.tw. or Cross-sectional studies/	Clinical study/ OR Case control study OR Family study/ OR Longitudinal study/ OR Retrospective study OR (Prospective study/ not Randomized controlled trials/) OR Cohort analysis/ OR (Cohort adj (study or studies)).mp. OR (Case control adj (study or studies)).tw.OR (follow up adj (study or studies)).tw.OR (observational adj (study or studies)).tw.OR (epidemiologic\$ adj (study or studies)).tw. OR (cross sectional adj (study or studies)).tw.
19	17 or 18	
20	16 and 19	
21	Case Study/ or case report.tw. or letter/ or Editorial.pt. or review.pt.	Case Study/ or case report.tw. or conference abstract.pt. or abstract report/ or letter/ or Editorial.pt. or review.pt.
22	20 not 21	

Table S2 Results of CENTRAL (Cochrane Central Register of Controlled Trials)

	No.	Searches
Patient 1	1	MeSH descriptor: [Liver Neoplasms] explode all trees
	2	((hepat* or liver) near/5 (neoplas* or cancer* or carcin* or tumo?* or malignan*)):ti,ab
	3	{or #1-#2}
Patient 2	4	MeSH descriptor: [Aged] explode all trees
	5	(advanced years or ageing or aging or aged or elder* or old* or frail* or geriatric* or gerontology* or oncogeriat* or senior adult* or senium or octogenari* or septuagenari*):ti,ab
	6	#4 or #5
Patient	7	#3 and #6
Intervention	8	MeSH descriptor: [Hepatectomy] explode all trees
	9	(liver or hepat* or segment*) near/5 (surgical or surger* or resect* or trans?ection* or operat* or excis* or extirpate* or segmentectom*):ti,ab
	10	hepatectom*:ti,ab
	11	{or #8-#10}
Patients & intervention	12	#7 and #11
Total	13	#12, in Trials

Table S3 Results of local databases

No.	KoreaMed	KMBASE	KISS
1	((("liver cancer"[TIAB])) OR ("hepatocellular carcinoma"[TIAB]))	([ALL=hepatocellular carcinoma] OR [ALL=liver cancer])	전체 = liver cancer hepatocellular carcinoma
2	((("hepatic"[TIAB]) OR ("liver"[TIAB])) AND (("cancer"[TIAB]) OR ("neoplasms"[TIAB]) OR ("tumor"[TIAB]) OR ("carcinoma"[TIAB]) OR ("malignant"[TIAB]))	([ALL=간암] OR [ALL=간세포암])	전체 = 간암 간세포암
3	1 OR 2		
4	("ageing"[TIAB]) OR ("aging"[TIAB]) OR ("aged"[TIAB]) OR ("elder"[TIAB]) OR ("older"[TIAB]) OR ("frail"[TIAB]) OR ("geriatric"[TIAB]) OR ("gerontology"[TIAB]) OR ("senior adult"[TIAB]) OR ("senium"[TIAB]) OR ("octogenarian"[TIAB]) OR ("septuagenarian"[TIAB])	((([ALL=aged] OR [ALL=aging]) OR [ALL=elderly]) OR [ALL=older]) OR (([ALL=노인] OR [ALL=노령]) OR [ALL=고령]) OR [ALL=초고령])	전체 = aging aged elderly older OR = 노인 노령 고령 초고령
5	("surgical"[TIAB]) OR ("surgery"[TIAB]) OR ("resection"[TIAB]) OR ("operation"[TIAB]) OR ("excise"[TIAB]) OR ("extirpate"[TIAB]) OR ("segmentectomy"[TIAB]) OR ("hepatectomy"[TIAB])	((([ALL=surgery] OR [ALL=resection]) OR [ALL=operation]) OR [ALL=hepatectomy]) OR (([ALL=간절제] OR [ALL=간제거]) OR [ALL=수술]) OR [ALL=엽절제])	전체 = segmentectomy hepatectomy O R 전체 = surgery resection operation OR 전체 = 간절제 엽절제 수술
6	4 AND 5		
7	3 AND 4 AND 5		

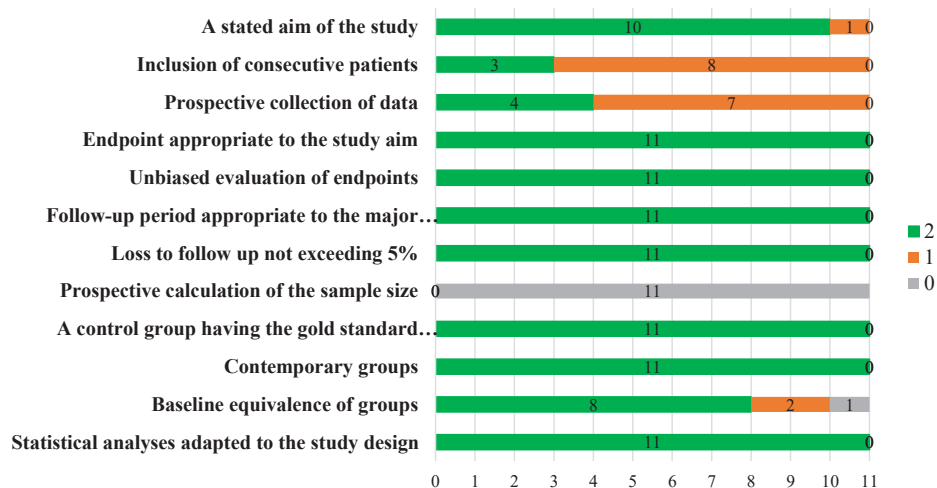


Figure S1 Quality assessment results using MINORS tool for the non-randomized study. MINORS, Methodological Index for Non-randomized Studies.

Table S4 Subgroup analysis for short-term post-operative mortality

Outcomes	Overall analyses/subgroup analyses				
	No. of studies	No. of patients, LLR/OLR	OR (M-H, random)	95% CI	I ² (%)
Overall	8	700/771	0.7	0.32–1.53	0
Age cut-off (years)					
≥65	2	167/231	1.3	0.23–7.17	0
≥70	4	367/367	0.78	0.29–2.06	0
≥75	2	166/173	0.16	0.32–1.53	NA
Type of LR					
Minor LR	5	408/415	0.71	0.26–1.88	0
Mixed LR	3	292/356	0.72	0.12–4.09	43
Country					
Asian	6	470/534	0.9	0.32–2.55	1
Non-Asian	2	230/237	0.49	0.15–1.65	NA

No., number; LLR, laparoscopic liver resection; OLR, open liver resection; OR, odds ratio; M-H, Mantel-Haenszel; CI, confidence interval; NA, not available; LR, liver resection.

Table S5 Subgroup analysis

Outcomes	Overall analyses/subgroup analyses				
	No. of studies	No. of patients, LLR/OLR	OR (M-H, random)	95% CI	I ² (%)
Overall complications	8	689/760	0.53	0.41–0.67	0
Age cut-off (years)					
≥65	2	167/231	0.45	0.26–0.80	0
≥70	4	356/356	0.64	0.47–0.88	0
≥75	2	166/173	0.35	0.21–0.58	0
Type of LR					
Minor LR	5	397/404	0.57	0.41–0.77	0
Mixed LR	3	292/356	0.47	0.31–0.71	5
Country					
Asian	6	459/523	0.49	0.36–0.68	0
Non-Asian	2	230/237	0.4	0.08–1.89	39
Major complications	9	764/835	0.51	0.35–0.74	2
Age cut-off (years)					
≥65	2	167/231	0.73	0.26–2.02	0
≥70	5	431/431	0.63	0.38–1.02	0
≥75	2	166/173	0.29	0.14–0.58	NA
Type of LR					
Minor LR	6	472/479	0.65	0.38–1.12	0
Mixed LR	3	292/356	0.43	0.24–0.74	13
Country					
Asian	7	534/598	0.55	0.34–0.88	7
Non-Asian	2	230/237	0.47	0.23–0.94	NA
Minor complications	8	689/760	0.72	0.54–0.94	0
Age cut-off (years)					
≥65	2	167/231	0.46	0.25–0.85	0
≥70	4	356/356	0.87	0.62–1.23	0
≥75	2	166/173	0.39	0.07–2.26	43
Type of LR					
Minor LR	5	397/404	0.66	0.41–1.06	32
Mixed LR	3	292/356	0.68	0.40–1.15	0
Country					
Asian	6	459/523	0.61	0.42–0.90	0
Non-Asian	2	230/237	0.44	0.05–3.68	58
Post-operative liver failure	6	625/625	0.56	0.33–0.94	0
Age cut-off (years)					
≥65	1	71/71	0.49	0.04–5.56	NA
≥70	4	399/399	0.67	0.33–1.36	10
≥75	1	155/155	0.41	0.15–1.08	NA
Type of LR					
Minor LR	4	429/429	0.63	0.29–1.38	7
Mixed LR	2	196/196	0.5	0.23–1.13	0
Country					
Asian	5	406/406	0.6	0.29–1.24	0
Non-Asian	1	219/219	0.52	0.25–1.08	NA

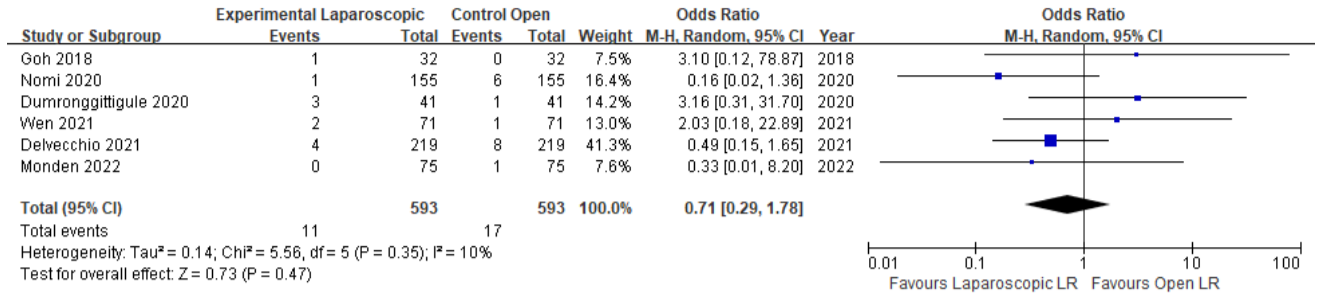
No., number; LLR, laparoscopic liver resection; OLR, open liver resection; OR, odds ratio; M-H, Mantel-Haenszel; CI, confidence interval; LR, liver resection; NA, not available.

Table S6 Various types of complication

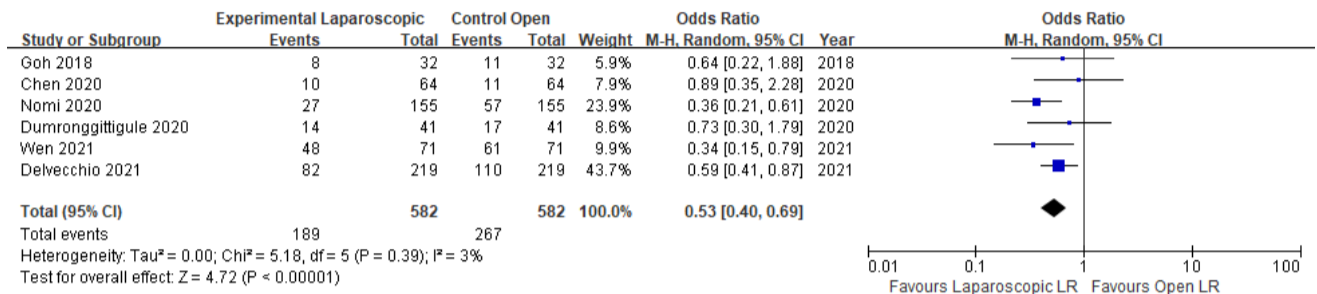
Outcome variables	No. of studies	Laparoscopic liver resection		Open liver resection		Random, M-H pooled OR	95% CI	I ² (%)
		No. of participants	Events	No. of participants	Events			
Ascites	4	360	53	470	78	0.63	0.30–1.35	48
Wound infection	3	205	2	315	10	0.47	0.11–2.00	0
Respiratory complication	5	435	13	545	49	0.31	0.16–0.59	0
Bile leak	5	435	8	545	24	0.45	0.20–1.01	0
Bleeding	5	435	4	545	9	0.65	0.21–2.02	0

No., number; M-H, Mantel-Haenszel; OR, odds ratio; CI, confidence interval.

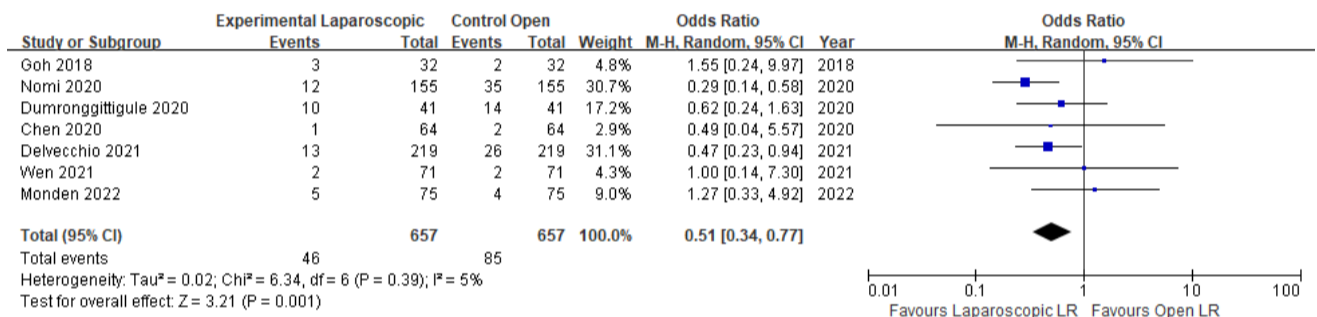
(A) Forest plot of post-operative 90-days mortality



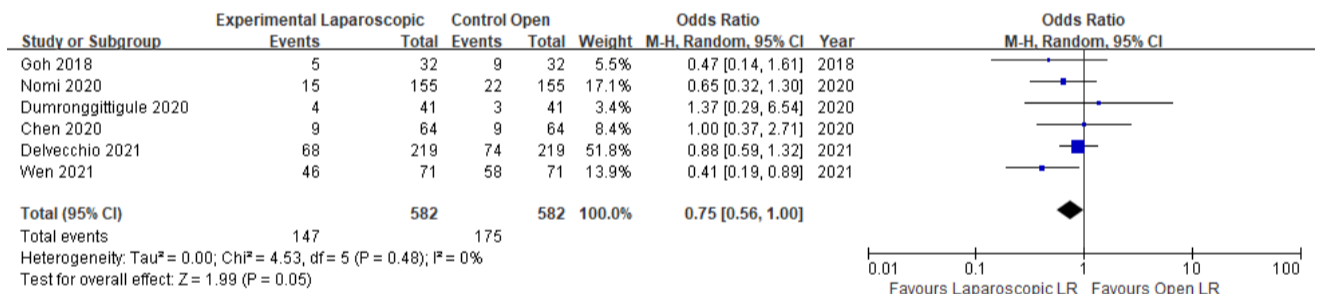
(B) Forest plot of overall complication rates



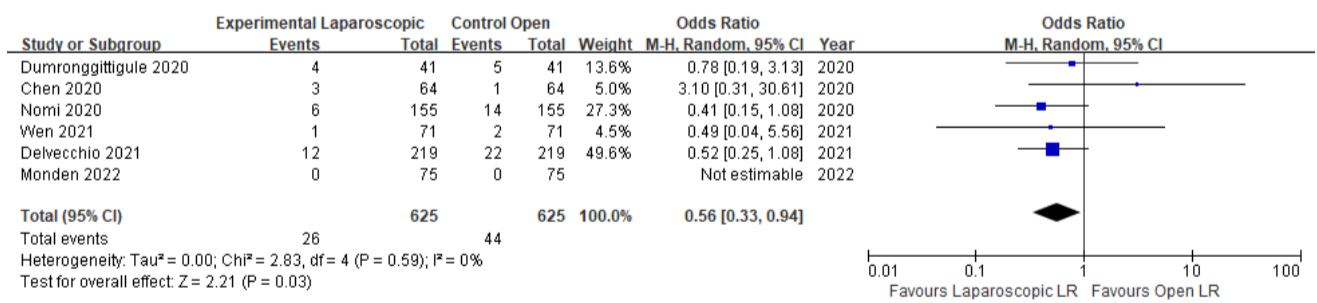
(C) Forest plot of postoperative major complication rates



(D) Forest plot of postoperative minor complication rates



(E) Forest plot of postoperative liver failure rates



(F) Forest plot of postoperative ascites rates.

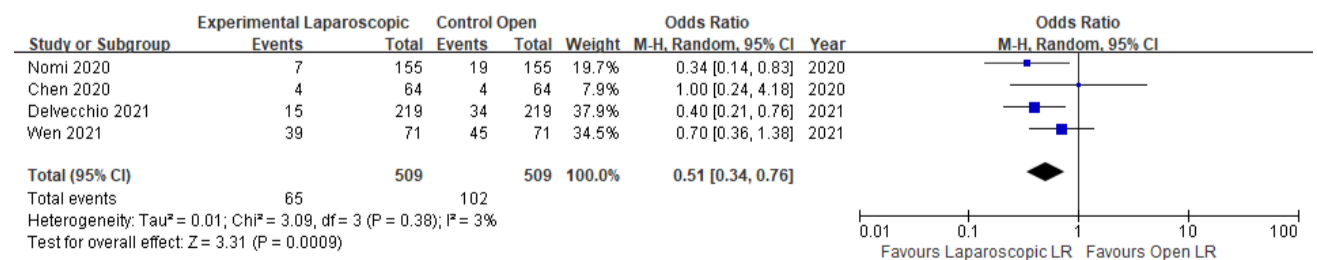
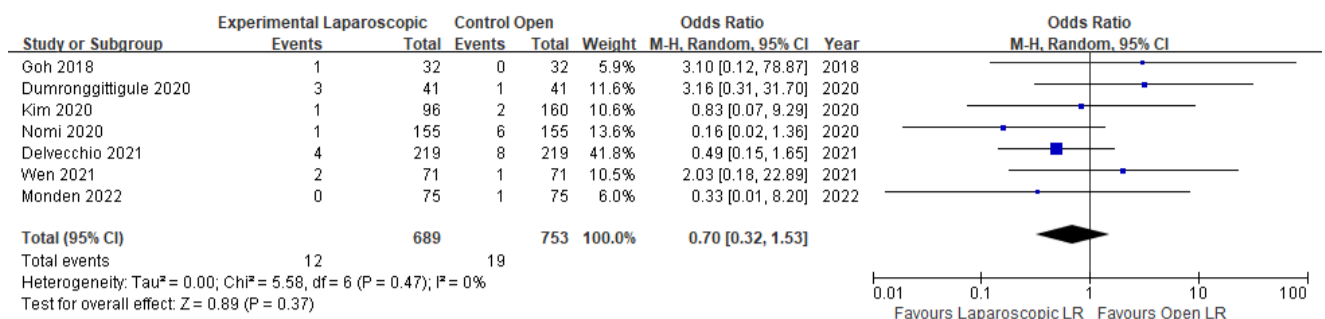
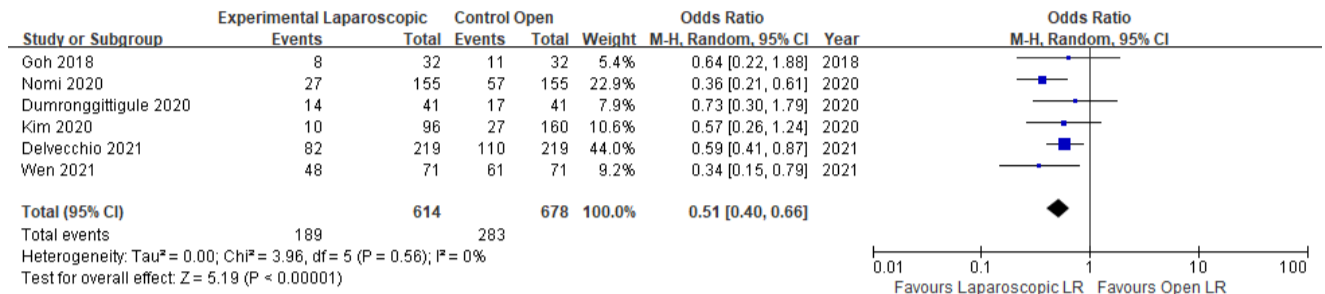


Figure S2 Forest plot of sensitivity analyses with matched studies. (A) Forest plot of post-operative 90-day mortality. (B) Forest plot of overall complication rates. (C) Forest plot of postoperative major complication rates. (D) Forest plot of postoperative minor complication rates. (E) Forest plot of postoperative liver failure rates. (F) Forest plot of postoperative ascites rates. M-H, Mantel-Haenszel; CI, confidence interval; LR, liver resection.

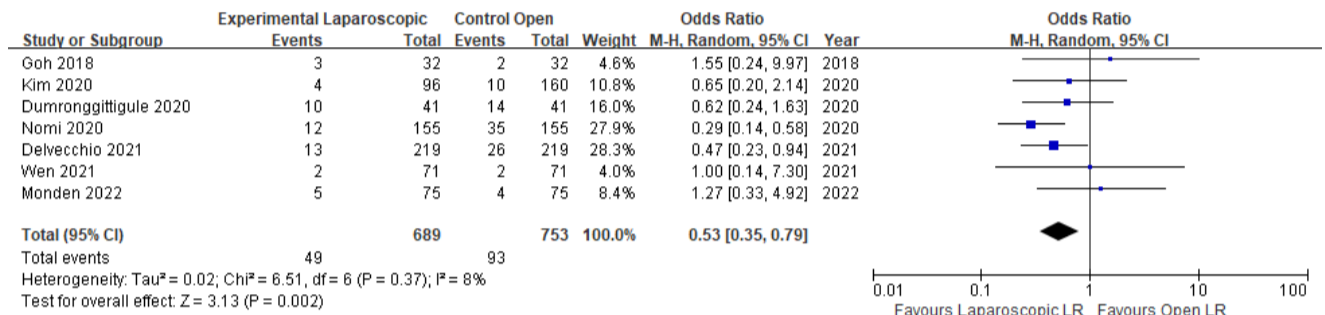
(A) Forest plot of postoperative ascites rates.



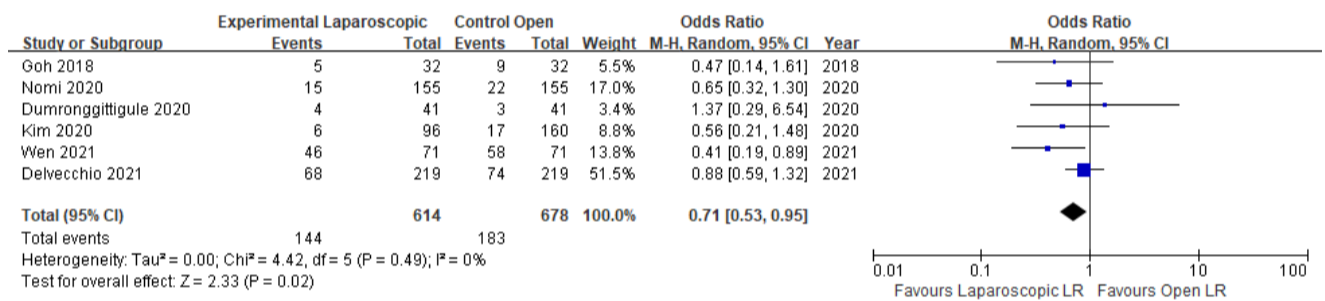
(B) Forest plot of overall complication rates



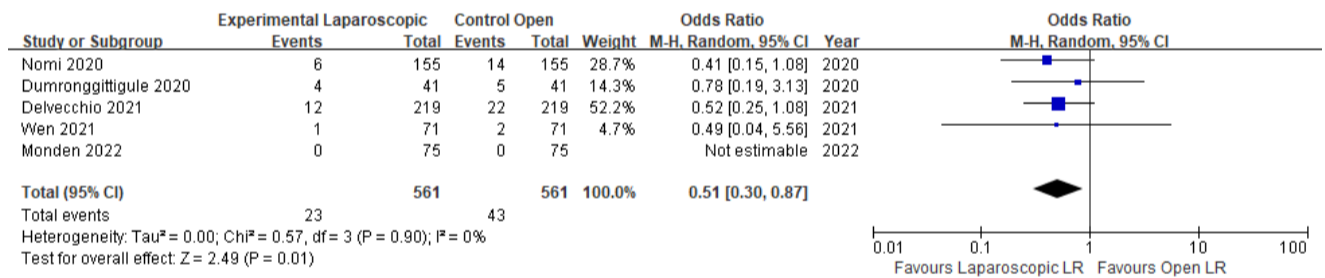
(C) Forest plot of postoperative major complication rates



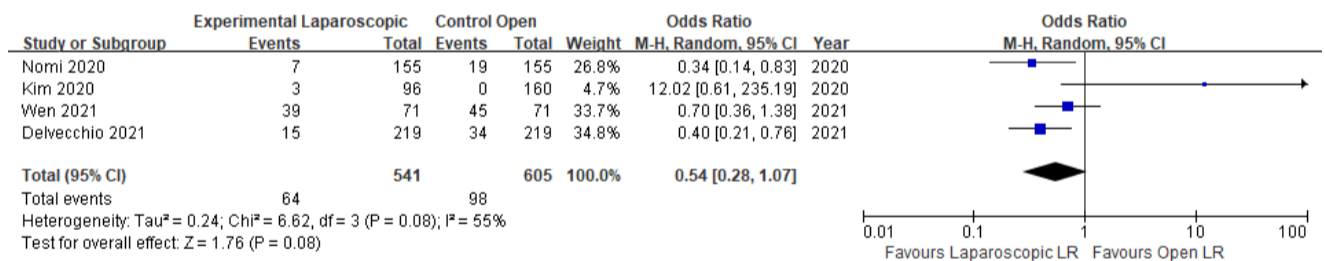
(D) Forest plot of postoperative minor complication rates



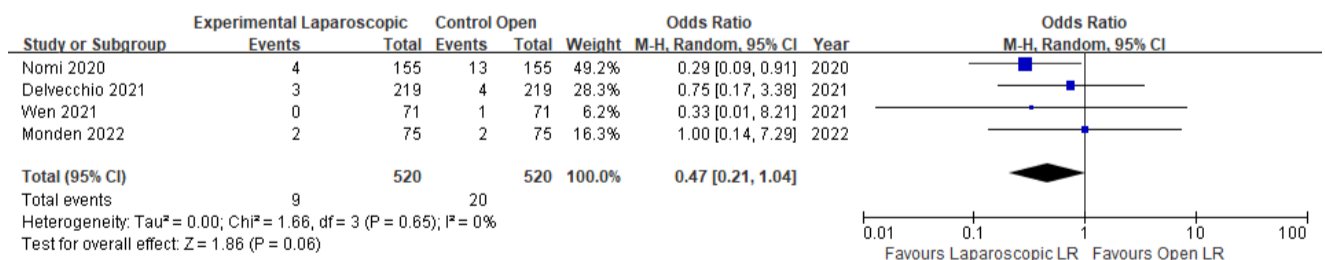
(E) Forest plot of postoperative liver failure rates



(F) Forest plot of postoperative ascites rates



(G) Forest plot of postoperative bile leakage rates



(H) Forest plot of postoperative hemorrhage rates

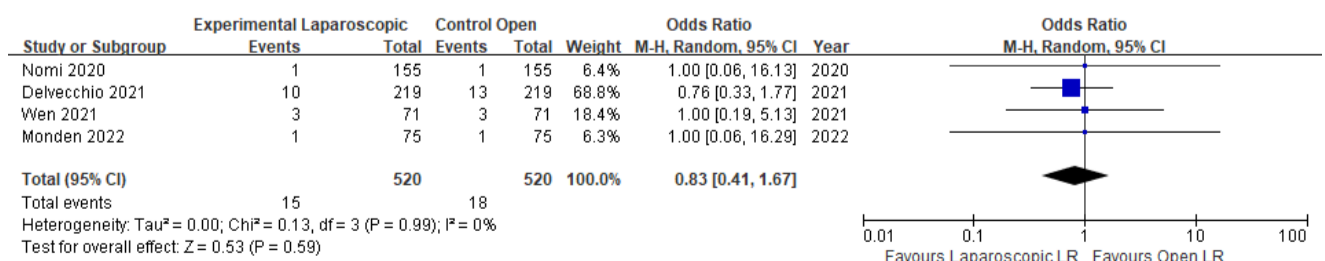


Figure S3 Forest plot of sensitivity analyses with studies over 21 MINORS score. (A) Forest plot of postoperative ascites rates. (B) Forest plot of overall complication rates. (C) Forest plot of postoperative major complication rates. (D) Forest plot of postoperative minor complication rates. (E) Forest plot of postoperative liver failure rates. (F) Forest plot of postoperative ascites rates. (G) Forest plot of postoperative bile leakage rates. (H) Forest plot of postoperative hemorrhage rates. M-H, Mantel-Haenszel; CI, confidence interval; LR, liver resection; MINORS, Methodological Index for Non-randomized Studies.