

Table S1 The search strategy of PubMed

#1 (“Choledochal Cyst”[MeSH] OR (((((((“Choledochal Cyst”[Title/Abstract] OR (“Choledochal Cysts”[Title/Abstract])) OR (“Choledochal Cysts”[Title/Abstract])) OR (“Bile Duct Cyst”[Title/Abstract])) OR (Choledochoceles[Title/Abstract])) OR (Choledochoceles[Title/Abstract])) OR (“Choledochal Diverticulum”[Title/Abstract])) OR (“Choledochal Diverticulus”[Title/Abstract])) OR (“Congenital Biliary Dilatation”[Title/Abstract])) OR (“Congenital Biliary Dilatations”[Title/Abstract])) OR (“Common Bile Duct Choledochal Cyst”[Title/Abstract])) OR (“Caroli Disease”[MeSH] OR (((((((“Caroli Disease”[Title/Abstract] OR (“Caroli’s Disease”[Title/Abstract])) OR (“Carolis Disease”[Title/Abstract])) OR (“Caroli’s Syndrome”[Title/Abstract])) OR (“Caroli Syndrome”[Title/Abstract])) OR (“Carolis Syndrome”[Title/Abstract]))))

#2 (“Laparoscopy”[MeSH] OR (((((((“Laparoscopy”[Title/Abstract] OR (Laparoscopies[Title/Abstract])) OR (Celioscopy[Title/Abstract])) OR (Celioscopies[Title/Abstract])) OR (Peritoneoscopy[Title/Abstract])) OR (Peritoneoscopies[Title/Abstract])) OR (“Laparoscopic Surgical Procedures”[Title/Abstract])) OR (“Laparoscopic Surgical Procedure”[Title/Abstract])) OR (“Laparoscopic Surgery”[Title/Abstract])) OR (“Laparoscopic Surgeries”[Title/Abstract])) OR (“Laparoscopic Assisted Surgery”[Title/Abstract])) OR (“Laparoscopic Assisted Surgeries”[Title/Abstract]))

#3 (“Robotic Surgical Procedures”[MeSH] OR (((((((“Robotic Surgical Procedures”[Title/Abstract] OR (“Robotic Surgical Procedure”[Title/Abstract])) OR (“Robot Surgery”[Title/Abstract])) OR (“Robot Surgeries”[Title/Abstract])) OR (“Robot-Assisted Surgery”[Title/Abstract])) OR (“Robot Assisted Surgery”[Title/Abstract])) OR (“Robot-Assisted Surgeries”[Title/Abstract])) OR (“Robot-Enhanced Procedures”[Title/Abstract])) OR (“Robot Enhanced Procedures”[Title/Abstract])) OR (“Robot-Enhanced Procedure”[Title/Abstract])) OR (“Robotic-Assisted Surgery”[Title/Abstract])) OR (“Robotic Assisted Surgery”[Title/Abstract])) OR (“Robotic-Assisted Surgeries”[Title/Abstract])) OR (“Robot-Enhanced Surgery”[Title/Abstract])) OR (“Robot Enhanced Surgery”[Title/Abstract])) OR (“Robot-Enhanced Surgeries”[Title/Abstract]))

#4 (“Biliary Tract Surgical Procedures”[MeSH] OR (((((((“Biliary Tract Surgical Procedures”[Title/Abstract] OR (“Biliary Tract Surgical Procedure”[Title/Abstract])) OR (“Biliary Surgical Procedure”[Title/Abstract])) OR (“Biliary Surgical Procedure”[Title/Abstract])) OR (“Biliary Tract Surgery”[Title/Abstract])) OR (“Bile Duct Operation”[Title/Abstract])) OR (“Bile Duct Surgery”[Title/Abstract])) OR (“Bile Tract Surgery”[Title/Abstract])) OR (“Biliary Surgery”[Title/Abstract])) OR (“Biliary Tract Operation”[Title/Abstract])) OR (“Biliary Tract Reoperation”[Title/Abstract])) OR (“Bile Tract Reconstruction”[Title/Abstract])) OR (“Bile Duct Reconstruction”[Title/Abstract]))

#5 (“Surgical Procedures, Operative”[MeSH] OR (((((((“Operative Procedures”[Title/Abstract] OR (“Operative Procedure”[Title/Abstract])) OR (“Surgical Procedures”[Title/Abstract])) OR (“Surgical Procedure”[Title/Abstract])) OR (“Ghost Surgery”[Title/Abstract]))

#6 #2 OR #3 OR #4 OR #5

#7 #1 AND #6

MeSH, medical subject heading.

Author	Representativeness of the exposed cohort	Selection of the non exposed cohort	Ascertainment of exposure to implants	Demonstration that outcome of interest was not present at start of study	Comparability of cohorts on the basis of the design or analysis	Assessment of outcome	Was follow up long enough for outcomes to occur	Adequacy of follow up of cohorts	NOS score
Koga H	1	0	1	1	2	1	1	1	8
Chi SQ	1	0	1	1	2	1	1	1	8
Xie X	1	1	1	1	2	1	1	1	9
Aspelund G	1	1	1	1	2	1	1	1	9
Urushihara N	1	0	1	1	2	1	1	1	8
Fujisawa MHA	1	1	1	1	2	1	1	1	9
Yu BH	1	1	1	1	2	1	0	1	8
Miyano G	1	0	1	1	2	1	1	1	8
Lee C	1	0	1	1	2	1	1	1	8
Guo WL	1	1	1	1	1	1	1	1	8
Liem NT	1	0	1	1	1	1	0	1	6
Matsumoto M	1	0	1	1	2	1	1	1	8
Diao M	1	0	1	1	2	1	1	1	8
Cherqaoui A	1	1	1	1	2	1	1	1	9
Ng JL	1	1	1	1	2	1	1	1	9
Ryu HS	1	1	1	1	2	2	1	1	10
Liu Ning H	1	0	1	1	2	1	1	1	8
Kim NY	1	1	1	1	2	1	1	1	9

Figure S1 Detailed NOS scores for individual included studies. NOS, Newcastle-Ottawa Scale.

Comparison	Number of studies	Within-study bias	Reporting bias	Indirectness	Imprecision	Heterogeneity	Incoherence	Confidence rating
Laparoscopic surgery:Open surgery	7	No concerns	Low risk	No concerns	No concerns	No concerns	Major concerns	Moderate
Laparoscopic surgery:Robotic surgery	2	No concerns	Low risk	Some concerns	Major concerns	No concerns	Major concerns	Low
Open surgery:Robotic surgery	2	No concerns	Low risk	Some concerns	No concerns	No concerns	No concerns	High

Figure S2 Detailed GRADE assessment for operation time. GRADE, grading of recommendations assessment, development, and evaluation.

Comparison	Number of studies	Within-study bias	Reporting bias	Indirectness	Imprecision	Heterogeneity	Incoherence	Confidence rating
Laparoscopic surgery:Open surgery	6	No concerns	Low risk	No concerns	No concerns	Major concerns	No concerns	Moderate
Laparoscopic surgery:Robotic surgery	3	No concerns	Low risk	No concerns	No concerns	Major concerns	No concerns	Moderate
Open surgery:Robotic surgery	2	No concerns	Low risk	No concerns	No concerns	Major concerns	No concerns	Moderate

Figure S3 Detailed GRADE assessment for hospital stay. GRADE, grading of recommendations assessment, development, and evaluation.

Comparison	Number of studies	Within-study bias	Reporting bias	Indirectness	Imprecision	Heterogeneity	Incoherence	Confidence rating
Laparoscopic surgery:Open surgery	3	No concerns	Low risk	No concerns	No concerns	Major concerns	No concerns	Moderate
Laparoscopic surgery:Robotic surgery	2	No concerns	Low risk	No concerns	No concerns	Major concerns	No concerns	Moderate
Open surgery:Robotic surgery	2	No concerns	Low risk	No concerns	Major concerns	No concerns	No concerns	Moderate

Figure S4 Detailed GRADE assessment for operation time. GRADE, grading of recommendations assessment, development, and evaluation.

Comparison	Number of studies	Within-study bias	Reporting bias	Indirectness	Imprecision	Heterogeneity	Incoherence	Confidence rating
Laparoscopic surgery:Open surgery	3	No concerns	Low risk	No concerns	No concerns	Major concerns	No concerns	Moderate
Laparoscopic surgery:Robotic surgery	2	No concerns	Low risk	No concerns	No concerns	Major concerns	No concerns	Moderate
Open surgery:Robotic surgery	2	No concerns	Low risk	No concerns	Major concerns	No concerns	No concerns	Moderate

Figure S5 Detailed GRADE assessment for intraoperative blood loss. GRADE, grading of recommendations assessment, development, and evaluation.

Comparison	Number of studies	Within-study bias	Reporting bias	Indirectness	Imprecision	Heterogeneity	Incoherence	Confidence rating
Laparoscopic surgery:Open surgery	9	No concerns	Low risk	No concerns	Major concerns	No concerns	Major concerns	Low
Laparoscopic surgery:Robotic surgery	2	No concerns	Low risk	No concerns	Major concerns	No concerns	Major concerns	Low
Open surgery:Robotic surgery	2	No concerns	Low risk	No concerns	Major concerns	No concerns	No concerns	Moderate

Figure S6 Detailed GRADE assessment for bile leakage. GRADE, grading of recommendations assessment, development, and evaluation.

Comparison	Number of studies	Within-study bias	Reporting bias	Indirectness	Imprecision	Heterogeneity	Incoherence	Confidence rating
Laparoscopic surgery:Open surgery	5	No concerns	Low risk	No concerns	Major concerns	No concerns	No concerns	Moderate
Laparoscopic surgery:Robotic surgery	1	No concerns	Low risk	Some concerns	Major concerns	No concerns	No concerns	Moderate
Open surgery:Robotic surgery	2	No concerns	Low risk	Some concerns	Major concerns	No concerns	No concerns	Moderate

Figure S7 Detailed GRADE assessment for intestinal obstruction after operation. GRADE, grading of recommendations assessment, development, and evaluation.

Table S2 Results of node-splitting analysis of inconsistency of operation time

Name	Direct effect (95% CI)	Indirect effect (95% CI)	Overall (95% CI)	P value
LA, OP	-1.21 (-1.77, -0.63)	-3.77 (-5.75, -1.81)	-1.35 (-2.15, -0.56)	0.02
LA, RO	-0.55 (-1.73, 0.60)	2.02 (0.36, 3.73)	0.26 (-1.07, 1.55)	0.02
OP, RO	2.06 (0.62, 3.64)	0.63 (-1.96, 3.17)	1.61 (0.30, 2.86)	0.3

CI, confidence interval; LA, laparoscopic cyst excision with a Roux-en-Y hepaticojejunostomy; OP, open cyst excision with a Roux-en-Y hepaticojejunostomy; RO, robotic cyst excision with a Roux-en-Y hepaticojejunostomy.

Table S3 Results of node-splitting analysis of inconsistency of length of hospital stay

Name	Direct effect (95% CI)	Indirect effect (95% CI)	Overall (95% CI)	P value
LA, OP	1.24 (-0.45, 2.75)	-0.95 (-5.64, 3.61)	0.93 (-0.59, 2.29)	0.33
LA, RO	-1.44 (-3.66, 0.70)	0.70 (-3.95, 5.09)	-1.26 (-3.19, 0.57)	0.35
OP, RO	-1.77 (-4.36, 1.04)	-3.43 (-6.41, -0.36)	-2.19 (-4.12, -0.15)	0.36

CI, confidence interval; LA, laparoscopic cyst excision with a Roux-en-Y hepaticojejunostomy; OP, open cyst excision with a Roux-en-Y hepaticojejunostomy; RO, robotic cyst excision with a Roux-en-Y hepaticojejunostomy.

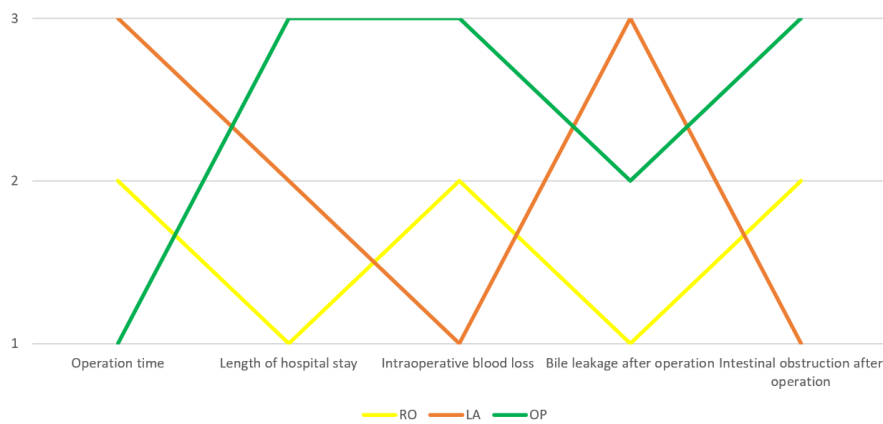


Figure S8 Rank probability of outcomes. LA, laparoscopic cyst excision with a Roux-en-Y hepaticojejunostomy; OP, open cyst excision with a Roux-en-Y hepaticojejunostomy; RO, robotic cyst excision with a Roux-en-Y hepaticojejunostomy.

Table S4 Results of node-splitting analysis of inconsistency of intraoperative blood loss

Name	Direct effect (95% CI)	Indirect effect (95% CI)	Overall (95% CI)	P value
LA, OP	116.98 (−25.77, 260.96)	−138.15 (−443.58, 159.47)	79.56 (−74.19, 232.37)	0.1
LA, RO	−9.47 (−183.22, 167.75)	248.90 (−34.44, 544.38)	64.56 (−106.05, 245.04)	0.1
OP, RO	47.18 (−152.74, 245.26)	−134.14 (−459.70, 195.49)	−12.48 (−188.96, 164.84)	0.28

CI, confidence interval; LA, laparoscopic cyst excision with a Roux-en-Y hepaticojejunostomy; OP, open cyst excision with a Roux-en-Y hepaticojejunostomy; RO, robotic cyst excision with a Roux-en-Y hepaticojejunostomy.

Table S5 Results of node-splitting analysis of inconsistency of bile leakage after operation

Name	Direct effect (95% CI)	Indirect effect (95% CI)	Overall (95% CI)	P value
LA, OP	−0.60 (−2.40, 0.86)	−16.17 (−44.09, −1.49)	−0.93 (−2.74, 0.58)	0.03
LA, RO	−27.84 (−66.65, −2.09)	0.54 (−4.27, 5.26)	−1.73 (−5.82, 1.23)	0.02
OP, RO	0.29 (−3.58, 3.91)	−24.59 (−84.21, −0.12)	−0.84 (−4.55, 2.22)	0.05

CI, confidence interval; LA, laparoscopic cyst excision with a Roux-en-Y hepaticojejunostomy; OP, open cyst excision with a Roux-en-Y hepaticojejunostomy; RO, robotic cyst excision with a Roux-en-Y hepaticojejunostomy.

Table S6 Results of node-splitting analysis of inconsistency of intestinal obstruction after operation

Name	Direct effect (95% CI)	Indirect effect (95% CI)	Overall (95% CI)	P value
LA, RO	2.31 (−2.58, 7.02)	17.98 (2.45, 53.18)	3.37 (0.07, 7.51)	0.06

CI, confidence interval; LA, laparoscopic cyst excision with a Roux-en-Y hepaticojejunostomy; RO, robotic cyst excision with a Roux-en-Y hepaticojejunostomy.