

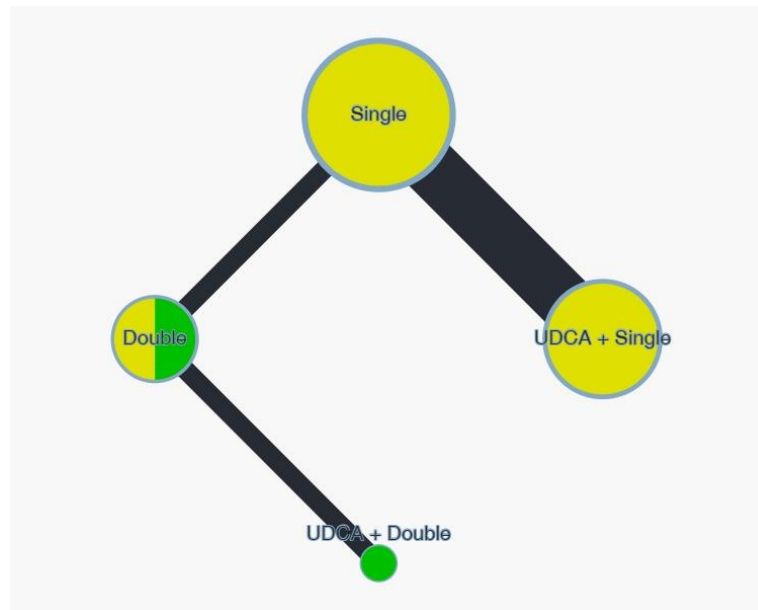
Supplementary Table I. Search strategies

PubMed 858 results (last search 20/10/2023)	("gallstones"[MeSH Terms] OR "gallstones"[MeSH Terms] OR "choledocholithiasis"[MeSH Terms] OR "cholelithiasis"[MeSH Terms] OR "gallstones"[MeSH Terms] OR "gallstones"[MeSH Terms]) AND ("stents"[MeSH Terms] OR "stenting"[All Fields] OR "plastic stent"[All Fields] OR "biliary stent"[All Fields] OR "stent*"[All Fields] OR "endoprotheses"[All Fields])
Scopus 1154 results (last search 20/10/2023) Limitation to: Title, abstract and Keywords	"common bile duct stone" OR "biliary calculi" OR "choledocholithiasis" OR "gallstones" OR "gallstone" AND "plastic stent" OR "biliary stent" OR "stenting" OR "endoprotheses"
CENTRAL 32 results (last search 20/10/2023)	#1 MeSH descriptor: [Gallstones] explode all trees 532 #2 MeSH descriptor: [Choledocholithiasis] explode all trees 151 #3 MeSH descriptor: [Stents] explode all trees 5630 #4 stent 15360

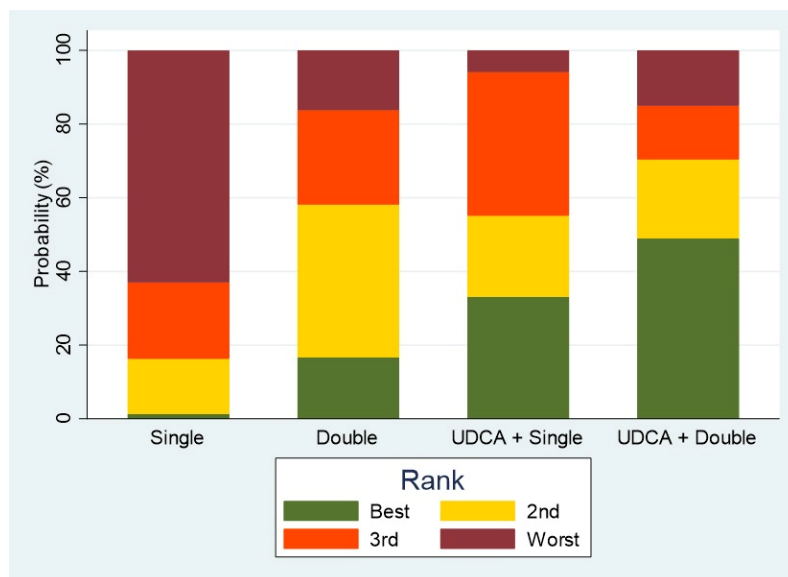
Supplementary Table II. Full text excluded with reason

N	Author (year)	Reason of exclusion
1	Cairns SR (1988)	Wrong study design. Surgery in over 50% of included patients
2	Chopra (1996)	Wrong study design. Randomization in prothesis vs ERCP clearance
3	Cotton (1987)	Wrong study design. Permanent stent or surgery
4	Law (1996)	Wrong study design. Permanent stent or surgery
5	Navicharern (1994)	Wrong study design:
6	Nielsen LB (2019)	Data concerning the outcome of interest not available
7	Soomers AJ (1990)	Wrong study design: Permanent stent
8	Zippi (2013)	Wrong study design: Cross-sectional study
9	DePalma (2000)	Outcome of interest not evaluated. Permanent stent or surgery
10	Siegel (1984)	Data concerning the outcome of interest not available
11	Naranjo Rodriguez (1997)	Wrong study design: Most of the patients placed a permanent endoprosthesis; the remaining part underwent to ERCP or surgery
12	Lauri A (1995)	Wrong study design. Permanent stent
13	Caos A (1990)	Wrong study design. Permanent stent
14	Nowakowsk-Duxawa E (1991)	Wrong study design. Permanent stent
15	van Steenberg W (1987)	Case report
16	Bergman J (1995)	The second ERCP was performed after a median of 7 days
17	De Palma GD (1999)	outcome of interest not evaluated
18	Chen JH (1999)	outcome of interest not evaluated
19	Bovvrey DJ (1998)	outcome of interest not evaluated
20	Sakai P (1998)	article not found
21	De Palma GD (2000)	outcome of interest not evaluated
22	Cortas GA (1997)	outcome of interest not evaluated

23	Topa L (1996)	outcome of interest not evaluated
24	Farca A (1991)	outcome of interest not evaluated
25	DeGuide JJ (1996)	outcome of interest not evaluated
26	Güitrón A (1995)	outcome of interest not evaluated
27	Döbrönte Z (1996)	outcome of interest not evaluated
28	Van Steenberg W (1992)	outcome of interest not evaluated
29	Hormati (2017)	Duplicate publication (Abstract)
30	Shevchenko (2022)	Not plastic stent used
31	Riditid (2022)	outcome of interest not evaluated
32	Sagami (2022)	outcome of interest not evaluated
33	Paspatis (2022)	outcome of interest not evaluated
34	Sayfutdinov (2021)	outcome of interest not evaluated
35	Sabbah (2020)	outcome of interest not evaluated
36	Hormati (2021)	outcome of interest not evaluated
37	Sbeit (2020)	outcome of interest not evaluated
38	Yriberry Ureña ()	outcome of interest not evaluated
39	Emara (2021)	outcome of interest not evaluated
40	Bektas (2017)	Multiple ERCP performed (first attempt after 10-21 days)
41	Yang (2012)	Review
42	Di Giorgio (2013)	Data concerning first ERCP is not available
43	Rochefort (2016)	Outcome of interest not evaluated
44	Mohammed (2016)	Systematic review
45	Horiuchi (2014)	Outcome of interest not evaluated
46	Slattery (2013)	Outcome of interest not evaluated
47	Sharma (2014)	Outcome of interest not evaluated
48	Baillie 2011	Comment (no paper)
49	Nishizawa 2013	Outcome of interest not evaluated
50	Pisello 2008	Clinical follow-up (not ERCP or MRI)
51	Hui 2003	Outcome of interest not evaluated
52	Anselmi 2006	Outcome of interest not evaluated
53	Di Giorgio 2013	Outcome of interest not evaluated
55	Kochlef 2011	Clearance obtained after multiple ERCP (Data at second ERCP not available)
56	Akcakaya 2009	Number of patients with clearance obtained after second ERCP not available
57	García-Cano Lizcano	outcome of interest not evaluated
58	Katsinelos (2003)	Clearance at second ERCP not reported
59	Kourounis (2021)	Only high-risk patients. Clinical decisions made in accordance with a high risk of bleeding
60	Hormati (2019)	Duplicate population in a more recent publication
61	Ueda (2016)	Endoscopic Sphincterotomy not performed (preservation of duodenal papilla)
62	Aslan (2014)	Clearance obtained after multiple ERCP (Data at second ERCP not available)
63	Li (2009)	Emergency setting: Endoscopic Sphincterotomy not performed and radiological follow-up (No second ERCP was performed)
64	Maxton (1996)	Duplicate population. Published as full text
65	Kenneth Jhonson (1993)	Clearance obtained after multiple ERCP (Data at second ERCP not available)



Supplementary Fig. 1. Network-map of NMA



Supplementary Fig. 2. NMA Rankogram

Study	Risk of bias domains					Overall
	D1	D2	D3	D4	D5	
Hormati (2020)	+	-	+	+	+	-
Katsinelos (2008)	-	-	+	+	+	-
Lee (2011)	+	+	+	+	+	+

Domains:
D1: Bias arising from the randomization process.
D2: Bias due to deviations from intended intervention.
D3: Bias due to missing outcome data.
D4: Bias in measurement of the outcome.
D5: Bias in selection of the reported result.

Judgement
- Some concerns
+ Low

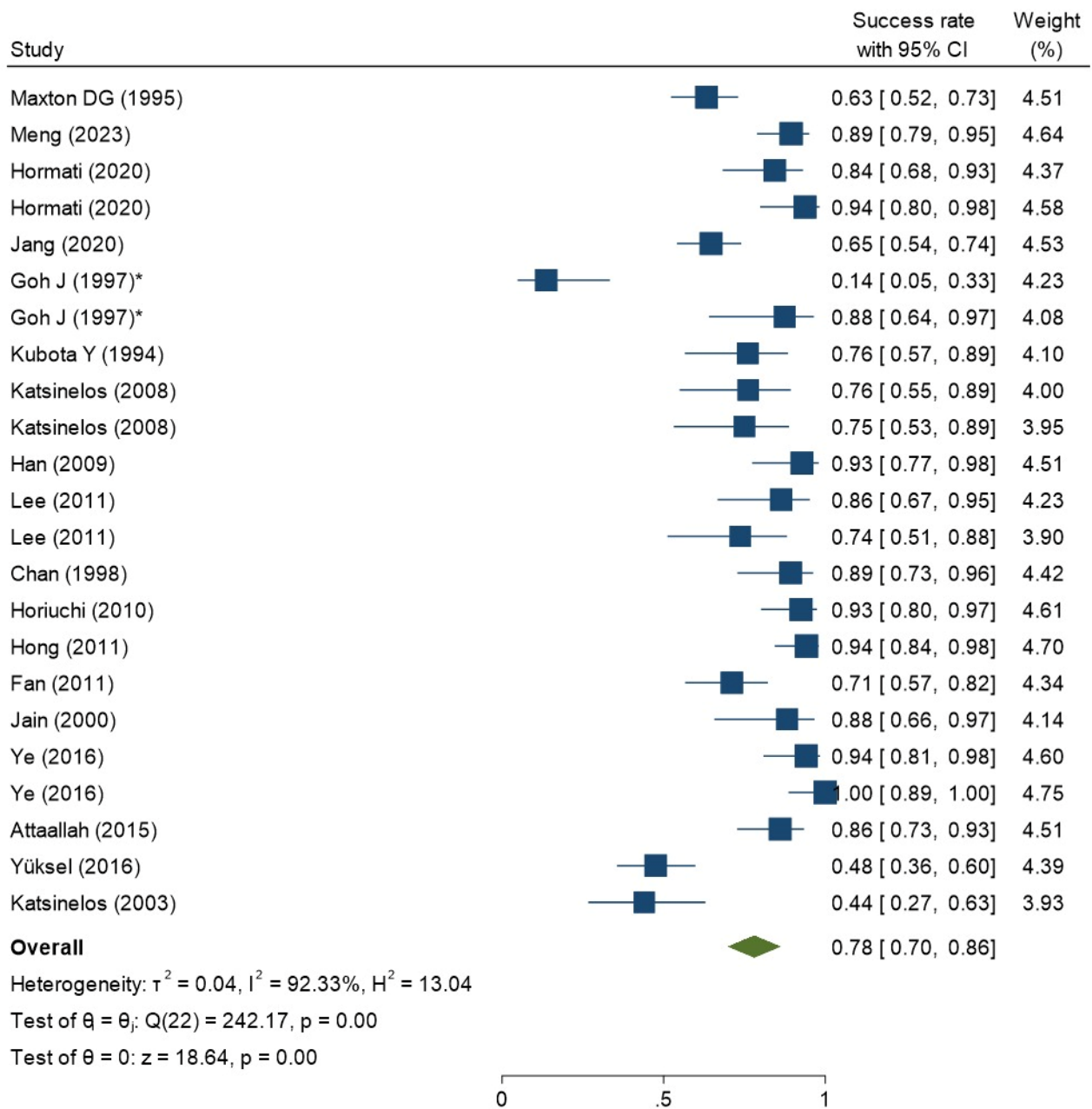
Supplementary Fig. 3. RoB 2.0 for Risk of Bias evaluation among included Randomized Controlled Trials

Study	Risk of bias domains							Overall
	D1	D2	D3	D4	D5	D6	D7	
Belvedere (2012)	-	-	-	-	+	-	×	×
Maxton (1995)	-	-	-	-	-	-	-	-
Kubota (1994)	-	-	-	-	-	-	-	-
Ismael (1994)	×	×	-	×	×	×	×	×
Chan (1998)	-	-	+	-	-	+	-	-
Horiuchi (2010)	+	-	+	+	+	+	+	+
Hong (2011)	+	+	+	+	+	+	+	+
Fan (2011)	-	-	+	-	+	+	-	-
Ye (2016)	+	+	+	+	+	+	+	+
Attaallah (2015)	-	-	-	-	+	-	-	-
Yüksel (2016)	+	+	+	+	+	-	-	-
Katsinelos (2003)	+	-	-	-	+	+	+	-
Goh J (1997)*	+	-	-	-	-	+	-	-
Han (2009)	+	-	+	-	+	+	-	-
Jain (2000)	-	-	+	-	+	+	-	-
Meng (2023)	-	-	+	+	×	-	-	-
Jang (2020)	+	+	+	+	+	+	-	-

Domains:
D1: Bias due to confounding.
D2: Bias due to selection of participants.
D3: Bias in classification of interventions.
D4: Bias due to deviations from intended interventions.
D5: Bias due to missing data.
D6: Bias in measurement of outcomes.
D7: Bias in selection of the reported result.

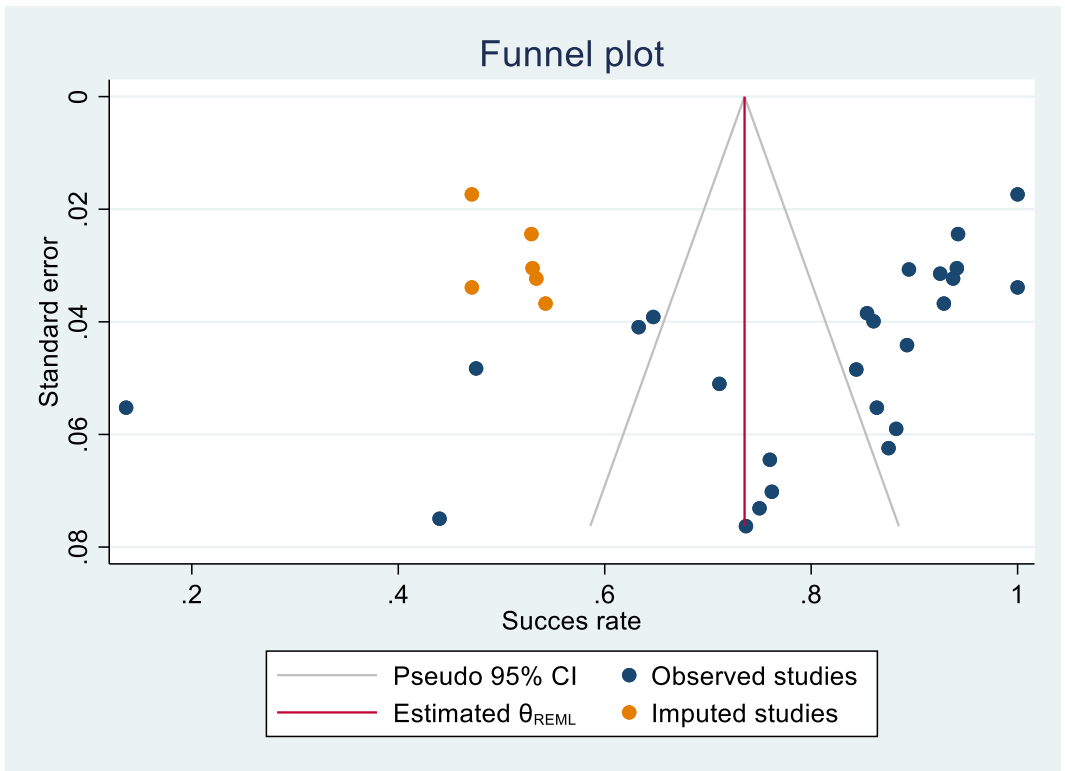
Judgement
× Serious
- Moderate
+ Low

Supplementary Fig. 4. ROBIS for risk of Bias evaluation among included NRSI

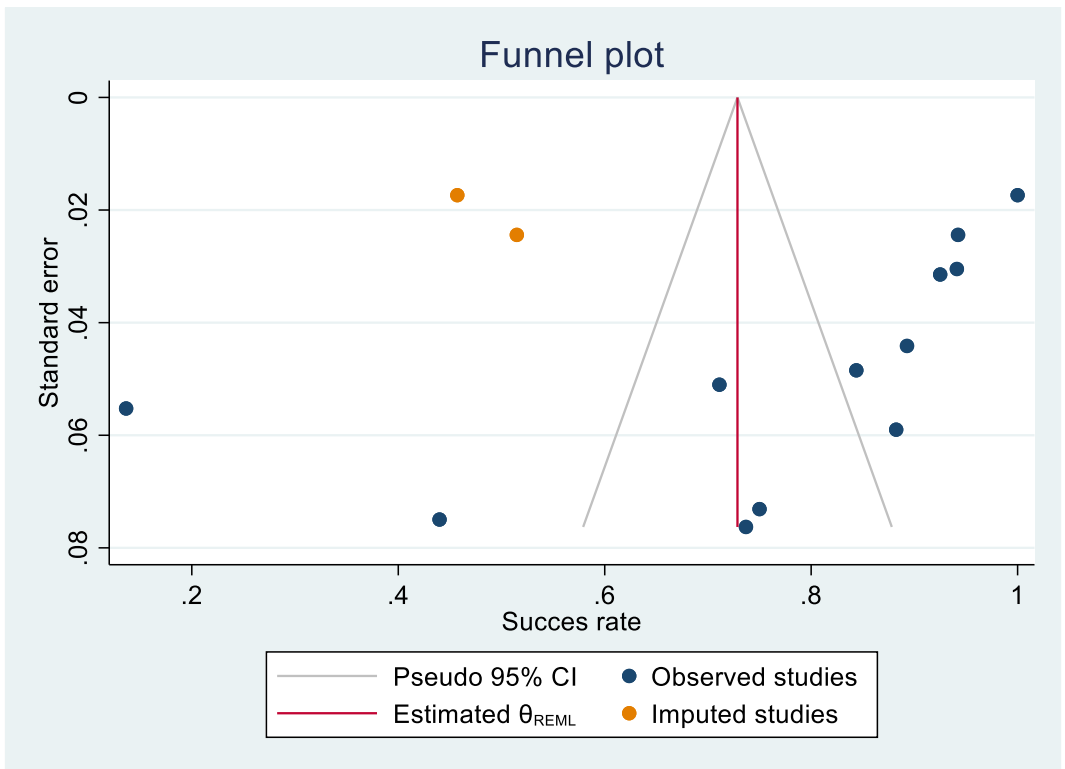


Random-effects REML model

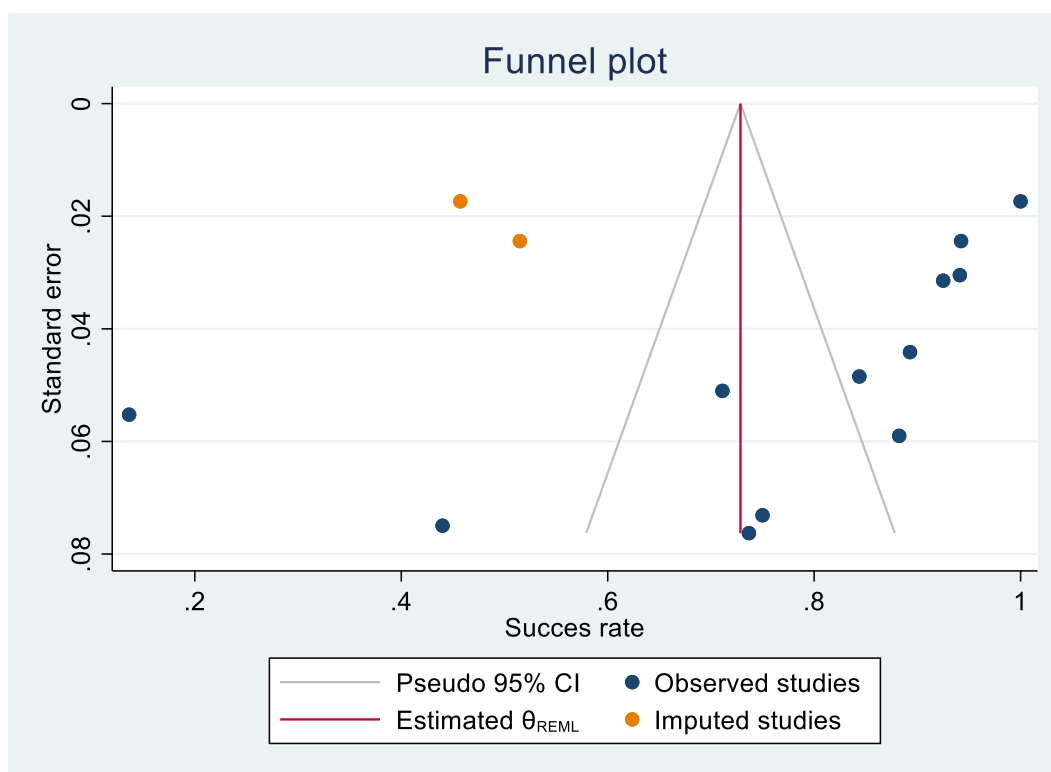
Supplementary Fig. 5. Sensitivity analysis of primary outcome after the exclusion of studies with high risk of bias



Supplementary Fig. 6. Funnel plot and Trim and Fill test among all the included studies



Supplementary Fig. 7. Funnel plot and Trim and Fill test among the included studies with the intervention group treated with stent alone



Supplementary Fig. 8. Funnel plot and Trim and Fill test among the included studies with the intervention group treated with Ursodeoxycholic acid

Supplementary Table III. PRISMA checklist

Section and Topic	Item #	Checklist item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	Title page
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	Abstract
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	Introduction
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	Introduction
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	Methods: Eligibility criteria and data items: - Inclusion criteria - Exclusion criteria
Information sources	6	Specify all databases, registers, websites, organizations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	Methods: - study protocol
Search	7	Present the full search strategies for all	Supplementary table and figure:

Section and Topic	Item #	Checklist item	Location where item is reported
strategy		databases, registers and websites, including any filters and limits used.	- Supplementary table 1
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	Methods: - Search and selection process
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	Methods: - Eligibility criteria and data extraction
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	Methods: - Eligibility criteria and data extraction - Synthesis methods
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	Methods: - Eligibility criteria and data extraction - Synthesis methods
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	Methods: Risk of bias evaluation
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	Methods: - Synthesis methods
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	Methods: Eligibility criteria and data items: - Inclusion criteria - Exclusion criteria
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	Methods: - Synthesis methods - Additional analyses

Section and Topic	Item #	Checklist item	Location where item is reported
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	Methods: - Summary of findings and GRADE profile
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	Methods: - Synthesis methods - Additional analyses: sensitivity and subgroup analysis
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	Methods: - Synthesis methods - Additional analyses: sensitivity and subgroup analysis
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	Methods: Additional analyses: sensitivity and subgroup analysis
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	Methods: risk of bias evaluation
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	Methods: - Summary of findings and GRADE profile
RESULTS			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	Results Figure 1: PRISMA flow diagram
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	Supplementary table and figure: - Supplementary table 2
Study characteristics	17	Cite each included study and present its characteristics.	Results Table 1
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	Results: - Risk of bias evaluation Supplementary table and figure: - Supplementary Figure 3 and 4
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	Results: Synthesis of results - Success rate of stenting in Difficult Choledocholithiasis - Success rate of stenting in difficult choledocholithiasis with or without UDCA treatment and different stent strategies

Section and Topic	Item #	Checklist item	Location where item is reported
			FIGURE: Supplementary figures S1-S2
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	Results: <ul style="list-style-type: none"> - Risk of bias evaluation Supplementary table and figure: <ul style="list-style-type: none"> - Supplementary figure 3 and 4
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	Results: Synthesis of results <ul style="list-style-type: none"> - Success rate of stenting in Difficult Choledocholithiasis - Success rate of stenting in difficult choledocholithiasis with or without UDCA treatment and different stent strategies Figure: 2-4
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	Results Results of additional analysis Supplementary table and figure: Supplementary Figure 5
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	Results <ul style="list-style-type: none"> - Results of additional analysis Supplementary table and figure: <ul style="list-style-type: none"> - Supplementary figure 5-8
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	Results <ul style="list-style-type: none"> - Results of additional analysis Supplementary table and figure: <ul style="list-style-type: none"> - Supplementary figure 6-8
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	Table 3
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	Discussion
	23b	Discuss any limitations of the evidence included in the review.	Discussion
	23c	Discuss any limitations of the review processes used.	Discussion
	23d	Discuss implications of the results for practice, policy, and future research.	Discussion
OTHER INFORMATION			
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	Methods: <ul style="list-style-type: none"> - Protocol and registration (PROSPERO n: CRD42023459712; October 2023)
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	Methods: <ul style="list-style-type: none"> - Protocol and registration https://www.crd.york.ac.uk/PROSPERO/#recordDetails

Section and Topic	Item #	Checklist item	Location where item is reported
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	Not performed
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	Title page - Conflict of interest
Competing interests	26	Declare any competing interests of review authors.	Title page
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	Available on request by contacting the corresponding author.