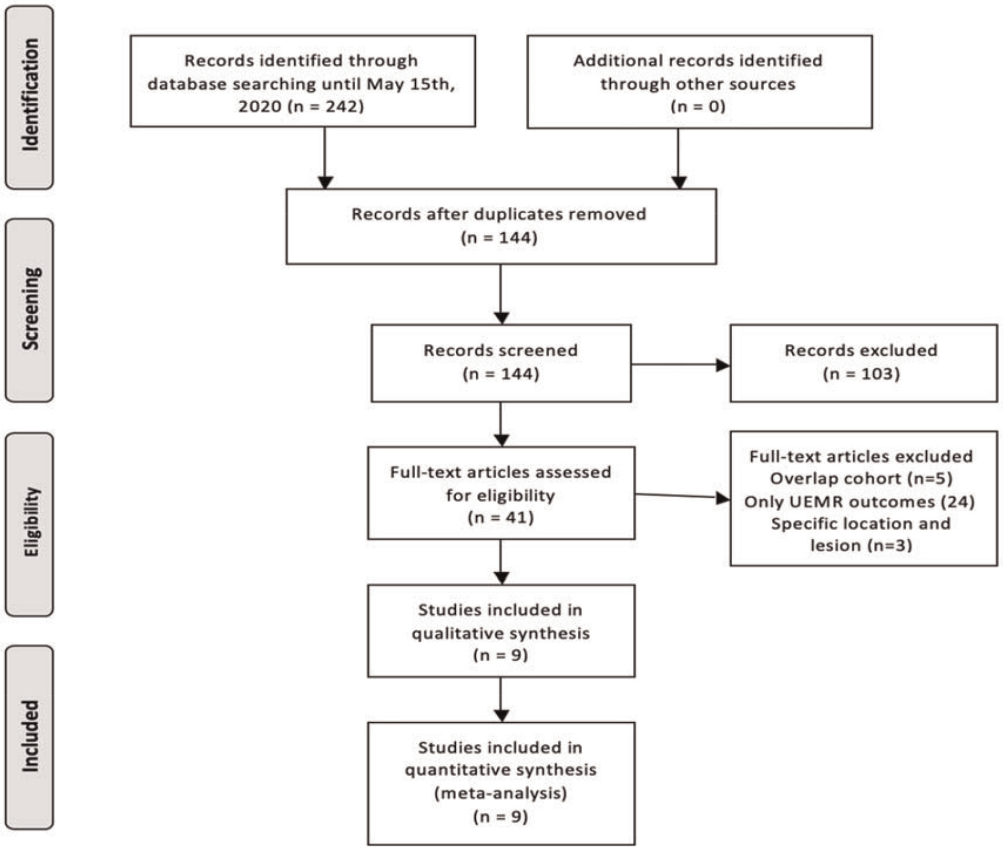
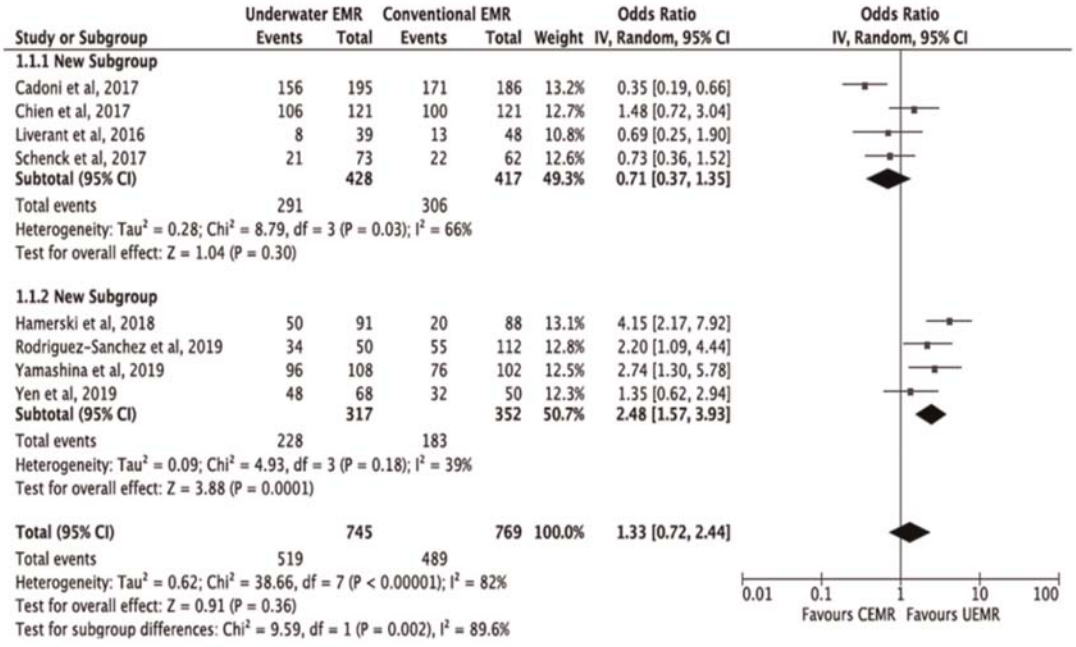
Supplementary material

Supplementary Fig. 1 PRISMA flowchart. From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097



Supplementary material

Supplementary Fig. 2 Forest plot showing odds ratio of en bloc with subgroup results of retrospective and prospective study comparing conventional and underwater endoscopic mucosal resection.



Supplementary Table 1 Study quality assessment.

Newcastle-Ottawa scale for observational study

Study	Selection				Comparability	Outcome			Score	Quality
	Representativeness of the average adult in community	Cohort size	Information on clinical outcomes	Outcome not present at start	factors comparable between the groups	Adequate clinical assessment	Follow up time	Adequacy of follow-up	Max=8	High > 6, medium 4 to 6, low ≤ 3
Liverant et al, 2016	0	1	1	1	1	1	0	0	5	Medium

Supplementary material

Cadoni et al, 2017	0.5	1	1	1	1	1	1	0.5	7	High
Chien et al, 2017	0.5	1	1	1	1	1	0	0	5.5	Medium
Schenk et al, 2017	0	1	1	1	1	1	1	0.5	6.5	High
Rodriguez-Sanchez et al, 2019	0.5	1	1	1	1	1	1	0.5	7	High
Mouchli et al, 2019	0	1	1	1	1	1	1	1	7	High

Jadad score for randomized controlled trials

Study	Randomization	Randomization generation	Double blinding	Allocation concealment	Withdrawals or dropouts	Jadad score (max=5)	Quality
Hamerski et al, 2018	1	0	0	0	0	1	Poor
Yamashina et al, 2019	1	1	0	0	1	3	Good
Yen et al, 2019	1	1	0	0	1	3	Good

Supplementary material

Supplementary Table 2 Data for assessed outcomes of nonpedunclated polyps ≥ 10 mm

Author	Nonpedunclated polyp Size≥ 10		Enbloc resection		Residual polyp		R0 resection		Complications		Early bleeding		Delayed bleeding		Perforation		Postpolypectomy syndrome		Mean follow up (months)	Recurrence per patient basis	
	CEMR	UEMR	CEMR	UEMR	CEMR	UEMR	CEMR	UEMR	CEMR	UEMR	CEMR	UEMR	CEMR	UEMR	CEMR	UEMR	CEMR	UEMR		CEMR	UEMR
Cadoni et al, 2017	77	81	51	58	NR	NR	51	56	11	11	11	10	0	1	0	0	0	0	NR	NR	NR
Chien et al, 2017	121	121	100	106	NR	NR	NR	NR	22	10	19	7	1	1	0	1	0	0	0	NR	NR
Schenck et al, 2017	62	73	22	21	8	1	NR	NR	0	3	0	0	0	3	0	0	0	0	6.1	13/46	4/55
Hamerski et al, 2018	88	91	20	50	NR	NR	NR	NR	28	19	23	16	4	1	1	0	0	1	NR	6/60	2/59
Rodriguez-Sanche	112	50	55	34	12	0	NR	NR	11	1	6	1	4	0	1	0	0	0	3-6	14/78	1/19

Supplementary material

z et al, 2019																				
Yamashina et al, 2019	102	108	76	96	NR	NR	51	74	2	3	0	0	2	3	0	0	0	0	NR	NR NR
Yen et al, 2019	50	68	32	48	0	2	NR	NR	3	5	3	5	0	0	0	0	0	0	3-6	0/12 0/12

CEMR, conventional endoscopic mucosal resection; UEMR, underwater endoscopic mucosal resection; NR, not reported.

Supplementary material

Supplementary Table 3 Data for assessed outcomes of nonpedunclated polyps ≥ 20 mm.

Author	Polyps > 20		Enbloc resection		Residual polyp		R0 resection		Complications		Early bleeding		Delayed bleeding		Perforation		Postpolypectomy syndrome		Mean follow-up (months)	Recurrence per patient basis	
	CEMR	UEMR	CEMR	UEMR	CEMR	UEMR	CEMR	UEMR	CEMR	UEMR	CEMR	UEMR	CEMR	UEMR	CEMR	UEMR	CEMR	UEMR		CEMR	UEMR
Cadoni et al, 2017	19	18	5	7	NR	NR	5	7	2	5	2	5	0	0	0	0	0	0	NR	NR	NR
Chien et al, 2017	42	42	22	29	NR	NR	NR	NR	NR	NR	12	2	NR	NR	NR	NR	0	0	NR	NR	NR
Schenck et al, 2017	27	40	8	3	NR	NR	NR	NR	0	2	0	0	0	2	0	0	0	0	6.1	12/27	3/40
Rodriguez-Sanchez et al, 2019	62	12	22	5	7	0	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Yen et al, 2019	16	16	7	4	0	1	NR	NR	2	3	2	3	0	0	0	0	0	0	3-6	0/12	0/12

CEMR, conventional endoscopic mucosal resection; UEMR, underwater endoscopic mucosal resection; NR, not reported.

Supplementary material

Appendix 1 Literature search strategy.

Database: Ovid MEDLINE(R) ALL <1946 to May 21, 2020>

Search Strategy:

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1 Colonic Polyps/ (8406)

2 ((colon* or colorectal) and (polyp* or adenoma* or lesion*)).mp. (73571)

3 1 or 2 (73571)

4 underwater.mp. (7071)

5 3 and 4 (58)

6 endoscopic mucosal resection/ (1621)

7 (endoscop* adj5 (resect* or dissect*)).tw. (15004)

8 ((hot or cold) adj5 emr).tw. (15)

9 ((hot or cold) adj5 (snare or snares or polypectom*)).tw. (270)

10 (resect* or polypectom*).tw. (351623)

11 6 or 7 or 8 or 9 or 10 (354220)

12 exp treatment outcome/ (1043132)

13 exp Postoperative Complications/ (542052)

14 Neoplasm Recurrence, Local/ (116712)

15 exp Recurrence/ (182445)

16 (outcome* or recur* or prognos*).tw. (2556333)

17 (adverse or complicat* or bleeding or hemorrhag* or haemorrhag*).tw. (1819757)

18 (perforat* or pain* or efficacy or safety).tw. (1800581)

19 12 or 13 or 14 or 15 or 16 or 17 or 18 (5654313)

20 5 and 11 and 19 (34)

21 limit 20 to english language (34)

Database: Embase <1974 to 2020 May 21>

Search Strategy:

Supplementary material

1 exp colon polyp/ (20052)

2 ((colon* or colorectal) and (polyp* or adenoma* or lesion*)).mp. (124141)

3 1 or 2 (125338)

4 underwater.mp. (7116)

5 3 and 4 (178)

6 endoscopic mucosal resection/ (6343)

7 (endoscop* adj5 (resect* or dissect*)).tw. (27101)

8 ((hot or cold) adj5 emr).tw. (63)

9 ((hot or cold) adj5 (snare or snares or polypectom*)).tw. (818)

10 (resect* or polypectom*).tw. (505081)

11 6 or 7 or 8 or 9 or 10 (510215)

12 exp treatment outcome/ (1639910)

13 exp postoperative complication/ (659878)

14 tumor recurrence/ or cancer recurrence/ (232141)

15 recurrent disease/ (176629)

16 (outcome* or recur* or prognos*).tw. (3737120)

17 (adverse or complicat* or bleeding or hemorrhag* or haemorrhag*).tw. (2609480)

18 (perforat* or pain* or efficacy or safety).tw. (2605030)

19 12 or 13 or 14 or 15 or 16 or 17 or 18 (7843415)

20 5 and 11 and 19 (121)

21 limit 20 to english language (119)

22 limit 21 to embase (42)

23 limit 21 to conference abstracts (76)

24 22 or 23 (118)

Cochrane CENTRAL

ID	Search	Hits
#1	[mh "colonic polyps"]	443
#2	(colon* or colorectal) and (polyp* or adenoma* or lesion*)	5983

Supplementary material

#3 #1 and #2 443

#4 underwater 271

#5 #3 and #4 5

#6 [mh "endoscopic mucosal resection"] 72

#7 endoscop* near/5 (resect* or dissect*) 1716

#8 (hot or cold) near/5 emr 20

#9 (hot or cold) near/5 (snare or snares or polypectom*) 163

#10 resect* or polypectom* 27232

#11 #6 or #7 or #8 or #9 or #10 27703

#12 [mh "treatment outcome"] 135429

#13 [mh "postoperative complications"] 38856

#14 [mh "neoplasm recurrence, local"] 4049

#15 [mh recurrence] 11881

#16 outcome* or recur* or prognos* 600785

#17 adverse or complicat* or bleeding or hemorrhag* or haemorrhag* 440755

#18 perforat* or pain* or efficacy or safety 544853

#19 #12 or #13 or #14 or #15 or #16 or #17 or #18 1001260

#20 #5 and #11 and #19 in Trials 5

Web of Science Core Collection, 1965 to date

6

38

(#4 AND #3 AND #2)

AND

LANGUAGE:

(English)

Indexes=SCI-EXPANDED, CPCI-S, ESCI Timespan=1965-2020

5

38

Supplementary material

#4

AND

#3

AND

#2

Indexes=SCI-EXPANDED, CPCI-S, ESCI Timespan=1965-2020

Edit

4

5,766,586

TOPIC:

(outcome* or recur* or prognos*)

OR

TOPIC:

(adverse or complicat* or bleeding or hemorrhag* or haemorrhag*)

OR

TOPIC:

(perforat* or pain* or efficacy or safety)

Indexes=SCI-EXPANDED, CPCI-S, ESCI Timespan=1965-2020

Edit

3

334,405

TOPIC:

(endoscop* near/5 (resect* or dissect*))

OR

TOPIC:

((hot or cold) near/5 emr)

OR

Supplementary material

TOPIC:

((hot or cold) near/5 (snare or snares or polypectom*))

OR

TOPIC:

(resect* or polypectom*)

Indexes=SCI-EXPANDED, CPCI-S, ESCI Timespan=1965-2020

Edit

2

86

TS=((colon* or colorectal) and (polyp* or adenoma* or lesion*)) AND TS=(underwater)

Indexes=SCI-EXPANDED, CPCI-S, ESCI Timespan=1965-2020

Edit

1

75,364

TOPIC:

((colon* or colorectal) and (polyp* or adenoma* or lesion*))

Scopus, 1823 to date

(TITLE-ABS-KEY (((colon* OR colorectal) AND (polyp* OR adenoma* OR lesion*)))) AND (TITLE-ABS-KEY (underwater)) AND ((TITLE-ABS-KEY (endoscop* W/5 (resect* OR dissect*)) OR TITLE-ABS-KEY ((hot OR cold) W/5 (emr OR snare OR snares OR polypectom*)) OR TITLE-ABS-KEY (resect* OR polypectom*))) AND ((TITLE-ABS-KEY (outcome* OR recur* OR prognos*) OR TITLE-ABS-KEY (adverse OR complicat* OR bleeding OR hemorrhag* OR haemorrhag*) OR TITLE-ABS-KEY (perforat* OR pain* OR efficacy OR safety))) AND (LIMIT-TO (LANGUAGE , "English"))

Supplementary material

Appendix 2 MOOSE checklist.

Item No	Recommendation	Reported on Page No
Reporting of background should include		
1	Problem definition	4
2	Hypothesis statement	-
3	Description of study outcome(s)	6
4	Type of exposure or intervention used	5
5	Type of study designs used	5
6	Study population	5
Reporting of search strategy should include		
7	Qualifications of searchers (eg, librarians and investigators)	1
8	Search strategy, including time period included in the synthesis and key words	5, appendix 1
9	Effort to include all available studies, including contact with authors	6
10	Databases and registries searched	5
11	Search software used, name and version, including special features used (eg, explosion)	7
12	Use of hand searching (eg, reference lists of obtained articles)	5
13	List of citations located and those excluded, including justification	8, Table 1, Supplementary Figure 1
14	Method of addressing articles published in languages other than English	-
15	Method of handling abstracts and unpublished studies	6
16	Description of any contact with authors	6
Reporting of methods should include		
17	Description of relevance or appropriateness of studies assembled for assessing the hypothesis to be tested	5-8
18	Rationale for the selection and coding of data (eg, sound clinical principles or convenience)	6-8
19	Documentation of how data were classified and coded (eg, multiple raters, blinding and interrater reliability)	6-8
20	Assessment of confounding (eg, comparability of cases and controls in studies where appropriate)	8
21	Assessment of study quality, including blinding of quality assessors, stratification or regression on possible predictors of study results	6
22	Assessment of heterogeneity	9
23	Description of statistical methods (eg, complete description of fixed or random effects models, justification of whether the chosen models account for predictors of study results, dose-response models, or cumulative meta-analysis) in sufficient detail to be	7

Supplementary material

	replicated	
24	Provision of appropriate tables and graphics	Tables 1-3, Figs 1-3
Reporting of results should include		
25	Graphic summarizing individual study estimates and overall estimate	Figs 1-3
26	Table giving descriptive information for each study included	Table 1 and 2
27	Results of sensitivity testing (eg, subgroup analysis)	11-12
28	Indication of statistical uncertainty of findings	12-16
Reporting of discussion should include		
29	Quantitative assessment of bias (eg, publication bias)	12
30	Justification for exclusion (eg, exclusion of non-English language citations)	5
31	Assessment of quality of included studies	8-9
Reporting of conclusions should include		
32	Consideration of alternative explanations for observed results	12-16
33	Generalization of the conclusions (ie, appropriate for the data presented and within the domain of the literature review)	12
34	Guidelines for future research	16
35	Disclosure of funding source	1

From: *Stroup DF, Berlin JA, Morton SC* et al, for the Meta-analysis Of Observational Studies in Epidemiology (MOOSE) Group. Meta-analysis of Observational Studies in Epidemiology. A Proposal for Reporting. JAMA 2000; 283: 2008-2012 doi: 10.1001/jama.283.15.2008.

Appendix 3 PRISMA checklist.

Section/topic	#	Checklist item	Reported on page #
Title			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	1
Abstract			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	3
Introduction			
Rationale	3	Describe the rationale for the review in the context of what is already known.	4
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	5-6
Methods			

Supplementary material

Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	-
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	5
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	5
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	Supp figure 1
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	5
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	6
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	6
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	6
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	7
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	7

Section/topi	#	Checklist item	Reported on page #
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	11-12
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	11
Results			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	7
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	8, Table 1
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	8
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	Fig 1-3
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	9-11
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	Suppl table 1b
Additional	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-	11-12

Supplementary material

analysis		regression [see Item 16]).	
Discussion			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	12
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	15-16
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	16
Funding			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	1

From: *Moher D, Liberati A, Tetzlaff J* et al The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

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