The Safety of Subtotal Over Total Cholecystectomy: A Systematic Review

Abstract:

Subtotal cholecystectomy (STC) is a promising alternative to total cholecystectomy (TC) for gallbladder procedures, with research showing a reduced incidence of bile duct damage. However, concerns persist regarding residual gallbladder tissue post-STC, potentially leading to serious postoperative complications like bile leakage. This study aimed to critically assess the safety profile of STC versus TC based on a thorough analysis of the current literature. A systematic review was conducted, involving eight studies from 2012-2024, involving human subjects. The review found that STC demonstrated distinct advantages and disadvantages compared to TC, manifesting differences in complication rates, postoperative outcomes, and healthcare resource utilization. Cumulative evidence suggests that STC may present advantages in select scenarios, such as a reduced risk of common bile duct injury. However, STC is also associated with elevated rates of certain postoperative complications, underscoring the need for careful consideration when opting for this approach. In contrast, TC appears to demonstrate lower rates of specific complications like bile leaks and subhepatic fluid collections. Surgeons should carefully consider the trade-offs between STC and TC based on the complexity of the cholecystectomy case and the associated risks and benefits of each procedure. Further research and ongoing evaluation are necessary to refine the understanding of the safety profile of subtotal cholecystectomy.

Keywords: Difficult gallbladder, Subtotal cholecystectomy, Total cholecystectomy.

Introduction:

Subtotal cholecystectomy (STC) is becoming increasingly popularas an alternative to complete cholecystectomy (TC) in complex gallbladder procedures [1]. Previous research has indicated a reduced incidence of bile duct injuries associated with this approach [2]. However, the presence of residual gallbladder tissue following STC can potentially result in significant postoperative complications, such as bile leakage [3]. STC use continues to climb in the United States, it is important to understand the dangers involved with this surgery. [4].

STC is a salvage procedure performed when encountering difficulties during laparoscopic cholecystectomy, such as failure to achieve the critical attitude of safety, the insufficient identification of relevant anatomical features, or an increased risk of harm [5]. The practice of partial gallbladder resection during challenging cholecystectomy was pioneered by Kehr in Germany and Mayo in the United States in the late 19th century, with Alfonso Bonilla Naar of Bogotá, Colombia, being the first to describe it in Latin America. Since its inception, the body of literature on STC has grown significantly [6].

The 2020 guidelines from the the leading journal of emergency surgery for acute calculous cholecystitis recommend considering STC in cases where identifying necessary anatomical structures is difficult or when there is a substantial danger of iatrogenic harm. Various contingency practices which can be undertaken In the challengeCholangiography is performed intraoperatively during cholecystectomy, convert to an open procedure, terminate the surgery,or carrying out STC. STC is rated the ideal salvage procedure when reaching the critical perspective of safety is not attainable after a complicated cholecystectomy [7]. Gupta et al.'s article on "Adoption of worldwide safety standards in cholecystectomy ensures safe laparoscopic surgery" advocates for STC as a surgical contingency plan that enables the safe completion of the procedure in challenging scenarios [8].

The relevance of STC has only grown over time, with increasing utilization rates. However, there is currently no comprehensive literature review encompassing its definition, occurrence, surgical approach, and variants, categorization, and short- and long-term surgical results. These aspects are significant for surgeons considering the use

of this surgery, since they provide data from the literature to support the selection of the most appropriate surgical method, ensuring that cholecystectomy rates align with expectations, and accurately documenting the specific type of STC employed for future comparative research [9].

Objectives:

The primary goal of this study was to evaluate the safety of partial cholecystectomy against whole cholecystectomy in the prior literature.

Methodology

This systematic review was conducted in accordance with PRISMA principles.

Study Design and Duration

This systematic review was initiated in February 2024.

Search strategy

To discover relevant material, a thorough search was conducted utilizing four main databases: PubMed, SCOPUS, Web of Science, and Science Direct. We searched just in English, taking into consideration each database's particular criteria. The relevant papers were located by translating the following keywords into PubMed Mesh terms: "Subtotal Cholecystectomy, Total Cholecystectomy, Long-term Outcomes"The Boolean operators "OR," "AND," and "NOT" all matched the needed criteria. The search results included human trials, publications with full text in English, and openly available information.

Selection criteria

The following criteria were examined for inclusion in this review:

- Studies comparing the safety of partial cholecystectomy against complete cholecystectomy.
- Studies undertaken between 2012 and 2024.
- Only humans are used as subjects.

- Proficiency in English required.
- Articles are freely available.

Data extraction

Rayyan (QCRI) was utilized twice to confirm the search method's outcome[9]. The researchers applied inclusion/exclusion criteria to the combined search results to assess the relevancy of the titles and abstracts. The reviewers examined each manuscript that fulfilled the inclusion criteria thoroughly. The writers discussed approaches to overcome disagreements.The authorized research was submitted using a previously generated data extraction form. The authors gathered information on the research titles, authors, study year, city, participants, gender, kind of participants, prevalence of the two most common blood categories, and primary outcomes. A second spreadsheet was built to analyze the risk of bias.

Strategy for data synthesis

A qualitative review of the research findings and components was carried out by constructing summary tables using information acquired from relevant studies. The data gathered for the systematic review was then used in the most effective way possible from the selected study papers.

Risk of bias assessment

The included studies were evaluated for quality using the ROBINS-I risk of bias assessment approach for non-randomized treatment trials. Confounding,Research participant selection, intervention classification, deviation from intended interventions, missing data, and outcome evaluation The seven assessed themes were used to choose the reported outcome.emes.

Results

Search results

After removing 182 duplicates, the systematic search yielded 376 study publications in total. 129 of the 164 papers that underwent title and abstract screening were excluded.

Ultimately, Twenty-seven studies were screened for full-text evaluation; seven were eliminated because the population type was wrong,Twelve were removed due to inaccurate study results.This systematic review included eight study papers that matched the qualifying criteria. An overview of the method used to choose studies is provided in **Figure 1.**

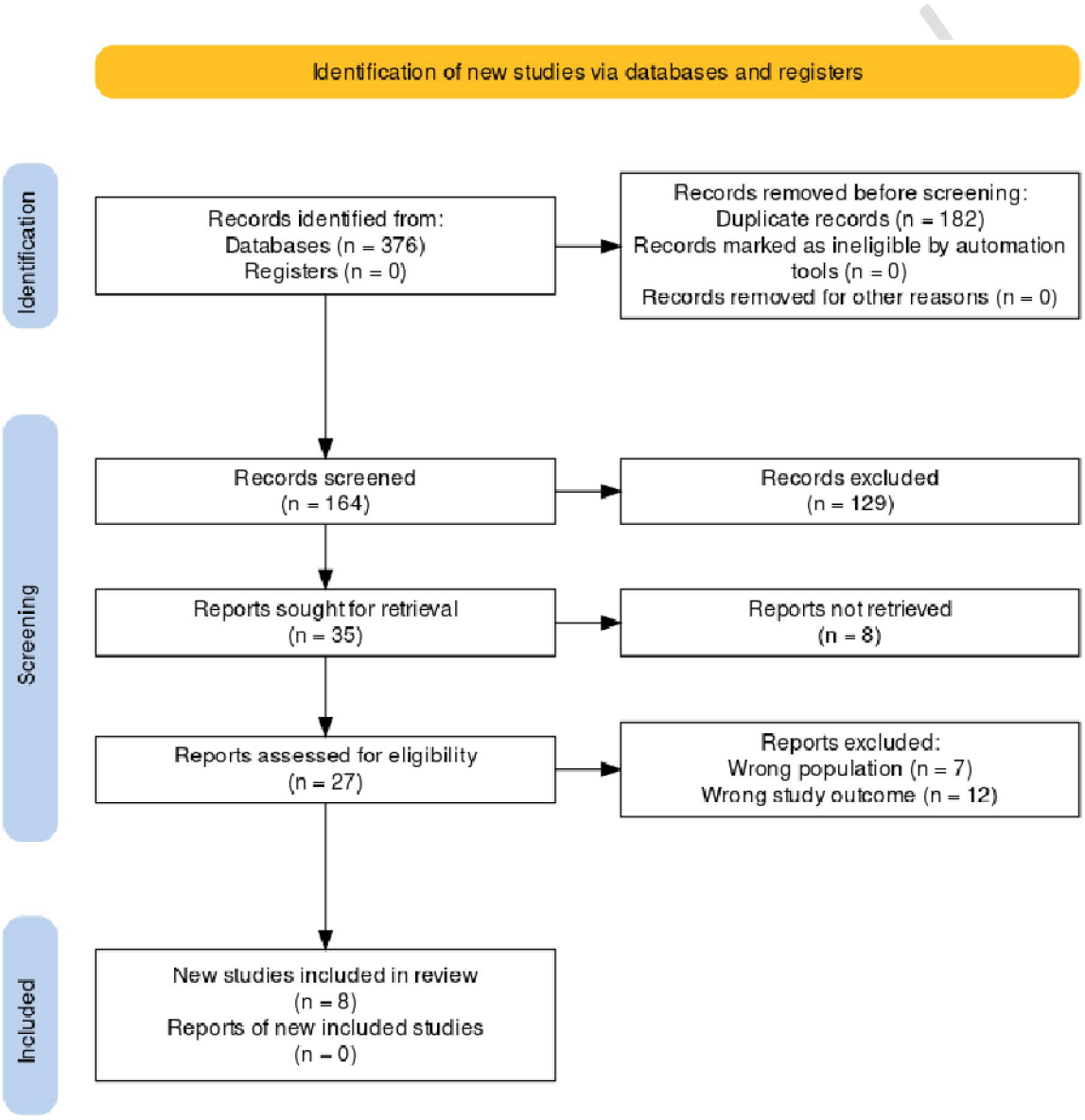

Figure 1 summarizes the research selection approach using a PRISMA flowchart.

Table [1] shows the sociodemographic characteristics of the enrolled subjects.

Author	Country	Study design	Participants (n)	Age (years)
Caitlyn Braschi and others [10]	California	Aretrospective cohort study	741	33-61
Sylvia Sj Koo et.al [11]	United States	A comprehensive review and a meta-analysis	Ten investigations were included	NM
Brian Martinez et.al [12]	USA	A comprehensive review and a meta-analysis	7 investigations with 135,233 cases	NM
Daniel Kaplan et.al [13]	USA	a retrospective cohort study	214	35-45
Brian Davis et.al [14]	United States	a retrospective cohort study	116	30-48
Goyal A, and others[15]	India	A comprehensive review and a meta-analysis	5research included a total of 632 subjects	NM
Alshamrani A, et.al [16]	Saudi arabia	A Retrospective Analysis	150	32-56
Young Kim et.al [17]	United States	a retrospective cohort study	131,082 TC and 487 STC	NM

Table [2] shows the clinical features and results of the included studies.

Study name	Publication year	Key discoveries	Conclusion
Early Results of Subtotal versus Total Cholecystectomy for Acute	2022	A total of 741 patients underwent cholecystectomy, with 11.7% being single trocar cholecystectomy (STC). When compared to patients who underwent traditional cholecystectomy	In this study, STC was linked to higher short-term problems,Longer LOS and greater readmission rates than TC, independent of

Cholecystitis		(TC), The STC group reported greater incidence of 30-day problems, including bile leak and intra-abdominal abscess. STC was also linked to increased rates of reintervention and longer postoperative length of stay (LOS). Bile duct injuries were more numerous in the TC group than the STC group. Additionally, the STC group had higher rates of 30-day readmissions, but similar 30-day mortality rates.	cholecystitis severity.The incidence of bile duct damage was greater with TC.
A comprehensive study and meta-analysis comparing subtotal and complete cholecystectomy for problematic gallbladders.	2023	In compared to subtotal cholecystectomy (STC), complete cholecystectomy (TC) was observed to significantly reduce the risk of common bile duct (CBD) damage (0.0% vs. 1.6%, Relative Risk (RR) 0.30, 95% Confidence Interval (CI) 0.10-0.87). However, it was linked to an increased risk of bile leaks (RR 3.5, 95% CI 1.79-6.84), postoperative endoscopic retrograde cholangiopancreatography (ERCP) (RR 2.86, 95% CI 1.53-5.35), intraabdominal collections (RR 2.55, 95% CI 1.32-4.93), and the need for reoperation (RR 2.92, 95% CI 1.14-7.47).	STC is an acceptable option to problematic gallbladders and may reduce the likelihood of CBD damage. Knowing both ways is critical for managing the problematic gallbladder and reducing injury. Further research is required to determine the efficacy of STC for complicated cholecystectomy.
A systematic review and meta-analysis of the clinical outcomes of laparoscopic	2023	Patients who had a laparoscopic complete cholecystectomy had a considerably lower incidence of postoperative bile leakage (RR: 0.15; 95% CI: 0.03, 0.80) and subhepatic fluid	When utilized as an alternative to laparoscopic complete cholecystectomy, laparoscopic partial cholecystectomy has a distinct complication profile,

subtotal and complete cholecystectomy for complicated acute cholecystitis.		collection (RR: 0.19; 95% CI: 0.06, 0.63). Furthermore, they were 2.94 times less likely to die than individuals who had partial cholecystectomy (RR 0.34; 95% CI: 0.15, 0.77). Patients who underwent subtotal cholecystectomy had a significantly longer hospital stay (mean difference 1.0 days; 95% CI: 0.5 days, 1.4 days).	including a higher risk of postoperative bile leak and subhepatic fluid collection, as well as in-hospital mortality and a longer hospital length of stay.
Subtotal cholecystectomy and open total cholecystectomy OTC: options for complicated cholecystitis.	2014	The study found five (3.3%) common bile duct (CBD) injuries in the OTC group, but none in the SC group. In all, there were 23 (15.2%) problems in the OTC group and nine (14.3%) in the STC group. The risk of serious complications, including CBD damage, vascular injury, and gastrointestinal injury, was substantially greater in the OTC group (0.0% to 7.9%, P = 0.036).	STC may be a safe option for complex cholecystitis.
In complex cholecystitis: subtotal cholecystectomy versus complete cholecystectomy.	2012	There were seven postoperative problems in the subtotal cholecystectomy (SC) group vs 14 in the complete cholecystectomy (TC) group. Three patients in the SC group developed cystic duct leaks, which were all successfully addressed by endoscopic retrograde cholangiopancreatography and biliary stenting. On the other hand, two patients in the TC group sustained common bile duct damage, but none in the SC group did. Additionally, two patients in the TC	Subtotal cholecystectomy is a possible alternative to total cholecystectomy in situations with complicated cholecystitis.

		group sustained gastrointestinal injuries.	
A comprehensive review and meta-analysis comparing subtotal cholecystectomy with complete cholecystectomy	2020	The study found that subtotal cholecystectomy was linked with a considerably reduced risk of postoperative complications (OR 0.41, 95% CI 0.20-0.84) and conversion to open surgery (OR 0.22, 95% CI 0.10-0.52) than complete cholecystectomy. There was no significant difference in the length of hospital stay or death rates between the two operations.	STC may be a safe option for complex cholecystitis.
Retrospective Evaluation of Subtotal and Total Cholecystectomy in Saudi Arabia	2020	The study discovered that partial cholecystectomy was linked with a reduced risk of postoperative complications than complete cholecystectomy. The rate of bile duct damage was substantially lower in the partial cholecystectomy group (3%) than in the whole cholecystectomy group (12%). Furthermore, the period of hospitalization was lower in the subtotal cholecystectomy group. The recurrence rates of gallstones were comparable in both groups.	Subtotal cholecystectomy is a feasible alternative to total cholecystectomy in situations with calculus cholecystitis.
Laparoscopic subtotal cholecystectomy (LSC) versus complete cholecystectomy: a matched national	2017	Patients with LSC had longer hospital admissions (4 days vs. 3 days), greater direct costs (9053$ vs. 6398$), higher readmission rates (11.9% vs. 7.0%), and higher fatality rates (0.82% vs. 0.28%; all $P < 0.05$). After matching, the difference in total direct expenses	LSC is an essential option to Laparoscopic complete cholecystectomy (LC) for the problematic gallbladder. Conversion to LSC is related with greater patient morbidity and resource use, resulting in

analysis		persisted (9053 vs. 7581, P < 0.001), but there were no differences in hospital stays, readmission rates, or overall mortality.	perceived poor results; however, this is attributed to patient characteristics at the time of presentation. If a patient is at risk of iatrogenic biliary tract damage, healthcare practitioners should consider LSC.

Discussion:

Subtotal cholecystectomy is a sort of surgical bail-out treatment advised when confronting problematic laparoscopic cholecystectomy owing to not achieving the critical perspective of safety, poor identification of the anatomical structures involved, and/or danger of harm. [18]. Several studies have examined the results of subtotal cholecystectomy (STC) against complete cholecystectomy (TC) in individuals undergoing cholecystectomy. According to the previously mentioned studies, Braschi et al.[2022] discovered that STC was associated with higher rates of 30-day complications, such as bile leak and intra-abdominal abscess, as well as higher rates of reintervention and longer postoperative length of stay (LOS) than TC. Koo et al. [2023] STC was observed to reduce the risk of common bile duct (CBD) damage while increasing the risk of bile leaks, postoperative ERCP, intraabdominal collections, and reoperations. Martinez et al.[2023] emphasized that laparoscopic complete cholecystectomy was linked with a decreased incidence of postoperative bile leakage and subhepatic fluid accumulation compared to partial cholecystectomy, with a lower mortality rate. Kaplan et al. [2014] noted a higher severe complication rate in the TC group, including CBD injuries. Davis et al. [2012] observed more postoperative complications in the TC group, with common bile duct injuries and duodenal injuries. Goyal et al. and Alshamrani et al. discovered that STC was related with a lower risk of postoperative complications and conversion to open surgery than TC, with Alshamrani et al. highlighting a reduced rate of bile duct damage

in the STC group. Kim et al. [2017] found that laparoscopic subtotal cholecystectomy patients had a longer hospital stay, higher total direct cost, higher readmission rates, and higher mortality rates at first, but after matching, differences in total direct cost persisted with no differences in hospital LOS, readmission rates, or overall mortality. Overall, the studies imply that STC may be associated with certain advantages, such as decreased incidence of particular problems compared to TC., but also with some trade-offs in terms of other outcomes like hospital LOS and costs.

Conclusion:

In conclusion, the findings from various studies comparing subtotal cholecystectomy (STC) to total cholecystectomy (TC) suggest that STC may offer advantages only in cases of complicated cholecystitis, such as a lower risk of common bile duct injury but is linked with greater risks of surgical complications such as bile leakage and intraabdominal abscesses., and the need for reintervention. While TC appears to have lower rates of specific complications like bile leaks and subhepatic fluid collections, STC may be a favorable bail-out technique in challenging cholecystectomy cases where achieving the critical view of safety is difficult. Surgeons should carefully weigh the risks and benefits of each procedure based on individual patient factors and the complexity of the surgical scenario. Further research and long-term outcome studies are warranted to provide a comprehensive understanding of Subtotal cholecystectomy is both safe and effective in complicated gallbladder procedures.

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Details of the AI usage are given below:

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