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ORIGINAL

ONE-STEP METHOD LAPAROSCOPIC BILE TUBE DETECTION AND CHOLECYSTECTOMY IN MALE ATHLETES: A META-ANALYSIS OF GALLBLADDER AND CHASSIS STONES TREATMENT

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ABSTRACT

Objective: This meta-analysis evaluates the effectiveness and safety of the "one-step method" laparoscopic bile tube detection (LCBDE) combined with laparoscopic cholecystectomy (LC) in treating gallbladder and common bile duct stones (CBDS) specifically in male athletes. **Methods:** A thorough search was conducted in both Chinese and English medical databases to collect clinical randomized control trials (RCTs) that applied LCBDE combined with LC for treating gallbladder stones in male athletes. Key outcome measures included CBD stone clearance, operative times, stone residual rates, stone recurrence rates, postoperative complications, and length of hospital stay. **Results:** Twenty-one studies were included in this analysis. The rates of CBD stone clearance and stone residual were statistically similar in both the one-step and two-step methods. However, the one-step method demonstrated a significantly lower recurrence rate compared to the two-step method (OR = 0.37, 95%CI: 0.20, 0.69). The overall incidence of complications was notably lower in the one-step method (OR = 0.66, 95%CI: 0.52, 0.84), and the postoperative hospitalization period was shorter (WMD = -1.07 days, 95%CI: -2.00, -0.14). **Conclusion:** The "one-step method" of LCBDE combined with LC for treating gallbladder stones and CBDS in male athletes is as effective as the ERCP/EST sequential LC method. However, it has the added advantage of fewer postoperative complications and a quicker recovery period, making it a more

ideal choice for male athletes who require a faster return to training and competition.

KEYWORDS: Gallbladder stones, Laparoscopic biliary tube detection, Laparoscopic gallbladder removal, Meta-analysis, Gallbladder Stones in Athletes, Sports Medicine Surgery

1. INTRODUCTION

Athletic performance and rigorous training regimens often push individuals to the limits of physical endurance. While the pursuit of excellence in sports is commendable, the lifestyle of male athletes can sometimes lead to unique health challenges, one of which is gallbladder and chassiss stones. These conditions can significantly affect an athlete's quality of life and performance, necessitating efficient and minimally invasive treatment strategies. (Vagholkar et al., 2019).

Laparoscopic cholecystectomy, a widely accepted surgical procedure for gallbladder stone removal, has evolved over the years. One such advancement is the one-step method, which combines the detection of bile duct stones and cholecystectomy into a single laparoscopic procedure (Parra-Membrives et al., 2018). This innovative approach offers the advantage of reduced surgical invasiveness, shorter recovery times, and potentially quicker return to athletic activities. This meta-analysis focuses on the one-step method of laparoscopic bile tube detection and cholecystectomy in male athletes, with a specific emphasis on the treatment of gallbladder and chassiss stones. By examining the outcomes, benefits, and potential drawbacks of this approach, we aim to provide a comprehensive evaluation of its effectiveness and suitability for the unique healthcare needs of male athletes (Dalmaso et al., 2019).

The significance of this research lies in its potential to inform clinical decision-making and improve the quality of care for male athletes dealing with gallbladder and chassiss stones (Ding & Yan, 2023; Olausson et al., 2020). The outcomes of this meta-analysis may contribute to optimizing treatment protocols, reducing recovery times, and facilitating a smooth transition back to athletic performance, ultimately enhancing the overall well-being of male athletes in their pursuit of excellence in sports. (Baucom et al., 2016; Lee et al., 2011).

2. Data and method

2.1 Literature inclusion criteria

(1) Research and Design: Clinical Randoming Research (RCT); (2) Research Objects: CBDS patients, age ≥ 18 years; (3) Treatment method: "One-step method" group (T group) Using LCDBE combined with LC, the "two-step

method group" uses ERCP/EST sequence LC; (4) describes the ending indicators of below ≥ 1 : CBD Qingshi rate; The incidence of post -complications; postoperative hospitalization time.

2.2 Literature exclusion criteria

(1) Repeated reports of the same research crowd, this situation is incorporated into the documents with the largest sample; (2) the data of the ending indicator is incomplete; Get the full text of the literature; (5) The quality of the literature is too poor (JADAD score < 2 points).

2.3 Literature search strategy

Retrieval Chinese and English electronic databases. The Chinese database includes the full -text database (CNKI), Wanfang database, and Vipvi database. English databases include Pubmed, Web of Science, Embase, Sinomed, COCHRANE LIBRARY.

The time limit for retrieval is from January 2006 to December 2021. Chinese keywords: gallbladder stones; gallbladder stones; laparoscopy; endoscopy; random. English retrieval word: Cholecystolithiasis; Choledocholithiasis; LAPAROSCOPIC; Endoscopic; Randomised. Retrieving the term related terms of MESH, the combination of the theme words and the free word.

2.4 Data extraction

Screened independently by two researchers, and data extracted from the included documents. The two researchers were consulting third parties when they were different. The data collection forms are formulated, and the extracted materials include the author, literature publishing year, research place, sample quantity, patient age, surgical plan, ending indicator, etc.

2.5 Literature quality evaluation

Adopted an improved JADAD meter for literature quality evaluation. The evaluation content includes random sequence generation, hidden, blind method, withdrawal and exit, maximum 7 points, ≥ 4 points into high -quality literature (Oremus et al., 2012).

2.6 Statistical analysis method

Uses STATA15 software for data analysis. Classification indicators (CBDS clearing rate, complications, etc.) adopt ratio ratio (or) as effect statistics, calculate 95%CI; quantitative data (postoperative hospitalization time) adopt a weighted average difference (WMD) as the effect statistical quantity Essence Use COCHRANE Q inspection for literary heterogeneity analysis, combined

with the I2 value for analysis, $P > 0.1$, $i^2 < 50\%$ of the ending indicators use a fixed effect model for META analysis; $P < 0.1$, $i^2 > 50\%$ of the ending indicators use random effects with random effects. The model performs META analysis. Egger inspection calculations are published to publish bias, and the main ending indicators are drawn.

3. RESULT

3.1 Literature screening process and the basic characteristics of the literature

This study has been included in 21 RCT studies. The document screening process is shown in Figure 1. There are 12 English literatures and 9 Chinese literature, from 9 countries. The sample samples of the "one -step method" and the "two -step method" group were 1376 cases and 1374 cases; Jadad scored 2 ~ 6 points, 14 points ≥ 4 , accounting for 66.7%; ending indicators: 13 documents reported CBD Qingqing Qingqing Stone rate, 12 documents reported the opening rate of the transfer, 12 documents reported the stones residual rate, 6 documents reported the recurrence rate of stones, 21 documents reported the occurrence of complications, 15 documents reported the postoperative hospital hospitalization time Essence, (Table 1).

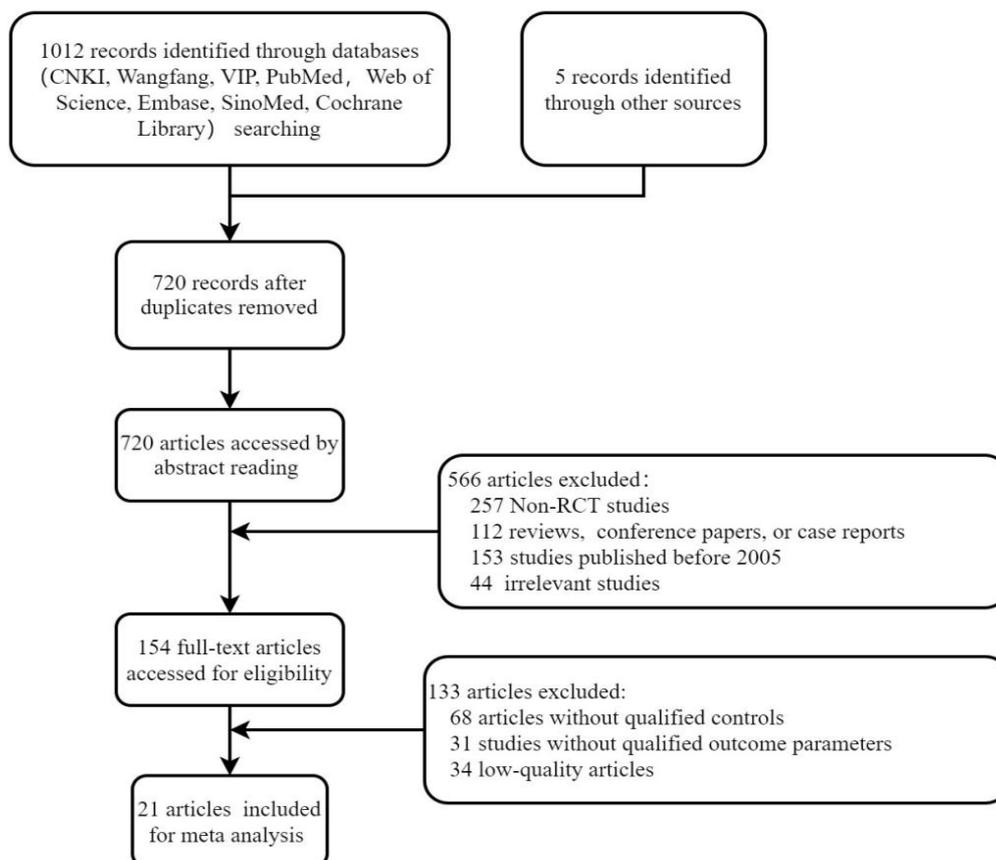


Figure 1: Literature screening process

Table 1: incorporate the basic characteristics of the literature

Author	Year	country	Cases		Age		outcom	Jadad
			T	C	T	C		
BANSAL VK (Bansal et al., 2010)	2010	India	15	15	47.1	39.1	5	
DING GQ (Ding et al., 2014)	2014	China	110	111	58.4	57.5	4	
NOBLE H (Noble et al., 2009)	2009	UK	47	44	75.9	74.3	4	
KOC B (Koc et al., 2013)	2013	Turkey	57	54	51.5	54.9	2	
ROGERS SJ (Rogers et al., 2010)	2010	USA	17	31	39.93	44.6	6	
GONZÁLEZ JEB (González et al., 2016)	2016	CUBA	43	45	56.3	57.7	3	
FERULANO GP (Ferulano et al., 2011)	2011	Italy	45	39	53	55	4	
LU J (Lu et al., 2013)	2013	China	88	122	49.5	52.1	3	
ELGEIDIE AA (ElGeidie et al., 2011)	2011	Egypt	112	107	32.5	29.2	5	
POH BR (Poh et al., 2016)	2016	Australia	52	52	53.4	53.9	6	
LIU S (Liu et al., 2020)	2020	China	104	103	56.9	57.1	5	
ALDARDEER AAK (Aldardeer & Redwaan, 2019)	& 2019	Egypt	75	75	—	—	3	
YUE DC (Yue Dacheng & Hu Shixiang, 2016)	2016	China	106	108	59.8	57.0	3	
DAI GQ (Dai Guoqing & Hu Hai, 2010)	2010	China	72	60	53.7	54.9	3	
LI JF (Li Jianfeng et al., 2020)	2020	China	53	53	68.1	68.1	4	
SHU CX (Shu Changxin & Li Mingxin, 2018)	2018	China	49	49	69.0	67.3	5	
YANG RG (Yang Rugao et al., 2017)	2017	China	51	49	54.5	53.9	4	
LUO H (Luo Hao et al., 2018)	2018	China	45	55	63.7	69.8	6	
MA DX (Ma Daxi et al., 2016)	2016	China	58	56	62.1	59.4	4	
FENG H (Feng Hao et al., 2021)	2021	China	87	65	—	—	4	
WANG GT (Wang Guotai et al., 2020)	2020	China	90	81	49.2	53.3	2	

3.2 Meta-analysis results

3.2.1 CBD Qingshi Rate

13 documents reported the CBD Qingshi rate. The results of the random effect model META analysis showed that there was no significant difference in the "one -step method" and the "two -step method" CBD Qingshi rate (OR = 1.03, 95%CI Intersection 0.58, 1.81), as shown in Figure 2.

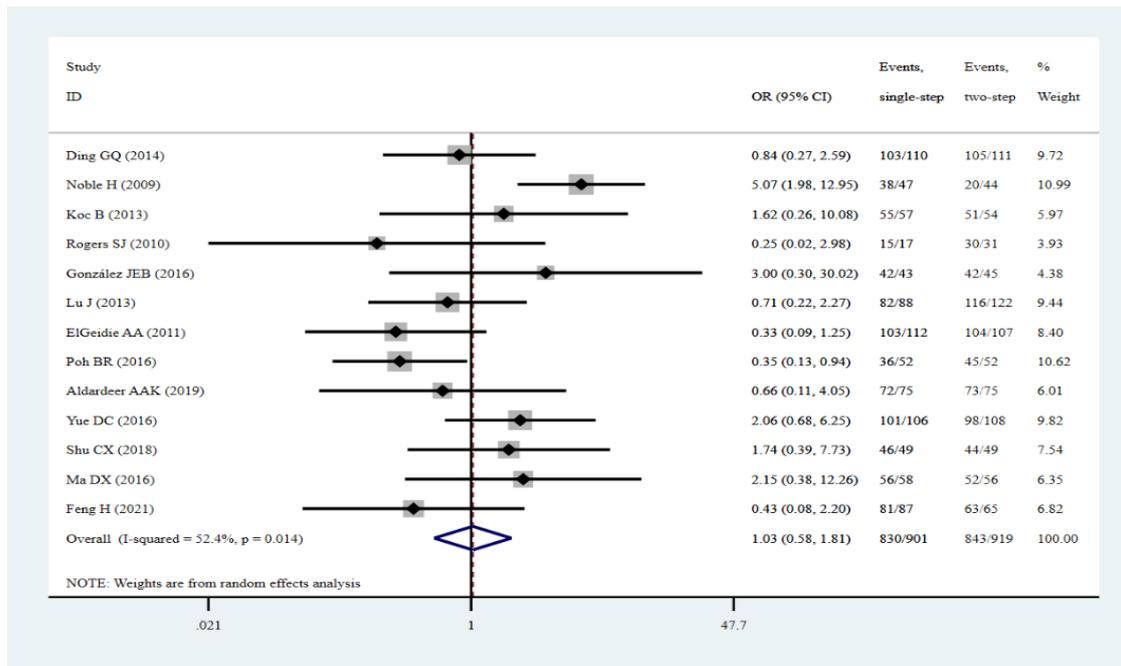


Figure 2: CBD Qingshi Rate Meta-analysis results

3.2.2 Transfer opening rate

12 documents Report the transit opening rate. The analysis of the fixed effect model META shows that there is no statistical difference in the opening rate in different groups (OR = 0.78, 95%CI: 0.49, 1.25), as shown in Figure 3.

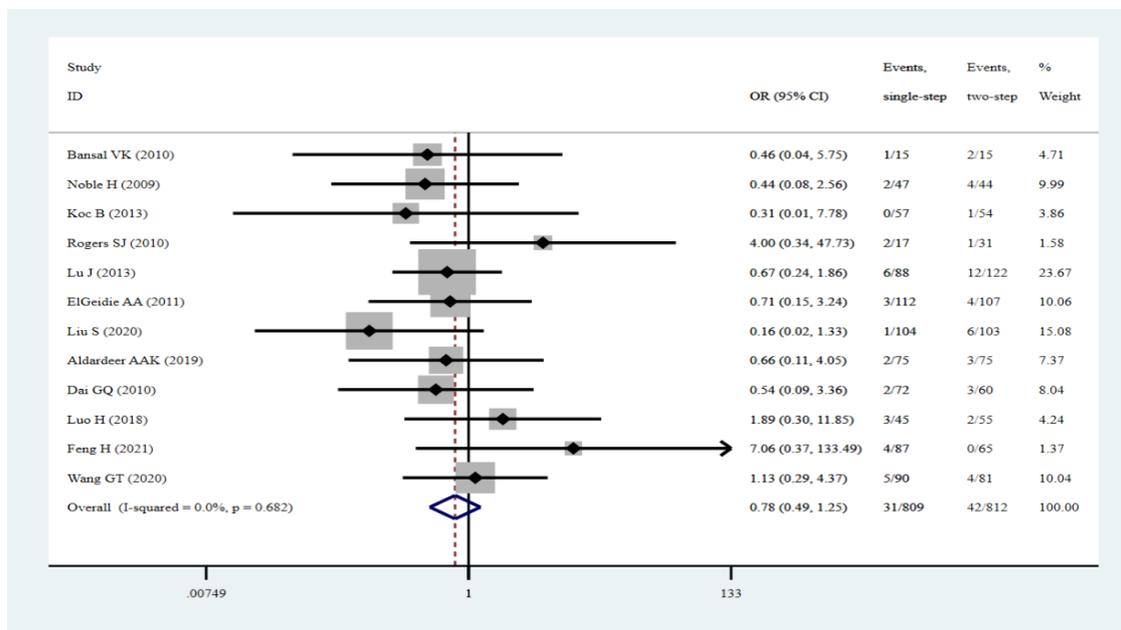


Figure 3: Results of transit meta-analysis

3.2.3 Stone residue

12 documents report the stones residual rate. The results of the random

effect model META analysis show that there is no statistical difference in the stones residue rate of different groups (OR = 0.73, 95%CI: 0.34, 1.56), as shown in Figure 4.

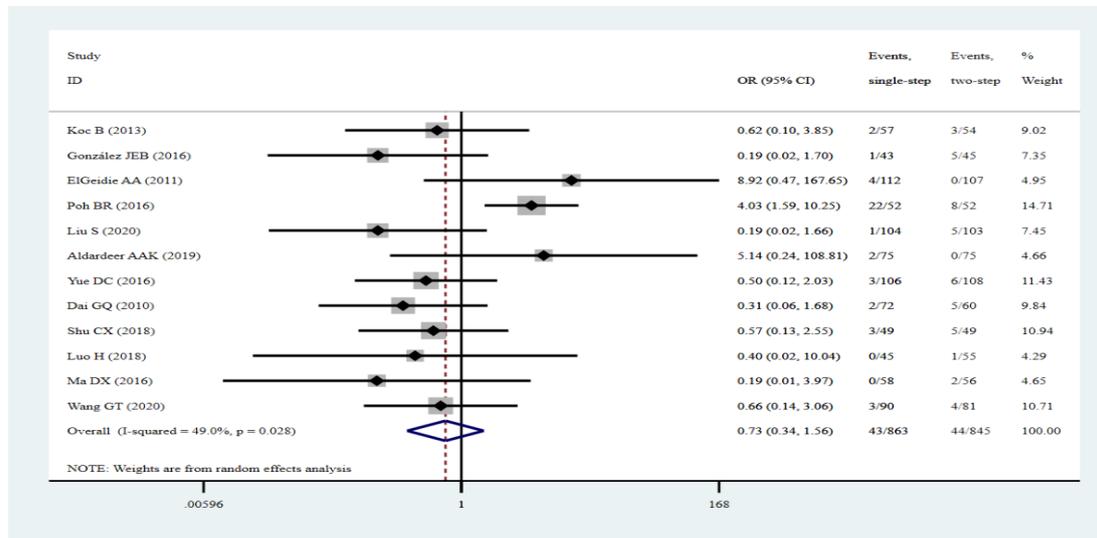


Figure 4: Stone residual rate Meta-analysis results

3.2.4 The recurrence rate of stones

6 articles reported the recurrence rate of stones. The analysis of the fixed effect model META showed that the "one -step method" of the "one -step method" was significantly lower than the "two -step method" (or = 0.37, 95%CI: 0.20, 0.69), as shown in Figure 5.

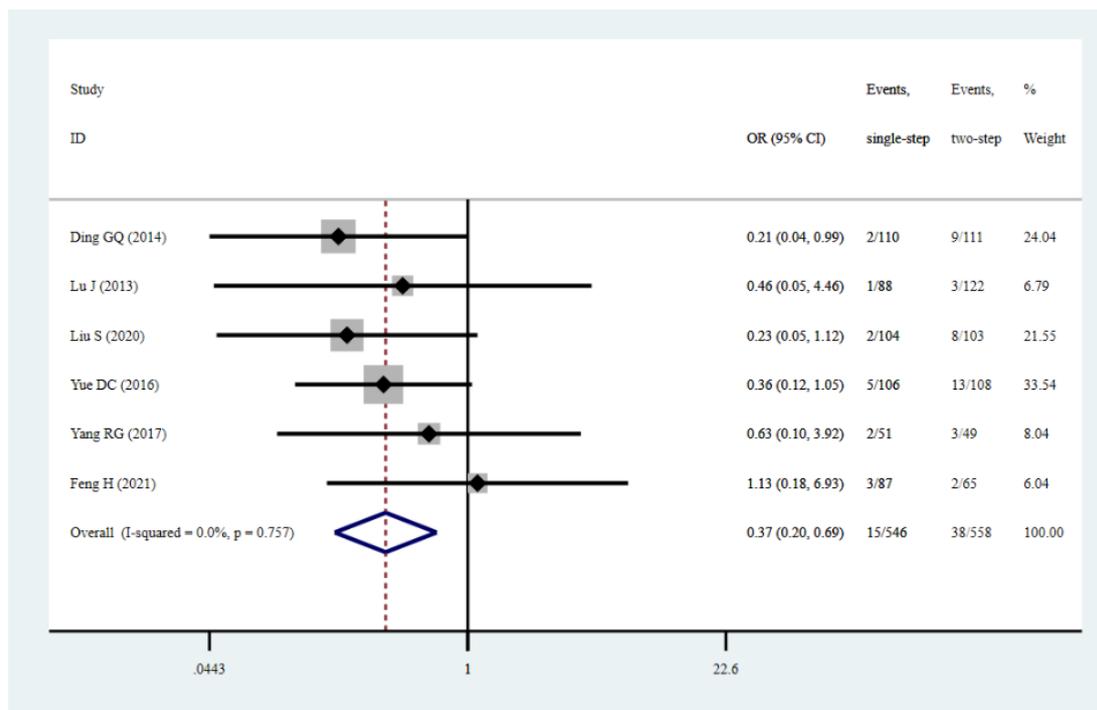


Figure 5: Stone recurrence rate Meta-analysis results

3.2.5 Postoperative complications

19 documents reported the total incidence of postoperative complications, and the analysis of the fixed effect model META analysis showed that the total incidence of complications of "one -step method" was lower than the "two -step method" 95%CI: 0.52, 0.84), as shown in Figure 6. Common complications analysis results show that the incidence of bile leakage in the "one-step method" is higher than the "two-step method" (or = 3.10, 95%CI: 1.77, 5.42), biliary bleeding (OR = 0.28, 95%CI: 0.12, 0.65), bile ductitis (or = 0.25, 95%CI: 0.11, 0.56) and pancreatitis (or = 0.19, 95%CI: 0.12, 0.32) The incidence rate is lower than the "two-step method", as shown in Figures 7, Figure 9, Figure 10, and Figure 11; there is no significant difference in the occurrence rate of abdominal cavity infection/incision infection (P> 0.05), as shown in Figure 8.

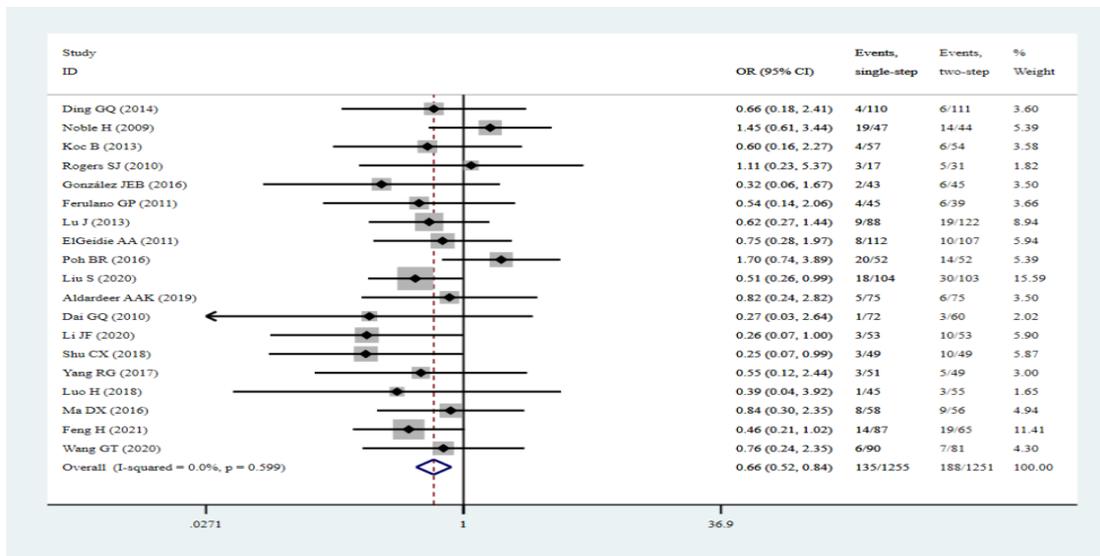


Figure 6: The total incidence of complications after surgery META analysis results

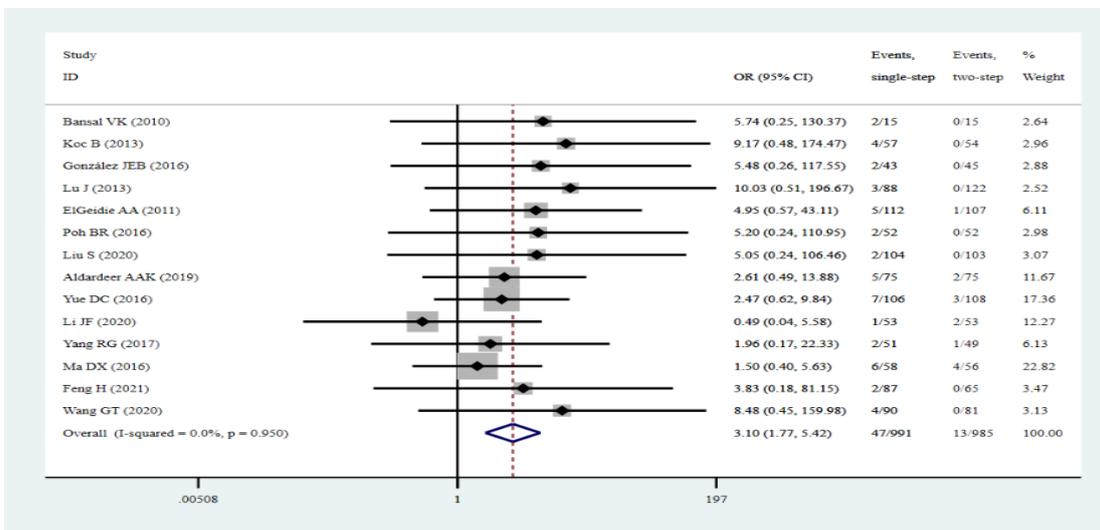


Figure 7: Bile missing rate Meta-analysis results

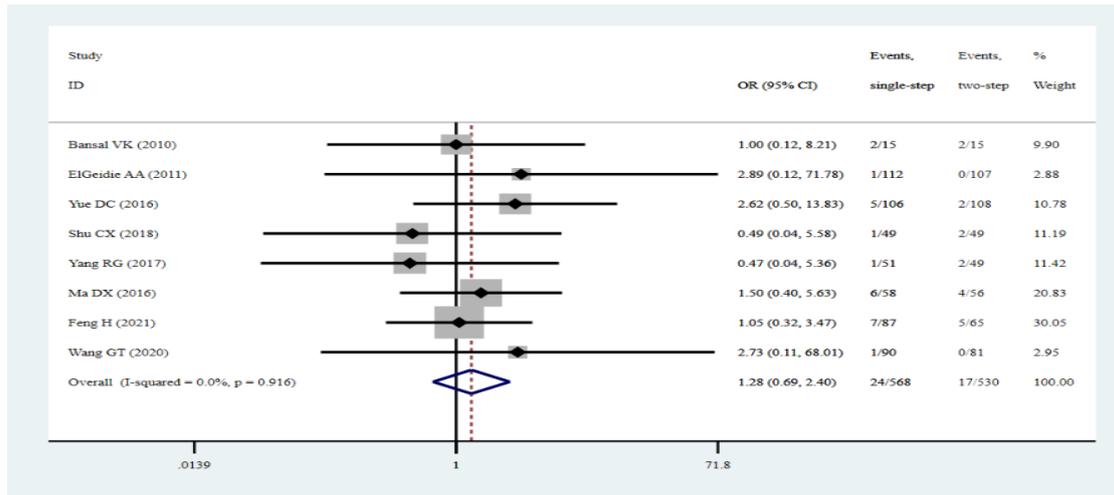


Figure 8: The incidence of peritoneal infection/incision infection rate Meta-analysis results

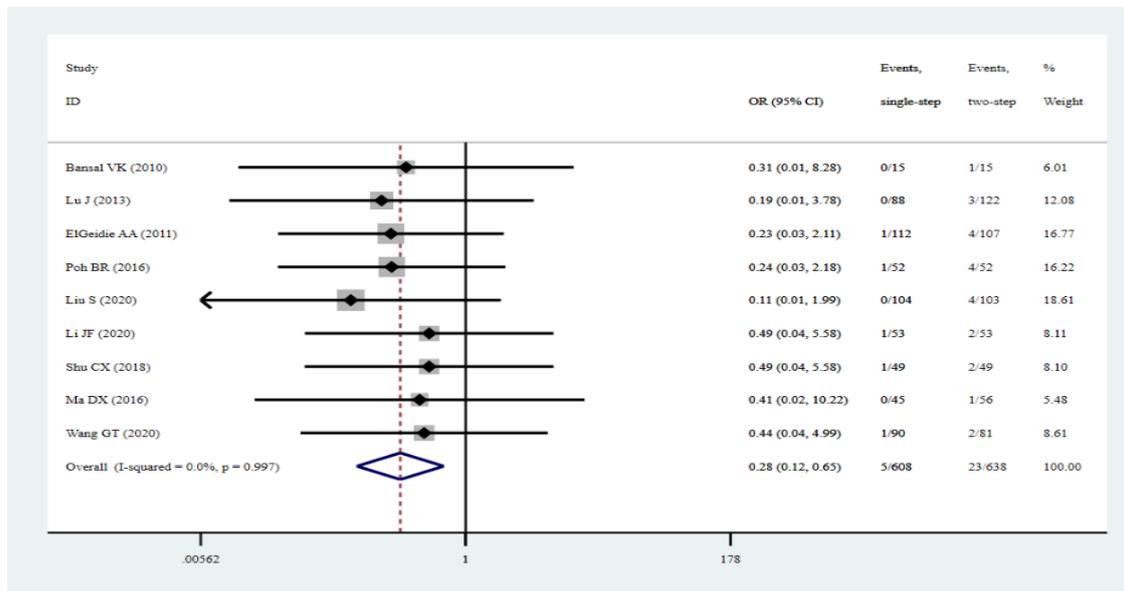


Figure 9: Biliary bleeding incidence rate Meta-analysis results

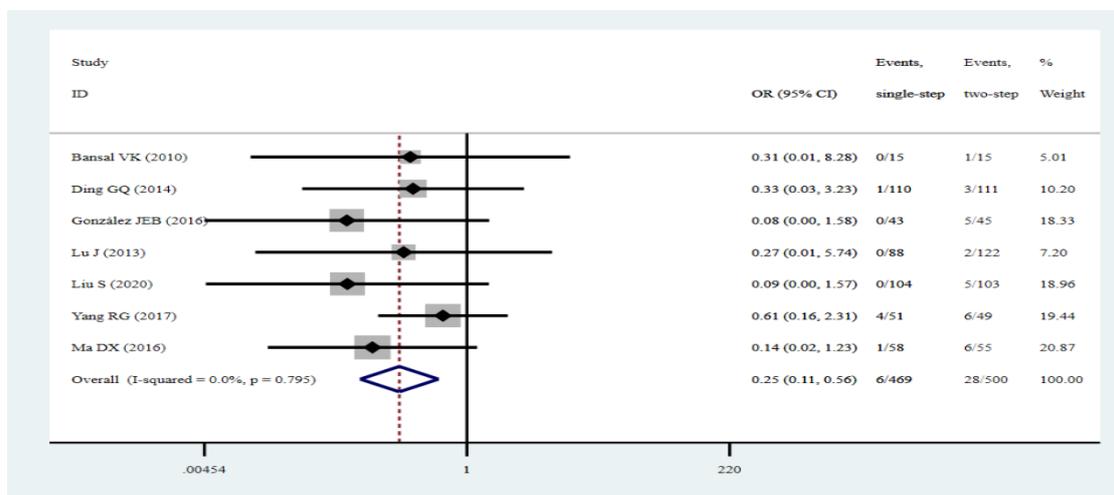


Figure 10: Bilebladitis incidence rate META analysis results

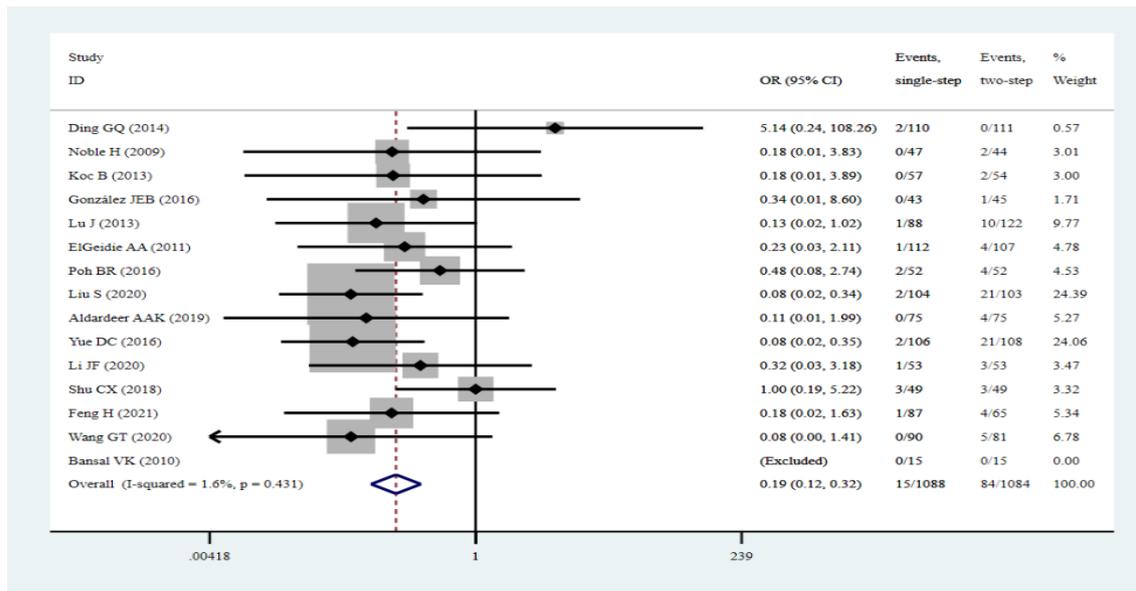


Figure 11: The result of the incidence of pancreatitis META analysis results

After surgery, 15 documents reported the postoperative hospitalization time. The results of the random effect model META analysis showed that the "one-step method" was significantly shorter after the operation of the operation (WMD = -1.07D, 95%CI: -2.00, - 0.14), as shown in Figure 12.

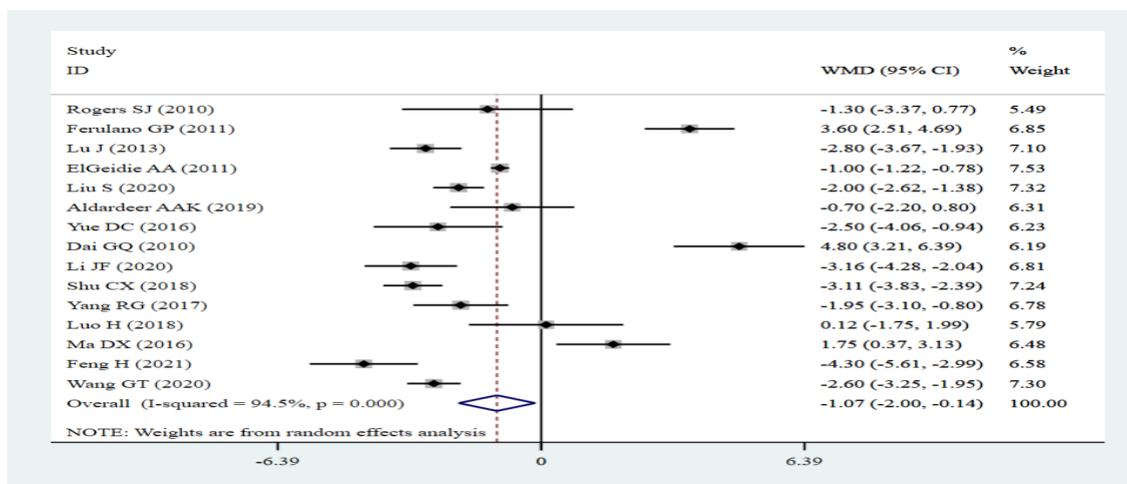


Figure 12: After surgery, hospitalization time Meta-analysis results

3.3 The results of the EGGER

Inspection of bias show that the CBD Qingshi rate, the incidence of rotation, the retention rate of the stones, the recurrence rate of the stones, the total incidence of complications, and the postoperative hospitalization time do not have publishing bias. The funnel diagram is shown in Figure 13. The incidence of bile missing and bile tubeitis has been published (P <0.05), and the incidence of the remaining complications has published bias (P > 0.05).

Table 2 in the Egger test results.

Table 2: Egger inspection results of each ending indicator

ENDING INDICATOR	COEFFICIENT	SE	T	P
CBD QINGSHI RATE	-2.164	2.461	-0.88	0.398
TURNOVER	2.029	1.309	1.55	0.152
STONES RESIDUE RATE	-1.043	2.025	-0.51	0.618
LONE RECURRENCE RATE	0.591	0.675	0.88	0.431
GENERAL INCIDENCE OF COMPLICATIONS	-0.636	0.568	-1.12	0.278
BILE LEAK	4.890	1.416	3.45	0.005
ABDOMINAL INFECTION/INCISION INFECTION	0.493	0.942	0.52	0.619
BILIARY BLEEDING	-0.093	0.261	-0.35	0.733
CHOLANGITIS	-0.485	0.146	-3.33	0.021
ACUTE PANCREATITIS	-0.835	0.876	0.95	0.359
POSTOPERATIVE HOSPITALIZATION TIME	0.065	1.778	0.04	0.971

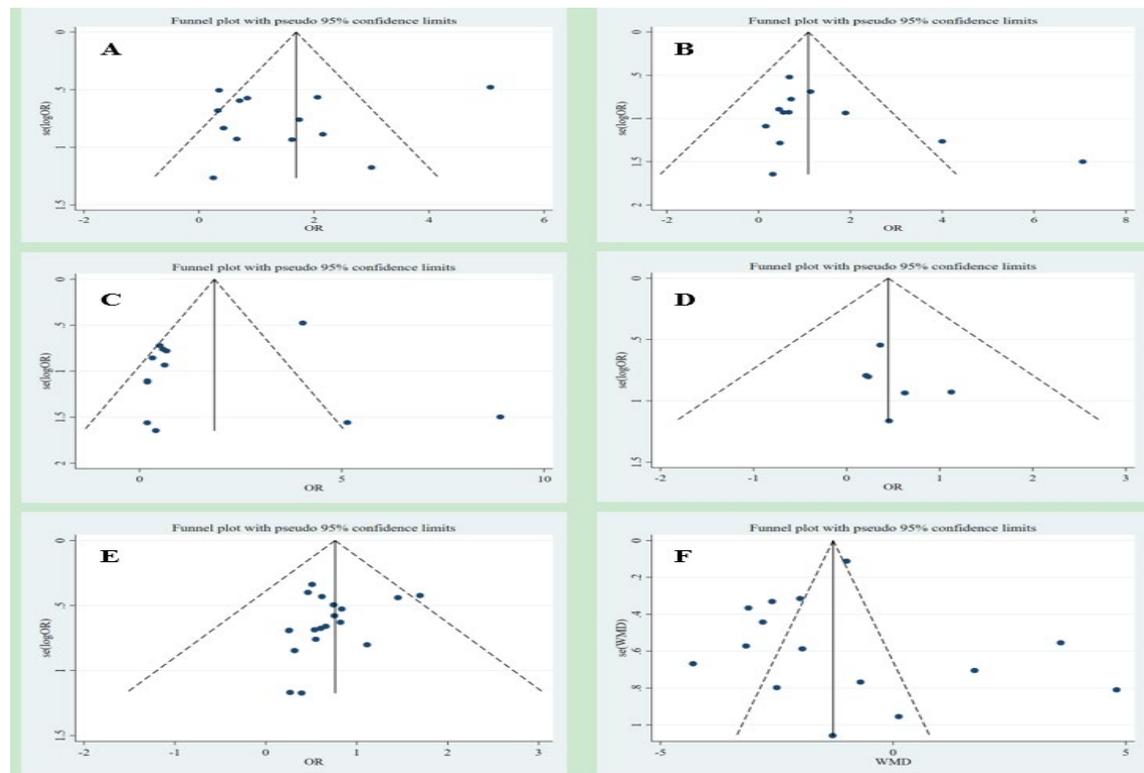


Figure 13: Publish bias funnel diagram

Figure A: CBD Qingshi Rate; **Figure B:** Rotary Open Humanity; **Figure C:** Stone Residual Rate; **Figure D:** Reproduction of stones; **Figure E:** Total incidence of complications; **Figure F:** Postoperative hospitalization time.

4. DISCUSSION

LCBDE combined with LC, ERCP/EST sequential LC is the two most commonly used minimally invasive techniques for gallbladder stones with

CBDS surgical treatment (Bansal et al., 2010; Ding et al., 2014). ERCP/EST sequential LC trauma is small, patients with good tolerance, suitable for poor basic conditions and older patients (Koc et al., 2013; Noble et al., 2009), but the surgical stones residue rate is at a high level, and the gastrointestinal obstruction (BRASLOW, 1986; González et al., 2016), the giant stones of the biliary tube are combined. The success rate of surgery is low (Ferulano et al., 2011; Lu et al., 2013). In addition, ERCP/EST sequences can also occur after LC surgery, such as pancreatitis, abdominal infections, etc. (ElGeidie et al., 2011; Poh et al., 2016), and EST may cause adverse events such as nipple bleeding and ODDI sphincter damage. The risk of bile duct cancer (Liu et al., 2020). LCBDE combined with LC can remove the gallbladder and perform stones for the gallbladder in the first phase of the biliary pipe, which can avoid the long-term hospitalization time caused by secondary surgery, and it can also reduce the occurrence of nipple sphincter injury and related complications. Combined with gravel technology, it can be used for clear stones and embedded stones (Aldardeer & Redwaan, 2019). LCBDE combined with LC can adopt phase I (PS) after surgery to improve patients' comfort in patients, avoid adverse events such as biliary tract retrograde infection, T tube falling, and electrolyte disorders caused by T-tubes (Ding & Yan, 2023). Patients who cannot suture stage I can perform T tube drainage. However, LCBDE combined with LC surgery has a large trauma, a long anesthesia time, and a higher incidence of complications such as bile missing (Culver, 2022).

Overall, LCBDE combined with LC, ERCP/EST sequence LC for gallbladder stones with CBDS treatment has their own advantages and disadvantages. The Guide released by the European Liver Research Association in 2016 recommends the advanced endoscopic sphincter cutting and stones, and later LC. With the development and improvement of laparoscopic technology, the defects of LCBDE and LC have gradually improved, and domestic and foreign researchers have conducted a lot of related research. GAO et al. A META analysis released in 2017 shows that LCBDE combined with LC and ERCP/EST combined with LC treatment gallbladder stones combined with CBDS effects and security, but the literature included in the study did not clearly specify endoscopic technology and LC's LC Application. ZHU et al. A Meta-analysis released by researchers in 2015 showed that the effect of LCBDE combined with LC and ERCP sequencing LC treatment of gallbladder stones is similar to postoperative complications, but LCBDE combined with LC can reach a higher clear stone rate rate. The patient's postoperative hospitalization time is shorter. However, the control group of this study was only included in the ERCP sequence LC, not considering EST, and less included in the literature. Only 8 articles, and part of the study before 2005, cannot reflect the advantages of laparoscopic technology in recent years. Overall, the current evidence-based medical research evidence cannot fully evaluate the effects and security of LCBDE combined with LC and ERCP/EST sequential LC.

This study was collected and data extracted from the relevant documents from 2005 to 2021. It was included in 21 documents from 9 countries, and compared the "one-step method" LCBDE combined with LC, ERCP/EST preface LC treatment gallbladder stones merger merger merger The effect and safety of CBDS. In terms of effect, there are no significant differences in the CBD clear stone rate and stones of the two surgical schemes. The surgical success rate is at a high level. There is no statistical difference between the transit rate. The LCBDE combined with LC stones is relatively low, prompting it to achieve a more ideal medium-term effect, which may be related to its higher clear stone efficiency. In addition, the "one-step method" LCBDE combined with LC has certain advantages in terms of security. Although the incidence of bile missing is high, the total incidence rate is significantly low. Compared with ERCP/EST sequence LC's pancreatitis, bile tubeitis. The incidence of biliary bleeding is significantly reduced, and patients have a short postoperative hospitalization time.

The above results suggest that the "one-step method" LCBDE combined with LC is more satisfactory, which is conducive to postoperative rehabilitation and hospitalization cost control. However, the "one-step method" LCBDE combined with LC should pay attention to the prevention and control of bile leakage. The occurrence of bile missing can be affected by various factors, including patient's disease characteristics, pre-surgery, and operation during physician surgery. Preoperative examination fully grasps the difficulty of the condition and surgery, the operation standards during the operation, and attach importance to the anatomical mutation can reduce the risk of bile missing to a certain extent. Doctors should evaluate bile missing in the early stage after surgery, and find that endoscopic treatment and laparoscopic treatment are treated in time when bile missing.

5. Conclusion

The meta-analysis focusing on the one-step method of laparoscopic bile tube detection and cholecystectomy in male athletes for the treatment of gallbladder and chassis stones provides valuable insights into the management of these conditions in this unique patient population. The findings of this study suggest that the one-step method is a promising and minimally invasive approach for the treatment of gallbladder and chassis stones in male athletes.

The combination of bile duct stone detection and cholecystectomy in a single laparoscopic procedure offers several advantages, including reduced surgical invasiveness, shorter recovery times, and the potential for athletes to return to their sports activities more swiftly. While this meta-analysis underscores the potential benefits of the one-step method, it also emphasizes the need for individualized care and consideration of patient-specific factors when determining the most suitable treatment approach. Each athlete's unique

health profile, athletic demands, and stone characteristics should guide treatment decisions to optimize outcomes. Furthermore, this research contributes to the ongoing dialogue in sports medicine and surgical practice, providing evidence-based insights that may influence treatment protocols and enhance the overall well-being of male athletes facing gallbladder and chasis stones. By addressing the specific healthcare needs of this patient population, this study seeks to support athletes in their journey toward excellence in sports while effectively managing these challenging medical conditions.

Data Availability Statement

The data used to support the findings of this study are available from the corresponding author upon request.

Funding Statement

We haven't received any funding.

Conflict of interest

Authors have no conflict of interest to declare.

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