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Prospective study of intraoperative and post-operative complications during laparoscopic cholecystectomy among patients presenting with acute calculous cholecystitis

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ABSTRACT

Background: Acute cholecystitis was initially thought to be a contraindication for laparoscopic cholecystectomy. Now, as the experience is increasing, laparoscopic surgeons are gradually undertaking laparoscopic cholecystectomy as the preferred procedure even in an acute setting. Early surgery in acute presentation has better surgical outcome with lesser and cheaper hospital stay and predictive of better quality of life as compared to delayed treatment. **Aims and Objectives**: The objectives of this study were to study the perioperative complications during early laparoscopic cholecystectomy. **Materials and Methods**: One hundred and five patients with acute calculus cholecystitis visiting Fortis Escorts Hospital, Faridabad from June 2017 to November 2018 were studied. All patients underwent laparoscopic cholecystectomy and subsequently compared for the following intraoperative parameters: Presence of adhesions, calot's anatomy, need for decompression of gallbladder, difficulty in dissecting the gallbladder from liver bed, retrieval of gallbladder, time taken to complete surgery, need of placement of drain, and need for conversion to open cholecystectomy. Complications studied were massive bleed, bile spillage during dissection, stone spillage, duodenal injury, and common bile duct [CBD] injury. **Results**: Decompression of the acute inflamed gallbladder facilitates laparoscopic cholecystectomy in acute cholecystitis with low conversion rate of 2.86%. Bleeding, CBD injury and duodenal injury are uncommon complications but major factors for conversion. **Conclusion**: Most common reasons for difficulty in laparoscopic cholecystectomy for acute cholecystitis were found to be adhesions in Calot's triangle and adhesion of gallbladder with surrounding structures (duodenum/transverse colon).

Key words: Acute calculous cholecystitis; Laparoscopic cholecystectomy; Complications

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INTRODUCTION

Laparoscopic cholecystectomy is well established as gold standard for cholelithiasis. Its role in acute cholecystitis was thought to be contraindicated initially. However, with improvement in laparoscopic skills, the procedure has become common for management of acute cholecystitis in many institutions. Early cholecystectomy is defined as a surgery within 4–7 days after onset of symptoms. Delayed cholecystectomy is defined as a delay of surgery for 6–12 weeks after the initial admission. About 17.5% (range 13.9–25%) of patients in whom surgery is delayed, require urgent surgery during the interval period, for failure of conservative treatment, or recurrent symptoms after discharge, and in this subset, the conversion rate is 45%.

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The European Association for Endoscopic surgery Consensus Conference statement also asserts early laparoscopic cholecystectomy to be the treatment of choice for acute cholecystitis. Furthermore, several reports show that early cholecystectomy is safe and effective even in the severe forms of the disease such as gangrenous, perforated, or emphysematous gallbladder or in the elderly population. There is clearly a higher rate of conversion in the setting of acute cholecystitis. It is lowest (9.5%) if surgery is performed within 2 days from the onset of symptoms, rises to 16% if surgery is done within 4 days. Thereafter, the conversion rate is similar to that of delayed surgery (38.9%).[1] The present study is conducted to assess intraoperative and post-operative complications during laparoscopic cholecystectomy among patients presenting with acute calculous cholecystitis.

Aims and objectives

The objectives of this study were to study the perioperative complications, laparoscopic to open conversion rate, and post-operative outcomes during early laparoscopic cholecystectomy.

MATERIALS AND METHODS

Patients with clinical features and ultrasound of the abdomen suggestive of acute calculus cholecystitis were included in this prospective observational cross-sectional study conducted during June 2017–November 2018 in the Department of Surgery, Fortis Escorts Hospital, Faridabad, Haryana, India. The study was pre-approved by the Institutional Ethics Committee for the final permission on 12/02/2018 with EIC number ECR/430/INST/HR/2013/RR-16.

Inclusion criteria

Patients admitted through emergency or outpatient department with complaints of the right upper abdominal pain and whose clinical examination and ultrasound of the abdomen was suggestive of acute calculus cholecystitis were included under study, irrespective of their age and gender.

Exclusion criteria

Patients having deviation from the inclusion criteria were excluded from study, for example, pancreatitis (raised serum lipase with radiological confirmation), perforated gallbladder with generalized peritonitis, choledocholithiasis, cholangitis, asymptomatic gall stones, obstructive jaundice, and acalculus cholecystitis. Pre-operative strategies: Patients with aforementioned inclusion criteria were admitted. Further, investigation included (Hemoglobin, total leukocyte count, differential leukocyte count, liver function test, kidney function test, prothrombin time, international normalized ratio, serum amylase, chest X-ray, and electrocardiogram). Patients were taken up for surgery after an informed written consent within 24 h of admission after pre-operative anesthetic fitness. Prophylactic antibiotics Inj. Cefuroxime 1.5 g I/V stat and Inj. Pantoprazole 40 mg I/V were given ½ h before incision. A standard procedure of four port laparoscopic cholecystectomy was performed. The following intraoperative parameters were noted.

Statistical analysis

Categorical variables were presented in number and percentage and continuous variables were presented as mean±SD and median. Appropriate statistical test was applied. The data were entered in Microsoft Excel spreadsheet and analysis was done using the Statistical Package for the Social Sciences version 21.0.

RESULTS

The proposed study was conducted in the Department of Surgery, Fortis Escorts Hospital, Faridabad, Haryana, India, over a period of approximately 16 months. All patients suffering from symptomatic cholelithiasis were included in

Presence of adhesions	Calot's anatomy	Need for decompression of gallbladder	Difficulty in dissecting the gallbladder from liver bed in term of	Retrieval of gallbladder
1.Clear 2. Filmsy 3. Dense	1. Clear 2. Clear after dissection 3. Not clear even after dissection	1. Yes 2. No	1. Bleeding 2. Bile leak due to perforation 3. Need of subtotal cholecystectomy	1. Easy 2. Difficult

Time taken to complete the surgery	Need of placement of drain	Need for conversion to open cholecystectomy	Complications studied
	1. Yes 2. No	1. Yes 2. No	1. Massive bleeding 2. CBD injury 3. Duodenal injury 4. Bile spillage 5.Stone spillage

CBD: Common bile duct

the study as per the study protocol. A total of 105 patients were operated during the study period.

Operative time

In our study, the mean operative time was 83.33 min, which is longer than operative time of elective laparoscopic cholecystectomy. This is attributed to the fact that edematous, inflamed gallbladder makes dissection a bit difficult.

Intraoperative

1. Presence of adhesions
2. Calot's anatomy
3. Difficulty during dissection
4. Subtotal cholecystectomy
5. Retrieval of gallbladder
6. Placement of drain
7. Need for conversion to open cholecystectomy

Complications

Complications				
Massive bleeding	**CBD injury**	**Duodenal injury**	**Bile spillage**	**Stone spillage**
0.95%	0	0	13.33%	12.38%

CBD: Common bile duct

DISCUSSION

Laparoscopic cholecystectomy has become the gold standard for the treatment of symptomatic gall stone disease. The various features that increase the technical difficulty are adhesions in the Calot's triangle (the hepatic artery, common bile duct [CBD], and cystic duct), distorted anatomy, empyema of the gallbladder, contracted gallbladder, Mirrizi's syndrome, previous upper abdominal operations, and cholecystitis. The conversion rates in various studies range from 1.5% to 35%.[2] The present study was carried out on 105 patients for 16 months in the Department of Surgery, Fortis Escorts Hospital, Faridabad, Haryana, India.

In the present study, the mean operative time was 83.33 min, which is longer than for elective laparoscopic cholecystectomy. Edematous, inflamed, gallbladder made dissection difficult. Cirocchi et al., had a median operation time of 84 min.[3] In this study, 43 (40.95%) cases had flimsy adhesions and 62 (59.05%) cases had dense adhesions (Figure 1). Sinha and Sharma, in their series, reported that 71 of the 281 patients with a gallbladder phlegmon had Zuhlke type 1 or 2 omental adhesions.[4] Adhesions are hallmark of inflammation and most of these adhesions are vascularized in acute setting. Sixteen (15.24%) cases out of 105 had clear Calot's anatomy, 86 (81.90%) had clear anatomy after dissection, and 3 (2.86%) patients did not have a clear Calot's anatomy even after dissection (Figure 2) in our study. All three patients were converted to open and underwent a fundus first cholecystectomy.

The present study revealed 22 (20.95%) cases out of 105, needed decompression of gallbladder (Figure 3). Lee et al., found that Veress needle decompression of the acutely inflamed gallbladder facilitated laparoscopic cholecystectomy in acute cholecystitis with low conversion rates.[5]

In the present study, 15 (14.29%) cases out of 105 had bleeding during dissection (Figure 3). Bleeding is a known complication of laparoscopic cholecystectomy with incidence up to 10% as reported in different series. Primary bleeding occurred in one case due to avulsion of cystic artery, which required conversion to open cholecystectomy. Reactionary hemorrhage occurred in three patients (0.96%)

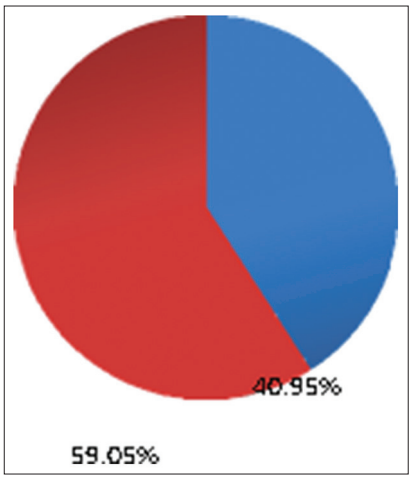

Figure 1: In our study, 43 (40.95%) cases out of 105 had flimsy adhesions, 62 (59.05%) cases had dense adhesions

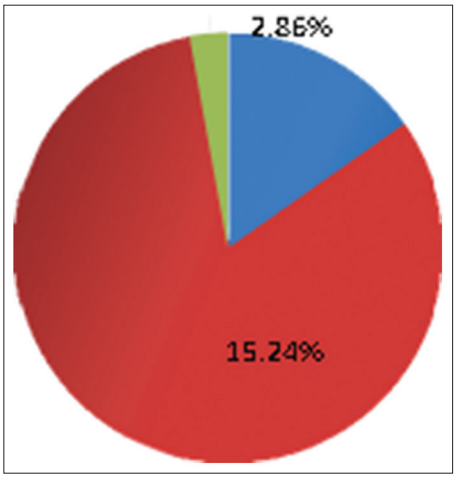

Figure 2: We observed that 16 (15.24%) cases out of 105 had clear Calot's anatomy, 86 cases (81.90%) had clear anatomy after dissection, and 3 (2.86%) patients did not have a clear Calot's anatomy even after dissection

from divided omental adhesions. Hemoperitoneum (0.32%) was diagnosed during 2nd post-operative week due to oozing of blood from liver bed due to underlying coagulopathy.[1]

None of our patients needed subtotal cholecystectomy (Figure 4). In a retrospective study of K J Ransom, out of total 125 cases, 31 had acute cholecystitis; eight patients among them required a subtotal cholecystectomy due to severe inflammation.[6]

Forty-five (42.86%) cases out of 105 had difficult retrieval and 60 (57.14%) cases had easy retrieval of gallbladder in the present study (Figure 5). Umbilical port was used for retrieval of the gallbladder. Memon et al., had difficult retrieval of gallbladder in acutely inflamed cases in 1.88% patients through umbilical port and difficulty in retrieval of gallbladder in 5.33% through epigastric port while retrieving with leakage or perforation of gallbladder in 4.11% patients.[7]

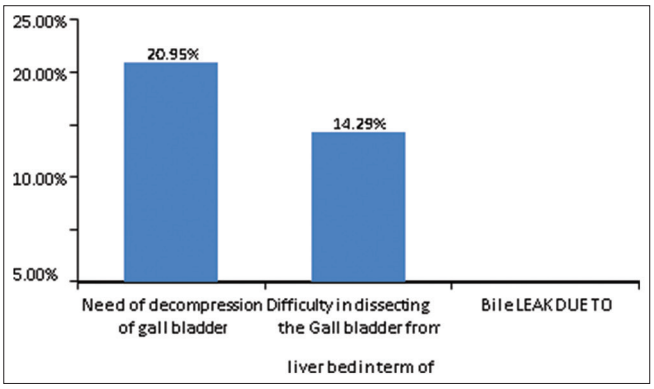

Figure 3: In our study, 22 (20.95%) cases out of 105 needed decompression of gallbladder, while 15 (14.29%) had bleeding during dissection; however, none of the cases had bile leak due to perforation.

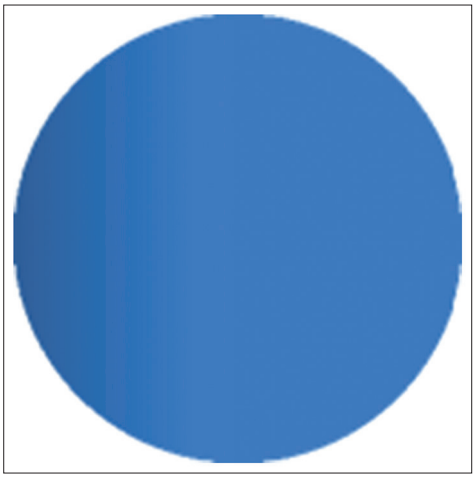

Figure 4: In our study, none of the patients underwent subtotal cholecystectomy

In the present study, 8 (7.62%) cases out of 105 needed placement of a drain (Figure 6). Sharma and Gupta reported that the routine drainage of gallbladder bed after elective laparoscopic cholecystectomy may not be justified and caused more post-operative pain and complications and prolonged the hospital stay.[8] However, in acute setting, since the tissues are oozing and there is presence of infection, drainage would appear prudent to prevent any intra-abdominal collection.

In this study, 3 (2.86%) cases out of 105 needed conversion to open cholecystectomy (Figure 7) due to massive bleeding and unclear calot's anatomy even after dissection due to dense adhesions. Out of 311 cases of acute cholecystitis about ten cases ended up with open cholecystectomy due to various reasons[1] in a study by Schäfer et al., and another study concluded that the conversion rate increased from

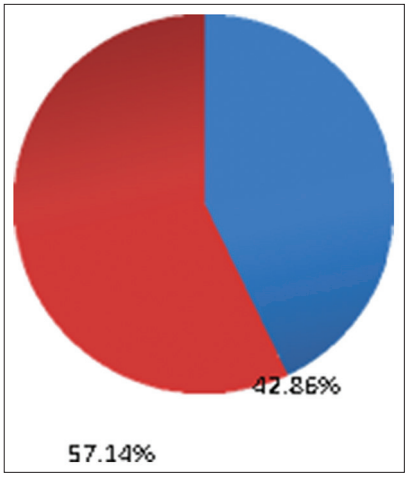

Figure 5: In our study, 45 (42.86%) cases out of 105 had difficult retrieval and 60 (57.14%) cases had easy retrieval of gallbladder. We used umbilical port for retrieval

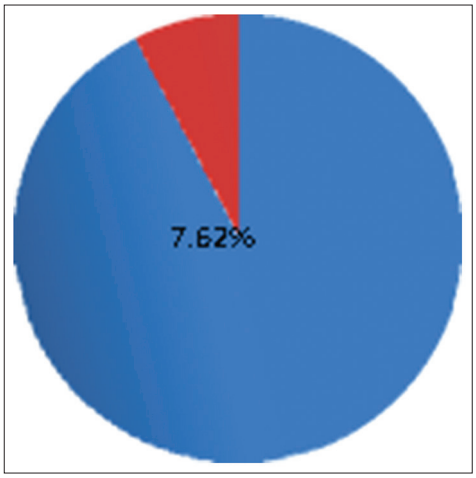

Figure 6: In our study, eight (7.62%) cases out of 105 needed placements of a drain

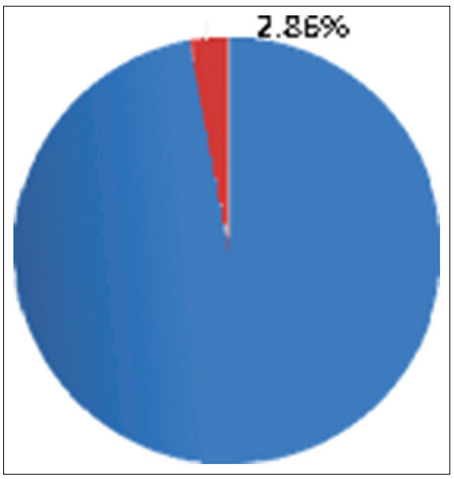

Figure 7: In our study, three (2.86%) cases out of 105 needed conversion to open cholecystectomy

10% for mild acute cholecystitis up to 48% for necrotizing acute cholecystitis.[9]

In our study, only one case (0.95%) had massive bleed during surgery, which was due to dense adhesions around Calot's triangle and got controlled by converting to open and retracting the bulky Hartmann's. The patient did not need any blood transfusion and had an uneventful post-operative recovery. Bleeding complications account for up to one third of all major complications seen in LC and are the second most common cause of death in patients undergoing the procedure. The reported incidence of uncontrollable bleeding in LC can be up to 2% (reported range, 0.03–10%), but the exact figure may actually be much higher. When bleeding occurs, the LC-related mortality reportedly goes up to nearly 15%, especially when the bleeding remains unrecognized.

Although acute cholecystitis, cirrhosis, and portal hypertension were also considered to be associated with higher complication rates and incidence of bleeding, recent reviews have suggested to the contrary; LC may actually be the procedure of choice in such patients, due to shorter operating time, lesser bleeding, and lower complication rates, especially when performed by an experienced operating team.[10]

In our study, 14 cases (13.33%) had bile spillage during dissection, the reason being that an inflamed, over distended gallbladder becomes friable and gets torn during retraction, even after decompression. Peponis et al., had an almost 59% rate of the bile spillage in laparoscopic cholecystectomy. In their study, 202 (20.2%) patients had bile spillage with accompanying stone spillage.[11]

In our study, 13 cases (12.38%) out of 105 had stone spillage during laparoscopic cholecystectomy. Papasavas et al., have mentioned 127 cases of spilled gallstones, of which 44.1% presented with intra-peritoneal abscess, 18.1% with abdominal wall abscess, 11.8% with thoracic abscess, 10.2% with retroperitoneal abscess, and the rest with various clinical pictures.[12] None of our patients presented with any such complications, which may be due to the fact that the sub hepatic space was packed with gauze during dissection, and each and every spilled stone was retrieved.

None of the cases in this study had duodenal injury. Avrutis et al., reported duodenal laceration presenting as massive hematemesis and multiple intra-abdominal abscesses after laparoscopic cholecystectomy.[13] Although duodenal lacerations have been reported with laparoscopic cholecystectomies, they are rare; approximately 30 such cases have been documented previously in the English literature.[13] In one study, Sharma and Singh reported duodenal injury in laparoscopic cholecystectomy as extremely fatal, four out of five patients (80%) did not survive. They attributed high mortality to delayed recognition resulting in septicemia, which persisted despite definitive surgery ultimately leading to multi-organ failure and death.[14]

None of the cases in this study had CBD injury. Bile duct injury occurred in one of 66 patients with acute cholecystitis treated laparoscopically, two of 227 cases of routine laparoscopic cholecystectomy but in no patient who underwent open cholecystectomy.[15]

Limitations of the study

Since this is a small sample study, a large sample size would give further inputs to the accuracy of these findings. Multivariate analysis, with a large sample size, would also be needed to give better and accurate predictions.

CONCLUSION

This prospective study was conducted on 105 patients undergoing laparoscopic cholecystectomy in the Department of Surgery in tertiary care institute in North India for 1 and 1/2 year from June 2017 to November 2018 to find intraoperative and post-operative complications during laparoscopic cholecystectomy among patients presenting with acute calculous cholecystitis.

The results of above study were: Gallstone disease is more common in females than in males with mean age 47.42±13.85 years. Most common reason for difficulty in laparoscopic cholecystectomy for acute cholecystitis was adhesions in Calot's triangle and adhesion of gallbladder with surrounding structures (duodenum/transverse colon).

Decompression of the acute inflamed gallbladder facilitates laparoscopic cholecystectomy in acute cholecystitis with low conversion rate of 2.86%. Bleeding is not a common complication but major factor for conversion into open cholecystectomy. Low threshold of conversion helps to improve patient outcome. CBD injury and duodenal injury are uncommon complications of laparoscopic cholecystectomy.

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REFERENCES

1. Afzal M, Mustafa MN, Zaidi AH, Chaudhry IA, Hanif MS and Shaikh SA. Outcome of early laparoscopic cholecystectomy for acute cholecystitis. J Islamabad Med Dent Coll (JIMDC). 2016:5(1):17-20.
2. Mishra BM, Behera AN and Jha RK. Preoperative predictors for conversion in laparoscopic cholecystectomy. J Med Sci Clin Res. 2017;5(12):31426-31440.
   https://doi.org/10.18535/jmscr/v5i12.34
3. Cirocchi R, Del Sol A, Morelli U, Cattorini L, La Mura F, Napolitano V, et al. Laparoscopic cholecystectomy for acute cholecystitis. G Chir. 2008;29(6-7):305-311.
4. Sinha R and Sharma N. Difficult laparoscopic cholecystectomy in acute cholecystitis: Use of 'finger port', a new approach. HPB (Oxford). 2003;5(3):133-136.
   https://doi.org/10.1080/13651820310015275
5. Lee KT, Shan YS, Wang ST, Lin PW. Verres needle decompression of distended gallbladder to facilitate laparoscopic cholecystectomy in acute cholecystitis: A prospective study. Hepatogastroenterology. 2005;52(65):1388-1392.
6. Ransom KJ. Laparoscopic management of acute cholecystitis with subtotal cholecystectomy. Am Surg. 1998;64(10):955-957.
7. Memon JM, Memon MR, Arija D, Bozdar AG and Talpur MM. Retrieval of gallbladder through epigastric port as compared to umbilical port after laparoscopic cholecystectomy. Pak J Pharm Sci. 2014;27(6 Spec No.):2165-2168.
   https://doi.org/10.7759/cureus.18087
8. Sharma A and Gupta SN. Drainage versus no drainage after elective laparoscopic cholecystectomy. Kathmandu Univ Med J (KUMJ). 2016;14(53):69-72.
9. Schäfer M, Krähenbühl L and Büchler MW. Predictive factors for the type of surgery in acute cholecystitis. Am J Surg. 2001;182(3):291-297.
   https://doi.org/10.1016/S0002-9610(01)00702-4
10. Kaushik R. Bleeding complications in laparoscopic cholecystectomy: Incidence, mechanisms, prevention and management. J Minim Access Surg. 2010;6(3):59-65.
    https://doi.org/10.4103/0972-9941.68579
11. Peponis T, Eskesen TG, Mesar T, Saillant N, Kaafarani HM, Yeh DD, et al. Bile spillage as a risk factor for surgical site infection after laparoscopic cholecystectomy: A prospective study of 1,001 patients. J Am Coll Surg. 2018;226(6):1030-1035.
    https://doi.org/10.1016/j.jamcollsurg.2017.11.025
12. Papasavas PK, Caushaj PF and Gagné DJ. Spilled gallstones after laparoscopic cholecystectomy. J Laparoendosc Adv Surg Tech A. 2002;12(5):383-386.
    https://doi.org/10.1089/109264202320884144
13. Avrutis O, Meshoulam J, Yutkin O, Mikchalevski V, Haskel L, Adler S, et al. Brief clinical report: Duodenal laceration presenting as massive hematemesis and multiple intraabdominal abscesses after laparoscopic cholecystectomy. Surg Laparosc Endosc Percutan Tech. 2001;11(5):330-333.
    https://doi.org/10.1097/00129689-200110000-00009
14. Sharma M and Singh R. Iatrogenic duodenal injury in laparoscopic cholecystectomy: A fatal complication. New Indian J Surg. 2018;9(2):161-165.
    https://doi.org/10.21088/nijs.0976.4747.9218.9
15. Kum CK, Goh PM, Isaac JR, Tekant Y and Ngoi SS. Laparoscopic cholecystectomy for acute cholecystitis. Br J Surg. 1994;81(11):1651-1654.
    https://doi.org/10.1002/bjs.1800811130

Authors' Contributions:
RK- Concept and design of the study and reviewed the literature; **C**- Coordination and patient study; **RKS**- Coordination and patient study; **VS**- Prepared the draft of manuscript, statistical analysis, and interpretation.

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