



Evaluation of Pre-operative Ultrasonography in Gall Stone Disease to Predict Technical Difficulties during Laparoscopic Cholecystectomy at Surgery Department of ShSMCH.

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Abstract

Background: Laparoscopic cholecystectomy is the gold standard in the treatment of gallstones. Gallstones are one of the major causes of morbidity in Western society. Prevalence of people with gallstones, whether symptomatic or asymptomatic, varies from 5 to 22%. **Aim of the study:** To evaluate the efficacy of pre-operative ultrasonography in assessing technical difficulty faced during laparoscopic cholecystectomy in gallstone disease. **Methods:** This observational study was conducted in the department of Surgery, Shaheed Suhrawardy Medical College Hospital (ShSMCH). A total of 80 patients were included in the study. The sample was selected by the purposive sampling technique. Collected information is compiled, analyzed and edited using the software SPSS (version 24.0) (IBM) Chicago, Illinois. After receiving approval from the ethical review committee of Shaheed Suhrawardy Medical College Hospital, Dhaka, the present study was conducted. **Results:** In this study, there was a total of 80 cases, among which 33 (41.25%) were in the group between 41-50 years, the commonest. The mean age was 41.8 ± 11.7 years. 60 (75%) were female, and 20 (25%) were male. 45 (56.25%) turned out to have undergone normal laparoscopic cholecystectomies. 35 (43.75%) were difficult, among which 3 (3.75%) were converted to open cholecystectomies. 85% patients with gallbladder wall thickness $< 3\text{mm}$ and 12/80 (15%) patients $> 3\text{mm}$. 66 (97%) had no adhesions, but the other two (3%) did. The mean level of difficulty of Calot's triangle dissection was in 0.25 ± 0.44 patients. 79% had undergone easy gallbladder bed dissection, and 21% had undergone difficult gallbladder bed dissection. The mean level of difficulty in holding gallbladder was in 0.25 ± 0.44 patients. Among the 62 patients with a normal gallbladder, there was no difficulty in holding gallbladder in 53 (85.5%) cases, whereas there was difficulty in holding the gallbladder in 9 (14.5%) cases. Mean bleeding occurred in 0.35 ± 0.53 patients. **Conclusion:** From this study, we conclude that pre-operative ultrasonography is a good predictor of difficulty in laparoscopic cholecystectomy in most cases and should be used as a screening procedure.

Keywords: Gallstones, Laparoscopic Cholecystectomy, Ultrasonography, Technical.

INTRODUCTION

Gallstones are one of the major causes of morbidity in Western society. The prevalence of people with gallstones, whether symptomatic or asymptomatic, varies from 5 to 22%. There is a consensus that only patients with symptomatic gallstones need treatment. In previous studies that attempted to relate abdominal symptoms to the presence of gallstones, about one-third of stones were found to be symptomatic, meaning that 2-8% of Western populations would need treatment in their lifetime.^[1] Laparoscopic Cholecystectomy (LC) is a revolutionary change in the treatment of patients with gallbladder stones. Mouret introduced laparoscopic cholecystectomy in 1987. It has rapidly replaced open cholecystectomy as the standard treatment.^[2] It has advantages over traditional open cholecystectomy in terms of minimal post-operative pain, shorter hospital stay, better cosmesis and earlier recovery.^[3] In addition to numerous advantages, also technical limitations of laparoscopy should be mentioned, which in the presence of chronic inflammation resulting in pricystic adhesions and conglutination increase the risk of undesirable conversion from laparoscopic cholecystectomy to open surgery.^[4] The ability to accurately identify an individual patient's risk for difficult cholecystectomy based on pre-operative information can result in more meaningful and accurate pre-operative counseling, improved operating room scheduling and efficacy, stratification of risk for technical difficulty and appropriate assignment of resident assistance, may improve patient safety by minimizing time to conversion and helps to identify patients in whom a planned open cholecystectomy is

indicated.^[5] The highest prevalence is found in the Pima Indian tribe of Arizona with total and female prevalence of 49% and 73%, respectively.^[6] Cholelithiasis has worldwide scope, with estimated incidence of 1.39/100 person per year, varying little between populations.^[7] Detection of gallstone on the basis of ultrasonography has been able to reach reliably in greater than 90% of symptomatic patients. Measurement of the gallbladder wall thickness by ultrasound is accurate to within 1mm in 93% of patients. Gallbladder wall thickness greater than 3mm suggests cholecystitis in some, but not all literature reports.^[8] The positive predictive value of ultrasonography for predicting difficult laparoscopic cholecystectomy was 80.95%.^[9] In 84% of the patients with a gallbladder wall thickening (>4mm) in a study, surgeons encountered surgical difficulties.^[10] Approximately 2-15% of attempted LC has to be converted to DLC.^[11] A study conducted by Ajay Anand et al. found 17.61% patients in their study group who had wide cystic duct. K toress et al. in their study found that 37.6% of patients had an atypical course of cystic artery.^[12] Nowadays laparoscopic cholecystectomy is considered a gold standard for treating symptomatic gall stones, but the procedure is technically more demanding than the classical open cholecystectomy, especially in difficult cholecystectomy.^[10]

OBJECTIVES:

- **General objective:**
 - The study is designed to evaluate the efficacy of pre-operative ultrasonography in assessing technical difficulty faced during laparoscopic cholecystectomy in gallstone disease.

- **Specific Objectives:**

- To assess the predictive factors of difficult laparoscopic cholecystectomy
- To assess difficult access into peritoneal cavity
- To assess difficult dissection of Calot's triangle
- To assess difficult dissection of gallbladder bed
- To assess difficult gallbladder extraction from abdomen

- **Inclusion Criteria**

- All the consecutive patients undergoing laparoscopic cholecystectomy for gallstone disease.

- **Exclusion Criteria**

- Patients with CBD stones, jaundice or abnormal liver function tests
- Patients with pregnancy, peritonitis or morbid obesity
- Patients with acute cholecystitis, empyema of gallbladder, acute pancreatitis, cholangitis, biliary-enteric fistula, carcinoma gallbladder.

MATERIALS AND METHODS

This observational study was conducted in the department of Surgery, Shaheed Suhrawardy Medical College Hospital (ShSMCH). A total of 80 patients were included for the study according to the following inclusion and exclusion criteria from November 2016 to May 2017. The sample was selected by purposive sampling technique. The primary outcome variables were thickness of gallbladder wall - 3mm or more, contracted/distended gallbladder, size of gallstones, stone impacted at the neck of gallbladder and common bile duct size -7 mm or more. Presentation of patients was in the surgical units with gallstone disease. Pre-operative Ultrasonography was done to evaluate predictive factors. Informed and written consent was taken for the study. Difficulties faced during laparoscopic cholecystectomy as per predesigned data collection sheet. Collected information is compiled, analyzed and edited using the software SPSS (version 24.0) (IBM) Chicago, Illinois. After receiving approval from the ethical review committee of Shaheed Suhrawardy Medical College Hospital, Dhaka, the present study was conducted.

RESULTS

In this study, there was a total of 80 cases, among which 33 (41.25%) were in the group between 41-50 years, the commonest. The mean age was 41.8 ± 11.7 years (Table I). 60 (75%) were female, and 20 (25%) were male (Table II). Among all the 80 patients, 45 (56.25%) underwent normal laparoscopic cholecystectomies. 35 (43.75%) were difficult, among which 3 (3.75%) were converted to open cholecystectomies. None of the normal ones had to be converted to open procedures (Figure I). A total of 68/80 (85%) patients with gallbladder wall thickness <3mm and 12/80 (15%) patients >3mm. Among the 68 patients, 66 (97%) had no adhesions, but the other two (3%) did. 12 patients, 4 (33.3%) had no adhesions, but 8 (66.7%) did. Mean adhesions present was 0.25 ± 0.44 . The result is significant at $p < 0.01$ (Table III). Among the 68 patients with gallbladder wall thickness <3mm, 56 (82.3%) had undergone easy Calot's dissection and 12 (17.7%) had undergone difficult Calot's dissection. 12 patients, 4 (33.3%) underwent easy Calot's

dissection, and 8 (66.7%) underwent difficult Calot's dissection. Mean level of difficulty of Calot's triangle dissection was in 0.25 ± 0.44 patients (Table IV). Among the 68 patients with gallbladder wall thickness $< 3\text{mm}$, 51(75%) had undergone easy gallbladder dissection and 17(25%) difficult gallbladder dissection. Among 12 patients, only 1(8.3%) underwent easy gallbladder bed dissection, and 11(91.7%) underwent difficult dissection. The mean level of difficulty of gallbladder bed dissection was in 0.25 ± 0.44 patients (Table V). Among the 68 patients, there was no difficulty in holding gallbladder in 54(79.4%) cases whereas there was difficulty in holding the gallbladder in 14(25%) cases. Among the 12 patients, there was no difficulty in holding the gallbladder in only 1(8.3%) cases, whereas there was difficulty in holding the gallbladder in 11(91.7%) cases. The mean level of difficulty in holding gallbladder was in 0.25 ± 0.44 patients (Table VI). Among the 68 patients, 54(79.4%) patients had undergone no gallbladder perforation, but 14 (20.6%) had undergone gallbladder perforation. Among 12 patients, 3(25%) patients had undergone no gallbladder perforation, but 9(75%) had undergone gallbladder perforation. Mean gallbladder perforation occurred in 0.25 ± 0.44 patients (Table VII). Among the 68 patients, 51(75%) patients had undergone mild bleeding, 16 (23.5%) had undergone moderate bleeding and only 1(1.5%) had undergone severe bleeding. Among 12 patients, 2(16.7%) patients had undergone mild bleeding, 9 (75%) had undergone moderate bleeding and only 1(8.33%) had undergone severe bleeding. Mean bleeding occurred in 0.35 ± 0.53 patients (Table VIII). A total of 62/80 (77.5%) patients with normal gallbladder, 13/80 (16.25%) patients with contracted gallbladder and 5/80 (6.25%) patients with the distended gallbladder.

Among the 62 patients, 59 (95.2%) had no adhesions, rest 3 (4.8%) had adhesions. Among 13 patients, 6(46.2%) had no adhesions but 7(53.8%) did. Among the 5 patients, all 5(100%) had no adhesions. Mean gallbladder adhesions were present in 0.33 ± 0.45 patients. The p-value is 0.015. Correlation is significant at the 0.05 level (Table IX). Among the 62 patients with a normal gallbladder, 54 (87.1%) had undergone easy Calot's dissection, and 8 (12.9%) had undergone difficult Calot's dissection. Among 13 patients with a contracted gallbladder, 3(23.1%) underwent easy Calot's dissection and 10 (76.9%) underwent difficult Calot's dissection. Among 5 patients with a distended gallbladder, 3 (60%) underwent easy Calot's dissection and 2 (40%) underwent difficult Calot's dissection. The mean level of difficulty of Calot's triangle dissection was in 0.25 ± 0.44 patients (Table X). Among the 62 patients with a normal gallbladder, 49 (79%) had undergone easy gallbladder bed dissection and 13 (21%) had undergone difficult gallbladder bed dissection. Among the 13 patients with contracted gallbladder, 1(7.7%) had undergone easy gallbladder bed dissection and 12 (92.3%) had undergone difficult gallbladder bed dissection. Among 5 patients with a distended gallbladder, 2 (40%) underwent easy gallbladder bed dissection, and 3 (60%) underwent difficult gallbladder bed dissection. The mean level of difficulty of gallbladder bed dissection was in 0.35 ± 0.48 patients (Table XI). Among the 62 patients with a normal gallbladder, there was no difficulty in holding gallbladder in 53 (85.5%) cases, whereas there was difficulty in holding the gallbladder in 9 (14.5%) cases. Among 13 cases of the contracted gallbladder, there was no difficulty in holding gallbladder in 1 (7.7%) cases, whereas there was difficulty in holding the

gallbladder in 12 (92.3%) cases. Among the 5 patients with a distended gallbladder, there was no difficulty in holding the gallbladder in only 1 (20%) cases whereas there was difficulty in holding the gallbladder in 4 (80%) cases. The mean level of difficulty in holding the gallbladder was in 0.31 ± 0.47 patients (Table XII). Among the 62 patients with a normal gallbladder, 51 (82.3%) patients had undergone no gallbladder perforation but 11 (17.7%) cases had undergone gallbladder perforation. 13 cases with a contracted gallbladder, 3 (23.1%) patients had undergone no gallbladder perforation but 10 (76.9%) cases had undergone gallbladder perforation. Among 5 patients with a distended gallbladder, 3 (60%) patients had undergone no gallbladder

perforation but 2 (40%) had undergone gallbladder perforation. Mean gallbladder perforation occurred in 0.29 ± 0.46 patients (Table XIII). Among the 62 patients with normal gallbladder, 49 (79%) patients had undergone mild bleeding, 13 (21%) had undergone moderate bleeding and none had undergone severe bleeding. Among the 13 cases with a contracted gallbladder, 2 (15.4%) patients had undergone mild bleeding, 9 (69.2%) had undergone moderate bleeding and 2 (15.4%) had undergone severe bleeding. Among 5 patients with a distended gallbladder, 2 (40%) patients had undergone mild bleeding, 3 (60%) had undergone moderate bleeding, and none had undergone severe bleeding. Mean bleeding occurred in 0.35 ± 0.53 patients (Table XIV).

Table I: Age distribution of the patients

Age (in years)	(n=80) No. (%)
11-20	0 (0.0%)
21-30	10 (12.5%)
31-40	23 (28.75%)
41-50	33 (41.25%)
51-60	10 (12.5%)
61-70	3 (3.75%)
71-80	1 (1.25%)
Total	(100.0%)
Mean±SD	41.8±11.7

Data were expressed as number, percentage and Mean ± SD
 Statistical analysis were done by unpaired student t-test

Table II: Sex distributions of the patients

Sex	(n=80) No. (%)
Male	20 (25.0%)
Female	60 (75.0%)
Mean±SD	0.25±0.44

Data were expressed as number and percentage

Figure I: Percentage of different types of cholecystectomy

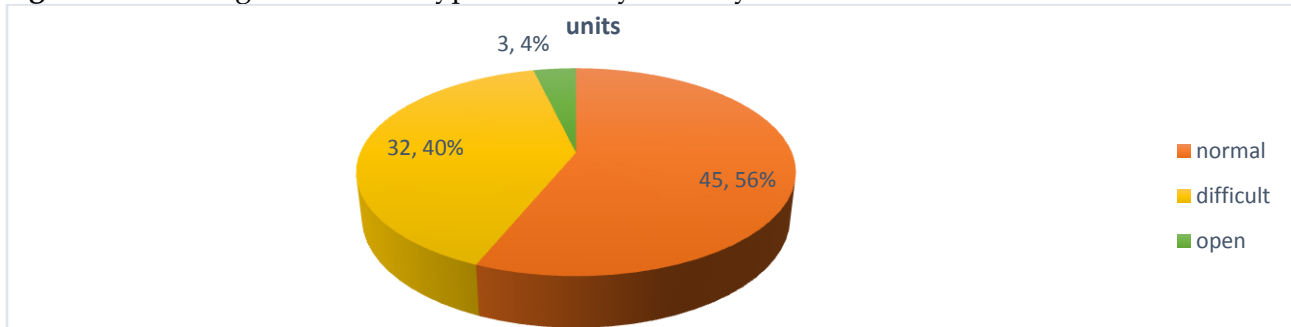


Table III: Correlation of Adhesions around the gallbladder with Gallbladder Wall Thickness

Gallbladder wall Thickness	Adhesions		Total
	0-Absent n=70 No (%)	1-Present n=10 No (%)	
0(<3mm)	66 (97%)	2 (3%)	68 (85%)
1(>3mm)	4 (33.3%)	8 (66.7%)	12 (15%)
Total	70 (87.5%)	10 (12.5%)	80
Mean ±SD	0.25±0.44		

Table IV: Correlation of Dissection of Callot's Triangle with Gallbladder Wall Thickness

Gallbladder wall Thickness	Calot's Triangle Dissection		Total
	0 n=60 No (%)	1 n=20 No (%)	
0	56 (82.3%)	12 (17.7%)	68 (85%)
1	4 (33.3%)	8 (66.7%)	12 (15%)
Total	60 (75%)	20 (25%)	80
Mean ±SD	0.25±0.44		

Table V: Correlation of Dissection of Gallbladder bed with Gallbladder Wall Thickness

Gallbladder wall Thickness	Gallbladder bed Dissection		Total
	0 n=52 No (%)	1 n=28 No (%)	
0	51 (75%)	17 (25%)	68 (85%)
1	1 (8.3%)	11 (91.7%)	12 (15%)
Total	52 (65%)	28 (35%)	80
Mean ±SD	0.35±0.48		

Table VI: Correlation of Difficulty in holding Gallbladder with Gallbladder Wall Thickness

Gallbladder wall Thickness	Difficulty in holding gallbladder		Total
	0 n=55 No (%)	1 n=25 No (%)	
0	54 (79.4%)	14 (20.6%)	68 (85%)
1	1 (8.3%)	11 (91.7%)	12 (15%)
Total	55 (68.75%)	25 (31.25%)	80
Mean ±SD	0.31±0.47		

Table VII: Correlation of Gallbladder Perforation with Gallbladder Wall Thickness

Gallbladder wall Thickness	Gallbladder Perforation		Total
	0 n=57 No (%)	1 n=23 No (%)	
0	54 (79.4%)	14 (20.6%)	68 (85%)
1	3 (25%)	9 (75%)	12 (15%)
Total	57 (71.25%)	23 (28.75%)	80
Mean ±SD	0.29 ± 0.46		

Table VIII: Correlation of Bleeding during Surgery with Gallbladder Wall Thickness

Gallbladder wall Thickness	Bleeding			Total
	0 n=53 No (%)	1 n=25 No (%)	2 n=2 No (%)	
0	51 (75%)	16 (23.5%)	1(1.5%)	68
1	2 (16.7%)	9 (75%)	1(8.33%)	12
Total	53 (66.25%)	25(31.25%)	2(2.5%)	80
Mean ±SD	0.35 ± 0.53			

Table IX: Correlation of Gallbladder Adhesions with Condition of Gallbladder

Condition of Gallbladder	Adhesions		Total
	0 n=70 No (%)	1 n=10 No (%)	
0	59 (95.2%)	3(4.8%)	62 (77.5%)
1	6 (46.2%)	7 (53.8%)	13 (16.25%)
2	5(100%)	0(0.0%)	5 (6.25%)
Total	70 (87.5%)	10 (12.5%)	80
Mean ±SD	0.33±0.45		

Table X: Correlation of Dissection of Calot's Triangle with Condition of Gallbladder

Condition of Gallbladder	Calot's Dissection		Total
	0 n=60 No (%)	1 n=20 No (%)	
0	54 (87.1%)	8 (12.9%)	62 (77.5%)
1	3 (23.1%)	10 (76.9%)	13 (16.25%)
2	3 (60%)	2 (40%)	5(6.25%)
Total	60 (75%)	20 (25%)	80
Mean ±SD	0.25 ± 0.44		

Table XI: Correlation of Dissection of Gallbladder bed with Condition of Gallbladder

Condition of Gallbladder	Gallbladder bed Dissection		Total
	0 n=52 No (%)	1 n=28 No (%)	
0	49 (79%)	13 (21%)	62 (77.5%)
1	1(7.7%)	12 (92.3%)	13 (16.25%)
2	2 (40%)	3 (60%)	5(6.25%)
Total	52 (65%)	28 (35%)	80



Mean \pm SD	0.35 \pm 0.48
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Table XII: Correlation of Difficulty in holding Gallbladder with Condition of Gallbladder

Condition of Gallbladder	Difficulty in holding gallbladder		Total
	0 n=55 No (%)	1 n=25 No (%)	
0	53 (85.5%)	9 (14.5%)	62 (77.5%)
1	1 (7.7%)	12 (92.3%)	13 (16.25%)
2	1 (20%)	4 (80%)	5(6.25%)
Total	55 (68.75%)	25 (31.25%)	80
Mean \pm SD	0.31 \pm 0.47		

Table XIII: Correlation of Perforation of Gallbladder with Condition of Gallbladder

Condition of Gallbladder	Perforation of Gallbladder		Total
	0 n=57 No (%)	1 n=23 No (%)	
0	51 (82.3%)	11(17.7%)	62 (77.5%)
1	3 (23.1%)	10 (76.9%)	13 (16.25%)
2	3 (60%)	2 (40%)	5(6.25%)
Total	57 (71.25%)	23 (28.75%)	80
Mean \pm SD	0.29 \pm 0.46		

Table XIV: Correlation of Bleeding during Surgery with Condition of Gallbladder

Condition of Gallbladder	Bleeding			Total
	0 n=53 No (%)	1 n=25 No (%)	2 n=2 NO (%)	
0	49(79%)	13(21%)	0(0%)	62(77.5%)
1	2 (15.4%)	9(69.2%)	2(15.4%)	13(16.25%)
2	2 (40%)	3(60%)	0(0%)	5(6.25%)
Total	53 (66.25%)	25(31.25%)	2(2.5%)	80
Mean \pm SD	0.35 \pm 0.53			

DISCUSSION

The mean age of patients presented for laparoscopic cholecystectomy in our study was 41.8 \pm 11.7 years. This is comparable with the mean age reported in other studies, ranging from 24 to 80 years and 18 to 75 years.^[1,13] Women outnumbered men, with a ratio of female to male ratio being 3:1 in this study. It is consistent with the results observed in other studies where the ratio was 4.18 and 9.^[1,14] There were total of 80 cases, among which 45 (56.25%) turned out to have undergone normal laparoscopic

cholecystectomies. 35 (43.75%) were difficult, among which 3 (3.75%) were converted to open cholecystectomies. In our study, the conversion rate to open surgery (3.4%) was within the range reported by several other studies (0.9-14%).^[15] 8 (66.7%) out of 12 patients with gallbladder wall thickness more than 3mm had adhesions and difficult Calot's triangle dissection. However gallbladder wall thickening may also result from other causes such as hypoalbuminemia, hepatitis, sclerosing cholangitis or AIDS cholangitis, adenomyomatosis, congestive heart failure, portal hypertension or tumours.^[16] Among 12

patients with gallbladder wall thickness >3mm, only 1(8.3%) underwent easy gallbladder bed dissection and 11(91.7%) underwent difficult dissection. Among 12 patients with gallbladder wall thickness >3mm, 3(25%) patients had undergone no gallbladder perforation but 9(75%) had undergone gallbladder perforation. In a particular study around 87% of the patients with gallbladder wall thickness (>4mm) surgeons encountered surgical difficulties.^[4] In gallstone disease, the histopathologic substrate for sonographic thickening of the gallbladder is chronic pericholecystic inflammation. In patients with chronic inflammation, pericholecystic adhesions frequently impede the separation of the gallbladder from its bed.^[15] Among 12 patients with gallbladder wall thickness >3mm, 2(16.7%) patients had undergone mild bleeding, 9 (75%) had undergone moderate bleeding and only 1(8.33%) had undergone severe bleeding. The incidence of operative bleeding in many series was up to 10%, with an average figure of 2%, which agrees with our study. The most important patient-related risk factors of operative bleeding are acute cholecystitis, liver cirrhosis, previous abdominal surgery, peritoneal adhesion and anatomical abnormalities.^[17] There were 62 (77.5%) patients with a normal gallbladder, 13 (16.25%) with contracted gallbladder and 5 (6.25%) with distended gallbladder. 7 (53.8%) out of 13 patients with contracted gallbladder had adhesions and none of the distended gallbladder had adhesions. Calot's dissection was difficult in 76.9% of patients with contracted gallbladder and 40% of patients with distended gall bladder. There was

gallbladder perforation in 76.9% patients with contracted gallbladder and 40% patients with distended gallbladder. There was moderate bleeding in 69.2% and severe bleeding in 15.4% patients with contracted gallbladder. There was only moderate bleeding in 60% patients with distended gallbladder and severe bleeding in none. Thus there is more rate of complications seen in this study associated with contracted gallbladder compared to distended gallbladder. A study mentioned that the thickened and contracted gallbladder was difficult to dissect because it had dense adhesions with the surrounding structure and in Calot's triangle.^[8] This author identified shrunken gallbladder as an independent risk factor for conversion along with other variables.^[18]

Limitation of the study:

The sample size was limited and the follow-up period was short in comparison to other studies. The study was conducted in a selected institute, so the study population might not represent the whole community.

CONCLUSION

From this study, we conclude that pre-operative ultrasonography is a good predictor of difficulty in laparoscopic cholecystectomy in the majority of cases and should be used as a screening procedure. It can help surgeons get an idea of the potential difficulty to be faced in that particular patient and thus helpful for pre-operative counselling and mentally prepare the patients for the kind of surgery. Larger sample size would have given a better result.

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