A Study to Predict the Conversion of Laparoscopic To Open Cholecystectomy Using Ultrasound Score

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I. Aims Of The Study

The aim of this study is to preoperatively predict the conversion of Laparoscopic to open cholecystectomy by using ultrasound scoring the following factors: GB Status, GB Wall thickness, No of stones, Pericholecystic collection , Stone size

II. Natural History:

"Most patients with gallstones remain asymptomatic throughout life. Around 3% of asymptomatic individuals become symptomatic per year and develop biliary colic. Once symptomatic they develop recurrent episodes of biliary colic. Only few patients without biliary symptoms develop complications. Prophylactic cholecystectomy for asymptomatic cholelithiasis is rarely indicated. Elderly patients with diabetes mellitus, individuals who will be isolated from medical care for a prolonged period of time, Gall bladder polyp > 1 cm are indications for prophylactic cholecystectomy.

III. Materials And Methods

A total of 50 cases with gallstones admitted in Rajiv Gandhi govt general hospital , Chennai, during the period from January 2015 to September 2015 and planned for Laparoscopic cholecystectomy were analysed in this study. They were subjected to a detailed history, clinical examination and then to blood investigations and radiological investigations. Their Name, Age, Sex, and findings of USG of Abdomen were recorded. All these patients were subjected to Laparoscopic cholecystectomy .the laparoscopic surgery was performed by surgeons at our unit experienced in laparoscopic surgery, therefore , the learning curve statistics do not apply to this study, the operating surgeon was blinded to these findings ,the operative findings were objectively graded as difficult or easy laparoscopic cholecystectomy from insertion of the veress needle or trocar until the extraction of the gall bladder was considered a difficult laparoscopic cholecstectomy, tear of GB, spillage of bile and stones considered a difficult procedure , > 30 minutes taken to dissect GB from GB bed was considered a difficult procedure , > 20 minutes taken to dissect calots triangle was considered difficult procedure,any laparoscopic cholecystectomy converted to the open procedure was considered a difficult laparoscopic cholecystectomy.

Inclusion Criteria:
* The patients presenting with symptom and sign of cholelithiasis/ diagnosed by ultrasound abdomen.
* Age 20 -70 yrs

Exclusion Criteria:
* Patients below 20yrs age
* Previous abdominal surgery
* Patients with CBD calculus, raised ALP , dilated CBD, where CBD exploration needed.
* Patients with features of obstructive jaundice
* Suspected malignant gall bladder disease
* Patient medically unfit for laparoscopic

Ultrasound Scoring

		1	2	3	4
1	GB status	normal	Contracted	distended	
2	GB wall thickness	<3mm	>3mm		
3	Number of stones	Single	multiple		
4	Pericholcystic collection	no			yes
5	Stonesize	<5mm	5mm- 1cm	>1cm	

IV. Results

Age Distribution:

A total of 50 patients with clinical and ultrasonographic evidence of gallstones admitted in our hospital were analysed in this study.Of these there were 33 females and 17 males

Sex					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	F	33	66.0	66.0	66.0
	M	17	34.0	34.0	100.0
	Total	**50**	**100.0**	**100.0**	

Gb Status:

Gb Status					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	DISTENDED	15	30.0	30.0	30.0
	NORMAL	35	70.0	70.0	100.0
	Total	**50**	**100.0**	**100.0**	

The GB according to ultrasound was found to be distended in 30% of cases and normal in the remaining 70% of cases

Gb Wall Thickness

Gb Wall Thickness					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NO	37	74.0	74.0	74.0
	YES	13	26.0	26.0	100.0
	Total	**50**	**100.0**	**100.0**	

No of Stones:

The ultrasound showed multiple stones in 90% of cases and single stones were found in 10% of cases

No Of Stones					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	MULTI	45	90.0	90.0	90.0
	SINGLE	5	10.0	10.0	100.0
	Total	**50**	**100.0**	**100.0**	

Peri Cholecystic Collection

Pericholecystic collections were found in 22% of cases and it was not found in 78% of cases

Peri Cholecystic Collection					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	NO	39	78.0	78.0	78.0
	YES	11	22.0	22.0	100.0
	Total	**50**	**100.0**	**100.0**	

Stone Size

The stones were found to be <5mm in 92% of cases , found to be within 5mm and 1 cm in 6% of cases and >1 cm in 2% of cases

Stone Size					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	>1cm	1	2.0	2.0	2.0
	5mm to 1 cm	3	6.0	6.0	8.0
	<5MM	46	92.0	92.0	100.0
	Total	**50**	**100.0**	**100.0**	

Score

Score					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	6	28	56.0	56.0	56.0
	7	8	16.0	16.0	72.0
	8	4	8.0	8.0	80.0
	9	4	8.0	8.0	88.0
	11	3	6.0	6.0	94.0
	12	3	6.0	6.0	100.0
	Total	**50**	**100.0**	**100.0**	

Procedure

Procedure

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	CONVERTED	5	10.0	10.0	10.0
	LAP	45	90.0	90.0	100.0
	Total	**50**	**100.0**	**100.0**	

Crosstab

Count

		PROCEDURE		Total
		CONVERTED	LAP	
GB STATUS	DISTENDED	5	10	15
	NORMAL	0	35	35
Total		5	45	50

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	12.963[a]	1	.000		
Continuity Correction[b]	9.524	1	.002		
Likelihood Ratio	13.413	1	.000		
Fisher's Exact Test				.001	.001
McNemar Test				.002[c]	
N of Valid Cases	50				

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 1.50.
b. Computed only for a 2x2 table
c. Binomial distribution used.

It was found that of the 35 cases in which the GB status was normal, it was possible to do the surgery in laparoscopy itself . of the remaining 15 cases in which GB was distended, 5 cases were converted to open. The statistical analysis also shows this difference to be significant with a p value of .001

Crosstab

Count

		PROCEDURE		Total
		CONVERTED	LAP	
GB WALL THICKNESS	<3 mm	0	37	37
	>3mm	5	8	13
Total		**5**	**45**	**50**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	15.812[a]	1	.000		
Continuity Correction[b]	11.827	1	.001		
Likelihood Ratio	15.185	1	.000		
Fisher's Exact Test				.001	.001
McNemar Test				.[c]	
N of Valid Cases	50				

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 1.30.
b. Computed only for a 2x2 table
c. Both variables must have identical values of categories.

It was found that of the 37 cases in which the GB wall thickness was <3mm, it was possible to do the surgery in laparoscopy itself . of the remaining 13 cases in which GB was thickened , 5 cases were converted to open. The statistical analysis also shows this difference to be significant with a p value of .001

Crosstab

Count

		PROCEDURE		Total
		CONVERTED	LAP	
NO OF STONES	MULTI	4	41	45
	SINGLE	1	4	5
Total		**5**	**45**	**50**

Chi-Square Tests					
	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.617[a]	1	.432		
Continuity Correction[b]	.000	1	1.000		
Likelihood Ratio	.508	1	.476		
Fisher's Exact Test				.423	.423
McNemar Test				.[c]	
N of Valid Cases	50				
a. 3 cells (75.0%) have expected count less than 5. The minimum expected count is .50.					
b. Computed only for a 2x2 table					
c. Both variables must have identical values of categories.					

It was found that of the 45 cases in which the multiple stones were found, 4 cases were converted .of the remaining 5 cases in which single stones were found , 1 cases were converted to open. The statistical analysis also shows this difference to be significant with a p value of .423. This suggests that in this study number of stones alone is not a significant factor to predict conversion into open.

Crosstab				
Count				
		PROCEDURE		Total
		CONVERTED	LAP	
PERI CHOLECYSTIC COLLECTION	NO	0	39	39
	YES	5	6	11
Total		5	45	50

Chi-Square Tests					
	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	19.697[a]	1	.001		
Continuity Correction[b]	14.970	1	.001		
Likelihood Ratio	17.350	1	.001		
Fisher's Exact Test				.001	.001
McNemar Test				.[c]	
N of Valid Cases	50				
a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 1.10.					
b. Computed only for a 2x2 table					
c. Both variables must have identical values of categories.					

It was found that of the 39 cases in which pericolecystic collection was not there , it was possible to do the surgery in laparoscopy itself . of the remaining 11 cases had pericholecystic collection , 5 cases were converted to open. The stastistical analysis also shows this difference to be significant with a p value of .001

Crosstab				
Count				
		PROCEDURE		Total
		CONVERTED	LAP	
STONE SIZE	1X.5CM	0	1	1
	1X1 CM	0	1	1
	1X1CM	2	0	2
	5MM	3	43	46
Total		5	45	50

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	11.433[a]	2	.003
Likelihood Ratio	6.509	2	.039
N of Valid Cases	50		
a. 5 cells (83.3%) have expected count less than 5. The minimum expected count is .10.			
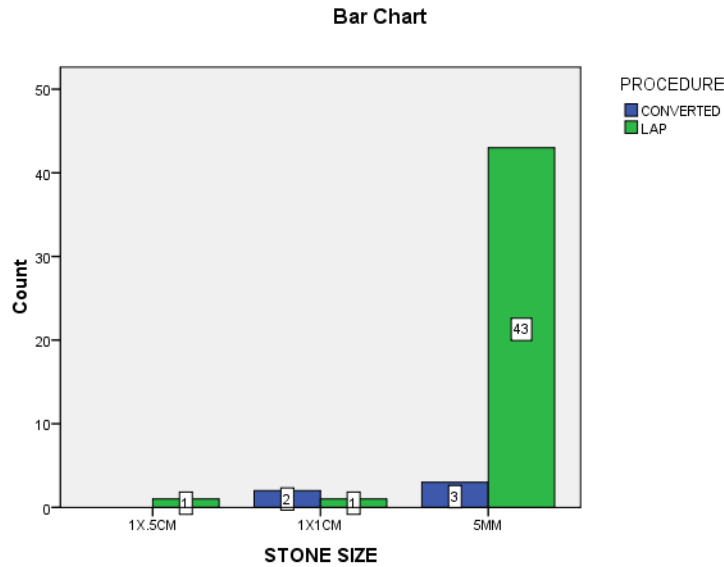
Bar Chart

It was found that of the 46 cases in which stones were <5mm , 3 cases were converted . of the 3 cases in which stones were between 5mm and 1 cm , 2 cases were converted to open. The one case with a stone more than 1 cm was done by laparoscopy , The statistical analysis also shows this difference to be significant with a p value of .003

Crosstab				
Count				
		PROCEDURE		**Total**
		CONVERTED	**LAP**	
SCORE	6	0	28	28
	7	0	8	8
	8	0	4	4
	9	0	4	4
	11	3	0	3
	12	2	1	3
Total		**5**	**45**	**50**

Chi-Square Tests			
	Value	**df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	42.593[a]	5	.001
Likelihood Ratio	28.689	5	.001
McNemar-Bowker Test	.	.	[b]
N of Valid Cases	50		
a. 10 cells (83.3%) have expected count less than 5. The minimum expected count is .30.			
b. Computed only for a PxP table, where P must be greater than 1.			

Bar Chart
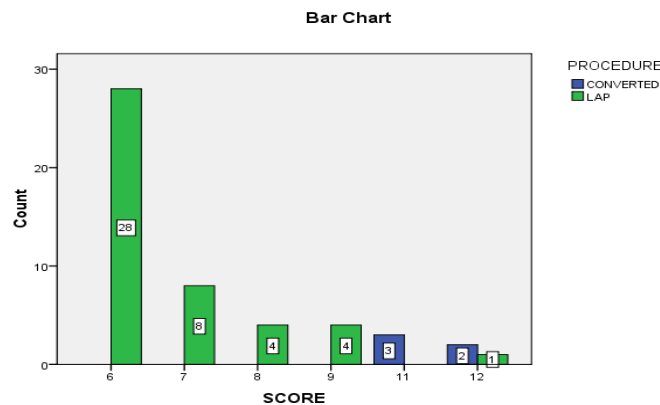
It can be noted that as the score increases the chance of the case being opened increases and all the opened cases had score of either 11(3 cases) or 12(2 cases). The statistical analysis also shows the difference to be significant with a p value of .001

V. Discussion

Laparoscopic cholecystectomy has become the gold standard treatment for patients with gallstones due to less morbidity, lesser hospital stay and early return to normal activities. The difficult gallbladder is the most common 'difficult' laparoscopic surgery being performed by general surgeons all over the world and the potential one that places the patient at significant risk[12]. Previous reports have promulgated the use of scoring systems to predict conversion to open cholecystectomy. However, these systems presented incongruent data points, evaluated a limited number of factors, included subjective variables, and some were formulated early in the course of laparoscopic cholecystectomy before the operation became uniformly established[16]. So we planned to analyse USG factors to predict the conversion of laparoscopic cholecystectomy to open cholecystectomy.

In our study, 50 patients diagnosed with gallstones were taken for Laparoscopic cholecystectomy. Among the 50 patients, 33 patients(i.e. 66%) were female and 17 patients (i.e. 34%) were male. Of the 50 patients, 5 patients were converted to open cholecystectomy.

GB status
It was found that of the 35 cases in which the GB status was normal , it was possible to do surgery in laparoscopic itself , of the remaining 15 cases in which GB was distended , 5 cases were converted to open , the statistical analysis also shows this difference to be significant with a p value of 0.001
GB wall thickness
It was found 37 cases with GB wall thickness was <3mm possible to do laparoscopic itself , remaining 13 cases GB wall thickness was > 3mm , of which 5 cases were converted to open, the statistical analysis also shows this difference to be significant with a p value of 0.001
Number of stones
it was found 45 casesin which the multiple stones found, 4 cases were converted, of the remaining 5 cases in which single stones were found, 1 cases were converted to open, the statistical analysis also shows this difference to be significant with a pvalue of 0.423 this suggest that in this study number of stones alone is not a significant factor to predict conversion to open

Pericholecystic collection
It was found that of the 39cases in which pericholecystic collection was not there , it was possible to do the surgery in laparoscopic itself.
Of the remaining 11 cases had pericholecystic collection , of which 5 cases were converted to open The statistical analysis also shows this difference to be significant with a P value of 0.001.
Stone size
It was found that of the 46 cases in which stones were <5mm, 3 cases were converted.
Of the 3 cases in which stones were between 5mm and 1 cm, 2 cases converted to open.
The one case with a stone more than 1 cm was done by laparoscopy , the statistical analysis also shows this difference to be significant with a P value of 0.003

A, Echogenic foci in the gallbladder with acoustic shadowing (S) are characteristic of gallstones. In this patient, the gallbladder wall is thickened.. Features suggest chronic cholecystitis. B, Multiple stones are layered in the dependent portion of the gallbladder, but the wall is not thickened.

Gallbladder wall thickness more than 3mm was found to be a risk factor for conversion in many studies. Hutchinson et al(2008), Liu et al considered gallbladder wall thickness to be the most important sonographic risk factor for conversion to open cholecystectomy.

Gallbladder wall thickness is related to the inflammation or fibrosis that follows previous attacks of cholecystitis and thus may reflect difficulty in delineation of anatomy during surgery. Similarly prolonged operating time was demonstrated in patients with Gallbladder wall thickness of more than 3mm.

This may be due to difficulty during grasping the gallbladder, difficult Gallbladder bed dissection and higher incidence of bleeding[20]. Our study also demonstrated that increased Gallbladder wall thickness is associated with increased risk of conversion to open cholecystectomy.

Many studies have considered gallbladder thickness as a significant risk factor for conversion to open cholecystectomy. In our study also it was found that increased gallbladder wall thickness of more than 3mm was associated with increased risk of conversion to open cholecystectomy.

The presence of pericholecystic collection renders the dissection of calot's triangle difficult and

increased chances of conversion to open cholecystectomy[11] .

In our study we analysed USG factors such as GB status, GB wall thickness, number of stones, pericholecystic collection, size of stone as the USG score increases the chance of the case being opened increases and all the opened cases had either 11 0r 12 ,

The statistical analysis also shows the difference to be significant with a p value of 0.001

VI. Conclusion

Laparoscopic cholecystectomy has gradually replaced open cholecystectomy in the treatment of patients with benign gallbladder disease. With the advancement in equipment and experience in laparoscopic surgery, most of the difficult gallbladder can be dealt laparoscopically.

Preoperative USG examination   of   the GB is a good predictor of difficult cholecystectomy in majority of cases and should be used pre operatively as a routine screening tool to delineate biliary tree anatomy and pathology, pre operative risk factor can help to predict difficult gallbladder and conversion to other type of cholecystectomy.

In our study we analysed USG factors such as GB status, GB wall thickness, number of stones, pericholecystic collection, size of stone.

In our study noted that as the USG score increases the chance of the case being opened increases and all the opened cases had either 11 0r 12, The statistical analysis also shows the difference to be significant with a p value of 0.001

Among USG factors, a distended GB, increased GB wall thickness, presence of pericholecystic collection ,large size of stone proved to be significant and was associated with increased risk of conversion to open cholecystectomy.

Our results demonstrate that an a accurate and easily derived estimation of risk factor predicting conversion from laparoscopic cholecystectomy to open cholecystectomy can be obtained from USG score , increase in score can predict difficulty to be encountered during laparoscopic cholecystectomy and help in making a decision for conversion thus shortening the duration of surgery thereby preventing unnecessary complications.

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