

Assessment of Efficacy of Parkland Grading System in Difficult Cholecystectomy

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Abstract: *Background:* Gallstones are the most common biliary pathology and also a major cause for the development of acute cholecystitis. It affects about 10-15% of the population in which majority are symptomatic (above 80%) 1 and prevalence of gallstones is related to factors like age, gender, and ethnic background, and varies widely from place to place2. Women are three times more affected and first-degree relatives of patients with gallstones have a two fold greater prevalence. Certain conditions predispose to the development of gallstones including obesity, pregnancy, dietary factors, Crohn's disease, terminal Ileal resection, gastric surgery, Hereditary spherocytosis, sickle cell disease and thalassemia. The different grades according to this grading scale has been compared with the clinical, biochemical, & radiological findings, to validate this scale.

Keywords: Difficult Lap cholecystectomy, efficacy of Parkland Grading system

Parkland grading scale for Cholecystitis

Cholecystitis Severity Grade	Description of Severity
1	Normal appearing gallbladder ("robin's egg blue") <ul style="list-style-type: none"> • No Adhesion Present • Completely normal gallbladder
2	Minor adhesions at neck, otherwise normal gallbladder <ul style="list-style-type: none"> • Adhesions restricted to the neck or lower of the gallbladder
3	Presence of ANY of the following: <ul style="list-style-type: none"> • Hyperemia, periocholecystic fluid, adhesions to the body, distended gallbladder
4	Presence of ANY of the following: <ul style="list-style-type: none"> • Adhesions obscuring majority of gallbladder • Grade 1-3 with abnormal liver anatomy, intrahepatic gallbladder or impacted stone (Mirrizi)
5	Presence of ANY of the following: <ul style="list-style-type: none"> • Perforation, necrosis, inability to visualize the gallbladder due to adhesions

Study Design:

Prospective.

Inclusion Criteria

- Age above 18 years and less than 60 years
- All the patients presenting with acute cholecystitis
- Chronic cholecystitis/cholelithiasis.

Exclusion Criteria

- Presence of common bile duct stones
- Gallstone pancreatitis
- Cholangitis
- Abdominal trauma
- Malignancy

3. Methodology

Procedure

All the patients who present to our institution with the gallbladder disease over a period of 18 months were evaluated and those who are subjected for surgery are included in the study. Patients were evaluated clinically, biochemically and radiologically and further classified according to age, gender, radiological and bio-chemical aspects. Patients underwent laparoscopic procedure. Gallbladder is assessed intraoperatively and pictures were taken after the placement of all laparoscopic ports, if the gall bladder was visualized easily, it was grasped and retracted cephalad prior to taking the photograph. When severe inflammation was present which limited the mobilization and the ability to visualize the gall bladder, the pictures were taken of the inflamed area. These images were referred to as the "initial view" of the gall bladder.

The status of gallbladder was assessed with the application of Parkland's grading system and all the cases were divided into 5 grades. These grades were then compare with the perioperative and post operative prognostic factors included in the study.

4. Observations

Total 110 patients were included in this study.

1. Aims and Objective

Aim

To assess the efficacy of the Parkland grading scale for cholecystitis in difficult cholecystectomy.

Objectives

- 1) To determine the pre-operative factor with Parkland grading scale to assess difficult cholecystectomy.
- 2) To assess expectant operative and post operative complication and outcome between Parkland grades.
- 3) To minimize operative duration and postop hospital stay.

2. Material and Methods

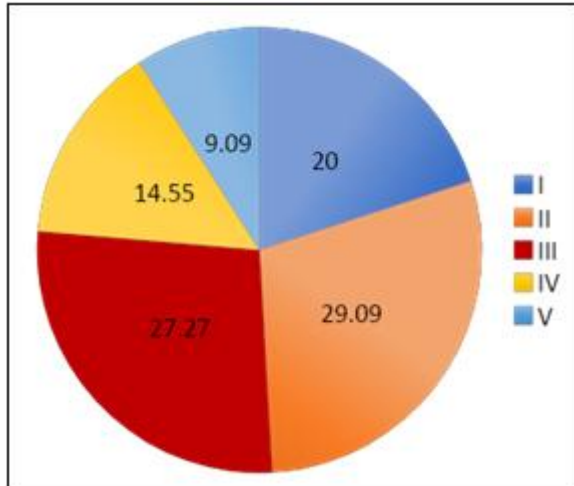
Study setting and procedures

All the patients admitted in our unit in surgery department in

Medical College, who underwent laparoscopic cholecystectomy over 18-month period between Jan.2021 and June 2022 were included in the study.

Table 1: Distribution of Cases According to Age

Age (yrs)	No.	%
20-30	22	20.00
30-40	32	29.09
40-50	30	27.27
50-60	16	14.55
60-70	10	9.09
Total	110	100.00
Mean±sd	40.16±10.83	
p	>0.05	



Above table shows 22 (20%) patients in age group 20-30, 32 (29.09%) in 30-40 years age group, 30 (27.27%) in 40-50 age group, 16 (14.55%) in 50-60 years age group and 10 (9.09%) in 60-70 age group

Table 2: Distribution of cases according to gender

Parkland grade	Male		Female		Total	
	No.	%	No.	%		
Grade-I	4	13.33	18	22.50	22	20.00
Grade-II	20	66.67	38	47.50	58	52.73
Grade-III	5	16.67	15	18.75	20	18.18
Grade-IV	1	3.33	7	8.75	8	7.27
Grade-V	0	0.00	2	2.50	2	1.82
Total	30	27.27	80	72.73	110	100.00

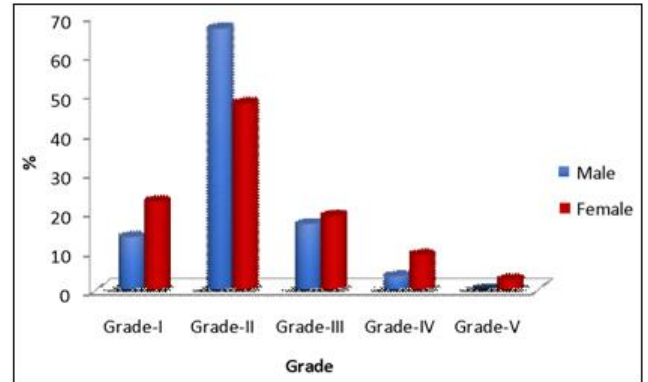


Table 3: Distribution of cases according parkland grade

Parkland grade	Patients	
	No.	%
Grade-I	22	20.00
Grade-II	58	52.73
Grade-III	20	18.18
Grade-IV	8	7.27
Grade-V	2	1.82
Total	110	100.00

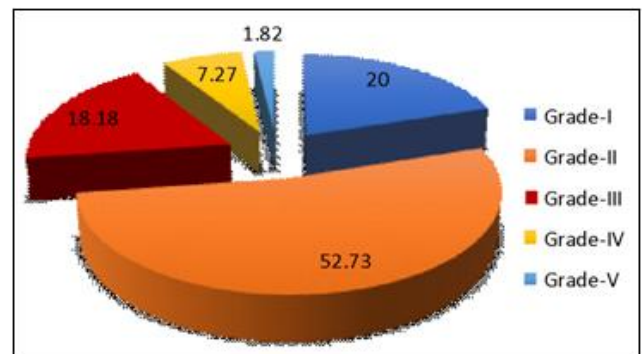
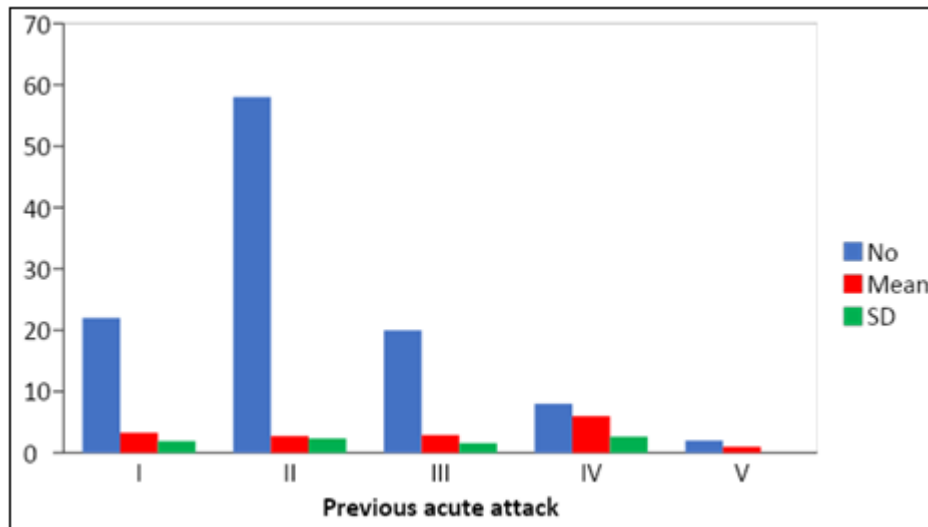


Table 4: Previous Acute Attack

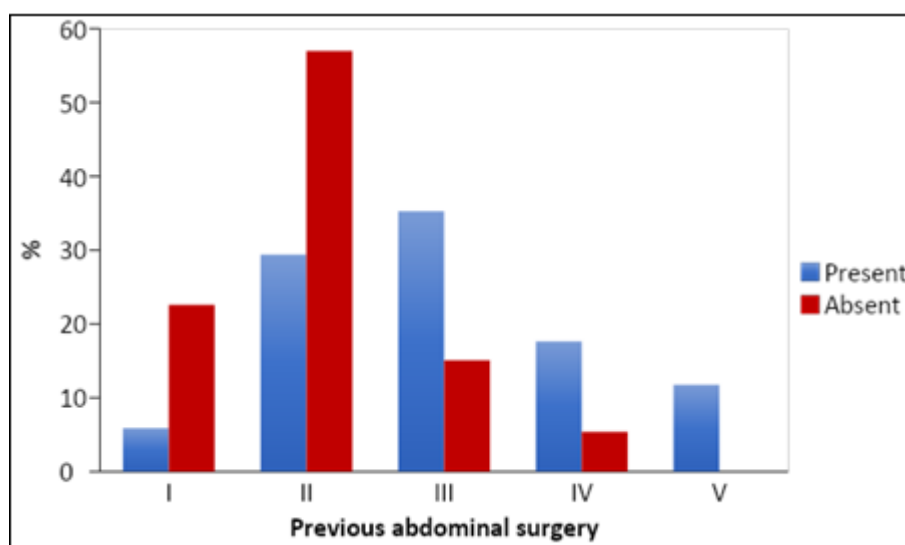
Parkland grade	No. of patients	No. of patients having history of episodes of acute attack	Mean	SD
I	22	15	3.27	1.91
II	58	58	2.74	2.36
III	20	16	2.90	1.58
IV	8	8	6.00	2.65
V	2	2	1.00	0.00
f			7.321	
p			<0.05	



Out of 110 patients previous acute attack having mean value 7.321 out of them 58 were found in grade-II with the mean 2.74 ± 2.36 followed by 22 of grade-I having mean 3.27 ± 1.91 and minimum 2 cases were of grade-V having mean of 1.00 ± 0.00 , statistically significant difference were observed between the grade (using Anova having $f=7.321$, $p < 0.05$)

Table 5: Previous Abdominal Surgery

Parkland grade	Present		Absent	
	No.	%	No.	%
I	1	5.88	21	22.58
II	5	29.41	53	56.99
III	6	35.29	14	15.05
IV	3	17.65	5	5.38
V	2	11.76	0	0.00
Total	17	15.45	93	84.55
df	4			
χ^2	21.175			
p	<0.05			



Out of 110 patients, 17 cases were having previous abdominal surgery and 93 didn't have grade-III having maximum 6 (35.29%) previous abdominal surgery while grade-II having no previous abdominal surgery, statistically significant different was observed between grades ($\chi^2=21.75$, $df = 4$, $p < 0.05$)

Table 6: Previous History of ERCP

Parkland grade	Present		Absent	
	No.	%	No.	%
I	0	0.00	22	20.95
II	2	40.00	56	53.33
III	0	0.00	20	19.05
IV	3	60.00	5	4.76
V	0	0.00	2	1.90
Total	5	4.55	105	95.45
df	4			
χ^2	22.53			
p	<0.05			

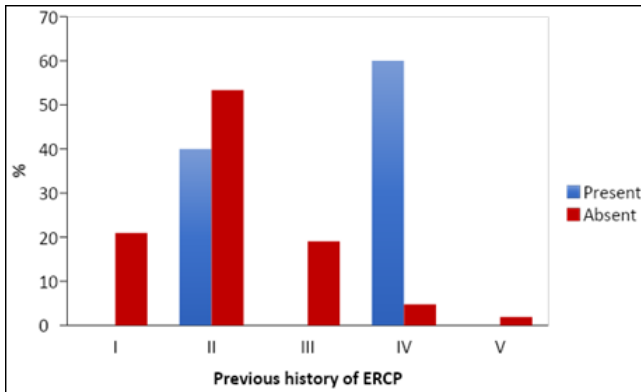
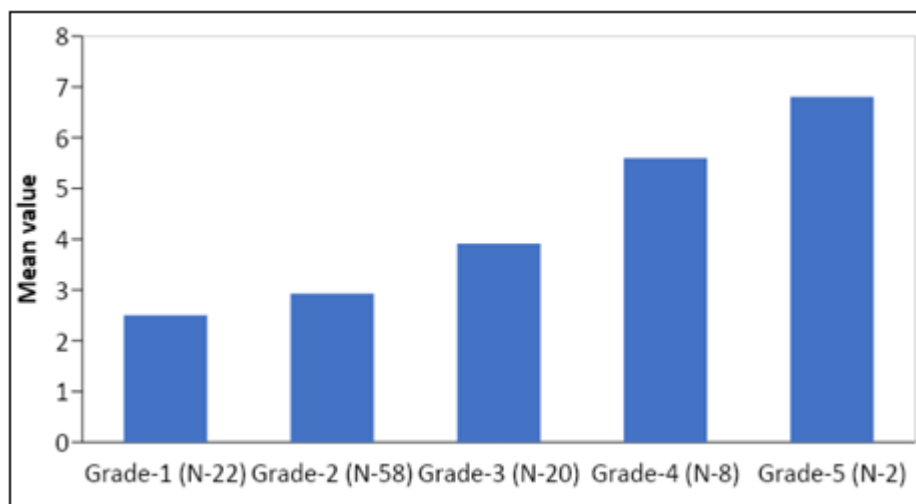


Table-3 showing patients having previous history of ERCP. Out of 110 patients 5 patients were having previous history of ERCP, while 105 did not have, grade-IV having maximum 3 (60%) previous history of ERCP followed by grade-II having 2 (40%) previous history of ERCP statistically significant difference was observed ($\chi^2=22.53$, $df = 4$, $p < 0.05$).

Table 7: Thickness of Gall Bladder Wall

	Grade-I (N-22)	Grade-II (N-58)	Grade-III (N-20)	Grade-IV (N-8)	Grade-V (N-2)
Thickness of gall bladder wall	2.5±1.32	2.93±2.09	3.91±2.74	5.6±2.11	6.8±3.40
f	11.872				
p	<0.0001				

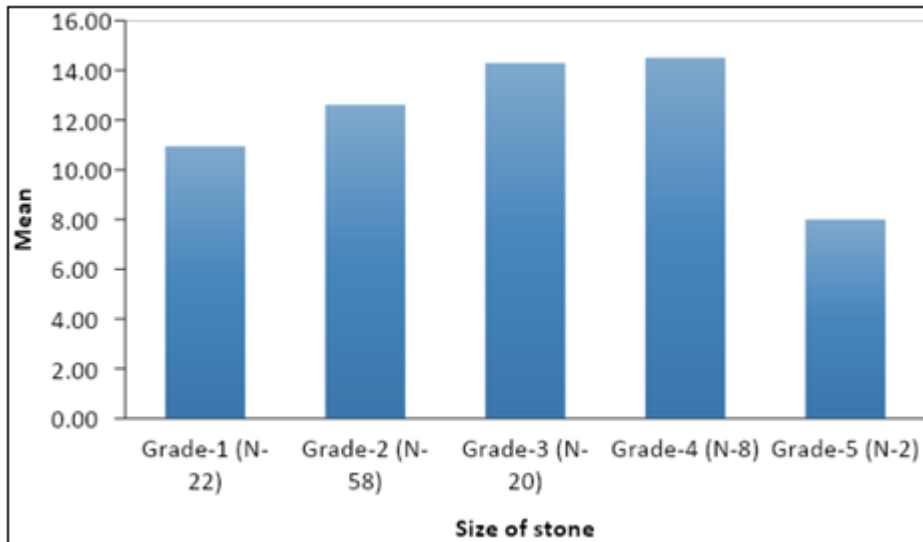


Above table shows radiological characteristics of gall bladder mean thickness was found to be more among patients of grade-V patient (6.80) following by 5.60 among

the grade IV and minimum mean wall thickness among patient of grade-II (2.93). Statistically significant difference was observed (f-11.872, $p < 0.05$).

Table 8: Size of Stone

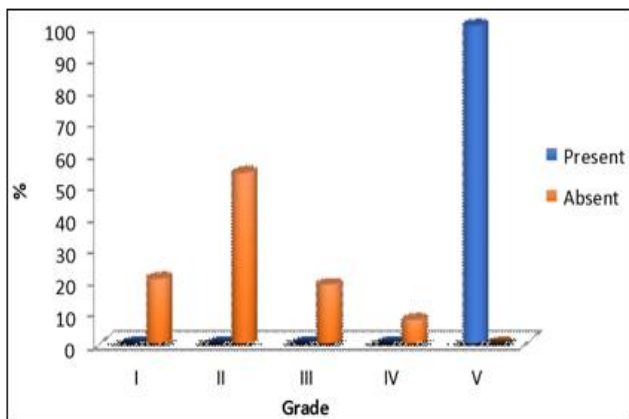
	Grade-1 (N-22)	Grade-2 (N-58)	Grade-3 (N-20)	Grade-4 (N-8)	Grade-5 (N-2)
Stone Size	10.95±2.14	12.62±3.60	14.30±3.18	14.50±3.57	8.00±0.0
f	18.62				
p	<0.05				



Out of 110 patients selected for present study maximum stone size in grade IV > III>II>I>V (minimum) that difference was found significant (f=18.62, p <0.05).

Table 9: Pericystic Fluid

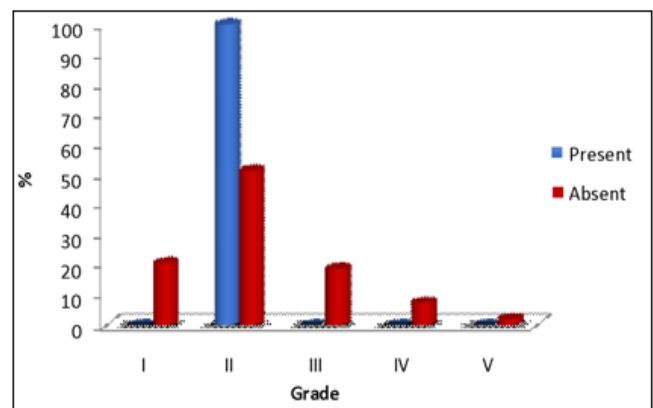
Parkland grade	Present		Absent	
	No.	%	No.	%
I	0	0.00	22	20.37
II	0	0.00	58	53.70
III	0	0.00	20	18.52
IV	0	0.00	8	7.41
V	2	100.00	0	0.00
Total	2	1.82	108	98.18
df	4			
χ^2	99.86			
p	<0.0001			



Out of 110 patients 2 patients in grade-V were having pericystic fluid collection and 108 did not have. Statistically significant difference was observed ($\chi^2=99.86$, df = 4, p <0.0001).

Table 10: CBD Injury

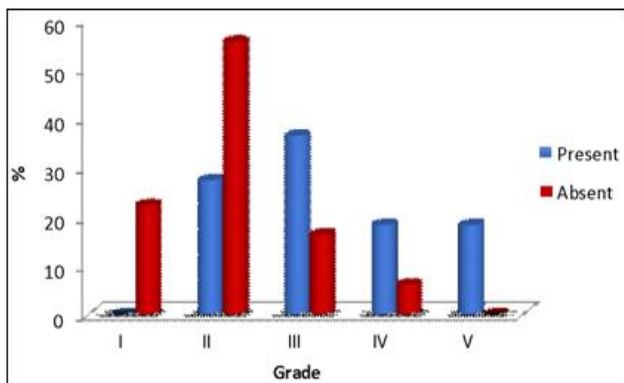
Parkland grade	Present		Absent	
	No.	%	No.	%
I	0	0.00	22	20.56
II	3	100.00	55	51.40
III	0	0.00	20	18.69
IV	0	0.00	8	7.48
V	0	0.00	2	1.87
Total	3	2.73	107	97.27
df	4			
χ^2	2.271			
p	<0.0001			



Out of 110 patients 3 cases were having CBD injury in grade-II and 107 did not have. Statistically significant difference was observed ($\chi^2=2.271$, df = 4, p <0.0001).

Table 11: Open Conversion

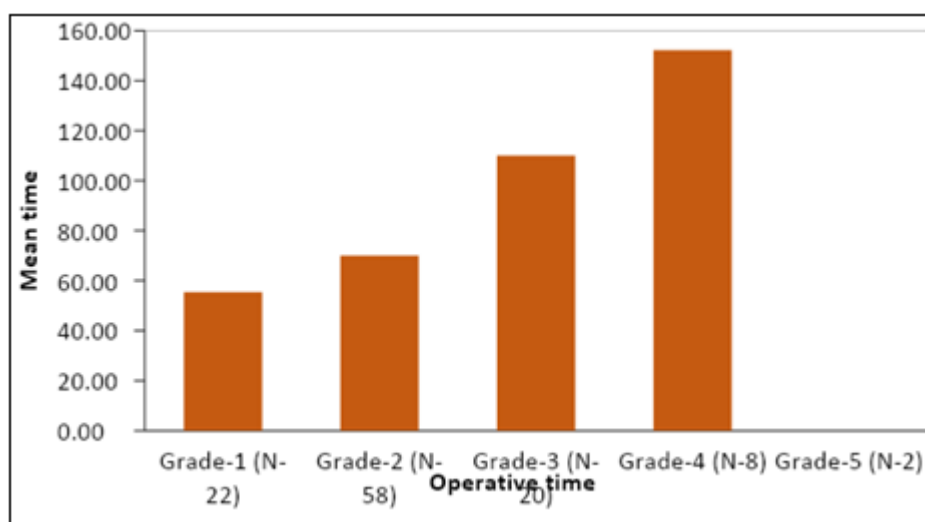
Parkland grade	Present		Absent	
	No.	%	No.	%
I	0	0.00	22	22.22
II	3	27.27	55	55.56
III	4	36.36	16	16.16
IV	2	18.18	6	6.06
V	2	18.18	0	0.00
Total	11	10.00	99	90.00
df	4			
χ^2	26.171			
p	<0.0001			



Out of 110 patients 11 cases were having open conversion and 99 did not have. Statistically significant difference was observed ($\chi^2=26.171$, $df = 4$, $p < 0.0001$).

Table 12: Operative Time

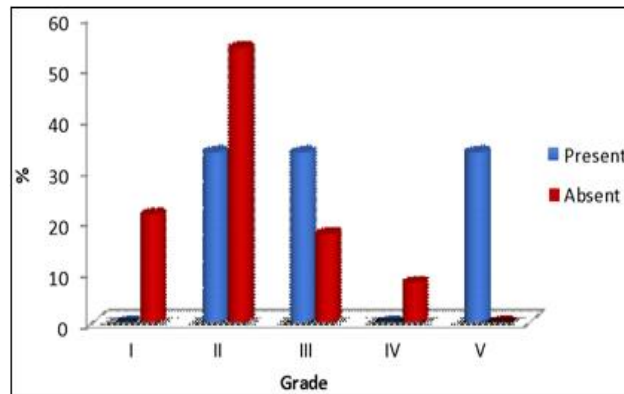
	Grade-1 (N-22)	Grade-2 (N-58)	Grade-3 (N-20)	Grade-4 (N-8)	Grade-5 (N-2)
Operative time	55.37±20.92	70.00±31.89	110.00±28.30	152.22±23.95	182±0.00
f	22.532				
p	<0.0001				



Out of 110 patients maximum operative time was seen in grade-V 182 minutes followed by grade-IV 152 minutes followed by grade-III 110 minutes followed by grade II 70 minutes and minimum operative time was seen in in grade-I 55.37 minutes. Statistically significant difference was observed $f = 22.532$, $p < 0.0001$).

Table 13: Bile Leak

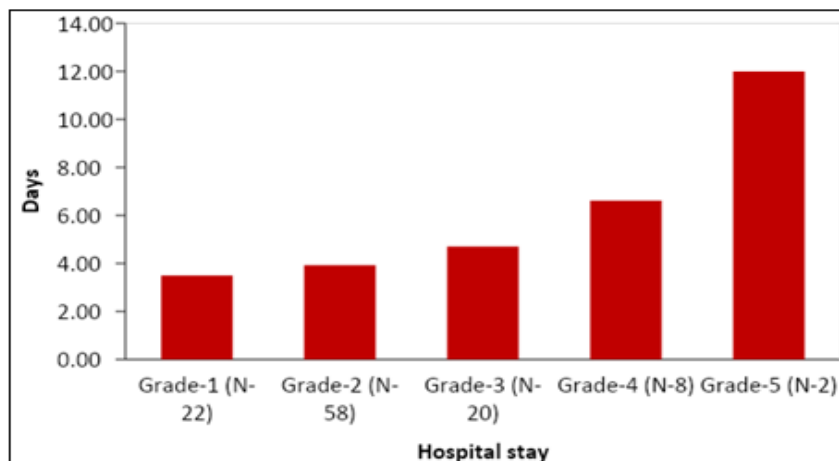
Parkland grade	Present		Absent	
	No.	%	No.	%
I	0	0.00	22	21.15
II	2	33.33	56	53.85
III	2	33.33	18	17.31
IV	0	0.00	8	7.69
V	2	33.33	0	0.00
Total	6	5.45	104	94.55
df	4			
χ^2	2.771			
p	<0.0001			



Out of 110 patients 6 cases were having bile leak and 104 did not have. Statistically significant difference was observed ($\chi^2=2.271$, $df = 4$, $p < 0.0001$).

Table 14: Hospital Stay

	Grade-1 (N-22)	Grade-2 (N-58)	Grade-3 (N-20)	Grade-4 (N-8)	Grade-5 (N-2)
Hospital Stay	3.50±0.50	3.93±1.51	4.70±0.71	6.62±0.48	12.00±0.00
f	4.532				
p	<0.0001				



Out of 110 patient selected for present study, maximum hospital stay duration was seen in grade-V (12 days) patients and minimum seen in grade-I (3.5 days). Statistically significant difference was observed ($f = 4.532$, $p < 0.0001$).

5. Discussion

Laparoscopic cholecystectomy was first performed in animal model by Fillipi, Mall and Roosma in 1985. Philip Mouret in 1987 was the first to remove the gall bladder successfully through an unmagnified mechanical rigid pipe without doing laparotomy.

Initially, the complication rate with laparoscopic cholecystectomy was high but with technological advancement and increase in the expertise, it has now reached a remarkably low level at 2.0-6.0%. Conversion rate of 7-35% has been reported in literature.

In our study, Laparoscopic Cholecystectomy was performed in 110 patients and different predictive risk factors for difficult Laparoscopic Cholecystectomy were analyzed. Gender, age, symptomatic/asymptomatic, biochemical tests, gall bladder wall thickening, pericholecystic collection,

presence/absence of stones, single/multiple stones, maximum stone size were included as risk factors in our study. Along with preoperative risk factors, we added intraoperative factors and these risk factors were graded using PGS accordingly.

Out of 110 gall bladder graded, 22 cases were assessed to be grade 1 (20%), 58 were Grade 2 (52.7%), 20 were grade 3 (18.18%), 8 was grade 4 (7.27%) and 2 was grade 5 (1.82%) on Parkland scale.

Grade 1 Gall bladders are corresponded with the shortest mean surgery time of 55.37 minutes where in grade 2 is of 70 minutes, grade 3 of 110 minutes, grade 4 of 152.22 minutes, grade 5 of 182.15 minutes. This signifies that operative difficulty is well established as severity grade increases. The cases with bile leak were mainly from cystic duct stump and were tackled with re application of clips and were reassessed for further leaks. Out of 110 patients 11 underwent open conversion in which grade-1 were 0 patient, grade-2 were 3 patients, grade-3 were 4 patients and grade-5 were 2 patients. Mean length of stay from grade 1 were 3.51, grade 2 were 3.93, grade 3 were 4.70, grade 4 was 6.62 and grade 5 was 12 days which is showing that length of stay in

the hospital were comparatively higher as the severity grade is increased. Our study was compared with Tarik et al.⁹ According to Tarik et al.⁹ ($p=0.0001$), perioperative Gall Bladder status, mean surgery duration ($p=0.0001$) and mean length of hospital stay ($p=0.0001$) was found to be same as our study results ($p=0.0001$) both were statistically significant.

We also compared our study with Gupta et al.²² who included only preoperative risk factors old age, male sex, history of hospitalization, obesity, previous abdominal surgery, palpable Gall Bladder and Ultrasonographic findings like Gall Bladder wall thickness, pericholecystic fluid collection, impacted stone, which were statistically significant ($P=0.0003$) as that of our study ($p=0.0001$). In addition to these factors, we included parameters like single/multiple stones, symptomatic / asymptomatic and also different age groups & gender, which were found to be statistically significant ($P=0.0001$) as well.

6. Conclusion

Through this study it's clear that increasing grade (PGS) is significantly associated with increased difficulty of surgery, conversion rates, length of the operation and incidence of postoperative bile duct leak. An operative grading scale in which higher scores can predict longer, more difficult surgery and higher complication rates with increased duration of postoperative stay. Comparatively Parkland Grading scale is less complex and covers wider range of difficulty variations. Specifically, the simplicity of such an intraoperative grading scale validated for peri-operative outcome. This grading system along with pre-operative evaluation for Cholecystectomies may offer a simple and improved means of assessing operative difficulty and post-operative outcome based on Gall Bladder anatomy and inflammation.

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