

Ab Observation Study To Evaluate The Effectiveness Of American Association For The Surgery Of Trauma Scoring System For Grading Of Acute Cholecystitis:

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ABSTRACT:

Background:

The AAST advocated for validation studies using this system to assess its applicability to EGS diseases and its predictive power for outcomes of patients presenting with these diseases. To date, there have been several validation studies. However laparoscopic cholecystectomy being a highly technical procedure can lead to dramatic complications in troublesome cases. So we take clinical, imaging, operative, and pathological details for study on acute cholecystitis grading scale. Given the heterogeneity and complexity of the aforementioned attempts at grading acute cholecystitis, the goal of this study is to outline a simplified, evidence-based grading scale for the acute care surgery (ACS) community that uses anatomic criteria to predict patient outcomes after laparoscopic cholecystectomy (LC).

Material and methods: Current study was Hospital based prospective observational study conducted at the Department of General Surgery, SMS Medical College and Hospital, Jaipur , Rajasthan from February 2021 to December 2022. A total 80 cases of acute cholecystitis underwent for laparoscopic cholecystectomy were included in the study. Patients with requiring concomitant laparoscopic cholecystectomy with CBD exploration, Intraoperative findings of intra-abdominal adhesions during laparoscopic cholecystectomy not related to gall bladder diseases, Pre operatively diagnosed GB malignancy and previous history of abdominal surgery were excluded from the study. A detailed history along with all investigations were recorded. Data were analysed in SPSS v- 24. Independent t-test, Anova test and Chi-square test were applied. p value <0.05 was considered statistically significant.

Results: In the present study, a statistically significant high rate of conversion of open procedure from laparoscopic procedure, partial completion of surgical procedure and high level of difficulty were increased as AAST grade increases and also a statistically significant decrement in Hb and a statistically significant increment in duration of hospital stay, duration of operation and ICU stay was seen as AAST grades increases.

Conclusion: This study concluded that higher grades of AAST anatomic severity were independently associated with some clinical outcomes in patients with cholecystitis. Refinement of the current scoring system may be necessary for improved ability to predict of outcomes, especially at lower anatomic grade, where most patients present. Larger, multicenter patient samples inclusive of higher-grade disease are still needed to further validate the AAST.

Keywords: AAST, Laparoscopic cholecystectomy, cholecystitis, severity grade, validity etc.

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I. Introduction:

Acute cholecystitis typically present with significant variability and can be treated relatively simply through surgical resection with low morbidity and mortality if diagnosed early.¹ Conversely it can be associated with significant morbidity and mortality if disease progression occurs. Acute cholecystitis is a common illness process that manifests in varying degrees of severity, with acute disease being compounded by severe inflammation, gangrene, and perforation. Several attempts have been made to build an evidence-based

grading scale in order to provide a uniform approach for describing disease severity. Disease severity therefore is important to accurately understand and improve outcome related to individual disease severity states.²

Accurate measurement of disease severity may provide important prognostic information to clinician to optimise care and accurately counsel their patients. To account for variability in disease severity, the American Association for the Surgery of Trauma (AAST) introduced an anatomic severity grading system for emergency general surgery (EGS) diseases in 2014³.

The AAST advocated for validation studies using this system to assess its applicability to EGS diseases and its predictive power for outcomes of patients presenting with these diseases. To date, there have been several validation studies.⁴⁻⁷ However laparoscopic cholecystectomy being a highly technical procedure can lead to dramatic complications in troublesome cases. So we take clinical, imaging, operative, and pathological details for study on acute cholecystitis grading scale.

Given the heterogeneity and complexity of the aforementioned attempts at grading acute cholecystitis, the goal of this study is to outline a simplified, evidence-based grading scale for the acute care surgery (ACS) community that uses anatomic criteria to predict patient outcomes after laparoscopic cholecystectomy (LC).

II. Material and methods:

Current study was Hospital based prospective observational study conducted at the Department of General Surgery, SMS Medical College and Hospital, Jaipur , Rajasthan from February 2021 to December 2022. A total 80 cases of acute cholecystitis underwent for laparoscopic cholecystectomy were included in the study. Patients with requiring concomitant laparoscopic cholecystectomy with CBD exploration, Intraoperative findings of intra-abdominal adhesions during laparoscopic cholecystectomy not related to gall bladder diseases, Pre operatively diagnosed GB malignancy and previous history of abdominal surgery were excluded from the study. A detailed history along with all investigations were recorded.

AAST using the following variables: mortality, morbidity, complication severity (Clavien-Dindo), duration of stay, increasing patient age, increasing Charlson Comorbidity score, male sex, need for cholecystectomy , open procedures, and conversion from laparoscopic to open procedures. Disease severity ranges from grade I (mild, localized inflammation) to grade V (severe, generalized inflammation) incremental stages of inflammation with AAST EGS grades III, IV, and V corresponding to increasingly severe stages of perforation.

Ethical approval from the institute was obtained. Data were analysed in SPSS v- 24. Independent t-test, Anova test and Chi-square test were applied. p value <0.05 was considered statistically significant.

III. RESULTS:

In the current study, out of the 80 participants, maximum 50 were belongs to AAST grade 1. (Figure 1). In our study, advanced age, obesity and hyperlipidaemia were significantly more common in AAST grade 3 and 5. However other baseline characteristics and clinical parameters were not found to be statistically significant different between AAST grades. (Table 1)

In the present study, a statistically significant high rate of conversion of open procedure from laparoscopic procedure, partial completion of surgical procedure and high level of difficulty were increased as AAST grade increases. (Table 2)

Our study showed that a statistically significant decrement in Hb and a statistically significant increment in duration of hospital stay, duration of operation and ICU stay was seen as AAST grades increases. (Table 3, 4)

IV. DISCUSSION:

In our study the maximum patients (N=50, i.e. 62.5%) belonged to AAST Grade 1, followed by 24 patients (30%) in AAST Grade 2. There were 4 cases and 2 cases of AAST Grade 3 and grade 4. The low number of patients in higher grade could be attributed to early recognition and treatment is the standard of care, which leads to prevention of more severe cholecystitis (eg, gangrene, abscess, perforation).

Similarly in a study by Kenneth Vera BS⁸ (2018) to prospectively validate the AAST for cholecystitis have majority of patients in grade 1 (69%) which is comparable to our study group, higher grades have less number of patients as most of our patients were taken for elective LC which is also supported by Sammy Siada et al.⁹

Shafi et al¹⁰. proposed that oversampling patients with severe disease could create a cohort more representative of the disease severity spectrum; nevertheless, this is challenging because high-grade disease (perforation and generalized peritonitis by AAST criteria) is relatively rare in cholecystitis.

The most common comorbidity seen were hypertension, diabetes, and hyperlipidemia. Similarly in a study by Kenneth Vera BS et al⁸ to prospectively validate the AAST for cholecystitis the most common comorbidity seen was hypertension.

In present study there were significant differences in TLC count in various AAST grades. The mean TLC were 8636, 9305, 11325, and 11775 in AAST grade 1, 2, 3 and 5 respectively and the application of t test showed that this difference was statistically significant i.e. TLC increases with increase in AAST grade.

Similarly Kenneth Vera BS et al⁸ in their study found that higher grades of AAST cholecystitis have higher SOFA score which means the higher grades have propensity for sepsis which can be comparable to our results.

Similarly Sammy Siada et al⁹ in their study found that higher grades of AAST cholecystitis have higher SIRS score which means the higher grades have propensity for sepsis which can be comparable to our results.

In our study Partial cholecystectomy was done in a total of 7 patients. We observed that in grade 1 had no case of partial cholecystectomy, there was 4 cases (16.66%) of partial cholecystectomy in AAST grade 2, 2 cases (50%) of partial cholecystectomy in AAST grade 3 and 1 case (50%) of partial cholecystectomy in AAST-Grade 5. It is an important outcome of our study which indicate that need for partial cholecystectomy increases with higher grades on AAST

This observation is consistent with a study by Sammy Siada et al⁹ (2019) who observed that higher grades has higher chances of partial cholecystectomies.

In our study difficulty of surgery was rated using a 5 point Likert scale. Ranging from very low difficulty (1), low difficulty (2), medium difficulty (3), high difficulty (4) and very high difficulty (5). The difficulty level is noted in the perioperative period and is a subjective finding of the surgeon. Difficulty of surgery depends on various factors like severity of inflammation, abnormal anatomy, difficult calot's triangle anatomy, intra-operative adhesions, intra-operative bile/stone spillage, intra-operative bleeding. Thus it is a novel measure of outcome of laparoscopic cholecystectomy.

Out of 50 patients in AAST Grade 1, 28 have difficulty level 1 and 22 have difficulty level 2. In AAST Grade 2, nine cases have difficulty level 1, ten cases have difficulty level 2 and five cases have difficulty level 3. In AAST Grade 3, one case have difficulty level 1, one case have difficulty level 2 and two case have difficulty level 3 and all two patients of AAST grade 5 had difficulty level 4 which shows that as grade increases difficulty in surgery increased.

Since the extremely difficult cases in our study underwent partial cholecystectomy, we can say that need for conversion was avoided. Also use of vascular clips to control the bleeder, harmonic scalpel for accurate dissection aided in preventing conversion.

In our study there were statistically increases in rate of Conversion to open cholecystectomy per AAST Score i.e. there was higher conversion to open cholecystectomy in higher grade. There was only conversion to open cholecystectomy in AAST grade 1 and all two patients of grade 2 got Conversion to open cholecystectomy which indicates that cases in higher AAST Grade have more difficulty and are complicated.

Similarly Sammy Siada et al⁹ in their study found that higher grades of AAST cholecystitis have higher conversion to open rate which is consistent with our results.

Similarly Kenneth Vera BS et al⁸ in their study found that higher grades of AAST cholecystitis have higher conversion to open rate, and length of operation which is consistent with our results.

The mean length of stay in hospitalization in our study show significant increase with increase in AAST grade (mean 3 days, 4 days, 6 days, 9 days in AAST grade 1,2,3, and grade 5 respectively) i.e. the duration of hospitalization increases with increase in AAST grade

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In present study there were significant differences in term of ICU use in various AAST grades. There was no requirement of ICU in any patients in AAST Grade 1 and grade 2 cholecystitis. The mean ICU requirement in days for grade 3 and 5 were 1 and 5 days respectively i.e. as grade increases the ICU requirement increased.

Similar to our results Kenneth Vera BS et al⁸ in their study found that ICU requirement was 16% in grade 1, 31% in grade 2, 67% in grade 3 and 67% in grade 5 i.e. higher chance of ICU in higher grade.

The mean duration of operation in our study show significant increase with increase in AAST grade (mean 47 minutes, 64 minutes, 90 minutes, and 135 minutes in AAST grade 1, 2, 3, and grade 5 respectively) and the application of t test showed that this difference was statistically significant i.e. the duration of surgery increases with increase in AAST grade which is consistent with Sammy Siada et al⁹ and Kenneth Vera BS et al⁸ results.

The major complications seen in our study were 30 day readmission, excessive blood loss requiring transfusion, AKI, infection, Pneumonia, Sepsis, Septic shock, uncontrolled blood sugar and UTI.

In AAST grade 1 there was complications in 27.4% cases, in AAST grade 2 there was complications in 48.1% cases, in AAST grade 3 there was complications in 60% cases, and in AAST grade 5 there was complications in 50% cases, this means higher grade was associated with higher complication rates, although

there was not progressive increase in percentage per increasing grade wise from grade 2 to grade 5 which could be possible due to small cases in higher grades.

Similarly Sammy Siada et al⁹ in their study found that higher grades of AAST cholecystitis have higher rate of complications which is consistent with our results. According to Flum DR et al¹⁰ the occurrence of complications other than readmission or death was not significantly associated with AAST grade, unlike in reports validating AAST for other EGS diseases. The lack of discrimination and clustering of patients in low disease grades likely contributes to this finding. Furthermore, complications arising from cholecystectomy, particularly laparoscopic cholecystectomy, are rare.¹²

V. Conclusion:

This study concluded that higher grades of AAST anatomic severity were independently associated with some clinical outcomes in patients with cholecystitis. Refinement of the current scoring system may be necessary for improved ability to predict of outcomes, especially at lower anatomic grade, where most patients present. Larger, multicenter patient samples inclusive of higher-grade disease are still needed to further validate the AAST.

Figure 1: Distribution of participants according AAST severity grade

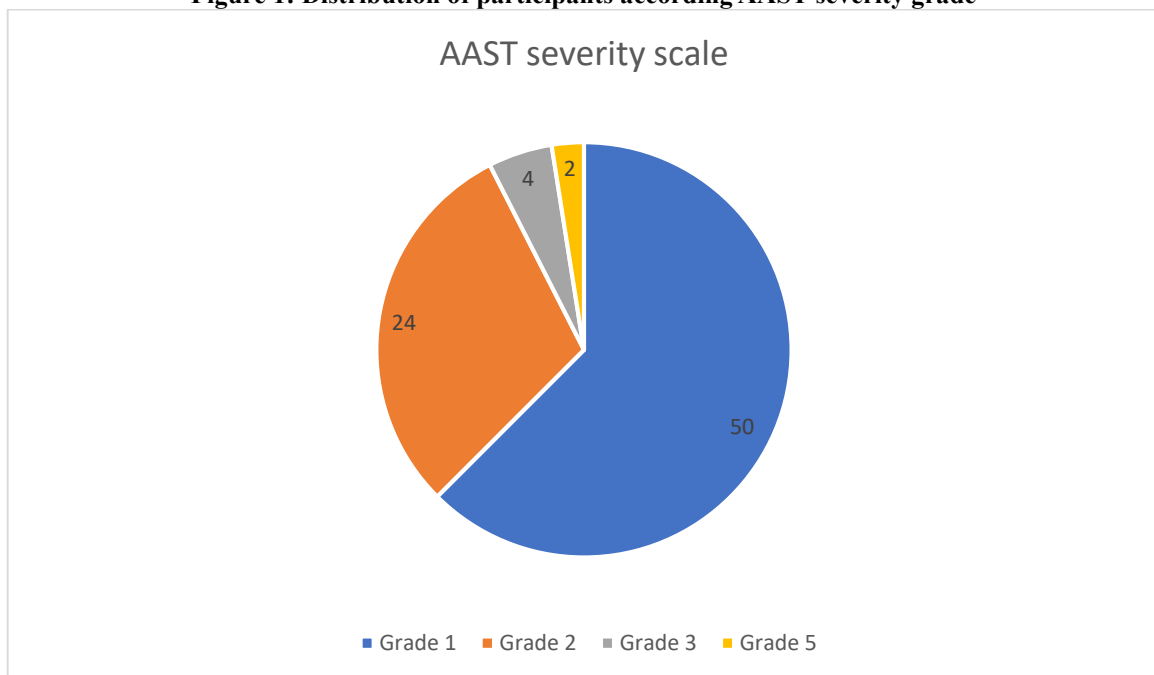


Table 1: Comparison of baseline and clinical parameters:

	AAST grade								p-value
	1 (n=50)		2 (n=24)		3 (n=4)		5 (n=2)		
	n	%	n	%	n	%	n	%	
Age group									
≤30 Years	5	62.5%	3	37.5%	0	0.0%	0	0.0%	0.001
31-40 year	19	63.3%	10	33.3%	1	3.3%	0	0.0%	
41-50 year	16	66.7%	7	29.2%	1	4.2%	0	0.0%	
51-60 year	6	50.0%	3	25.0%	2	16.7%	1	8.3%	
>60 years	4	66.7%	1	16.7%	0	0.0%	1	16.7%	
Gender									
Female	35	63.6%	17	30.9%	3	5.5%	0	0.0%	0.279
Male	15	60.0%	7	28.0%	1	4.0%	2	8.0%	
History									
Obesity	2	33.3%	0	0.0%	2	33.3%	2	33.3%	0.001
DM	10	50.0%	7	35.0%	2	10.0%	1	5.0%	0.234
Hypertension	23	59.0%	13	33.3%	2	5.1%	1	2.6%	0.926
Hyperlipidemia	10	50.0%	4	20.0%	4	20.0%	2	10.0%	0.001
Smoking	8	57.1%	3	21.4%	2	14.3%	1	7.1%	0.148

Table 2: Comparison of different outcome variables

	AAST grade								p-value
	1 (n=50)		2 (n=24)		3 (n=4)		5 (n=2)		
	n	%	n	%	n	%	n	%	
Intervention									
Converted to open	1	20.0%	0	0.0%	1	20.0%	3	60.0%	0.001
Complications	14	27.45%	13	48.15%	3	60.0%	1	50.0%	0.001
Surgical Procedure Completion									
Partial	0	0	4	16.67	2	50	1	50	0.001
Complete	50	100	20	83.33	2	50	1	50	
Difficulty Level of Surgery									
1	28	56	9	37.50	1	25	0	0	0.001
2	22	44	10	41.67	1	25	0	0	
3	0	0	5	20.83	2	50	0	0	
4	0	0	0	0	0	0	2	100	

Table 3: AAST Score based classification of cases as per various continuous parameters

Variable	AAST grade								p-value
	1		2		3		5		
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
AGE	42	10	39	9	49	10	59	4	.899
Hb	12.6	1.0	11.9	1.0	11.1	.7	11.0	1.7	.001
TLC	8636	2815	9305	2958	11325	2934	11750	6435	.243
PT-INR	1.0	.2	1.3	.8	1.1	.2	1.3	.3	.088
OT	48	11	47	10	46	18	61	38	.681
PT	52	13	52	12	50	11	69	33	.849
S. BILIRUBIN	1.6	.7	1.4	.8	2.6	.6	2.7	2.2	.562
B. UREA	60	36	41	23	82	19	49	23	.326
S. CREATININ	1.2	.3	1.2	.3	1.5	.5	1.5	.6	.331
AMYLASE	30	12	31	11	68	18	48	8	.056
LIPASE	34	14	34	12	27	5	25	1	.550
Duration of Operation	47	4	64	5	90	42	135	21	0.001
Length of Stay (days)	3	0	4	1	6	1	9	2	0.001
ICU Days	0	0	0	0	1	2	5	3	0.001

Table 4: Pairwise comparisons of significant variable among AAST grades

Sample 1-Sample 2	p-value			
	Hb	Duration of operation	Length of stay	ICU days
3-2	.053	.000	.000	.031
3-5	.174	.000	.000	.000
3-1	.004	.005	.003	.000
2-5	.423	.220	.057	.050
2-1	.001	.007	.008	.001
5-1	.222	.117	.050	.048

REFERENCES:

- [1]. Gurusamy KS, Davidson BR. Gallstones. BMJ. 2014;348:G2669
- [2]. Bourgouin S, Mancini J, Monchal T. How To Predict Difficult Laparoscopic Cholecystectomy? Proposal For A Simple Preoperative Scoring System.
- [3]. Shafi S, Aboutanos MB, Agarwal S, Brown CV, Crandall M, Feliciano DV, Et Al. Emergency General Surgery: Definition And Estimated Burden Of Disease. J Trauma Acute Care Surg. 2013;74(4):1092-7
- [4]. Savage SA, Klekar CS, Priest EL, Crandall ML, Rodriguez BC, Shafi S. Validating A New Grading Scale For Emergency General Surgery Diseases. J Surg Res. 2015;196(2):264-9.
- [5]. Shafi S, Priest EL, Crandall ML, Klekar CS, Nazim A, Aboutanos M Et Al. Multicenter Validation Of American Association For The Surgery Of Trauma Grading System For Acute Colonic Diverticulitis And Its Use For Emergency General Surgery Quality Improvement Program. J Trauma Acute Care Surg. 2016;80(3):405-10; Discussion 10-1.
- [6]. Hernandez MC, Aho JM, Habermann EB, Choudhry AJ, Morris DS, Zielinski MD. Increased Anatomic Severity Predicts Outcomes: Validation Of The American Association For The Surgery Of Trauma's Emergency General Surgery Score In Appendicitis. J Trauma Acute Care Surg. 2017;82(1):73-9.

- [7]. Baghdadi YMK, Morris DS, Choudhry AJ, Thiels CA, Khasawneh MA, Polites SF Et Al. Validation Of The Anatomic Severity Score Developed By The American Association For The Surgery Of Trauma In Small Bowel Obstruction. *J Surg Res.* 2016;204(2):428-34.
- [8]. Vera K, Pei KY, Schuster KM, Davis KA. Validation Of A New American Association For The Surgery Of Trauma (AAST) Anatomic Severity Grading System For Acute Cholecystitis. *J Trauma Acute Care Surg.* 2018 Apr;84(4):650-654.
- [9]. Siada S, Jeffcoach D, Dirks RC, Wolfe MM, Kwok AM, Sue LP. A Predictive Grading Scale For Acute Cholecystitis. *Trauma Surg Acute Care Open.* 2019 Jul 11;4(1):E000324.
- [10]. Shafi S, Priest EL, Crandall ML, Klekar CS, Nazim A, Aboutanos M, Agarwal S, Bhattacharya B, Byrge N, Dhillon TS, Et Al. Multicenter Validation Of American Association For The Surgery Of Trauma Grading System For Acute Colonic Diverticulitis And Its Use For Emergency General Surgery Quality Improvement Program. *J Trauma Acute Care Surg.* 2016;80(3):405–410; Discussion 410–1.
- [11]. Ansaloni L, Pisano M, Coccolini F, Peitzmann AB, Fingerhut A, Catena F, Et Al. 2016 WSES Guidelines On Acute Calculous Cholecystitis. *World J Emerg Surg.* 2016;11:25.
- [12]. Flum DR, Koepsell T, Heagerty P, Sinanan M, Dellinger EP. Common Bile Duct Injury During Laparoscopic Cholecystectomy And The Use Of Intraoperative Cholangiography: Adverse Outcome Or Preventable Error? *Arch Surg.* 2001;136(11):1287–1292.