



## A PROSPECTIVE STUDY OF USE OF CLAVIEN-DINDO CLASSIFICATION IN ASSESSMENT OF POST SURGICAL COMPLICATIONS IN PATIENTS UNDERGONE LAPAROTOMY IN A TERTIARY CARE HOSPITAL OF NORTH WESTERN INDIA

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### ABSTRACT

**Background:** Laparotomy is one of the most commonly performed surgeries by general surgeons, where we open the abdomen and search for any pathology. The Clavien-Dindo classification is an accepted surgical complication classification system that grades complications based on the extent of therapy required for their treatment. The study's main aim was to assess various grades of complications post-laparotomy with respect to the Clavien-Dindo classification. **Methods:** This study was a prospective and descriptive study conducted from June 2023 to July 2024. 180 patients who underwent laparotomy during this period were included and followed up in postoperative period and all the complications developed till discharge/death were recorded. **Results:** Complications were more common in emergency laparotomies (40%) as compared to elective laparotomies (30%). In elective laparotomies, 24 patients who had complications, 4 (17%) belonged to grade 1, 13 (54%) were in grade 2, 2 (8%) were in grade 3a, 2 (8%) were in grade 3b, 1 (4%) in grade 4a, 1 (4%) in grade 4b and 1 (4%) in grade 5. In emergency laparotomies, 40 patients who had complications, 8 (20%) belonged to grade 1, 15 (37.5%) were in Grade 2, 3 (7.5%) were in grade 3a, 5 (12.5%) were in grade 3b, 1 (2.5%) in grade 4a and 1 (2.5%) in grade 4b and 7 (17.5%) in grade 5. **Conclusion:** The Clavien-Dindo classification can be used in all hospital settings as a simple way for postoperative complications.

**KEYWORDS :** Laparotomy, Postoperative complications, Clavien-Dindo

### INTRODUCTION

Laparotomy is one of the most commonly performed surgeries by general surgeons, where we open the abdomen and search for any pathology [1]. Every surgery has its own set of complications, and the same goes with laparotomy. The final result of any laparotomy is related to the underlying pathology such as tuberculosis, cause of peritonitis, extent of metastasis, and duration of illness. However, pre-operative general condition, care in the postoperative period and surgical techniques also contribute to the final results. Postoperative complications are a major challenge to the surgeon. Despite various advanced modes of care available, there is limited standardization of effective post-operative care after exploratory laparotomy for reduction of these postoperative complications [2].

Differences in clinical practices all around the world whether in India or abroad, in various hospitals, have triggered interest in measuring and improving the quality of healthcare delivery. For a valid and valuable assessment of the relevant data on the outcomes in a postoperative care, classification has to be universal by which the comparison among different centers, different procedures, and within a center over time has to be valid and applicable at any post-operative period [3].

Clavien-Dindo classification is a very effective and useful tool for reporting complications following abdominal surgeries in a simple way based on the extent of therapy required for their treatment [4].

In Clavien Dindo's classification, there are five grades. Grade I includes patients in which any deviation from the normal postoperative course without the need for pharmacological treatment, surgical, endoscopic, and radiological

interventions. Drugs that can be used are antiemetics, antipyretics, analgesics, diuretics, electrolytes, and physiotherapy. Wound infections opened at the bedside are also included in this grade. Grade II includes patients requiring pharmacological drugs other than those allowed for grade I complications. It also includes blood transfusion and total parenteral nutrition. Grade III includes in which any surgical, endoscopic, or radiological intervention is done. Grade IIIa in which intervention is done under local anesthesia and grade IIIb in which intervention is done under general anesthesia. Grade IV includes patients who had life-threatening complications including central nervous system complications, requiring IC/ICU management. Grade IVa includes patients in which there is single-organ dysfunction (including dialysis) and Grade IVb in which there is multi-organ dysfunction. Grade V includes patients who died after the surgery [2].

The Clavien-Dindo classification also allows coding for sequelae occurring after surgery, with the letter "d" for disability that can be added to the surgical grade of the complications if necessary. This integrates the principle of some previous surgical classification systems differentiating outcomes after surgery into three groups - complication, failure to cure, and sequelae [3].

The present study aimed to evaluate the understanding of Clavien Dindo classification and its need in describing the post-operative complications in patients who underwent laparotomy.

### METHODS

This study was a prospective descriptive study of patients admitted from June 2023 to July 2024. 180 patients who underwent laparotomy in P.B.M Hospital during this period

have been included in the study.

**Inclusion And Exclusion Criteria:**

All patients undergoing emergency or elective laparotomy, who were ≥ 14 years of age and both genders were included in the study. Patients who were previously operated for abdominal surgeries were excluded from the study. Those patients who did not give consent and had complications after discharge were also excluded.

All the patients with the diagnosis of pain abdomen were assessed clinically after admission. A complete history was taken, emphasizing age, marital status, fertility, and past medical and surgical history. USG, CT, and MRI were done according to complains and respective diagnosis. Among such cases, all those patients undergoing laparotomy were selected. Patients who fulfilled the inclusion criteria were part of this study according to inclusion criteria and were followed up till discharge of the patient to look for any postsurgical complications.

**Statistical Analysis:**

The recorded data was compiled and entered into a spreadsheet computer program (Microsoft Excel) and appropriate tests were applied. For all tests, confidence level, and significance level were set at 95% and 5% respectively.

The study protocol was ethically reviewed and approved by the Ethical Review Committee of SPMC Medical College & Hospital, Bikaner.

**RESULTS**

In this study, 180 patients who underwent laparotomy and satisfied the inclusion criteria were selected. All the patients gave consent to participate in this study. Out of 180 patients, 100(56%) patients underwent emergency laparotomy, and 80(44%) patients had elective laparotomy.

In elective cases, 6 patients belonged to the age group <20. 14 patients were in the age group of 21-30 and 12 patients were in 31-40 age group. 13 patients were in the age group of 41-50. The maximum number of patients 21 were in the age group 51-60. 14 patients were >60 years of age. Among all these elective laparotomies, when we see the age-wise distribution of postoperative complications the maximum of 10 patients was in the age group of 51-60 years, followed by 6 patients who belonged to the age group of >60 years. It is evident that in elective cases, the postoperative complications occurred higher in patients >50 years of age, i.e. 16(66.6%) patients, and less among the younger age group, i.e. 8(33.4%) patients. In emergency cases, out of 100 patients, 6 belonged to the group of 14 to 20 years, 19 were in the age group of 21-30, 17 were in the age group of 31-40, 18 were in the group of 41-50 and 18 belonged to the group of 51-60. The maximum number of patients 23 belonged to the age group of >60 years of age. When comparing postoperative complications in emergency cases, out of 40 patients who had complications, a maximum of 12 patients belonged to the age group >60 years. Among patients who had complications among emergency laparotomies, 18(45%) cases were of age >50 years and 22(55%) cases were of age <50 years.

Of these 180 patients, 95(53%) were male and 85(47%) were female which shows a slightly male preponderance. In elective laparotomies, 45 patients were female and 35 were male. On the other hand in emergency laparotomies, 40 were female and 60 were male. 64 patients had postoperative complications, out of which 28(44%) were females and 36(56%) were males demonstrating a higher number in males as shown in Table 1.

**Table 1: Sex wise distribution of patients with postoperative complications**

	TOTAL PATIENTS (N=180)	PATIENTS WITH COMPLICATIONS (N=64)
MALE	95	36
FEMALE	85	28

When seen individually, in elective cases, 24(30%) patients had postoperative complications out of 80 patients. As compared to emergency laparotomies, 40(40%) patients had postoperative complications out of 100. The postoperative complications in emergency cases were higher when compared with elective cases.

**Table 2: Clavien Dindo grading in all patients with complications**

CLAVIEN DINDO GRADE	NO. OF PATIENTS (N=64)	PERCENTAGE
1	12	19%
2	28	44%
3a	5	8%
3b	7	11%
4a	2	3%
4b	2	3%
5	8	12.5%

The highest number of patients were included in grade 2 of Clavien Dindo, i.e. 28(44%) patients, followed by grade 1 which included 12(19%) patients with complications. A total of 8(12.5%) patients out of 64 patients with complications, were the cases with mortality grade V as shown in Table 2.

Among 24 patients who had complications in the elective laparotomies group, 4 belonged to grade 1, 13 were in grade 2, 2 were in grade 3a, 2 were in grade 3b, 1 in grade 4a, 1 in grade 4b, and 1 in grade 5. In emergency laparotomies group, among 40 patients who had complications, 8 belonged to grade 1, 15 were in grade 2, 3 were in grade 3a, 5 were in grade 3b, 1 in grade 4a and 1 in grade 4b, and 7 in grade 5.

**Table 3: Clavien-Dindo grading in Elective vs. Emergency laparotomies**

CLAVIEN DINDO GRADE	ELECTIVE	EMERGENCY
1	17%	20.00%
2	54%	37.50%
3a	8.00%	7.50%
3b	8.00%	12.50%
4a	4.00%	3%
4b	4%	2.50%
5	4%	17.50%

Comparing the elective cases and emergency cases, we see that higher grades of complications (3b-5) were seen more among emergency cases. In elective cases, grade 1-3a were 19(79%) patients and 3b-5 were only 5(21%) patients. On the other hand in emergency cases, grade 1-3a were 26(65%) patients, and 3b-5 were 14(35%) patients as shown in Table 3. In elective cases, the procedure with the highest number of patients with complications was sigmoidectomy. This was followed by APR and right hemicolectomy. In emergency cases, the procedure with the highest number of patients with complications was resection anastomosis or RA with ileostomy/ primary repair followed by ileostomy alone, adhesiolysis, billroth II and colostomy.

The mean duration of hospital stay was 7.6 days (the day of surgery was considered as day zero). For elective cases it was 6.5 days and for emergency cases it was 8.4 days.

**Table 4: Average duration of hospital stay according to Clavien-Dindo grade**

CLAVIEN DINDO GRADE	AVERAGE DURATION OF HOSPITAL STAY
I	7.5 DAYS

II	8.6 DAYS
IIIA	11.2 DAYS
IIIB	12.7 DAYS
IVA	13.5 DAYS
IVB	19 DAYS
V	13.3 DAYS

For grade I, the average duration of stay was 7.5 days; for grade II, it was 8.6 days; for grade IIIA, it was 11.2 days; for grade IIIB, it was 12.7 days; for grade IVA, it was 13.5 days; for grade IVB, it was 19 days; and for grade V, it was 13.3 days as shown in Table 4.

## DISCUSSION

The Clavien-Dindo classification differentiates the complication severity in different grades, starting from grade 1 to grade 5. This classification continues to be of prime importance in analyzing the development of complications among various surgeries.

Among all laparotomies, 44% of the cases were elective and 56% were emergency cases. This data is as per a study done by Kapoor S et al. 2017 [5] in which emergency laparotomies were 74% and elective ones were 26%. As ours is a tertiary care center, therefore emergency cases were more common as compared to elective cases.

Among elective cases who developed complications, a maximum of 10 (42%) patients were in the age group 51-60, followed by >60 years in which there were 6 (25%) patients. Similar results were seen in the study done by Bollinger M. et al. 2018 [6] which had patients with a mean age group of 59 years. In contrast, according to a study done by Vignesh et al. 2016 [7] most common age was 30-39 years 21 (26.25%) patients followed by >60 years 17 (21.3%) patients. With old age, there is reduced function of different organs and an increase in comorbidities, which are associated with deterioration in the postoperative period, thereby increasing morbidity and mortality.

Among emergency cases who developed complications, a maximum of 12 (30%) patients were in the age group >60 years, followed by 21-30 years in which there were 10 (25%) patients. A study done by Manoj et al. 2021 [8] had a maximum number of patients of 31-40 years and Deshwali A. et al. 2021 [9] also had a maximum number of patients in the age group of 20-39.

Males (38%) had a higher complication rate than females (33%). There are more males among emergency cases because of their high prevalence of addiction and higher amount of outdoor activities, making them more prone to trauma and perforation.

Complications emerged in 35.5% of the total cases in our study, which when compared to Vignesh et al. 2016 [7] study done in Mysore the percentage was 57.5%, AR Bansal et al. 2019 [10] study done in Rohtak complication percentage was 68% and Rapaka RR et al. 2020 [11] study in Telangana complication percentage was 62%. So in comparison to Indian standards, the complications percentage was much lower. But when compared to international standards like the study done by Dindo D et al. 2004 [2] in Switzerland complications were seen in 16.4% of cases and Bolliger M et al. 2018 [6] in Europe which showed complications in 12.5% of cases, the percentage found in our study was much higher. The total percentage of postoperative complications was lower in our hospital in comparison to hospitals in our country because of the tertiary care hospital, more facilities present in our hospital, and a better understanding of the perioperative period. Contrary to this fact, when compared to more developed nations like Europe where the percentage of patients developing complications is much lower. This is

because of different approaches to treatment and the availability of more advanced healthcare facilities present in developed nations.

The incidence of complications in elective surgeries was 30%, while in emergency surgeries, the complication rate was 40%. Therefore, the incidence of complications was higher in emergency laparotomies. This data is similar to the studies conducted by Mentula PJ et al. 2014 [12] complications among elective cases were 18.2% and emergency cases were 49.3%, Chauhan S et al. 2017 [13] in which the complication rate in elective laparotomies was 22% and in emergency laparotomies it was 37% and Kapoor S et al. 2017 [5] where complications in emergency surgeries were higher than elective surgeries. This is because of a lack of preoperative stabilization in emergency cases and more complex cases referred to our hospital.

As per Clavien Dindo's classification, we saw that higher grades of complications (3b-5) were seen more in emergency cases. In elective cases, grades 1-3a were 79% and 3b-5 were only 21%. On the other hand in emergency cases, grades 1-3b were 65%, and 3b-5 were 35%. Mortality grade that is grade 5 was much higher in emergency cases (17.5%) when compared to elective cases (4%). Thus elective and emergency laparotomies performed in our hospital developed only low-grade complications (Clavien dindo grade I -IIIA) in most of the patients. Only a few high-grade complications (Clavien Dindo grade IIIb-V) were recorded, which were far more common in emergency laparotomies. Similar data is seen when compared to studies like Mentula PJ et al. 2014 [12] where the percentage of patients in grades 1-3 was 62% and grades 4-5 was 38% and Singh A et al. 2016 [14] where the percentage of patients in grade 1-3 was 71% and grade 4-5 was 29%. Mortality grade 5 was seen in 17.6% of cases with complications.

In contrast, study done by Deshwali A et al. 2021 [9] grades 1-3 were seen in 46% of cases, and grades 4-5 were in 54% of cases. Mortality grade 5 was seen in 30% of cases with postoperative complications.

The operative procedure that had the most patients with postoperative complications in elective cases was sigmoidectomy. This is followed by APR and right hemicolectomy. A study done by Schilling PL et al. 2008 [15] also showed that out of all elective procedures, colectomy was the procedure with the highest number of complications. It is because these patients are at high risk of infections and dysmotility.

The operative procedure that had the most patients with postoperative complications among emergency cases was resection anastomosis or RA with ileostomy/ primary repair followed by ileostomy alone, adhesiolysis, Billroth II, and colostomy. A study done by Jeppesen MM et al. 2019 [16] showed that in emergency laparotomies, the most common location was the intestine, and patients with anastomosis were at high risk of complications.

In our study, the mean duration of hospital stay was 7.6 days and for elective cases, it was 6.5 days and for emergency cases, it was 8.4 days. The maximum duration of stay was for grade IVB Clavien-Dindo classification 19 days. As we go from grade I to grade IVB the duration of hospital stay also increases.

As the cases of this study were collected from a tertiary care hospital, this study provides us with data regarding postoperative complications in elective and emergency laparotomies. Emergency patients account for a huge number of cases and can be used for quality improvement and

negative outcomes should be measured and classified to find more specific targets for quality improvement. Therefore, complications in emergency laparotomies were also included in the study along with elective laparotomies. The simplicity and attractiveness of the Clavien Dindo classification focusing on morbidity and mortality makes it easy to use. This can also be used by less experienced surgeons.

There are various limitations of the Clavien-Dindo classification which are that it does not take into account the preoperative morbidity of the patients. Subjectivity is a potential limitation in the use of this classification due to different surgical approaches in the evaluation of a specific complication. Also, the age of the patients and the complexity of surgery are not included, which plays an important factor when considering postoperative complications. Patients were not followed up after discharge, some of which might develop complications post discharge which was also not included.

## CONCLUSION

Any deviation from the normal course following surgery can be easily distinguished by the Clavien-Dindo classification. Many of these complications can be prevented by thorough pre-operative evaluation, sound surgical technique, and careful follow-up care. The Clavien Dindo classification can reasonably be used in all hospital settings as a simple way of calculating postoperative complications. With these promising results, further evaluation must be done so we can establish a standard classification and a standard protocol of care. Also, the patient's comorbidities, perioperative organ dysfunction, and type of surgery should be included in such a classification for risk adjustment.

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