

## A Review of 100 Cases of Colonic Injuries Admitted to Baghdad Teaching Hospital According to ACS Grading System

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### ABSTRACT:

#### BACKGROUND:

In Iraq nearly 95% of colonic injuries are caused by penetrating trauma (gun shot, blast injuries, stab injuries, or iatrogenic trauma), blunt injuries are rare & commonly result from road traffic accidents or fall from height. While in the rest of the world, penetrating trauma accounts for 80-90% of cases. This higher rate of penetrating trauma in Iraq is due to the high rate of terrorism attacks with low & high velocity missiles.

#### OBJECTIVE:

The aim is to study cases with colonic injuries according to ACS(American College of Surgeons) grading system, the surgical management applied & the postoperative outcome of each grade.

#### PATIENTS AND METHODS:

This prospective study comprises (100) patients with documented colonic injuries admitted to the surgical wards at Baghdad Teaching Hospital spanning the years 2006 to 2008.

The parameters used in this study include: age, gender, mechanism of injury, part of the colon involved by injury, the grade of the injury, other associated organ injuries, the method chosen to manage the injury & the outcome (uneventful recovery, postoperative morbidity & death).

#### RESULTS:

Colonic injuries were caused by bullet injuries in 50% of cases, sigmoid colon was the most common involved part (32%), 64% of cases were of grade 2 ACS, the most common associated organ injury was small intestine (60%), colonic injuries were primarily sutured in 48% of cases, while other 48% of cases ended with colostomy. Morbidity postoperatively were recorded in 32% of cases, most frequently with grade 2 & in cases treated by colostomy. Postoperative Death was recorded in 14 % of cases.

#### CONCLUSION:

According to our study, ACS grading system proves to be highly beneficial to be applied in the course of management of colonic injuries.

**KEYWORDS:**ACS grading system, colonic injuries.

### INTRODUCTION:

The morbidity and mortality from acute trauma to the colon have been significantly reduced by an aggressive surgical approach. During the American civil war, the mortality of colonic trauma was nearly 100%. At the time of First World War, primary repair was practiced for all the types of colonic injuries and it had the mortality of 60%<sup>(1)</sup>.

The surgical opinion that treatment of traumatic perforation of the colon mandated faecal diversion rather than primary repair had, with few exceptions, escaped unchallenged since being established during the second world war<sup>(3,4)</sup>.

In the later phase of Korean conflict, however, some modification of the aggressive technique was noted in that small primary wounds treated early were handled by primary closure without exteriorization<sup>(2)</sup>. In recent years, this uniform (gold standard) approach has been subjected to intense review<sup>(5)</sup>. The colon is the second most commonly injured organ in penetrating trauma, while its rare in blunt trauma (2-5%). Colorectal injuries have always presented challenge and some degree of confusion.

Primary repair can be performed in almost all cases except in certain selected cases that are decided on the table, taking into account the above risk factors. Mortality in cases of colonic injuries is associated with risk factors rather than colonic injury itself<sup>(10)</sup>.

According to ACS grading system, colonic injuries are graded into: (11)

Grade 1: serosal injury, hematoma, or contusion.

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Grade 2: laceration of <50% of bowel wall circumference.

Grade 3: laceration of >50% of bowel wall circumference.

Grade 4: complete transaction of bowel.

Grade 5: segmental loss or devascularisation of bowel.<sup>(11)</sup>

### PATIENTS AND METHODS:

This prospective study comprises consecutive 100 patients with documented colonic injuries admitted to the all surgical wards at Baghdad Teaching Hospital over a period of two years from 2006-2008.

The parameters used in this study include: age, gender, mechanism of injury. Vital signs were recorded and digital rectal examination (DRE) had been done for all the patients and they were managed at the surgical emergency unit and prepared for emergency laparotomy during which the colonic injury was dealt with and data were collected during the postoperative follow up period regarding the part of the colon involved by the injury. For purpose of comparison, the anatomical site of the colonic injuries were classified into four groups: caecum + ascending colon, transverse colon, descending and sigmoid colon. Informations regarding the grading of the colonic injury, degree of abdominal contamination and any associated organ injuries were recorded.

Thereafter we followed up the patients with the recording of postoperative complications or running of the patient through uneventful postoperative period, or death. Then we correlated the occurrence of postoperative complications and death with each grade of colonic injury and each type of management. The results were shown in the form of figures and tables and were statistically described.

### RESULTS:

Of the 100 cases with documented colonic injuries included in this study, 80% were males and 20% were females, with a ratio of 4:1.

Regarding age distribution of the patients, our study shows that 32% of patients were in the (30-39years) age group, also it shows that 84% of them were under 39 years old, the mean age was 29 years.

Only 4% of cases of colonic injuries were caused by blunt trauma, while the rest of injuries were caused by perforating injuries which was subdivided into bullet injuries(50% of cases), shell injuries-blast (40% of cases), and iatrogenic injuries (6% of cases). According to ACS grading system of colonic injuries 10% of cases were of Grade one and in all of them (100%) DRE was negative (table- 3). Sixty Four of cases were of Grade two, only four patients of them (7%) where with positive DRE results. Grade three was recorded in 18% of cases and DRE was positive in eight patients of them (44%). Both Grades four and five recorded in 4% of cases and all of them (100) were with positive DRE as shown in figure.1.

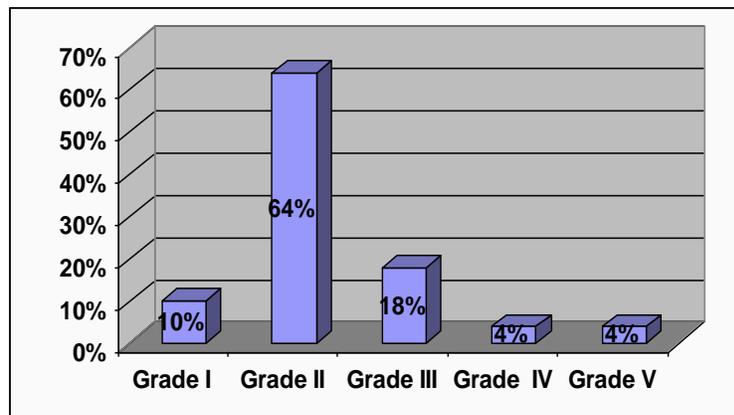


Figure 1:Grades of colonic injuries according to ACS grading system

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The descending and sigmoid colon were the most frequently injured part of the colon (50% of cases), DRE was positive in 12 patients (24% of this group). Injuries involving the transverse colon were recorded

in 26% of cases and DRE was positive in six patients (23%). The caecum and ascending colon were injured in 24% of cases & DRE was positive in two patients (8.3%).

**Table 1: Results of Digital rectal examination (DRE) preoperatively, according to the ACS grading system & anatomical parts of the colon**

ACS Grades	DRE positive (%)	DRE negative (%)
Grade I	Nil	10 (100%)
Grade II	4(7%)	60 (93%)
Grade III	8 (44%)	10 (56%)
Grade IV	4 (100%)	NIL
Grade V	4 (100%)	NIL
Total	20	80

A eighteen patients were at shock state when admitted to the emergency unit, six of them found to have grade one colonic injuries and grade two was recorded in five patients. Regarding associated intra abdominal organ injuries, 40 patients were found to have one or two associated organs injured and the

other 60 patients were found to have more than two associated organ injuries.

In 44% of cases, a mild intra abdominal contamination was found while moderate and severe degrees of intra abdominal contamination were recorded in 24% and 22% of cases respectively.

**Table 2: Risk Factors Versus ACS grading of colonic injuries**

Risk factors	patient number	Grade1 No (%)	Grade2 No (%)	Grade3 No (%)	Grade4 No (%)	Grade5 No (%)
shock						
SBP > 90 mmhg	82	4 (40%)	59(92%)	16(89.9%)	2(50%)	1(25%)
SBP < 90mmhg	18	6(60%)	5(8%)	2(11.1%)	2(50%)	3(75%)
No. of associated intra abd. Organ Injury:						
1-2 organ injury:	40	2(20%)	26(40.6%)	8(44.5%)	2(50%)	2(50%)
>2 organ injury:	60	8(80%)	38(59.4%)	10(55.5%)	2(50%)	2(50%)
Contamination:						
Mild:	44	0(-)	38(59.4%)	6(33.3%)	0(-)	0(-)
Moderate:	24	0(-)	15(23.4%)	6(33.3%)	2(50%)	1(25%)
Severe:	22	0(-)	11(17.2%)	6(33.3%)	2(50%)	3(75%)

Pure colonic injuries was recorded in 8% of cases only & the most common associated injuries were small intestinal injuries (60% of cases), followed by renal injuries (16% of cases).the most common extra-

abdominal associated injury was affecting the cardi thoracic system (16% of cases), followed by the neurological system (12% of cases) as shown in table.3.

**Table 3 :Associated intra & extra abdominal injuries in colonic trauma**

5	Ureters and urinary bladder injury.	6
6	Diaphragm injury.	6
7	Liver injury.	10
8	Gastrodudenal injury.	6
9	Splenic injury.	8
10	Renal injury.	16
11	Ophthalmologic injury.	4
12	Burns.	4
13	Vascular injury.	8
14	Gynecological injury.	2
15	Penoscrotal injury.	2
16	Neurological injury.	12
17	Fasciomaxillary injury.	6
18	Rectal injury.	2

A 45% of cases were treated by primary repair (both debridement & repair + resection and repair), 14 patients of them had hemicolectomy (31%); 27 patients of them (60%) recover without developing any complication, while 16 patients (35.5%) develop postoperative complications (wound infections, chest infections, DVT, etc). Postoperative death was recorded in two patients (4.5%).

In 45% of the patients, colostomy had been performed (16 patients of them had primary repair with proximal colostomy), 46.6% of them (21 patients) recover completely, 18 patients (40%) develop postoperative complications and six patients (13.4%) died postoperatively as shown in table.4.

**Table 4: Types of surgical management of colonic injuries versus the outcome**

Type of surgical management	Total No	Smooth recovery No (%)	Complicated recovery No (%)	Death No (%)
Primary closure	31	19 (61.2%)	12 (38.8%)	Nil
Colostomy	29	11 (37.9%)	14 (48.3%)	4 (13.8%)
Hemicolectomy and primary anastomosis	14	8 (57.2%)	4 (28.5%)	2 (14.3%)
Proximal colostomy and primary repair	16	10 (62.5%)	4 (25%)	2 (12.5%)
No repair–no colostomy	10	6(60%)	Nil	4 (40%)

In all patients with Grade one colonic injuries (100%) no repair-no colostomy approach was adapted, primary repair was used in 39 patients (61%) with grade two injuries.

In patients with colonic injuries of grades three, four and five, colostomy approach was used in 67%, 100% and 100% of cases respectively as shown in table.5.

**Table 5: Grades of colonic injury versus types of surgical management**

Types of surgical management	G1	G2	G3	G4	G5
Primary closure	0	27(42%)	4(22%)	0	0
Hemicolectomy + primary anastomosis	0	12(19%)	2(11%)	0	0
Colostomy	0	16(25%)	5(28%)	4(100%)	4(100%)
Proximal colostomy + primary repair	0	9(14%)	7(39%)	0	0
No repair-no colostomy	10(100%)	0	0	0	0

Of the 100 patients included in our study, 54 % of patients recover without complications, 44 patients of them were of Grade two (68.7% of cases with Grade two), while the other ten patients were of grade one & three (four & six patients respectively). 34% of patients developed postoperative complications, of

them 16 patients were of Grade two (25%of cases with Grade two). Postoperative death was recorded in 12% of cases and mostly patient having more than three organ injuries, four of them were of Grade two colonic injuries as shown in table.6.

**Table 6: Colonic Injuries According to the ACS grading system versus management outcome**

Grade	Stable recovery No (%)	Complicated recovery No (%)	Death No (%)
G I	4 (40%)	2 (20%)	4 (40%)
G II	44 (68.7%)	16 (25%)	4(6.3%)
G III	6 (34%)	10 (55.5%)	2 (10.5%)
G IV	NIL	4 (100%)	Nil
G V	Nil	2 (50%)	2 (50%)
Total	54	34	12

**DISCUSSION:**

This study of 100 cases of documented colonic injuries demonstrates that 80% of cases were males and the remaining 20% were females, this gives a male: female ratio of four: one. This result goes with that of Foster K et al <sup>(11)</sup>, who found male predominance in a ratio of 6.5:1.

Regarding age distribution, this study shows that 32% of patients were in the (30-39 years) age group and that 84% of them were <40 years of age with a mean age of 29 years, this result is in accordance with that of Bowly DMG et al <sup>(12)</sup>, who found a mean age of 30 years. This can be attributed to the fact that most of the individuals affected by explosions and bullets are the young (civilian and armed) employees. The greatest number of colonic injuries were the result of penetrating trauma (96% of cases), only 4% of cases were caused by blunt trauma (mostly by road traffic accidents and fall from heights). The offending insult was low and high velocity missiles in 90% of cases due to the fact that most of the cases are victims of terrorist attacks.

This result is in accordance with that of Stankovic N et al <sup>(13)</sup>, who also found that 80% of cases were due to perforating trauma.

This result goes with that of Kandil AA et al <sup>(15)</sup>, who found that the majority of cases were of Grade two & three (60% of cases), and it also goes with the results of Wienberg JA et al <sup>(16)</sup>, who concluded a relationship between positive results of DRE with the increasing grade of colonic injuries.

Considering the site of colonic injury, the most frequently injured part of the colon was the descending and sigmoid colon, followed by the transverse colon and lastly the caecum and ascending colon in the following percentages respectively (50%, 26%, 24%), also DRE was recorded positive in these parts in the following percentages respectively (24%,23%,8.3%). This result doesn't concedes with that of Woo K et al<sup>(14)</sup>, who concluded that the transverse colon was the most frequently injured part of the colon followed by sigmoid colon. This difference probably due to difference in number of

patient sample in each study.

Three risk factors were studied:

1. Shock: a systolic blood pressure of less than 90 mmHg at presentation was taken as an indicator for shock, 18 patients were with shock state at presentation, except for grade one (in which there is higher percentage of patients with shock -60%, due to multiple and complicated associated intraabdominal injuries), otherwise, there is an increasing rates of patients with shock with the increasing grade of colonic injuries (8%, 11.1%, 50% and 75% respectively).

2. Number of associated intraabdominal organs injuries: as mentioned, patients with grade one colonic injuries were more associated with multiple (>two) intraabdominal organ injuries (80% of them), while it was recorded in 59.4%, 55.5%, 50% and 50% in patients with colonic injuries of grade two, three, four & five respectively.

3. Contamination: this study demonstrates that an increase in the grade of colonic injuries is associated with an increase in the degree of intraperitoneal contamination (according to George grading system). Severe contamination was recorded in 17% of cases with G2 colonic injuries, and this increase to 33.3%, 50% and 75% in cases with colonic injuries of G3, G4 and G5 respectively. These results goes with the results of the study of Behrman SW et al<sup>(17)</sup>, & the study of Murray JA et al<sup>(18)</sup> which confirm a relationship between those risk factors and the increasing scores of colonic injuries.

In 92% of cases, colonic injuries were associated with other injuries in the body, the most commonly associated intraabdominal organ to be injured was the small intestine (60 % of cases), followed by renal injuries (16 % of cases), while cardiothoracic injuries were the most common extra abdominal associated injury (16% of cases) followed by central nervous system injuries (12% of cases). These results concede with that of Bowley DMG et al<sup>(12)</sup>, who also found that the main associated intraabdominal organ injuries was in the small intestine (48% of cases), and the most commonly associated extra abdominal injury was cardio-thoracic injury (15% of cases).

Our study shows that 45% of cases were treated by primary repair, (31% of these cases had hemicolectomy), postoperative followup shows low postoperative morbidity and mortality rates were recorded in this group of patients (35.5% and 4.5% respectively), most of these postoperative morbidity and mortality were due to extra colonic

complications (e.g. DVT, cardiothoracic injuries, head injuries, etc).

While in 45% of cases surgical intervention ended with colostomy (in 16 patients it was primary suturing with proximal diversion colostomy), a higher rate of postoperative morbidity was recorded (40% of cases), and a higher rate of mortality was also recorded (13.4% of cases).

These results concede with those found in a Iraqi board thesis submitted by Waseem A Elkatib<sup>(19)</sup>, which show a higher rate of postoperative morbidity in patients treated by diversion colostomy (73.6%) than in patients treated by primary repair (27.5%).

This also goes with the results found by Bowley DMG et al<sup>(12)</sup>, which show a better outcome regarding postoperative recovery in cases managed by primary repair rather than colostomy. Cornwell EE et al<sup>(20)</sup>, also found better results in cases managed by primary repair.

Regarding patients with Grade two colonic injuries, 61% of cases were treated by primary repair (with or without hemicolec -tomy); while in patients with Grades three, four and five, the surgical management included colostomy in 67%, 100%, 100% of cases respectively, this can be explained by the higher levels of fecal contamination and the poor general condition of patients with higher grades of colonic injuries. This concedes with the results found in the thesis submitted by Nagham H. Altarafi<sup>(21)</sup> who found that most of cases treated by primary repair were with colonic injuries of grades two, while the majority of cases with colonic injuries of grades three, four & five end with colostomy.

Our study shows that postoperative recovery without complications was recorded in 54% of cases, postoperative morbidity was recorded in 34% of cases and postoperative mortality was recorded in 12% of cases.

Except for Grade one in which higher rates of postoperative morbidity & mortality was recorded due to extensive extra colonic multisystemic associated injuries, otherwise postoperative morbidity and mortality for Grades two, three, four and five were : 31.3%, 66%, 100%, 100% respectively. This concede with the results of Nelken N et al<sup>(22)</sup>, which conclude that there is an increase in morbidity in all indices related to the increase in the scores of colonic injuries.

### **CONCLUSION:**

ACS grading system for colonic injuries is a useful method in scoring these injuries and is beneficial in

the followup of these cases in the postoperative period because the increase in the ACS grade of colonic injuries is associated with increasing risks of developing postoperative complications with higher rates of postoperative morbidity and mortality.

A systolic blood pressure of less than 90 at presentation, association with multiple injured organs and severe degree of contamination are important adverse risk factors, and are related to higher ACS grades of colonic injuries. Most of the postoperative morbidity and mortality was due to extra colonic injuries and their complications.

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