

Relaparotomies in Abdominal Trauma, Systematic Review

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ABSTRACT:

BACKGROUND:

Treatment of a number of complications that occur after abdominal trauma surgeries may require that Urgent Abdominal Re-explorations, the life-saving and obligatory operations, are performed.

OBJECTIVE:

To evaluate the reasons and incidence of re-operations in abdominal trauma cases and their outcomes in our centre, so that more preventable morbidity can be avoided.

METHODOLOGY:

A retrospective study of all trauma victims who sustained laparotomies and relaparotomies in the Emergency Department of Al-Imamain Al-kadhymain Medical City, Baghdad, over a 2 years period. A review of the case sheets of these victims has been reviewed to identify the various circumstances of trauma cases and the detailed operative findings and definitive causes of relaparotomies were noted.

RESULTS:

The study included 21 relaparotomy cases out of 244 laparotomy for various abdominal trauma reasons ; 180 patients (74%) males and 64 (26%) females, with a male to female ratio of about (3:1). The commonest causative accidents were missile injury 97pt (39%), gunshot injuries 58 (24%), road traffic accidents 43pt (18%), stab wound 32 pt(13%), and. Fall from height 14 pts (6%) . Reoperations were performed in 21 cases Incidence (8.6%), finding in reoperation including second look operation (which constituted 4 patients) were as the followings:

Bleeding 11 pts (52%), peritonitis from missed bowel injuries & anastomosis leak 5 pts (24%), small bowel obstruction one pt (5%), IAC(abscess) 2pt (9.5%) and prolonged ileus & peritonism 2 Pts (9.5%).

Overall mortality in the reexplored patients was 8 patients(38%). Incidence of missed injuries 24% of reoperation and 1.6% of total trauma cases.

CONCLUSION:

many pt can be saved from repeat laparotomy by avoiding missed injuries. The main reason for immediate reoperation is bleeding and lately is peritonitis and sepsis.

KEY WORDS: relaparotomies, abdominal trauma,systemic review.

INTRODUCTION:

The term "Relaparotomy" (RL) refers to operations performed within 60 days in association with the initial surgery.

RL is categorized as early or late; radical or palliative; urgent or elective; and, planned or unplanned depending on the performed period, its purpose, urgency, and whether or not it is scheduled, respectively ⁽¹⁾.

Urgent abdominal re-explorations (UARs) following complicated abdominal surgeries are generally known as "final-choice operations" with high mortality and morbidity rates ⁽²⁾.

There has traditionally been reticence to perform RL after abdominal surgery because of difficulty in establishing the diagnosis, risks of transporting critically ill patients to theatre and subjecting them to further surgery and anesthesia. However, intra-abdominal sepsis and continued hemorrhage is associated with a high mortality. Delays in performing surgery increases chances of MOF which the common final pathway for death in many of these pts ⁽³⁾.

Missed injuries are defined variously as injuries identified after the initial period of resuscitation (primary and secondary survey of ATLS), although they may also be injuries identified after a defined time period after injury, such as 12 or 24 hours ^(1,2). However, there is no absolute definition, since some missed injuries may

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present long after the traumatic event (e.g. many months to years later as a hernia⁽⁴⁾).

Missed injury has been a source of concern to clinicians for many years, and the first series examining the influence of missed injury from South Africa was reported by Gordon in 1986. While missed injury is not new, what is surprising is that injuries are missed even in developed countries with experienced units^(2,5).

Missed injury in the context of major trauma remains a persistent problem, both from a clinical and medico-legal point of view, and its incidence is variable but may be as high as 38%.⁽⁴⁾ The care of the trauma patient is demanding and requires speed and efficiency. Evaluating patients who have sustained blunt abdominal trauma remains one of the most challenging aspects of acute trauma care, and missed intra-abdominal injuries continue to cause preventable deaths⁽⁵⁾.

Uncontrolled post-traumatic bleeding is the leading cause of potentially preventable death among trauma patients⁽⁶⁾. About one-third of all trauma patients with bleeding present with a coagulopathy on hospital admission^(7,8).

This subset of patients has a significantly increased incidence of multiple organ failure and death compared to pts with similar injury patterns in the absence of a coagulopathy^(7,8,9). The early acute coagulopathy associated with traumatic injury has recently been recognised as a multifactorial primary condition that results from a combination of shock, tissue injury-related thrombin generation and the activation of anticoagulant and fibrinolytic pathways. The condition is influenced by environmental and therapeutic factors that contribute to acidemia, hypothermia, dilution, hypoperfusion and haemostasis factor consumption^(8,10,12).

A number of terms have been proposed to describe the condition, which is distinct from disseminated intravascular coagulation, including acute traumatic coagulopathy, early coagulopathy of trauma, acute coagulopathy of trauma-shock and trauma-induced coagulopathy^(7,9,10,13).

AIM OF STUDY:

To evaluate the incidence, indications and outcomes for planned and unplanned relaparotomies in patients sustained abdominal trauma in our centre in order to reduce mortalities.

PATIENTS AND METHODS:

This is a retrospective study which was undertaken in Department of General Surgery, Al-Imamain Al-kadhymain Medical City, a tertiary hospital in Baghdad, on victims of

abdominal trauma who were admitted to the Emergency Department over 2 years period from the first of January 2012 to the thirty-first of December 2013.

Most of the victims were received directly after the accident. Some of the victims were referred from primary and secondary hospitals of Baghdad province either after resuscitation of major injured patients or because of development of complications after a period of hospitalization, in addition to some complicated cases received after management in other tertiary hospitals.

We started our study in the Emergency Department of the hospital by collecting data from the case sheets of the victims regarding age, sex, residence, clinical findings, diagnoses, and management. The number of abdominal trauma patients who sustained laparotomy in the period of the study was (244). We excluded the patients who died prior, during and immediately after first laparotomy, also those relaparotomies for wound dehiscence (burst abdomen) without intra abdominal complications. Data regarding operative findings and post-operative events were collected from case sheets and theatre, RCU and surgical wards registry. Patients who received damage control surgeries, planned RLs were recorded.

Complications were determined by performing clinical, hematological and radiological examinations upon observation of patient's altered general condition or of existence of blood or inflammatory material or intestinal content in the drain during postoperative period.

Estimates of the incidence of missed injuries vary widely, dependent on the precise parameters of the study.

We analyzed the results statistically using (SPSS 15).

RESULT:

The study included 244 laparotomies; relaparotomy was performed in 21 patients (8.6%). The mean age was 27.8 year with a M:F ratio of 3:1.

The commonest penetrating trauma is the missile injuries found in 97 pts (39%) and RTA was the commonest blunt trauma (18%) as shown in table 1.

Out of 244 laparotomy cases, 21 pts sustained RL including planned RL or what is called second look operations and they were 4 cases of continuous uncontrollable bleeding (2 pts with open pelvic hematomas, 1 central infra-colic hematoma and 1 pt with liver injury, for them packing and correction of coagulopathy, acidosis

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hypothermia and interval re-exploration within 48 hr to ensure hemostasis and removal of packs. Two of them died due to persistent exsanguinations, DIC and MOF (table 5). In 17 pts with unplanned RL, the commonest indication was hemorrhage 7 pts (41%) followed by peritonitis 5 pts (29%). Missed injuries were in 5 pts (4 gut perforations and 1 vascular injury), it represent 24% of RL cases and 2% of total laparotomy cases (table 7).

The most frequent injured sites in first laparotomy of RL pts were small bowel 8pts (38%) and the retroperitoneal structures 9 pts (43%), followed by liver 6 pts (28%) and spleen 4pts (19%), as shown in table 4.

The operative details of unplanned RL pts and their fates were summarized in table 8.

The mortality rate was 38% (8/12Pts), including 6 pts from unplanned RL and 2 pts from planned RL. The shock and DIC was main reason for death 5/8 Pts (62%), as seen in table 4 and 5.

Table 1:Types and frequencies of causative accidents.

Accident	No.	%	
Penetrating trauma	Missile injury	97	39
	Gunshot	58	24
	Stab wound	32	13
Blunt trauma	Road traffic accident	43	18
	Fall from height	14	6
Total	224	100	

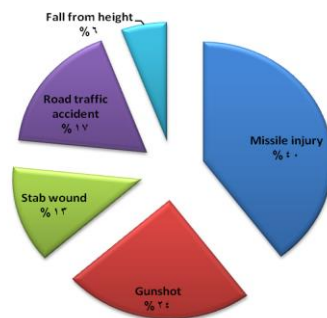


Figure 1 . Percentage of causative accidents

Table 2:Basic patient characteristics.

Total laparotomies	244
Total relaparotomies	21 (8.6%)
• Unplanned RL	17 (7%)
• Planned RL (second look)	4 (1.6%)
Age (mean) 27.8	26.4 yr
Sex M:F	3:1
Duration between 1 st and 2 nd laparotomy	2.6 (1-24) day
Mortality	8/21 pts (38%)

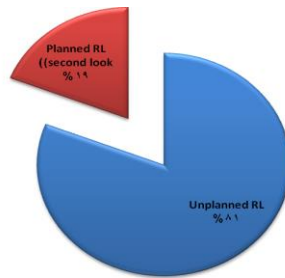


Figure 2. Percentage of types of relaparotomies

Table 3: The operative findings in first laparotomy among RL cases.

The injured organ	N (%)
Retroperitoneal*	9 (42.86%)
Small intestine & mesentry	8 (38.1%)
Liver	6 (28.57%)
Spleen	4 (19.05%)
Large intestine & mesentry	3 (14.29%)
Kidneys	2 (9.52%)
Stomach	1 (4.76%)
Bladder	1 (4.76%)
Rectum	1 (4.76%)
Diaphragm	1 (4.76%)

- The patient may have more than one organ injury.
- **Retroperitoneal**= it includes all types of hematomas (zone one, two, three)

Table 4: Operative findings in unplanned RL cases.

Indication for RL	N	%	Mortality reason
Hemorrhage	7	41	3 Shock, D.I.C
Peritonitis	5	29	2 Sepsis, ACS, M.O.F
I.A.C (abscess)	2	12	
Prolonged ileus and peritonism	2	12	1 Thromboemolism
Intestinal (dynamic) obstruction	1	6	
Total	17	100%	6

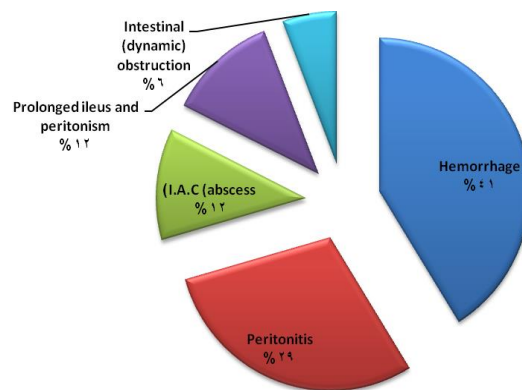


Figure 3. Operative findings in unplanned RL cases

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Table 5: Operative finding in planned RL (Second look surgery).

Hemorrhage	N	Mortality	Reason
Zone 1	1	0	/
Zone 2	0	0	/
Zone 3	2	1	Shock, D.I.C
Liver injury (grade 4)	1	1	Shock, D.I.C
Total	4	2	

Table 6: Details of operative cases of unplanned RL & their fate.

Reasons for RL	1 st Laparotomy	RL finding	Action	Fate
Hemorrhage (7 pt) 33%	Hepatorraphae packing	Retrohepatic veins	Repacking	Died
	Hepatorraphae	Segmental vascular bleeders	Pringle, ligation and plugging....	Survived
	Splenectomy	Splenic bed	Ligations	Died
	Splenorrhaphae	Paranchymal oozing	Splenectomy....	Survived
	SB resection & anastomosis	Mesenteric vessel bleeders	Ligation of slipped ligature	Survived
	Multiorgan inj.	Missed vascular inj.	Vascular repair	Died
	RP hematoma & Colostomy (rectal injury)	Pelvic hematoma sacral bones fracture bleeding	Bilateral I.I.A ligation and packing	Died
Peritonitis (5 Pts) 24%	Stomach and liver repair	Missed duodenal injury	Repair & drainage	Survived
	Multiple inj.	Missed splenic flexure colon inj.	Colostomy	Died
	SB repair and RP hematoma	Missed inj. of descending colon	Colostomy	Survived
	Splenectomy & SB repair	Missed DJ junction inj.	Repair & drainage	Survived
	Multiple inj.	SB anastomosis leak	Re -anastomosis	Died
IAC (2 Pts)	Bladder & LB repair	Pelvic collection	Drainage	Survived
	Splenectomy & nephrectomy	Lt. subhepatic collection	Drainage	Survived
Prolonged ileus & Peritonism (2 Pts)	SB & LB repair RP hematoma	Dilated Small & LB Fibrinous adhesion	PL & GIT decompression	Died
	RP hematoma liver	Dilated Small & LB	PL & GIT decompression	Survived
I. I.O. (One pt.)	SB resection & RP hematoma	Adhesive IO.	Adhesiolysis	Survived

Table 7: Missed injuries.

Missed inj.	Detailed finding	% of RL	% of total Laparatomies
Gut perforations	D2 posteriorly	4/21 19%	4/244 1.6%
	DC splenic flexure		
	DC posteriorly		
	DJ junction		
Vascular injury	Lt. Common iliac artery	1/21 4%	1/244 0.4%

DISCUSSION:

The mortality from sepsis and hemorrhage after abdominal surgery for trauma is high^(3,14). Many studies have been performed to date, but no optimal management plan has emerged, which demonstrates a consistent reduction in mortality. It is a clear that resuscitation, organ support and parenteral antimicrobial therapy have limitations in management of an intra-abdominal

septic/hemorrhagic source. A further laparotomy (RL) is required, but the diagnosis of post-operative intra-abdominal complications remains difficult even with aids of modern imaging techniques, although these techniques have improved our diagnostic accuracy^(11,14,15,16). The rate of complications related RL (unplanned RL) in our study was 7%, this is not consistent

with rates of between 1-4.4% reported in other series^(17,18). This can be explained that our study concerned with trauma cases only and those rates concerning abdominal surgeries in general, and the risk of bleeding and missed injuries are definitely higher in emergency and trauma cases. The indications requiring RL are similar everywhere and in their study, they are nearly match with numerous previous studies^(2,18,19).

Parameters that formed the basis for decision to undergo relaparotomies we were broadly categorized as:

- 1) Hemorrhage unresponsive to conservative measures
- 2) Peritonitis generalized, local or intra-abdominal abscess not amenable to treatment by percutaneous methods.
- 3) Mechanical or prolonged postoperative ileus.
- 4) Clinically significant post-operative leak or fistulas
- 5) Burst abdomen (evisceration/eventration)^(20,21).

The commonest indication for RL in our study was hemorrhage 33% and the mortality due to bleeding among RL group was 19%, these figures are consistent with other studies^(2,22). The mortality (4 pts) was directly related to abundant hemorrhage due to uncontrolled vascular bleeder (one case) or coagulopathy and physiological exhaustion and subsequent DIC and death (in other 3 cases).

Postoperative hemorrhage rate following abdominal surgical interventions is 0.1%⁽²³⁾. This low rate is a result of adequate and appropriate preoperative preparation and early diagnoses of patients who are under hemorrhage risk. However, it has been shown that 22.22% of the RL requiring hemorrhages were observed in patients who were operated under elective conditions and that 72.22% of the hemorrhages in these cases were caused by technical mistakes (such as inadequate hemostasis) in the first operation⁽²³⁾.

The second important indication for RL was peritonitis 24% of RL cases with mortality of 9.5% and we can add 2 cases of IAC as it can be considered as local form of peritonitis, collectively it become 7 pts (33%), which is more or less similar to other studies^(14,24).

Surgery in intrabdominal sepsis improves survival. Studies suggest early intervention impacts mortality^(24,25). As shown by Hutchins⁽¹⁹⁾ and colleagues this could be due to reduction in multiorgan failure rates by early intervention. Studies have shown that early diagnosis following the first abdominal surgery and

management by early RL of intraperitoneal sepsis decrease multiorgan failure by 60% and, thereby lowers mortality rates⁽¹⁸⁾.

Mortality rate following re-exploration in cases in whom treatment-resistant sepsis was identified 37.5%, whereas this ratio was 67% in pts who did not receive re-exploration suggests that the surgeon should seriously consider performing a RL⁽²⁶⁾.

The most common cause of obstructions in postoperative periods is adhesive lesions, which is one of the common problems in general surgery⁽²⁷⁾. The risk of adhesions exists throughout the lifetime following laparotomies. Rate of early ileus following abdominal operations is 0.86%⁽²⁸⁾ which is consistent with our result 2/244 (0.81%). However, difference approaches for the treatment of early ileus exist among surgical centers. Conservative measures are corner stone first line treatment in both adhesive and paralytic ileus. Ellozy et al⁽²⁹⁾, suggested that an immediate operation should not be considered in these patients since 87% of postoperative small bowel obstructions can be reversed by nasogastric decompression⁽²⁹⁾, regarding ileus it is difficult to decide when to operate the patients whose clinical condition did not improve in time. In our study we have one case of adhesive obstruction and 2 prolonged ileus 0.81%, necessities RL, hence total cases of obstruction was 3/21 (14%) out of RL cases, one of them died due to thromboembolism and respiratory failure.

Regarding planned RL or second look operation was 4/244 (1.6%) and 19% out of 21 RL cases. All are part of damage control surgery aimed to pack the bleeding sites and correction of physiological exhaustion (hypothermia, acidosis and coagulopathy) and later re-exploration and tackling the primary insult. There were 2 pts with zone 3 (pelvic hematoma) one of them died after RL due to continued hemorrhage and shock. One pt with zone 1 treated by packing and later sustained RL and ligation of bleeders in presence of vascular team. The last pt with severe paranchymal liver injury (grade 4) who also died after RL due to uncontrolled bleeding and DIC. Concept of 'damage control' intuitively makes sense, many Retrospective studies support he concept showing reduced morbidity and mortality rates in selective populations^(30,31,32,33).

Total missed injury pts was 5/244 (2%) of total cases and 5/21 (24%) of RL cases. In Sung CK⁽³⁴⁾, they found 12/607 (2%) over 8 years study which is similar to our result. The missed injuries in our report were 4 gut perforations and one

vascular injury. The notable finding that missed GIT injuries mostly retroperitoneal and hidden and easily overlooked particularly in presence of other distracting injuries or competing priorities, 2 of them died due to sepsis and MOF after re-exploration.

The consequences of missed abdominal injury are devastating, with the need for admission to an intensive care unit (ICU), multiple relaparotomies, the risk of multiple organ dysfunction or failure and prolonged hospital stay for survivors, while the mortality of abdominal sepsis remains high at around 25%^(35,36). Therefore, concept of tertiary survey is emerged to reduce the incidence of missed injury among trauma pts. Tertiary survey is a team-based review, which should include at least one unbiased senior staff member, preferably not previously involved with the case. It should include a complete review of the patient's clinical findings and incorporate all body systems, a review of all radiology and blood results and a review of all procedural interventions that have been performed during the resuscitation and definitive care phases, so as to allow for determination of further care plans^(37,38).

CONCLUSION:

- The incidence of RL; planned 1.6%, unplanned 7%
- The commonest two indications for RL were bleeding and peritonitis.
- The rate of missed injuries was 5/21: 24%
- The overall mortality was 8/21: 38%

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