

Non therapeutic Laparotomies in Penetrating Abdominal Trauma Patients: Time to Change the Trend

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ABSTRACT

Objective To determine the frequency of non therapeutic laparotomies in penetrating abdominal trauma patients, their relation with the diagnostic procedures and hemodynamic status of patients and the final outcome in terms of morbidity and mortality.

Study design Case series.

Place & Duration of study A & E Department of Dow University of Health Sciences and Civil Hospital Karachi, from January 2011 to June 2014.

Methodology Patients with penetrating abdominal injuries who presented to Accident and Emergency Department and underwent exploratory laparotomy were included in the study. Laparotomies were labeled as therapeutic if intra-abdominal injuries required surgical intervention and repair done, while laparotomies with injuries that did not require surgical intervention i.e, serosal tear, non expanding retroperitoneal, mesenteric and visceral hematoma were labeled as non therapeutic. Patient's vital instability and investigations directed to find out intra-peritoneal visceral injuries and local wound exploration findings were recorded along with the outcome in terms of morbidity and mortality.

Results A total of 115 patients with penetrating abdominal injuries were included. Majority (n=109-94.8%) of the patients were young males. Most common cause of penetrating injury was firearm (n=106 92.2%). Non therapeutic explorations were done in 23 (20%) patients. The major causes of non-therapeutic explorations were vital instability due to associated injuries (34.7%) and peritoneal breach confirmation on local wound exploration (n=12 - 52.17%). One patient who underwent non therapeutic laparotomy along with thoracotomy due to associated chest injury died on table. One patient developed wound infection and other developed respiratory infection. Average hospital stay was 8.1 days.

Conclusions The study highlighted the need of selective nonoperative approach for the clinically stable patients with penetrating abdominal trauma. With the use of CT scan abdomen or diagnostic laparoscopy along with repetitive clinical examination the frequency of non-therapeutic explorations can be minimized.

Key words Laparotomy, Penetrating injury, Firearm injury, Non therapeutic exploration.

INTRODUCTION:

Exploratory laparotomy is the long-established treatment for penetrating abdominal trauma.¹ The

early exploration is believed to prevent spread of contamination caused by damage to hollow viscus.² It is considered necessary for homeostasis and stabilization of patients by early packing of the abdominal cavity.² However studies have shown that this approach may result in increasing rate of non therapeutic laparotomies that may reach up to 40%.^{3,4}

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The increasing rates of non therapeutic laparotomies defined as serosal tears and non expanding

retroperitoneal, mesenteric and visceral hematomas that do not require therapeutic intervention, has gained the interest of researchers globally to formulate a selective approach for these patients.^{5,6} The frequency of non therapeutic laparotomies can be minimized by offering imaging studies like contrast enhanced computerized tomography (CT scan), diagnostic laparoscopy or serial ultrasound scan along with clinical examination to stable patients or those who are stabilized after initial resuscitation.⁷⁻¹¹

Non therapeutic laparotomy is not only a burden to hospital resources but also a source of discomfort and misery for the patients. It is shown to be associated with postoperative complications like wound infection, postoperative adhesions, intra-abdominal abscesses, incisional hernia etc.^{12,13} However the selective non operative approach in stable patients with penetrating abdominal trauma has shown to minimize complications, duration of hospital stay and cost.⁷⁻¹⁰ There is little data from Pakistan about the rate and impact of non therapeutic laparotomies in penetrating abdominal trauma patients.^{1,3,14} This study aimed to determine the frequency of non therapeutic laparotomies in penetrating abdominal trauma patients, their relation with the diagnostic procedures and hemodynamic status of patients and the final outcome in terms of morbidity and mortality.

METHODOLOGY:

Patients with penetrating abdominal injuries who presented to A & E Department Dow University of Health Sciences and Civil Hospital Karachi and underwent exploratory laparotomy from January 2011 to June 2014 were included in the study. The demographic profile of all the patients, their clinical presentation at the time of arrival to the hospital, mode of injury (stab versus firearm), the site of the entry and exit wounds, associated thoracic, limb, vascular, head, neck and spinal injuries were recorded. Investigations directed to find out intraperitoneal visceral injuries i.e. x-ray chest erect to see gas under the diaphragm, ultrasound (FAST), diagnostic peritoneal lavage, CT scan etc. Local wound exploration findings were also recorded. The laparotomy findings were noted and the laparotomies were labeled as therapeutic if intra-abdominal injuries requiring surgical intervention and repair were found, while laparotomies with injuries that did not require surgical intervention i.e. serosal tear, non expanding retroperitoneal, mesenteric and visceral hematoma were labeled as non therapeutic.

The outcome in terms of intensive care admission, duration of hospital stay, discharge or referral,

mortality and morbidity in terms of surgical complications i.e. wound infection, wound dehiscence, intra-abdominal sepsis etc. were also recorded. Finally the demography, clinical presentation, associated injuries, diagnostic investigations and outcome were analyzed using statistical software SPSS version 15.

RESULTS:

A total 115 patients with penetrating abdominal injuries were managed. They all underwent exploratory laparotomy. In 23 patients no therapeutic intervention was required on exploration. Majority (n=109 - 94.8%) of the patients were young males. The firearm injury to the abdomen (n=106 - 92.2%) was the common mechanism. Details are given in table I.

Clinical instability of the patients was judged with parameters like pulse, systolic pressure, respiratory rate, Glasgow coma scale and presence of peritonism (table II). Out of 23 patients with non-therapeutic exploration 8 (34.7%) presented in shock state due to associated chest and limb injuries, as shown in fig. I. Investigations were performed for the confirmation of peritoneal breach and included chest x-ray, ultrasound abdomen and wound exploration under local anesthesia (table III). The major causes of non therapeutic explorations were vital instability due to associated injuries (34.7%) and peritoneal breach confirmation on local wound exploration (52.17%).

One patient who underwent non therapeutic laparotomy along with thoracotomy due to firearm thoracic injury died on table. One patient with non-therapeutic exploration developed wound infection and other developed respiratory infection (table IV).

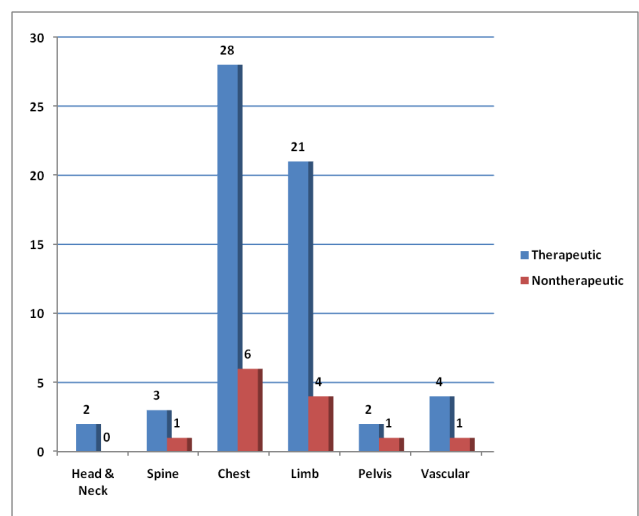


Fig. I: Associated Injuries

Table I: Demography				
		Type of Laparotomy		Total
		Therapeutic	Non therapeutic	
Age (Year)	12-20	12 (13%)	1 (4.3%)	13 (11.3%)
	21-30	41 (44.6%)	9 (39.1%)	50 (43.5%)
	31-40	17 (18.5%)	9 (39.1%)	26 (22.6%)
	41-50	17 (18.5%)	3 (13%)	20 (17.4%)
	>50	5 (5.4%)	1 (4.3%)	6 (5.2%)
Gender	Male	86 (93.5%)	23 (100%)	109 (94.8%)
	Female	6 (6.5%)	0	6 (5.2%)
Mode of injury	Firearm	87 (94.6%)	19 (82.6%)	106 (92.2%)
	Stab	5 (5.4%)	4 (17.4)	9 (7.8%)
Total		92 (80%)	23 (20%)	115

Table II: Clinical Indicators of Laparotomy				
Clinical Signs		Type of Laparotomy		Total (115)
		Therapeutic (92)	Non therapeutic (23)	
Systolic pressure	< 90	26 (28.3%)	8 (34.8%)	34 (29.5%)
Pulse	> 100	54 (58.7%)	8 (34.8%)	62 (53.9%)
Respiratory rate	> 20	83 (90.2%)	13 (56.5%)	96 (83.5%)
Shock	Yes	24 (26.1%)	8 (34.8%)	32 (27.8%)
GCS Score	13 or 14	28 (30.4%)	5 (21.7%)	33 (28.7%)
Peritonism	Yes	66 (71.7%)	0	66 (57.4%)

Table III: Investigations Indicating Laparotomy				
Modality	Findings	Type of Laparotomy		Total
		Therapeutic	Non therapeutic	
Chest X-Ray	Gas under diaphragm	5 (5.4%)	0	5 (4.3%)
FAST	Collection	9 (9.8%)	1 (4.3%)	10 (8.7%)
Wound Exploration	Peritoneal breach	21 (22.8%)	12 (52.2%)	33 (28.7%)

DISCUSSION:

This study showed a high rate (20%) of non therapeutic laparotomy in patients with penetrating abdominal trauma. Arikan et al, also found that mandatory laparotomy approach for penetrating abdominal trauma patients lead to high frequency of non-therapeutic or unnecessary operations in 40% of patients.⁴ Chiu and colleagues reported similar rate (17%) of non-therapeutic or negative laparotomy among firearm abdominal trauma

patients.¹⁵ In a study from Mexico, Pinedo showed that out of 79 laparotomies performed on penetrating abdominal trauma patients only 60.53% were therapeutic. They also recommended a selective approach to the penetrating abdominal trauma patients along with repetitive physical examinations and the appropriate use of imaging studies.¹⁶

The real dilemma was with the abdominal firearm trauma patients who were clinically unstable due to

Table IV: Outcome		
	Therapeutic Laparotomies	Non therapeutic Laparotomies
Wound infection	23	1
Dehiscence	05	0
Abdominal sepsis	04	0
ARDS	05	1
DIC	02	0
Sepsis	02	0
SICU admission	26	3

associated injuries to other body parts (thorax, pelvis) and were rushed to emergency theatre for homeostasis. In present study 34.7% patients were explored due to presence of shock and associated thoracic and pelvic injuries while in 12 (52.2%) patients local wound exploration revealed peritoneal breach and thus explored. In a recent study Schnüriger and colleagues reviewed 1871 laparotomies during a six year period and showed that the common indications for non therapeutic laparotomy was peritonitis (54.8%) followed by hypotension (28.8%) and suspicious computed tomographic scan findings (27.4%).¹⁷ In this study, one patient was explored due to presence of collection on ultrasound examination.

Biffi suggested that patients who present with shock, evisceration and peritonitis should be explored immediately, while stable patients with penetrating thoraco-abdominal wounds can be further evaluated with ultrasonography, CT scan and diagnostic laparoscopy or thoracoscopy.⁶ Combo recommend that routine laparotomy should not be considered in penetrating stab wounds with peritoneal breach if they are clinically stable without signs of peritonitis or diffuse abdominal tenderness. Further, stable patients with tangential firearm wounds and no signs of peritonitis should be offered diagnostic laparoscopy or CT scan with close observation.¹⁰ However selective non operative management to hemodynamically stable patients with peritoneal breach can delay diagnosis of hollow viscus injuries.¹⁸ Isolated bowel injuries may be associated with minimal vital instability and delayed signs of peritonitis.¹⁹

O'Malley in a systematic review of 2569 patients who underwent diagnostic laparoscopy for penetrating abdominal trauma concluded that it can accurately predict the need of laparotomy but less reliable in predicting hollow viscous injuries.¹¹ They also suggested laparoscopy for therapeutic purpose if expertise is available.¹¹ Other studies also showed

that laparoscopy is less reliable in detecting occult small bowel and retroperitoneal injuries.^{20,21} With the application of standardized systematic laparoscopic examination up to 100% of small bowel injuries can be detected and treated laparoscopically.^{22,23} Chiu and colleagues showed that triple contrast abdomino-pelvic CT scan can accurately predict the need of laparotomy in 95% of cases.¹⁵ Goodman in his systematic review concluded that CT scan in patients with penetrating abdominal trauma has high sensitivity, specificity, negative predictive value and accuracy, but lower positive predictive value in determining the need for laparotomy.⁹

CONCLUSIONS:

Selective nonoperative approach for the clinically stable patients with penetrating abdominal trauma is needed. CT scan abdomen with contrast and diagnostic laparoscopy along with repetitive clinical examination can decrease the frequency of non therapeutic explorations.

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