ISSN NO. 2320-5407

*Journal homepage: http://www.journalijar.com*

*INTERNATIONAL JOURNAL OF ADVANCED RESEARCH*

RESEARCH ARTICLE

# Multiple Diagnostic Methods Together For Intra Abdominal Injuries Must Be For Ideal Diagnosis

**Mohamed E.Eraki,PHD,Hassan Awad Saad,MD**
Department Of General Surgery, Faculty Of Medicine, Zagazig University,Egypt

*Manuscript Info*

*Manuscript History:*

Received: 15 July 2015
Final Accepted: 22 August 2015
Published Online: September 2015

*Key words:*

Abdominal trauma, FAST, DPL, DL

***Corresponding Author**

**Mohamed E.Eraki**

*Abstract*

**Introduction** : Trauma is the most common cause of death during the first four decades of life ,abdominal trauma is the 3rd most common injured region (1).Blunt abdominal trauma is a leading cause of morbidity and mortality among all age groups ,clinical examination may not be helpful in the evaluation of trauma patients especially of associated co morbidity (2).Carefully performed physical examination remains the most important method to determine the need for exploratory laparotomy, there is little evidence to support this tenet, So the use of diagnostic tools in the management of injured patient with abdominal trauma is essential especially if associated with another injuries(3) .

**Aim of the work:** Increase the accuracy of diagnosis of cases of abdominal trauma.

**Patients and methods**: we review records of 62 abdominal trauma patients presented to emergency department in Zagazig University Hospital in the period between April 2013 to April 2014.we divide the patients in two groups , one group with abdominal trauma only and another group with abdominal trauma with associated co morbidities. Comparison had done between two groups such as , type and mechanism of injuries, mental status at presentation ,physical examinations, diagnostic modalities, and need for surgical intervention, and at the end we compare discrepancy between physical examination findings and final diagnosis .

**Results**: we record 62 abdominal trauma patients we divide patients in two groups. group I 26 (42%) abdominal trauma with associated injuries and group II 36 (58%) abdominal trauma only .associated injuries for group I was 10 patients with head injuries,8 patients with pelvic bone fracture ,4 patients with shift fracture of hip bone,2 patients with upper humorous fracture and 2 patients with rib fracture. Conservative management was done for 15% of patients in group I and in 22% in patients in group II .Signs of abdominal injuries by physical examinations was positive in 15% in group I and in 72% in group II. So there is a significant difference in two groups .2 deaths was in group I versus all patients survive in group II.

**Conclusion**: physical examination alone unreliable and misleading in patients with abdominal trauma with associated injuries .and the use of multiple diagnostic tools is mandatory.

*Copy Right, IJAR, 2015,. All rights reserved*

## INTRODUCTION

Poly trauma is the major cause of morbidity and mortality in both developed and developing countries (4 ).Trauma remains the leading cause of death in children and young adults (5).Abdomen is the 3rd most common site of

injury(6 ). Diagnosis of blunt abdominal trauma is a real challenge even for experienced trauma surgeons (7). The clinical findings are usually unreliable because clinical examinations is compounded by different factors such as, fracture of lower chest ribs, contusion and abrasion of abdominal wall, fracture vertebra ,retroperitoneal hematoma and impaired level of consciousness ( 8). Although laparotomy is required in only 30% -40% of patients with blunt abdominal trauma, the importance of prompt evaluation and operative therapies underscored by the observation that the majority of preventable deaths after blunt abdominal trauma is due to either unrecognized abdominal injury or under-appreciation of the severity of abdominal injury (3 ). This record will focus on multiple diagnostic tools that improve the diagnosis and management of abdominal injuries such as, FAST, DPL, CT and diagnostic laparoscopy.

## Patients and methods:

We review records of 62 abdominal trauma patients presented to emergency department in Zagazig University Hospital in the period between April 2013 to April 2014.we divide the patients in two groups , one group with abdominal trauma only and another group with abdominal trauma with associated co morbidities. All patients was assisted and treated as trauma patients ,resuscitation A,B,C,D,E was applied to all patients , all patients subjected to the following investigations, intervention and imaging according to hemodynamic stability of the patients,

- Chest X-ray
  An erect chest radiograph with air under diaphragm. Stab or gunshot wound may be the cause of air. However signs of peritoneal irritation is warning signs for viscous injury.
- Nasogastric Tube to discover of Blood from the stomach will indicates gastric injury and we use it also to decrease intra abdominal pressure.
- Urinary catheter for urine output and to discover hematourea.
- Rectal examination for rectal bleeding or sigmoid penetration. Serial Physical Examination (PE).
- Local abdominal and Wound Exploration (LWE).
- Diagnostic Peritoneal Lavage (DPL).
- Focused Assessment Sonograph Trauma (FAST) and repeated U/S.
- CT scan.
- Repeated physical examination.
- Diagnostic laparoscopy (DL).
- Laparotomy.

Local wound exploration (LWE) was done for a stab wound under local anesthesia. This procedure was performed in the operating room, but sometimes done in the emergency department room in aseptic condition. The wound is explored by vision or laparoscopy.

If there is Penetration of the anterior fascia is considered a positive LWE, as penetration of the peritoneum is difficult to visualize. A positive LWE leads to laparotomy or diagnostic test such as DPL or DL.

We use Diagnostic Peritoneal Lavage (DPL), by passing a small catheter into the peritoneal cavity, usually at the umbilicus. If frank blood can be aspirated from the catheter, it indicates a positive 'tap' or aspiration (DPA). If no blood aspirated, a liter of warm crystalloid solution used to wash the peritoneal cavity and then drain out. This lavage fluid is then sent to the laboratory for analysis for presence of red cell count, white cell count and any bowel contents (fecal or food matter).

DPL in the hemodynamically stable patient is different from that in the unstable patient. In the unstable patient the problem is one of major hemorrhage, and identifying the site of hemorrhage. DPL is used as an alternative to the FAST scan to identify intra-peritoneal hemorrhage (more often in blunt trauma). In the unstable patient one is searching for a lot of blood, so a positive DPL in this setting requires either a positive aspiration (DPA) or a high red-cell count (>100,000/ml).

The situation in penetrating abdominal trauma is very different. A hemodynamically unstable patient with an abdominal stab wound we don’t proceed to another investigation we did laparotomy soon, as discussed above. So the role of DPL in the hemodynamically stable patient with penetrating abdominal trauma is to identify hollow

viscous injury (stomach, small bowel, colon) so, we proceed to C.T or DL.

In blunt trauma When DPL is used, our decisions based on the presence of gross blood on initial aspiration (i.e., 10 ml) or microscopic examination of analysis fluid was positive. If hemodynamically stable patients with a positive DPL, follow-up CT scan should be considered, especially in the presence of pelvic fracture or suspected injuries to the genitourinary tract, diaphragm or pancreas.

In all cases we did laparotomy if gross pure blood come or positive lap, for fecal or food.

**FAST**

when we use of focused assessment sonography trauma (FAST) it was not sensitive for small amount of fluid also we not depend on its result if positive that need further intervention specially if we had time in stable patient also negative result not exclude significant abdominal injury .

We use it to give initial idea about abdomen especially in unstable patient before laparotomy

**CT scan**

C.T was helpful especially in unstable patient with suspected bowel injury or diaphragmatic tear suspected by tachypenic patients.

All cases we used triple contrast study (oral-intravenous-and rectal).

It is helpful by showing free air or gas or the track of bowel injury or wall thickness or definite tear.

**Laparoscopy**

We did not used Diagnostic Laparoscopy (DL) in trauma patient as initial procedure but we used it in some cases of continuous fever or sudden changes of consciousness with irrelevant U/S or local wound exploration, if the patient stable.

## RESULTS:

During the study period we recorded 62 patients with abdominal trauma that treated by surgical or conservative management. These patients were divided in two groups, group I abdominal trauma with associated co morbidity and group II with abdominal trauma alone Table (1). The Group I patient included 26 (42%) patients that were associated with additional injuries whereas the Group II included 36 (58%) patients abdominal trauma only. Group I, 24 patients suffered from blunt abdominal trauma whereas 2 patient presented with penetrating trauma. The majority of the patients were involved in car accidents (14 out of 26 patients) that included high speed accidents, overthrows, falls of cliffs etc, whereas less patients were injured after a fall usually from height (10 out of 26patients) and 2 patient suffered from a stab wound. The additional coexisting injuries were in 10 patients with head injuries, in 8 cases pelvic pubic bone fractures, 4 patients with shift femur fractures, 2 patients with upper humorous fractures and 2 patients with rib fracture with hemothorax.

16 of these patients presented to the our emergency unite hemodynamically stable with a heart rate less than 100 b/m and systolic blood pressure more than 90mmHg;

10patients were unstable (38% hemodynamically compromised patients). 16patients had good mental state with GCS more than13 (Glasgow Coma Score) whereas 10 patients had reduced state meaning GCS less than 13 (reduced consciousness). With respect to patients with good mental status the latter was attributed to head injuries suffered hypoxia secondary hypo perfusion. In all 26 patients had little physical finding during examination. With regard to the patients with decreased consciousness, absent sings of acute abdomen (no signs of tenderness, no rigidity no rebound). And in all10 patients. These patients had good mental status, and were no any specific symptom. So Clinical examination was unreliable and all underwent imaging modalities to search for final diagnosis. With regard to alert conscious patients, signs of peritonitis were present in only 4 out of 16 patients despite all were suffered from serious intra-abdominal injuries proven later. Most of them complaining about pain in the sites of fractures occurred as were pubic area, mid thigh and upper humorous; in the same time that physical finding of the abdomen in most cases indicated no signs of injury. So, the imaging modalities was done to confirm whether there were abdominal injuries is the cause or not because of the complex mechanisms of injury.

In total, positive clinical signs of intra-abdominal injury were present in 4 out of 26 patients of Group I meaning only in 15%. So, we depend on appropriate diagnostic techniques for all by their hemodynamic condition. CT scan is more sensitive and specific for abdominal injuries so multiple modalities scan was done in the 16 hemodynamically stable patients.

In the remaining hemodynamically unstable 10 patients FAST was done in three cases but DPL in the other 4 patients. The result of imaging technique by U/S is the same, when a laparotomy was done, involved solid organs. In14 patients with a splenic injury and in 12 patients with a liver injury.

Out of 26 patients, a total of 22 patients did surgery, whereas 4 patients managed conservatively. About laparotomies performed, 14 regarded splenectomy for splenic injuries and 6 liver packing and 2 sutures for liver injuries In the 4 cases managed by conservative treatment, liver was the injured intra-abdominal organ. 4 out of 26 patients finally died during operation from associated injuries.

One out 22 of surgical patient suffers from fever after 3 days and raised white blood cell for 3 days we did diagnostic laparoscopy (DL), we find pelvic hematoma around the mesentery of appendix, and we remove the appendix and drainage of abdomen with good recovery.

The group of patients suffered from abdominal injuries alone included 36 (58%) of all patients (Group II): Of these, 26 patients suffering from blunt abdominal trauma, whereas 10 patients suffering from penetrating abdominal trauma. A total of 28 patients were stable at the time of examination and only 8 patients were hemodynamically unstable, a significantly low rate when compared to the group of patients with that injuries (38% hemodynamic instability in Group I vs. 22% in Group II). Decreased consciousness was observed in 6 patients, 4 of which were toxic (38% in Group I vs. 17% in Group II). During physical signs of peritonitis or acute abdomen, were found in 1 out of 6 patients with good mental status and 24 out of 28 patients accepted consciousness (awake). Thus physical examination of the abdomen was apparent in 26 of 36 patients (15% physical findings on clinical examination in Group I vs. 72% in Group II).

Injured abdominal organs were spleen injury in 13 patients, liver in 9 patients, large bowel in 6 patients, small bowel in 3 patients, urinary bladder in 3patients and mesentery in 2 patients.

one patient of splenic injury diagnosed by Diagnostic Laparoscopy(DL) first as he had past history of blunt abdominal trauma 4 days and come to emergency stable but had splenic shadow by U/S and suspected hematoma so, we did DL we found splenic hematoma with tear so, splenectomy was done with good recovery and vaccination regimen done after splenectomy .

Also we had another 2 patient of 10 penetrated, we did local wound exploration by DL with negative finding. 8 out of 36 patients were managed conservative all 6 with liver injuries and 2 with splenic trauma (15% of conservative treatment in Group I vs. 22% in Group II). When Comparison of hemodynamic instability, decreased consciousness and need for surgical intervention between patients with abdominal with associated injuries (Group I) and in patients with abdominal injuries alone group II.All patients in group II was survived and discharged from hospital.

## DISCUSSION

Trauma is the first cause of death and mortality during the four first decades of life (1, 2). Because anterior and wide area of the abdomen, the abdomen is the 3rd most commonly injured site (3). Clinical examination alone can be inaccurate. So, important role for imaging modalities was needed when assessment such patients. Especially in multiple traumas associated injury patients.

Abnormal physical examination was detected in 72% of patients of (Group II) that come with abdominal trauma alone but only in 15% of patients with (Group I) that of associated injuries. Therefore, we miss a significant amount of injuries in patients of Group II during physical examination, it has less sensitivity that makes it completely inaccurate when management patients of Group I. So. Role of imaging modalities in the diagnosis and management of these patients is important. Furthermore the rate of decreased consciousness in patients with abdominal trauma with co morbidity group I when compared to abdominal trauma alone group II(38% vs. 17%) makes the diagnosis is more hazardous and the use of appropriate diagnostic modalities is mandatory.

Finally when we see great amount of associated injuries patient come to emergency unit whose died as poor investigation compared to abdominal trauma alone make us increase the accuracy by using multiple investigation together.

Other studies report similar findings, the important role of imaging studies in the evaluation of trauma patients.

A large prospective observational study of one thousand patients with polytrauma but no clinical signs of abdominal injury that underwent a pan scan found radiological evidence of injury in about 8.3% of these patients. This rate was even higher among patients with low consciousness due to head injuries or other causes, reaching 10%.

The high rate of associated co morbidities makes the important role of imaging study. In our study this rate was 42% while others study rate of 66, 1% for both blunt and penetrating abdominal trauma (9). Associated co morbidity has been found is the cause of worse prognosis in our study.

Similar findings are reported the associated pelvic fracture to add to the severity of the associated injured patient with abdominal trauma (15).

In the literature, DPL, ultrasound, CT scan and DL are reported as the main important diagnostic tools used for trauma patients.

DPL has to be a highly accurate (sensitivity 95%, specificity 99%) test for detection of internal bleeding (16). It can be used in the emergency room so it could add in the diagnosis of the hemodynamically unstable patient. Disadvantage of DPL can not specify the site of injury, has a high rate of false positive results in the presence of pelvic fractures retroperitoneal hematoma or injury (17). Also it is an invasive procedure that carries a small risk of bowel injury (6%) (12). On the other hand FAST and ultrasound is non-invasive, and can be performed in the emergency room and can be repeated, And its sensitivity of 74% for organ injury (10).but it is not a satisfactory imaging modality for hemodynamically stable patients, because up to a 25%of hepatic and splenic injuries, had missed renal injuries, and almost all pancreatic injuries, and there is no role in mesenteric, bladder, and gut injury (18).

Negative finding with using U/S alone not exclude the injury and must be repeated (18, 19).

C.T is the imaging modality of choice in assessment of hemodynamically stable patients being both sensitive (92-97.6%) and specific (98.7%) (11, 19). It can detect the dye extravasations and gut tear wall thickness and plays an important role in management decisions (14, 18). Additionally, a large prospective multicenter study showed that a normal abdominal computed tomography scan has a high negative predictive value (99.63%), and the decision for admission or discharges of patients according to C.T results (13). DL (diagnostic laparoscopy) help us in diagnosis of 3 cases one of counseled hematoma of spleen after many days of trauma ended by splenectomy with stable patient another patient with fever and raised white blood cell after 3 days of conservative treatment we found pelvic omental hematoma with appendix removed also serve us in local wound exploration in all stable patients.

## Conclusion:

Physical examination is unreliable especially in patient with multiple associated co morbidity with decreased consciousness .So the use of diagnostic tools in the evaluation and management of these patients is mandatory. DPL is good for discovering of blood in unstable patients and bowel injuries in stable patients by detecting fecal matter in aspiration.

FAST is the investigation of choice in the hemodynamic unstable patients. A negative result does not exclude the

injury and patients must be admitted with repeat examination.

CT scan had upper hand in hemodynamic stable patient and makes the decision of discharge after trauma.

Diagnostic laparoscopy (DL) is helpful in diagnosis of many stable cases.

**Our recommendations**: Diagnostic tools that help the treating doctor to take critical decisions like the need for laparotomy or conservative treatment are mandatory.

**Table (1):**

| | **Group I** | **Group II** |
|---|---|---|
| **Nature of trauma** | Abdominal trauma with associated co morbidities | Abdominal trauma only |
| **No of patients** | 26(42%) | 36(58%) |
| **Associated injuries and types of trauma** | Head injuries10 patients | 26 patients with blunt abdominal trauma |
| | Pelvic bone fracture 8 patients | 10 patients with penetrating abdominal injuries |
| | Shaft femur fracture 4 patients | |
| | Humors fracture 2 patients | |
| | Rib fracture with hemothorax 2 patients | |
| **Hemodynamic stability** | 16 patients sable | 28 patients stable |
| | 10 patients unstable | 8 patients unstable |
| **Physical finding on examinations** | +ve in 4 patients (15%) | +ve in 26(72%) |
| **laparotomy** | 22 patient's laparotomies and 4 patients with conservative managements. | 28 patients with laparotomies and 8 patients with conservative management |

## References:

1. Pre Hospital Trauma Life Support, 6th edition p. 1-11.
2. Advanced Trauma Life Support, Course Manual, 7th edition
2002, p.1-12.
3- Kontopodis.N , Kouraki A, Panagiotakis G, Volakakis J,Spiridakis K: Diagnosis of intra abdominal injuries can be challenging in multi trauma patients with associated injuries. Our experience and review of lecturer .G Chir Vol.34-n.1/2- pp.27-31 January-February 2013.

4- Puri Payal, Goel Sonu, Gupta Prachi: Mangement of poly trauma patients in emergency department: An experience of a tertiary care health institution of northern India: World J Emerg.vol 4,No1,2013.

5. Hemmila MR, Wahl WL. Management of the injured patient.
Doherty GM, Current Surgical Diagnosis and Treatment, Mc-
Graw-Hill Medical; 2008, p.227-8.
6. Gilroy D. Deaths from blunt trauma, after arrival at hospital: plus
ça change, plus c'est la même chose. Injury 2005;36:47-50.
7. Livingston DH, Lavery RF, Passannante MR, Skurnick JH, Fabian
TC, Fry DE, et al. Admission or observation is not necessary
After a negative abdominal computed tomographic scan in
Patients with suspected blunt abdominal trauma: results of a prospective,
Multi institutional trial. J Trauma 1998; 44:273-80.
8. Jansen JO, Yule SR, Loudon MA. Investigation of blunt abdominal
Trauma. Clinical Review. BMJ 2008; 336:938-42.

9- Mohamed M,Radwan,Fikri M.Abu-Zidan: Focussed Assessment Sonograph Trauma (FAST). And CT scans in blunt abdominal trauma: surgeons perspective: African Health Sciences Vol 6 No 3 September 2006.

10-Malhotra A.K, Ivatury R,Latifi R: blunt abdominal trauma: Evaluation and Indication of Laparoscopy: Scandinavian Journal of Surgery 91: 52-57,2002.

11. Mohamad A Gad, Ali Saber, Sheirif Harag, Mohamed E Shams, Goda M Ellaban. Incidence, patterns and factors predicting Mortality of Abdominal Injuries in Trauma Patients. N Am J Med Sci 2012;4(3):129-34.

12. Ali Salim, Burapat Sangthong, Matthew Martin, Carlos Brown, David Plurad, Demetrios Demetriades. Whole Body Imaging in Blunt Multisystem Trauma Patients Without Obvious Signs of Injury Results of a Prospective Study. Arch Surg 2006;141.

13. Nagy KK, Roberts RR, Joseph KT, Smith RF, An GC, Bokhari F, et al. Experience with over 2500 diagnostic peritoneal lavages. Injury 2000;31:479-82.

14. Bain IM, Kirby RM,Tiwari P, McCraig J, Cook AL,Oakley PA, et al. Survey of abdominal ultrasound and diagnostic peritoneal lavage for suspected intra-abdominal injury following blunt trauma. Injury 1998;29:65-71.

15. Shuman WP, Holtzman SR, Bree RL, Bettman MA, Cascani T, Foley WD, et al. American College of Radiology appropriateness criteria. Blunt abdominal trauma. 2005. www.acr.org/SecondaryMainMenuCategories/quality_safety/app_criteria/pdf/Exp ertPanelon Gastrointestinal Imaging.aspx.

16. Myers J. Focused assessment with sonography for trauma (FAST): The truth about ultrasound in blunt trauma. J Trauma 2007;62:S28.

17. Hoff WS, Holevar M, Nagy KK, Patterson L, Young JS, Arrillaga A, et al; Eastern Association for the Surgery of Trauma. Practice Management guidelines for the evaluation of blunt abdominal Trauma: the EAST practice management guidelines work group. J Trauma 2002; 53:602-15.

18. Yao DC, Jeffrey RB, Mirvis SE, Weekes A, Federle MP, Kim C, et al. using contrast-enhanced helical CT to visualize arterial extravasations After blunt abdominal trauma: incidence and organ Distribution. AJR Am J Roentgenol 2002;178:17-20.

19. Velmahos GC, Toutouzas KG, Radin R, Chan L, Demetriades D. Nonoperative management of blunt injury to solid abdominal Organs: a prospective study. Arch Surg 2003; 138:844-51.