

## DISCUSSION

Trauma represents a major health problem. It is the principal cause of death during the first half of normal human life span and the third leading cause of death for all age groups.<sup>(1)</sup>

Blunt trauma is the most common mechanism of injury. Blunt abdominal trauma (BAT) is present in about 25-30% of multiply injured patients and represents the most common type of abdominal injuries, while 10 % of civilian injuries that require operations are the result of blunt abdominal trauma.<sup>(2-4)</sup>

Non-operative management of blunt abdominal trauma is not a novelty. Over the past few decades it has become well established and strategies based on hemodynamic stability and CT scan findings are now being widely used. Even the patients with hemoperitoneum, altered mental status, higher grades of injury and older ages have now been routinely managed non-operatively in many well established trauma centers with very few failures.<sup>(5)</sup> But in a hospital where facilities are limited, it often becomes the challenge.<sup>(6)</sup>

Non operative management of blunt traumatic injuries is well established, and strategies based on FAST & CT scan diagnosis and the hemodynamic stability of the patient are now being widely used in the treatment of solid organ injury, including the liver, the spleen, the kidneys, as well as pelvic injuries. In blunt abdominal trauma (BAT), including severe solid organ injuries, selective non-operative management has become the standard of care.<sup>(7)</sup>

Our study was a prospective one, which was performed on patients suffered from blunt abdominal trauma admitted to the Emergency Department of the Alexandria Main University Hospital for a period of six months. Our aim was to identify clinical predictors of successful non-operative management (NOM) of blunt abdominal trauma All patients of Blunt abdominal trauma were assessed by Emergency doctor and attended by surgical team.

The prevalence of BAT in our study was significantly higher in male 332 patients (77.2%) compared to female 98 patients (22.8%). In agreement with other studies, Ghimire P et al and G. Ruhinda et al who reported that men tend to be affected by BAT more often than women (67% male and 33% female) and (83.2% males, 16.8% females) respectively.<sup>(8)</sup>

In our study, the median age was 27 years, with mean age  $30.35 \pm 11.75$  (ranges from 17 to 60 years), the most common age group affected is from 20 to 30 years. Young adult males group are more exposed to trauma as they spend more time outdoors, moreover the hard character of the work of a lot of them; also they are more prone to assault.

This is in agreement with Ghimire P et al. and M. Bala et al. who reported that the mean age in their studies was 27.12 years and 30.2 years respectively.<sup>(9)</sup>

The most common mechanism of trauma to all studied patients with blunt abdominal trauma (430 patients) was road traffic accident, included 286 patients (66.5%), followed by falling from height 82 patients (19.1%), then 62 patients assault by blunt object (14.4%).

According to Liu M et al <sup>(155)</sup> who studied the mechanisms of trauma, motor vehicle accidents represented major source of blunt abdominal trauma which occurred in 70% of patients, blow or direct kick to abdomen represented 15%, falling from height was 11% of all cases.

There is agreement in the predominance of road traffic accident (RTA) as the most common mechanism of blunt abdominal trauma. Increased incidence of road traffic accidents mostly due to many factors: overcrowding in Alexandria and surrounding cities, bad design of many roads, bad quality of many vehicles, lack of experience of many drivers and many pedestrians are not stuck to traffic rules.

In spite of synchronization of the period of the study with the events Egyptian revolution and following riots, assault didn't take the upper hand of mechanisms of trauma; this is because of the scope of the study included only blunt abdominal trauma, while in riots most attacks were done either by sharp objects or by gun shots.

Among studied patients, 320 patients with Glasgow Coma Scale (GCS) equal 15 (74.4 %) and 110 patients had with GCS equal or less than 14 and more than 8 (25.6 %).

In one study, transient loss of consciousness in the field was significantly associated not only with head injuries but with extracranial injuries as well. In this series, nearly 20% of patients suffering loss of consciousness required surgery for life-threatening injuries; many needed laparotomies. Holmes et al mentioned that GCS score less than 14 associated with high risk of intraabdominal injuries after blunt trauma. <sup>(91,156, 157)</sup>

Revised trauma score (RTS) is a well-established predictor of mortality in trauma populations. It is scored from the first set of data obtained on the patient and consists of GCS, systolic blood pressure and respiratory rate. RTS of less than 11 is used to indicate the need for transport to a designated trauma center. Score analysis of our current study revealed that 185 patients (59.3%) had score  $\leq 11$  with NOM-S, most patients (61 patients) (89.7%) with operative intervention and all deaths (100%) had score  $\leq 11$ .

In one study Gwaram, et al <sup>(158)</sup> used the RTS as a standard physiological scoring system for the prediction of survival in trauma patients. There was a statistically significant relationship between the RTS and outcome ( $P < 0.05$ ) from the study, and the RTS could be used as a standard physiological trauma scoring system in prediction of outcome.

Paul Jennings <sup>(159)</sup> concluded that RTS has been used in both the prehospital and hospital environment primarily as an instrument to predict the likelihood of serious injury and mortality.

In our study, there were 103 patients with isolated blunt abdominal trauma (24 %), and 327 patients had associated extra-abdominal injuries (76 %) and most common associated injuries were orthopedics fractures (55.7 %) followed by CNS injuries (34.8 %) and cardiothoracic injuries (33.5%).

While according to Malhotra AK et al <sup>(85)</sup> who studied the distribution of 551 cases with blunt abdominal trauma according to associated injuries, (16.6%) of studied patients had no associated injuries, and remaining patients (83.4%) had one or more associated injuries, with chest injury being the most common.

There is agreement in predominance of association of blunt abdominal trauma with other injuries, while in our study the predominance of orthopedic fractures as associated injuries was mostly because the most common mechanism of trauma was road traffic accident and most of road traffic accidents victims were pedestrians who were more liable to get wounds or fractures in long bones or pelvis. As well as victims of falling from height (as second most common mechanism of trauma) were liable to get wounds and fractures. While in Malhotra AK et al<sup>(85)</sup> study most of victims were either drivers or riders who were more liable to get chest injury. So that mean the mechanism of injury determine the nature of the associated injury.

In our study BAT with associated injuries 245 patients (74.9%) managed with successful NOM while 38 patients (11.7 %) needed surgical intervention at admission and 42 patients (12.8) died. BAT with isolated BAT injury 67 patients (65.1 %) managed with successful NOM, 30 patients (29.1 %) need surgical intervention and 6 patients died.

In our analysis there are no significant differences between isolated BAT and BAT with associated injuries in relation to the success of non operative management as shown in table (15). In contrast with M. Bala et al.<sup>(154)</sup> who mentioned in his study that limited extra-abdominal injury is an important and significant predictor for the success of non-operative management.

The majority of patients (252 patients) with successful NOM their admission SBP  $\geq$  90 mmHg (80.8%) who were considered hemodynamically (HD) stable on admission, while 60 patients had admission SBP  $<$  90 mmHg (19.2 %). While the majority of those undergoing operative intervention (89.7%) had admission SBP  $<$  90.

Normal heart rate and admission systolic blood pressure are clearly signs of hemodynamic stability and intuitively predictors of the success of non-operative management. Hypotension after BAT typically results from visceral organ injury and hemorrhage, usually of the spleen.<sup>(1)</sup> These patients need emergent evaluation of the peritoneal cavity, and coincident appraisal of any extraabdominal injury creating hemorrhage or hemodynamic instability, such as long bone fracture, scalp laceration, hemothorax, pneumothorax, or, in infants, severe head injury.<sup>(25)</sup>

This is in agreement with Raza et al,<sup>(160)</sup> who mentioned in his study that 885 patients (92%) had admission SBP  $\geq$  90. While 189 patients (88%) who underwent operative intervention their admission SBP  $<$  90. Holmes et al<sup>(91)</sup> reported that hypotension after blunt torso trauma would be a marker for high-severity injury.

About heart rate (HR), 187 patients with successful NOM had HR  $\geq$  100 beats/minute (60 %) and 125 patients had HR  $<$  100 beats/ minute (40 %). As tachycardia can be used as hemodynamic instability parameter. Even though healthy adults may not develop tachycardia despite profound shock. In a study of over 10,000 major trauma patients, relative bradycardia (defined as a systolic pressure  $<$  90 mmHg and a pulse rate  $<$  90 beats per minute) occurred in nearly 30% of all hypotensive patients.<sup>(156, 161)</sup>

Patients underwent operative intervention 7 patients (10%) had admission BP  $\geq$  90 and 68 patients (100%) had HR  $\geq$  100, this is with agreement with Ghimire P et al,<sup>(152)</sup> who reported in the study that 3 patients (16%) had admission BP  $\geq$  90 and 19 patients (100%) had HR  $\geq$  100.

In our study the majority of deaths were hemodynamically unstable 42 patients with admission SBP < 90 (84.5 %) and 48 patients with HR > 100 (100 %). This is in agreement with Lalezarzadeh et al<sup>(162)</sup>, who studied 6964 trauma patients over a 5-year period and stated that ED hypotension is a strong predictor of in-hospital mortality and need for emergent surgical intervention in trauma patients. ED blood pressures should serve as a significant marker of the patient's condition.

Initial physical examination suspect abdominal injuries, help to detect sign of peritoneal irritation and hemoperitoneum. As regard abdominal inspection in our series 147 patients (47.8 %) presented with abdominal external wounds or bruises with successful NOM, 49 patients (72.1 %) with operative group.

As regard abdominal palpation and percussion, both were associated with operative group. Hundred percent of OP patients had rigidity and guarding in abdominal examination, and 82 % of OP patients had dullness on abdominal percussion.

This is in agreement with Moore et al<sup>(163)</sup> who mentioned in his study that abdominal rigidity and guarding were predominant clinical signs accounting 86.3% of all cases of severe intraabdominal organs injuries, however these finding were not specific. Bowel sounds were infrequently valuable, their absence usually means visceral injury, but could also occur with retroperitoneal hematoma, their presence didn't exclude serious visceral damage.

This is also coincides with Schurink G et al<sup>(28)</sup>, who reported that physical examination of the abdomen was beneficial in blunt abdominal trauma, eighty seven percent ( 20 patients out of 23 patients ) of patients with major blunt abdominal injuries had rigidity and guarding in abdominal examination. Tenderness and guarding were somewhat sensitive for indicating an intra-abdominal injury.<sup>(26)</sup>

Auscultation of the injured abdomen provides little information. Many experienced practitioners reported that the presence of bowel sounds does not rule out ileus or serious injury, and their absence in no way proves that injury exists. However, this premise has not been subjected to in-depth study. Perhaps the most valuable physical finding in abdominal trauma comes from palpation. Local or generalized tenderness is found in approximately 90% of alert patients with intraabdominal visceral injury.<sup>(156, 164)</sup>

The sensitivity of the clinical examination for detection of an intra-abdominal injury is difficult to assess because it depends on the definition of a normal clinical examination and the reference standard study chosen. The clinician is probably mainly influenced and perhaps misguided by the presence of extra-abdominal “distracting injuries” to predict the occurrence of an intra-abdominal injury. The presence of an extra-abdominal injury (distracting injury) has been shown to increase the number of false-negative clinical examinations for intra-abdominal injury, when compared with the result of CT.<sup>(26, 29)</sup>

Focused assessment with sonography for trauma (FAST) and computed tomography (CT) were the diagnostic tests used to detect free intraperitoneal fluid and solid organ injuries in all BAT patients in our study.

Most of BAT patients had single organ injuries including 272 patients (63.3%). Spleen was the commonest solid single organ injured in 74 patients (17.2 %). The

location of the spleen in the abdomen where it is not protected by a bony cage makes it very prone to traumatic injury. Basile G et al<sup>(165)</sup> reported that the most injured organ was spleen. Liver ranked second of solid single organ injury 26 patients (6.0 %) in our study because of its size and location in the upper right quadrant of the abdomen. In Velmahos GC et al<sup>(166)</sup> study (48%) of BAT patients had a liver injury while (50%) had a splenic injury. Giannopoulos GA et al<sup>(148)</sup> in his series reported 26.7% patients with multiple organ injuries. This is with agreement with our study which reported that 158 patients (36.7%) of BAT patients had multiple organ injuries. Liver with spleen injuries were reported in 48 patients (11.1 %) while 32 patients (7.4%) had liver and kidney injuries. Additional 27 patients (6.2%) had liver, spleen and kidney injuries in our series.

Most patients (212 patients) with successful NOM had Hct value  $\geq 30$  % (67.9%). Patients who required surgical intervention on admission 62 patients (91.2 %) had a Hct value  $<30$  %. This is in agreement with Raza et al<sup>(160)</sup> who reported that 963 NOM-S group patients (75%) had Hct value  $\geq 30$  % and 214 operative group patients (16.6%) had Hct value  $< 30$  %.

Hematocrit reflects a balance of acute blood loss, endogenous plasma refill, and administration of crystalloids.<sup>(167)</sup> Serial measurements are helpful in monitoring continued haemorrhage, but they do not give any information about the site of bleeding in the polytrauma patient.<sup>(168)</sup> Holmes et al<sup>(91)</sup> concluded that hematocrit level less than 30% is one of the clinical prediction rules for intraabdominal injuries in BAT patients.

Most of patients with successful NOM (245 patients 78.5%) didn't have microhematuria and 67 patients (21.5 %) had microhematuria. While the majority (307 patients 98.4%) with successful NOM didn't have grosshematuria. Recent controversy has focused on the significance of microscopic haematuria after blunt abdominal trauma, particularly after insertion of a urinary catheter. In published literature, some authors believe that screening urinalysis after blunt trauma should be omitted and only gross haematuria will mandate investigation of the genitourinary tract.<sup>(168)</sup>

This coincides with Davis et al,<sup>(1)</sup> who reported that grossly bloody urine was present in 71 patients (16%), and an additional 88 (20%) had microhematuria. Holmes et al,<sup>(91)</sup> concluded that the most important variable in our prediction rule having the highest relative risk for intra-abdominal injury was the presence of significant hematuria. In one previous study has suggested that microscopic hematuria is a very important predictor of intra-abdominal injury in adults and is useful as a screening tool.<sup>(169)</sup>

The majority of patients (300 patients) with successful NOM didn't have coagulopathy (96.2%), while 12 patients had coagulopathy (3.8%) and 36 patients (75%) of deaths had coagulopathy.

Several studies explored coagulopathy as a predictor of mortality in trauma patients. Brohi et al,<sup>(170)</sup> reported that patients presenting to the emergency department with an established coagulopathy are liable to poor outcomes. Mitra et al<sup>(171)</sup> who studied coagulopathy as a predictor of early trauma deaths reported that among 77 early trauma deaths coagulopathy was present early in 55 patients (71.4%).

In our study the majority of patients with successful NOM (246 patients) didn't receive more than 2 packed RBCs (84.6%) while all OP patients received more than 2

packed RBCs blood (100%). This is in agreement with Malhotra A. K. et.al.<sup>(99)</sup> reported that patients requiring >2 units of packed cell transfusion due to the solid organ injury should undergo urgent laparotomy.

Bismar HA. et al<sup>(172)</sup> reported that all operative group patients received blood (100%) compared to only 18 (37.5%) in NOM group. The blood transfusion rate was 3.7 units / patient in operative group and 0.8 units / patient in NOM group (p = 0.015).

Hamdy H et al<sup>(173)</sup> reported that criteria for discontinuing conservative management should include; hemodynamic instability, decreasing hemoglobin percentage attributable to the injury; despite transfusion of up to 2 units of packed red blood cells in 24 hours and/or physical signs of an acute abdomen.

Beuran M et. al.<sup>(174)</sup> reported that 2 units of transfused blood during the first 48 hrs (in order to maintain a Hb level above 8 g/dl) is compatible with a successful NOM.<sup>(175)</sup> In contrast, Longo, Uranüs and Sartorelli<sup>(176-178)</sup> reported that blood transfusions < 4 units should be used as a predictive parameter for a successful NOM of splenic trauma.

As regard hospital stay in the NOM, 277 patients stayed for ≤5 days (88.7%) and 35 patients stayed for 6- 15 days (11.2%).

All patients who managed with NOM were admitted to surgical wards except only 12 patients (3.9%) who were admitted to ICU. As regard patients who needed surgical intervention at admission 12 patients (17.6%) stayed in wards for ≤ 5 days while 56 patients (82.4%) were admitted to ICU for 6-15 days.

This is in contrast with Raza et al<sup>(160)</sup> where the operative group had an ICU admission rate of 57%, with a longer period of hospitalization (mean= 23.31 days) compared to the NOM group with an ICU admission rate of 24%, and mean length of stay of (10.23 days).

This discrepancy of results is mostly due to shortage of certain supportive means, such as ICU beds, possibly facilitates a "preventive" operation. Nevertheless, in the present series the majority of patients of the NOM-S group remained at the surgical ward under close monitoring.

Bismar HA. et al<sup>(172)</sup> reported that the hospital stay was longer in operative group (18.6 days) vs (11.2 days) in NOM group.

According to our experience, hemodynamically stable or rapidly stabilized trauma patients can be admitted in a non-ICU ward with the provision of close monitoring.

As regards outcome of this study was 312 patients with abdominal injuries were treated successfully by non-operative management (NOM-S) (72.6 %), 2 patients needed surgical intervention after failure of NOM (NOM-F) (0.5 %), 68 patients were operated immediately on admission (OP) (15.8 %) and 48 patients died (11.2 %).

Most deaths (37 patients) were in patients who were hemodynamically unstable on presentation and unresponsive to resuscitation. Eleven more deaths were intraoperative had multiple extraabdominal injuries with shortage of blood products.

## ***Discussion***

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One patient who needed surgical intervention after failure of NOM (NOM-F) had splenic injury after RTA, on the 2<sup>nd</sup> day he developed hypotension that mandated surgical exploration and splenectomy then discharged on 6<sup>th</sup> day. The other patient had blunt abdominal trauma caused by assault, the initial FAST screening was negative, over 12 hours the abdominal pain, tenderness and distension increased. CT Abdomen revealed pneumoperitoneum, exploration laparotomy with small bowel perforation repair done and discharged after 4 days.

With the publication of many reports of success during the last 20 years, NOM has become an established and accepted management protocol for solid organ injuries in hemodynamically stable patients.

## SUMMARY

Trauma is the third leading cause of death overall. Blunt abdominal trauma presents in about 25-30% of multiply injured patients and represents the most common type of abdominal injuries.

Over the past two decades, there has been a major shift from operative to selective non-operative management (NOM) of traumatic injuries in blunt abdominal trauma (BAT) including severe solid organ injuries. Selective non-operative management has become the standard of care and is considered as safe and effective method in the management of haemodynamically stable patient with blunt solid abdominal organ injury.

The increased utilization of NOM is facilitated by the various sophisticated and highly accurate non-invasive imaging tools. The specific tests are selected on the basis of the clinical stability of the patient, the ability to obtain a reliable physical examination. In hemodynamically stable patients with a reliable physical examination, the main diagnostic choice is between FAST and/or CT scanning.

If the decision has been made to observe the patient and to pursue non-operative management, close monitoring of vital signs and frequently repeated physical examinations are instituted. Adjunctive laboratory testing, such as serial determination of hemoglobin and hematocrit levels, can also help in non-operative approach.

The present study was a prospective one performed on 430 patients who suffered major blunt abdominal trauma who admitted to the Emergency Department of the Alexandria Main University Hospital for a period of six months from 1<sup>st</sup> of August 2012 to 1<sup>st</sup> February 2013.

The aim of the current study was to identify clinical predictors of successful non-operative management in blunt abdominal trauma patients.

Males are predominantly affected by BAT the study included 332 patients (77.2%) compared to 98 female patients (22.8%). BAT affects mainly the young patients with the median age was 27 years, with mean age  $30.35 \pm 11.75$  (ranges from 17 to 60 years), the most common age group affected is from 20 to 30 years.

In our series road traffic accident was the most common mechanism of blunt abdominal trauma in our study, it represented 286 patients (66.5%), followed by 82 patients falling from height (19.1%), then 62 patients assault by blunt object (14.4%).

Among studied patients, 320 patients with Glasgow Coma Scale (GCS) equal 15 (74.4 %) and 110 patients had GCS equal or less than 14 and more than 8 (25.6 %).

The revised trauma score (RTS) is a well-established predictor of mortality in trauma populations. It is scored from the first set of data obtained on the patient and consists of GCS, systolic blood pressure and respiratory rate.

Our current study revealed that those with NOM-S 127 patients (40%) had score 12 and 185 patients (59.3%) had score  $\leq 11$  with. Most patients (61 patients) (89.7%) with operative intervention and all deaths (100%) had score  $\leq 11$ .

## *Summary*

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In our study, there were 103 patients with isolated blunt abdominal trauma (24 %), and 327 patients with associated injuries (76 %) and most common associated injuries were orthopedics fractures (55.7%) followed by CNS injuries (34.8 %) and cardiothoracic injuries (33.5%).

BAT with associated injuries were 245 patients (74.9%) managed with successful NOM while 38 patients (11.7 %) needed surgical intervention at admission and 42 patients (12.8) died. BAT with isolated organ injury 67 patients (65.1 %) managed with successful NOM, 30 patients (29.1 %) needed surgical intervention and 6 patients died.

As regards haemodynamic HD status, the majority of patients (252 patients) with successful NOM their admission SBP  $\geq$  90 mmHg (80.8%) who were considered HD stable on admission and 60 patients with admission SBP < 90 mmHg (19.2 %). While the majority of those undergoing operative intervention (89.7%) had admission SBP < 90 mmHg.

In our study the majority of deaths were hemodynamically unstable 42 patients with admission SBP < 90 mmHg (84.5 %) and 48 patients with HR > 100 beats/ minute (100 %).

Abdominal tenderness and rigidity were the most common signs of abdominal examination, The presence of an extra-abdominal injury (distracting injury) has been shown to increase the number of false-negative clinical examinations for intra-abdominal injury.

Focused assessment with sonography for trauma (FAST) and computed tomography (CT) were the diagnostic tests used to detect free intraperitoneal fluid and solid organ injuries in all BAT patients.

Most of BAT patients had single organ injuries including 272 patients (63.3%) and 158 patients (36.7%) had multiple organ injuries.

The spleen was the commonest solid single organ injured 74 patients (17.2 %), liver ranked the second 26 patients (6.0 %).

Most of patients (212 patients) with successful NOM had Hct value  $\geq$  30 % (67.9%). While patients who needed surgical intervention at admission 62 patients (91.2 %) had Hct value < 30%. Hematocrit reflects a balance of acute blood loss, endogenous plasma refill, and administration of crystalloids.

In 245 patients (78.5) with successful NOM didn't have microhematuria and 67 patients (21.5 %) had microhematuria. While 307 patients (98.4%) with successful NOM didn't have grosshematuria. Many studies reported that only grosshaematuria will mandate investigation of the genitourinary tract.

The majority of patients (300 patients) with successful NOM didn't have coagulopathy (96.2%) while 36 patients (75%) of deaths had coagulopathy.

In our study the majority of patients with successful NOM (246 patients) didn't receive more than 2 packed RBCs (84.6%) while all OP patients received more than 2 packed RBCs blood (100%).

## *Summary*

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As regard hospital stay for patients managed with NOM, 277 patients had shorter hospital stay  $\leq 5$  days (88.7%) while 35 patients stayed 6- 15 days (11.2%).

Majority of patients managed with NOM, 293 patients stayed at the surgical emergency ward (96.1%), while 12 patients were admitted to Intensive Care Unit ICU (3.9%).

According to our experience, the hemodynamically stable or rapidly stabilized trauma patient can be admitted in a non-ICU ward with the provision of close monitoring.

The outcome of our study was 312 patients with abdominal injuries treated with successful non-operative management (NOM-S) (72.6 %), 2 patients needed surgical intervention after failure of NOM (NOM-F) (0.5 %), 68 patients were operated immediately at admission (OP) (15.8 %), 48 patients died (11.2 %).

NOM for blunt abdominal trauma was found to be highly successful, safe in our analysis and strategies based on FAST & CT scan diagnosis. Management by NOM depends on clinical and hemodynamic stability of the patient, after definitive indications for laparotomy are excluded.

Lastly the parameters that predict success of non-operative management in our series were (admission SBP  $\geq 90$  mmHg, Hct value  $\geq 30$  % , absence of grosshematuria, absence of coagulopathy, transfusion of  $\leq 2$  Packed RBCs). Identification of these parameters have enabled the surgeons to better predict those patients who are appropriate candidates for non-operative management.

## CONCLUSIONS

- The management of multiply injured trauma patients is a skill requiring broad knowledge and rapid systematic approach. These patients benefit from skillful resuscitation. Emergency physicians play a vital role in the stabilization and diagnostic phases of trauma care; what happens in these stages of management often determines the outcome of care.
- The aim of this prospective study was to identify clinical predictors of successful non-operative management of blunt abdominal trauma patients admitted to the Emergency Department of Alexandria Main University Hospital for a period of six months from 1st of August 2012 to 1st February 2013.
- Road traffic accident is the most common mechanism of injury in cases of blunt abdominal trauma.
- Adult Males are more prone to blunt abdominal trauma.
- Most cases of blunt abdominal trauma are associated with other injuries. Orthopedic fractures are the most common associated injuries.
- The outcome of this study was 312 patients with abdominal injuries treated with successful non-operative management (NOM-S) (72.6 %), 2 patients needed surgical intervention after failure of NOM (NOM-F) (0.5 %), 68 patients were operated immediately at admission (OP) (15.8 %), 48 patients died (11.2 %).
- NOM for blunt abdominal trauma was found to be highly successful, safe in our analysis and strategies based on FAST & CT scan diagnosis. Management by NOM depends on clinical and hemodynamic stability of the patient, after definitive indications for laparotomy are excluded.
- The parameters that predict success of non-operative management in our series were (admission SBP  $\geq$  90 mmHg, Hct value  $\geq$  30 % , absence of grosshematuria, absence of coagulopathy, transfusion of  $\leq$  2 Packed RBCs). Identification of these parameters have enabled the surgeons to better predict those patients who are appropriate candidates for non-operative management.
- According to our experience, selection of patients with NOM for blunt abdominal trauma in hemodynamically stable patients is safe, effective, shorter hospital stay and no mortality and can be admitted in a non-ICU ward (surgical ward) with the provision of close monitoring.

## RECOMMENDATIONS

- Including larger numbers of blunt abdominal trauma patients in similar future studies would probably give more accurate results.
- We should encourage multicentre registries to have more concern regarding medical research field and implementation of their results in clinical practice.
- As road traffic accident is considered as the main cause of blunt abdominal trauma; measures should be taken to decrease its rate, this is may be done by improving quality and design of roads , improving quality of vehicles, giving more training for drivers before giving driving license, applying sharp traffic rules with safety instructions, public education of traffic rules and safety measures, and governmental plan to decrease over crowding in large cities by building up new cities and encourage immigration to these new cities.
- Safety measures should be applied to all personnel with hard work condition and those who are prone to trauma as an occupational hazard.
- First aid and resuscitation measures should be applied as soon as possible even at the scene of trauma by rescuer. Stabilization of trauma victim should be done in primary health care units before patient transfer.
- Advanced trauma life support ATLS protocols should be well known to emergency doctors and other members of trauma team to improve the quality of trauma patient management.
- FAST scan learning classes should be done for all emergency doctors as well as surgeons.
- Urgent laparotomy should be done to all patients following blunt abdominal trauma who are hemodynamically unstable or become unstable with no response to resuscitation measures, with radiological evidence of massive free intraperitoneal fluid collection.
- Conservative management should be done to all BAT patients who are hemodynamically stable with close observation of vital signs and periodic follow up with lab and imaging.
- Laparoscopy is the newest modality to establish its role in the evaluation and treatment of blunt abdominal trauma. It can be used as an adjunct to CT in non-operative management of blunt abdominal trauma to evaluate the injury, detect occult lesions, and select patients for non-operative treatment.
- Diagnostic laparoscopy has the potentials to become a valid part of the initial workout of blunt abdominal trauma. With the improvement of techniques and instrumentations, and the expansion of bedside laparoscopic procedures under local anaesthesia with mini-scopes, it is likely that with more controlled studies, laparoscopy will find its place as an integral part of evaluating and treating patients with blunt abdominal trauma.

## *Recommendations*

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- Angiographic embolisation for liver and spleen has gained more and more importance over the last few years. An improved visualization of the vascularization made conservative treatment for larger parenchymal lesions possible. During the same procedure, smaller (i.e. subcapsular) bleeding can be treated by embolisation. Occasionally, lumbar or pelvic arterial embolization is useful for massive retroperitoneal or pelvic bleeding. This new procedure should be implemented in our hospitals to avoid morbidity associated with laparotomy and further studies should be done for its application.
- Efforts should be done to increase ICU capacity in our hospital because care for major blunt abdominal trauma patients should continue in the ICU to ensure the best of care and rapid continued evacuation of our overloaded emergency department.
- We should search for solutions for shortage of blood banks to supply blood and blood products by encouraging blood donations to improve the quality of resuscitation in hemodynamically unstable patients.
- Lastly efforts should be done to provide consultants' supervision as much as possible day and night throughout the care of polytrauma patients as we always need more expert minds and hands.