

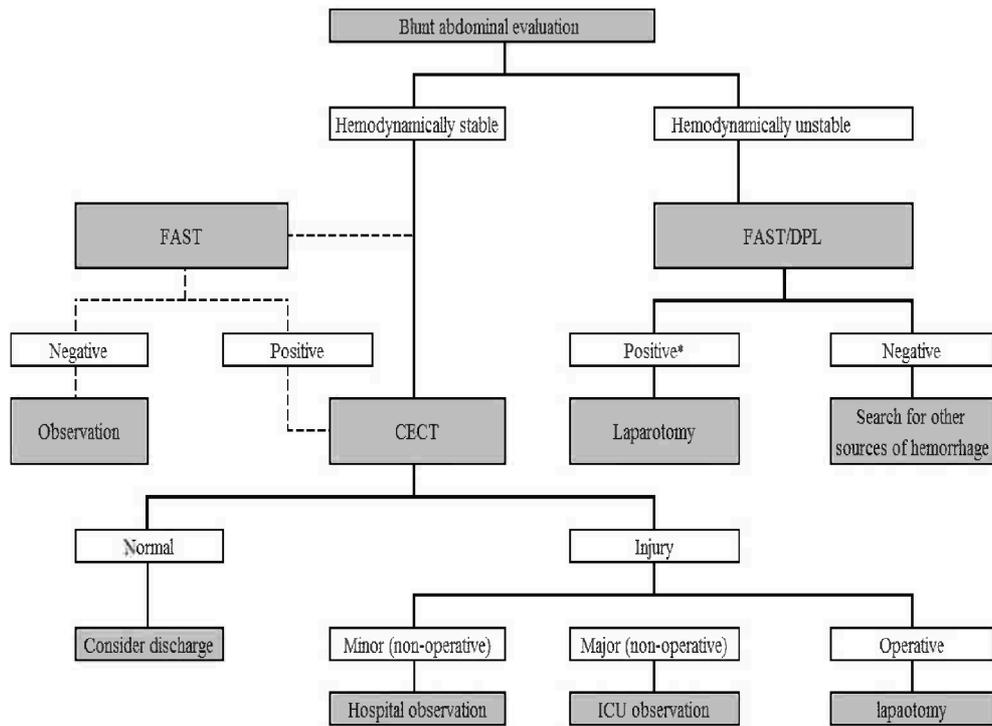
## CONCLUSIONS

Based on the results of the present study the following may be concluded:

1. Abdominal injuries are more common in adults than in children.
2. There are obvious anatomic and clinical differences between children and adults that must be kept in mind.
3. Road traffic accidents are the most common mechanism of injury in both age groups.
4. Males are more prone to BAT in both age groups
5. Associated injuries with BAT are more common than isolated BAT in both age groups.
6. Cardiothoracic injuries are the most common associated injuries in both age groups.
7. Focused assessment of sonography of trauma (FAST) has high sensitivity in detection of free fluid collection associated with abdominal organ injury after BAT.
8. Computerized tomography is considered as a gold standard in the diagnosis of abdominal solid organ injury.
9. The spleen is the most commonly affected intra-abdominal organ in both age groups followed by the liver.
10. Most cases after BAT can be managed conservatively with close observation of vital signs and periodic follow-up imaging. Deterioration of vital signs and/or radiological evidence of increased intraabdominal collections are indications for urgent laparotomy.
11. In cases of BAT, hemodynamic instability on presentation without response to intravenous fluid resuscitation, with evidence of massive intraabdominal free fluid collection by abdominal US, are signs for urgent laparotomy without further clinical observation or imaging evaluation.
12. Mortality rate is higher among children than adults, but the difference is not statistically significant.

## RECOMMENDATIONS

1. As RTA is considered as the main cause of BAT; measures should be taken by the government to ensure safety on the roads. Occupational measures should also be applied to all personnel.
2. As 36% of victims are children, so pediatric surgeon should be present in all trauma centers.
3. First aid and resuscitation measures should be applied at the scene of trauma by the rescuer. Stabilization of the trauma victim should be done in primary health care units before patient transfer.
4. All trauma patients should be evaluated at the scene or in the emergency department by Advanced Life Support guidelines; applying primary survey (Airway, breathing, circulation, disability and exposure) to identify and immediately correct life threatening condition by resuscitation measures, followed by secondary survey which includes full clinical examination with full radiological and laboratory investigations to identify other injuries.
5. Focused Assessment by Sonography for Trauma is indicated immediately after primary survey and therefore it should be available at all trauma centers.
6. Conservative management should be done to all victims following BAT who are hemodynamically stable with close observation of vital signs and periodic follow-up imaging.
7. Urgent laparotomy should be done to all victims following BAT who are hemodynamically unstable or become unstable despite of resuscitation measures, and those with radiological evidence of massive free intra-peritoneal fluid collection.
8. This algorithm should be known by all emergency doctors and surgeons to evaluate victims with blunt abdominal trauma.



Algorithm for abdominal evaluation following blunt trauma.

\*Positive DPL: aspiration of >10 ml of gross blood.

Gray boxes: action; White boxes: result; Dashed lines: alternative pathway.

CECT: contrast enhanced CT; FAST: focused abdominal sonogram for trauma; DPL: diagnostic peritoneal lavage

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# COMPARATIVE ANALYSIS OF BLUNT ABDOMINAL TRAUMA IN ADULTS AND CHILDREN

مقارنة تحليلية لإصابات البطن الرضية لدى البالغين و الأطفال

Protocol of a thesis submitted  
to the Faculty of Medicine  
University of Alexandria  
In partial fulfillment of the  
requirements of the degree of  
**Master of Emergency Medicine**

خطة بحث مقدمة  
لكلية الطب  
جامعة الإسكندرية  
إيفاءً جزئياً  
لشروط الحصول على درجة  
الماجستير في طب الطوارئ

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2013

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بكالوريوس الطب والجراحة ، الإسكندرية  
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٢٠١٣

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## INTRODUCTION

Trauma remains the major cause of death in children and young adults. Adult and pediatric patients differ significantly in both mechanism of and physiologic response to injury. Blunt trauma was responsible for most adult (82.8%) and pediatric (94.3%) injury, although it was relatively more frequent in the pediatric group.<sup>(1)</sup>

The etiology of injury with respect to age was comparable; however, several distinct differences were noted. Children were more likely to be injured as pedestrians struck by motor vehicles, and were also more likely to be injured in bicycle accident.<sup>(1,2)</sup> Children were injured in falls twice as often as adults. Mortality was higher for children than adults involved in motor vehicle accident's (MVA's), but lower when children were injured as pedestrians.<sup>(3)</sup> This latter finding may reflect the fact that most pedestrian accidents occur at home (e.g., when a parent is backing out of the driveway) and are therefore more likely to be low-velocity.<sup>(4)</sup>

Abdominal injuries occurred with approximately equal frequency in adults and children. The spleen was the most commonly injured organ, followed by the liver. Liver trauma did not differ significantly between adults and children, and the incidence and degree of severity of the injuries were similar. The third most common intra-abdominal injury in both groups was retroperitoneal hematoma (9.5% of adults and 8.5% of children).<sup>(5,6)</sup> Genitourinary injuries were infrequent in both adults and children, and the specific type of injury did not differ significantly

between the two groups. the most common renal injury was contusion (<4% incidence in both groups).<sup>(7)</sup>

The trauma patient should be evaluated adequately, provided stabilizing treatment as needed, and managed in accordance with advanced trauma life support (ATLS) and pediatric advanced life support (PALS) principles. Persistent vital sign instability (particularly tachycardia) is a worrisome sign and should be treated aggressively.<sup>(1,8,9)</sup>

The most common presenting features of intra-abdominal injury are abdominal pain, tenderness, guarding and distention.<sup>(10)</sup> Other symptoms such as shortness of breath or chest pain may also be associated with significant abdominal injuries. One must remember, however, that 40% of patients with significant hemoperitoneum have no peritoneal signs.<sup>(11,12)</sup>

The absence of physical findings does not preclude serious pathology, and no sign is exclusively diagnostic of a specific injury . Extensive observation and the focused use of specific diagnostic tests help prevent missed injuries, which may occur if complete examination in Emergency Room (ER) is precluded by life threatening injuries or if mental status is altered.<sup>(13,14)</sup>

Radiologic studies can aid in diagnosis of intra-abdominal injuries. Computed tomography (CT) is the imaging method of choice in the evaluation of abdominal and pelvic injuries after blunt trauma in hemodynamically stable patients. Unstable patients need to be stabilized before CT. If they require rapid imaging, hemodynamically unstable patient can be examined at the bedside with sonography. Evaluation with CT allows accurate detection and quantification of injury to solid and

hollow viscera. CT also identify and quantifies intraperitoneal and extraperitoneal fluid and blood and active hemorrhage. CT shows associated bone injury to the ribs, spine, and pelvis.<sup>(15,16)</sup>

The use of IV contrast material by rapid bolus injection is essential to maximize opacification of solid viscera and ensure adequate injury detection. IV contrast material is necessary because solid viscus laceration or hematoma may be relatively isodense to unenhanced or poorly enhanced solid viscera. In addition the use of IV contrast material allows the detection of active hemorrhage.<sup>(15,16,22)</sup>

Non operative management (NOM) is considered as standard of care in all hemodynamically stable injured adults and children without peritoneal signs and numerous recent studies demonstrate success rates exceeding 80%.<sup>(17,18,19)</sup>

NOM of liver injuries has an even higher success rate, exceeding 90%. All liver injuries can be treated conservatively regardless the magnitude of injury in hemodynamically stable patients. NOM is also very successful in renal injuries with success rate over 90%.<sup>(19,20)</sup>

Splenic injury, especially with multiple-site free intra abdominal fluid in abdominal CT , carries a high risk for NOM failure. The main criterion for a laparotomy in a NOM patient was hemodynamic deterioration after a second rapid fluid load.<sup>(18,19,21)</sup>

Trauma continues to be the major cause of death in children. It is hoped that advances in both prevention and treatment will reduce this toll.

## **AIM OF THE WORK**

The objective of this study is to compare study between blunt abdominal trauma in adults and children regarding the mode of trauma, organ affection, the importance of CT in diagnosis and the outcome of treatment (operative and non operative ) and at the Emergency Department of Alexandria Main University Hospital.

## **PATIENTS**

This prospective study will include all adults (16 to 60 old years) and all children (<16 years old) with BAT admitted to the Emergency Department of Alexandria Main University Hospital, in 6 month period from July 2013 to January 2014.

### **Exclusion criteria:**

Patients with the following criteria will be excluded from the study:

1. Glasgow coma scale (GCS)  $\leq$  8.
2. Pathological spleen.
3. Penetrating abdominal injuries.
4. Pregnancy.
5. Refusal of management /discharged against medical advice (AMA).

Informed written consent will be obtained for all patients or their care-givers.

## METHODS

All patients will be fully examined and assessed by the following:

### 1. History Taking:

- Full history taking with special emphasis on age and mode of trauma.

### 2. Physical examination:

- Vital signs.
- Head and neck examination.
- Chest examination with special emphasis on costal margin tenderness.
- Abdominal examination with special emphasis on signs of peritoneal irritation (Abdominal tenderness, guarding, distension , abdominal wall ecchymosis)
- Back and extremities with special emphasis on pelvic fractures.
- Neurological examination with special emphasis on glasgow coma scale (GCS).

### 3. Lab Investigations:

- Complete blood picture (hemoglobin and hematocrit).
- Complete urine analysis (microscopic and gross hematuria).
- Coagulation profile.

### 4. Radiological work up:

I- Chest and Pelvis x-ray.

II- Focused Assessment by Sonography for Trauma (FAST).

This is a four quadrant ultrasonographic assessment of the abdomen:

1. Hepatorenal pouch (of Morrison).
2. Subphrenic/splenic recess.

3. Suprapubic region.
  4. Sub-xiphisternal/ pericardial view.
- III- Computed tomography (CT) will be performed to indicated patients:<sup>(18,19)</sup>
8. Hemodynamically stable patients with equivocal findings on physical examination.
  9. Associated neurological injury.
  10. Multiple extra-abdominal injuries (chest and pelvic).
  11. Allows accurate assessment of solid organ injury for grading and detection of ongoing bleeding.
  12. Hemodynamically unstable patients with negative FAST constitute a diagnostic challenge; CT scan can be performed after aggressive resuscitation.
  13. Suspicion of retroperitoneal collection (the pancreas, the duodenum, and the genitourinary system).
  14. All cases with evidence of collection in ultrasound.

## **5. Management:**

NOM inclusion criteria are:

5. The mechanisms by which blunt abdominal trauma injures abdominal viscera should be kept in mind include (crushing, displacement, acceleration-deceleration, and bursting).
6. Patient should be hemodynamically stable and have no coagulation disorders.
7. The patient should be examined repeatedly.
8. Higher level of care with round-the-clock availability of laboratory and radiology.
9. Continuous monitoring by obtaining serial hemoglobin levels every six hours in the first 24 hours.

Patient shifted to exploration when there is:

5. Deterioration of vital signs.
6. Development of manifestation of peritonitis .
7. Continued need for blood transfusion.
8. Falling haemotocrit or progressing haematoma.

Operative management (OM):

Operative finding regarding (percentage of splenic injury ,liver injury, retroperitoneal injury and genitourinary injury) and the operative procedure (splenectomy, resection anastmosis, liver resection,.....etc.)

#### **6. Outcome:**

- Morbidity and mortality in adults and children regarding NOM and OM.
- Percentage of success of NOM regarding adults and children.

## **RESULTS**

The results of the present study will be recorded, tabulated and statistically analyzed according to appropriate methods.

## **DISCUSSION**

The results will be discussed in the view of achievement of the aim, their significance and their comparison with previous related researches.

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## الملخص العربي

لا تزال إصابات البطن الرضية تمثل مشكلة كبرى و مسألة جدال ليس فقط من حيث التشخيص ولكن أيضاً من حيث سبل العلاج. إن الإختلافات بين الأطفال و البالغين قليلة لذلك ينبغي عند التعامل مع المريض المصاب ألا ننظر الى السن فقط ولكن الى مدى خطورة الإصابة. يمثل السن لنا مرشداً و خلفية للعلاج حيث أن كل سن له الفسيولوجية والأمراض الخاصة به الذي لا بد ان تكون حاضرة بأذهاننا.

كانت دراستنا دراسة مستقبلية في الفترة من يوليو 2013 إلى يناير 2014 وشملت 164 مريضاً أصيبوا بإصابات بطن رضية وأدخلوا الى قسم الطوارئ بالمستشفى الرئيسي الجامعي. وتم تقسيم الضحايا إلى مجموعتين وفقاً لأعمارهم، مجموعة الأطفال (>16 سنة)، و مجموعة البالغين (<16-60 سنة).

وقد لوحظ ان أغلبية المصابين بإصابات البطن الرضية في كلا المجموعتين العمرية من الذكور حيث شملت الدراسة على 81,4 %، و 78,1 % ذكور من الأطفال والكبار مع التوالي. وكانت حوادث الطريقتي السبب الأكثر شيوعاً في كلا المجموعتين، فقد مثلت 52,5% في مجموعة الأطفال و 64,8% في مجموعة البالغين، يليه السقوط من ارتفاع حيث يمثل 22% في مجموعة الأطفال و 16,2% في مجموعة الكبار.

تمثل إصابات البطن الرضية وحدها 40,7% في الأطفال و 25,7% في الكبار، في حين أن المرضى الذين يعانون من إصابات أخرى يمثلون 59,3% من الأطفال و 74,3% من البالغين، وكانت الإصابات الأكثر شيوعاً هي إصابات القلب والصدر في كلا المجموعتين يليها إصابات الجهاز العصبي المركزي لدى الأطفال و كسور الحوض لدى البالغين.

لقد أظهرت الدراسة لدينا عدم وجود إختلافات جوهرية من حيث الكشف الظاهري لكل من الأطفال و البالغين بينما كانت هناك بعض الإختلافات بينهما من حيث الكشف عن وجود آلام، صلابة بالبطن وأصوات الأمعاء. ولقد أظهرت الدراسة أن نسبة دقة الأشعة المقطعية في الكشف عن وجود تجمعات دموية ووجود إصابات في الأعضاء الداخلية الصلبة قد بلغت 100%. أما الموجات فوق الصوتية فكانت نسبة الدقة فيها قد بلغت 100% في الكشف عن التجمعات الدموية بينما أظهرت 61% في الكشف عن وجود إصابات في الأعضاء الداخلية الصلبة في الأطفال و 56% في البالغين.

لم تكن هناك فروق في علاج إصابات البطن الرضية حيث ان غالبية الحالات تمت معالجتها بالعلاج غير الجراحي مع متابعة العلامات الحيوية و عمل متابعة و فحص دوري. وأي تدهور في العلامات الحيوية أو وجود أدلة علي زيادة التجمعات الدموية داخل البطن فذلك يتطلب التدخل الجراحي الفوري.

أما الحالات التي تعاني من البداية من عدم استقرار في علاماتها الحيوية أو لم تستقر بعد اعطاء السوائل، أو وجود تجمع دموي ظاهر بالأشعة التلفزيونية فذلك تطلب أيضاً التدخل الجراحي الفوري.

لم تكن هناك فروق في معدل الوفيات بين الفئتين العمريتين حيث انها تمثل 11,9% و 10,5% في كل من الأطفال و البالغين على التوالي.