

# Management of stab wounds to the anterior abdominal wall

## *Abordagem dos ferimentos por arma branca na parede anterior do abdome*

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### A B S T R A C T

The meeting of the Publication "Evidence Based Telemedicine – Trauma and Emergency Surgery" (TBE-CITE), through literature review, selected three recent articles on the treatment of victims stab wounds to the abdominal wall. The first study looked at the role of computed tomography (CT) in the treatment of patients with stab wounds to the abdominal wall. The second examined the use of laparoscopy over serial physical examinations to evaluate patients in need of laparotomy. The third did a review of surgical exploration of the abdominal wound, use of diagnostic peritoneal lavage and CT for the early identification of significant lesions and the best time for intervention. There was consensus to laparotomy in the presence of hemodynamic instability or signs of peritonitis, or evisceration. The wound should be explored under local anesthesia and if there is no injury to the aponeurosis the patient can be discharged. In the presence of penetration into the abdominal cavity, serial abdominal examinations are safe without CT. Laparoscopy is well indicated when there is doubt about any intracavitary lesion, in centers experienced in this method.

**Key words:** Abdominal injuries. Wounds, penetrating. Tomography. Laparoscopy. Laparotomy.

### INTRODUCTION

The selective non-operative treatment of patients with stable penetrating injury to the anterior abdominal stab wounds (AASW) was originally suggested 50 years ago<sup>1</sup>. Nevertheless, the best way to conduct these patients is still a matter of debate<sup>2-4</sup>. The mandatory laparotomy is clearly indicated in patients who present with hemorrhagic shock, clear signs of peritonitis and evisceration. However, extending this strategy to patients without this critical condition results in nontherapeutic laparotomy (NTL) in 50% of the time. Though NTL for trauma rarely leads to death, morbidity is significant (20%)<sup>5-7</sup>. In addition, the NTL results in increased demand for already limited hospital resources and create a considerable burden on its finances<sup>8</sup>. On the other hand, an excessively conservative approach may lead to a delay in surgery. Despite this concern, a recent study showed no increased morbidity if surgery was performed within the first 12 hours after injury<sup>9</sup>. Several studies have shown that patients with AASW may undergo selective treatment based on protocols that incorporate specific features.

The participants of the TBE-CITE discussed and analyzed the current literature and generated recommendations for the management of patients victims of stab wounds to the anterior abdominal wall.

### STUDY 1

"Validating the Western Trauma Association algorithm for managing patients with anterior abdominal stab wounds: A Western Trauma Association multicenter trial (USA)"<sup>2</sup>.

### Background

Study published in 2009 by the Western Trauma Association – WTA – demonstrating that local exploration of the AASW in selected patients constitutes an effective method to exclude intracavitary penetration and allow discharge in 41% of cases. Furthermore, contrary to expectations, it was demonstrated in the same study that computed tomography (CT) of the abdomen and diagnostic peritoneal lavage (DPL) resulted in high rates of

Meeting of TBE-CITE Journal on February 18<sup>th</sup>, 2014, with the participation of following services: St. Michael's Hospital and Sunnybrook Health Science Centre, University of Toronto, Toronto, Canada; Department of Trauma Surgery, Department of Surgery, Faculty of Medical Sciences, State University of Campinas (UNICAMP), Campinas, SP, Brazil; General Surgery, Albert Sabin Israeli Hospital; Trauma, Lourenço Jorge County Hospital, Rio de Janeiro, RJ, Brazil; and John XXIII Hospital, Belo Horizonte, MG, Brazil.

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nontherapeutic laparotomy, 24% and 31%, respectively<sup>10</sup>. A new study was then developed to evaluate the safety and efficacy of a protocol involving local exploration of the wound followed by hospital discharge (DIS) if the operation is negative (not penetrating the aponeurosis) or serial examination of the abdomen (SEA) if the exploration is positive (penetrated the aponeurosis).

### Question

How effective and safe is the protocol involving local exploration of the wound followed by DIS or SEA, without any other invasive or imaging methods in the management of stab AASW victims without definite indication for surgical treatment?

### Key findings

They studied AASW of 222 patients, 62 having been excluded from the protocol because of the immediate need for laparotomy (hemorrhage, shock, evisceration, unambiguous peritonitis). Although the remaining 160 patients fulfilled the criteria for local exploration of the wound, only 109 (68%) were thus approached. In addition, 17 patients with positive wound exploration underwent laparotomy without passing through the period of SEA (53% had non-therapeutic or negative laparotomy) and other 11 were submitted to DPL after the positive wound exploration. Among these, the rate of non-therapeutic or negative (NTL) laparotomy was 57%. Only 81 of the 109 patients (53%) who underwent local wound exploration were conducted exactly as proposed by the protocol, i.e., were discharged due to the negative wound exploration or underwent SEA due to the positive wound exploration. The results of this group were remarkable. Eleven (14%) eventually underwent laparotomy after SEA. Only two (18%) of the operated on had NTL. Virtually all laparotomies were performed within the first four hours of observation. The number of laparotomies was significantly lower ( $p < 0.05$ ) in patients conducted according to the protocol (11 vs. 38). The NTL rate was also significantly lower in this group (2% vs 21%).

### Strengths

The multicenter study was conducted in a short period (approximately two years) in selected patients and convincingly answered the question posed by the authors. The secondary findings of this study were very important. Among them, the fact that abdominal sonography (FAST) in stable patients with penetrating stab injuries to the anterior abdominal wall did not serve as a useful diagnostic method (sensitivity of only 36%, positive predictive value of 67% and negative predictive value of 86%). Important conclusions were also obtained with respect to TC. Among the patients operated based on the results of CT, 31% had NTL. Although the sensitivity of CT was 89% and positive and negative predictive values of 53% of 97%, respectively, only 57% of patients were discharged to home based solely

on the results of this method. The NTL index in surgical patients based on the results of the DPL was 57%.

### Limitations

Only 53% of patients were conducted with the proposed protocol. There is no information on follow-up of patients who had negative exploration of the wound and were discharged to home from the emergency room. Low turnover surgeons on duty could have contributed to the favorable results of the protocol. The exploration of the wound requires local anesthesia, incision and expansion of strict hemostasis. Not all emergency rooms provide ideal conditions for this.

## STUDY 2

"Diagnostic laparoscopy after anterior abdominal stab wounds: worth another look?"<sup>4</sup>

### Background

In some patients it is difficult to establish the entering of the peritoneal cavity by penetrating agents. The use of serial examination of the abdomen (SEA) is suggested by several protocols instead of mandatory laparotomy. There are currently a large number of unnecessary laparotomies, coupled with a growing demand for beds in trauma centers. The authors believe that patients with negative diagnostic laparoscopy (DL) after anterior abdominal wall stab wounds (AASW) are not candidates for mandatory laparotomy and may be released early from the hospital.

### Question

Would it be preferable to use DL as a tool to indicate mandatory laparotomy when compared with the recommendations suggesting SEA? Does the use of DL decrease the length of stay and hospital costs?

### Key findings

Of the 120 patients with hemodynamically stable AASW and unaltered physical examination, 99 had penetration upon wound exploration. Of these, 70 (71%) underwent DL for investigation, resulting in 32 indications for laparotomy, of these 20 therapeutic. Thirty eight (54%) DLs were negative, 50% of patients being immediately discharged. The rest was hospitalized for evaluation of other medical problems.

No patients with negative DL had postoperative complications.

There was a decrease in the number of nontherapeutic laparotomies in patients who underwent DL when compared with results obtained through protocols of SEA, from the Western Trauma Association (WTA), but without statistical significance. The number of patients with early discharge, however, is significantly higher in the study

with DL (33%) compared with the same WTA works for SEA with local exploration of the wound.

The costs of negative DL are similar to negative laparotomy, but both are much higher than the costs of the SEA.

### Strengths

The comparison of the data with a prospective multicenter study showed to be consistent. In a simple manner, with clear protocols, easily replicable in structured trauma centers, the authors suggest a different approach that may impact the management of a substantial group of patients. By using simple inclusion and exclusion criteria, it would be possible to reduce the need for serial evaluations by an experienced surgeon, laboratory assessments and frequent imaging, with consequent increase in the number hospital admissions. The method would also be useful in that group of patients with multiple lesions, in which the physical examination would be jeopardized.

### Limitations

This was a retrospective study from a single institution. The authors admit the possible lack of complete data in the documentation of patients, which could lead to bias or systematic error (recall and selection bias, characteristic of retrospective studies). Of the 28 patients who underwent exploratory laparotomy after clinical worsening, there is no way to determine the reasons why the surgeon opted for surgery.

## STUDY 3

"Prospective evaluation of the role of computed tomography in the assessment of abdominal stab wounds"<sup>3</sup>.

### Background

The use of CT for diagnosis of abdominal injuries in patients with stab wounds in the abdomen is uncertain. The few tissue changes caused by protruding objects are not sufficient to determine the path and the injuries caused by it. Thus, the study aimed to compare patient assessment by serial clinical examination (SEA) with the evidence found in the CT scan and to hence safely define the treatment to be instituted (laparotomy or observation).

### Question

Compare the accuracy of CT with SEA to determine the need for laparotomy in patients with abdominal stab wounds.

### Key findings

The study strongly demonstrated that clinical examination was the decisive factor in determining the treatment of the 249 evaluated patients, 45 of these being referred to laparotomy on admission only by clinical data

(peritonitis, hemodynamic instability, inability to exam the abdomen, abnormal level of consciousness – drugs or Traumatic Brain Injury – and evisceration). Twenty-seven patients were released due to having only superficial injuries of the abdominal wall. The remaining 177 underwent observation with CT scans and SEA. Of these, 154 patients were released after 24 hours of observation, and 30 had lesions of solid organs at CT that did not require any intervention. Twenty-three underwent "late" operations (the majority within six hours of observation), three being thoracotomies (one lung injury and two non-therapeutic due to haemopericardium at CT). Of the 20 patients undergoing laparotomy, two were due to CT findings and resulted in non-therapeutic surgeries. The remainders were directed by altered physical examination, the signs of peritonitis and hemodynamic instability being the most frequently found (70% and 40%, respectively). Of these, 88% had abdominal injuries requiring approach.

The CT identified only 5% of significant lesions. If it had been used as the sole criterion to exclude injuries and release patients without observation, it would show 68% of non-identified injuries. The sensitivity and specificity of serial physical examination are 100% and 98.7%, respectively, and the one of TC are only 31.3% and 84.2%.

Thus, the study concluded that the safest way to manage patients with abdominal stab injuries is the observation with serial clinical examination for a period of 24 hours. CT was not effective in identifying most injuries and did not shorten hospital stay.

It is worth remembering that the absence of significant changes in the tissues caused by stabbing weapons due to low kinetic energy complicates the interpretation of the images and identifying their course.

### Strengths

1. Prospective study, in which the compared methods were applied to all patients (SEA and abdominal CT).
2. Significant number of patients included in the series (N = 177).
3. Clinical examination performed by the same team (LA County + University of Southern California Medical Center) and radiological examinations in the same apparatus, with standardized protocol.
4. Exclusion of patients with a clear indication for laparotomy (hemodynamic instability, peritonitis, altered level of consciousness by trauma or drug use and eviscerations) and patients with superficial lesions.

### Limitations

1. Lack of follow-up after hospital discharge, thereby increasing the risk of patients released after 24 hours of observation, and evolving with complications, being referred to other medical centers.
2. The algorithm of the authors did not consider surgical exploration of the wounds. This method,

which is properly used, can result in early discharge in patients in whom there was no violation of the abdominal wall.

3. The authors did not clarify the observation period, indicating who performed the clinical reassessments and how often they were conducted.

## CONCLUSIONS

Regarding AASW, there are different types of approach to define the indication for surgical treatment. The only consensus is that laparotomy is indicated in patients with AASW and hemodynamic instability or signs of peritonitis, or evisceration. In patients who are admitted without symptoms, local exploration of the AASW is important to guide conduct, the absence of penetration into the abdominal cavity determining the care of the wound and discharge. When there is violation of the peritoneum, the approaches are still controversial. One study still uses peritoneal lavage for screening, something that has already been abandoned by most centers. CT has been used in some protocols, which requires adequate technical and experienced staff to interpret it, but even so, with low sensitivity and specificity for these lesions. The SEA is a safe method in centers that have trained surgery teams and units with suitable structure for observing the patient, since the symptoms of injury requiring surgical treatment usually manifest in the initial 12 hours. Laparoscopy, on its turn, can be used in patients with AASW with positive wound exploration, who present stable, when there is doubt about the presence of intracavitary injury and in cases of injury to the left thoracoabdominal transition. Therefore, according to the current literature, there are different approaches and each service should establish its protocol according to human resources (surgeons with experience

in trauma and surgical and non surgical treatment, horizontal teams, radiologist for discussion of the case) and materials (bed for observation, multislice CT, laparoscopy equipment) available 24 hours a day, with the balance not to let pass unnoticed injuries that are operated later, nor have high rates of nontherapeutic laparotomy.

## RECOMMENDATIONS

In patients suffering from penetrating stab wounds to the anterior abdominal wall, with no immediate indication for laparotomy, the TBE -CiTE recommends:

1. The exploration of the injury requires local anesthesia, wound enlargement and hemostasis. Not all emergency rooms in our environment offer ideal conditions for such exploration.

2. The AASW can be effectively and safely conducted through exploration of the lesion, followed or not by serial examination of the abdomen. The ability to compare findings between serial examinations of the abdomen is essential to safely conduct the case, which requires that the service have a well defined protocol for this.

3. The abdominal CT is not necessary in AASW due to low accuracy.

4. Laparoscopy, when available, and with an experienced surgeon, is well indicated when in doubt about the presence of intracavitary lesions (especially if there is possibility of treatment by this route) and in cases of injury to the left thoracoabdominal transition.

\* The authors emphasize that these recommendations do not apply to services that do not have well-established protocols to perform selective treatments of cases or that do not have adequate infrastructure to serial clinical observation.

## R E S U M O

*A reunião de Revista "Telemedicina Baseada em Evidências - Cirurgia do Trauma e Emergência" (TBE-CiTE) através de revisão da literatura selecionou três artigos recentes sobre o tratamento do paciente vítima de agressão por arma branca na parede abdominal. O primeiro trabalho observou o papel da tomografia computadorizada (TC) no tratamento do paciente com agressão por arma branca na parede abdominal. O segundo analisou o uso da laparoscopia diagnóstica em detrimento do exame físico seriado para avaliar os pacientes com necessidade de laparotomia terapêutica. O terceiro fez uma avaliação da exploração cirúrgica do ferimento abdominal, uso do lavado peritoneal diagnóstico e TC na identificação precoce de lesões significativas e o melhor momento para intervenção. Houve consenso para a indicação de laparotomia na presença de instabilidade hemodinâmica, ou sinais de peritonite, ou evisceração. O ferimento deve ser explorado sob anestesia local e se não houver lesão da aponeurose o doente pode receber alta. Na presença de penetração na cavidade abdominal, o exame seriado do abdome é seguro, sem a necessidade de TC. A laparoscopia está bem indicada quando existe dúvida de lesão intracavitária em centros com experiência nesse método.*

**Descritores:** Traumatismos abdominais. Ferimentos penetrantes. Tomografia. Laparoscopia. Laparotomia.

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