Conservative approach in drilling–cutting tool injuries

Osman Köneş¹, Murat Akarsu², Cevher Akarsu¹, Mehmet Emin Güneş¹, Halil Doğan³∗

¹Department of General Surgery, Bakirkoy Dr Sadi Konuk Training and Research Hospital, Istanbul, Turkey
²Department of Internal Medicine, Bakirkoy Dr Sadi Konuk Training and Research Hospital, Istanbul, Turkey
³Department of Emergency Medicine, University of Health Sciences Bakirkoy Dr. Sadi Konuk Training and Research Hospital, Istanbul, Turkey

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Abstract
Objective: To prevent unnecessary laparotomies by evaluating the effectiveness of conservative approach in abdominal trauma cases due to drilling-cutting instruments. Methods: Demographic data, effected region of the body, additional findings of trauma, hemodynamic parameters, duration of admission, diagnostic methods and treatment modalities were retrospectively evaluated in 217 cases with abdominal injury (lower thoracic region, abdominal wall and back) among 1128 victims with drilling-cutting instrument injuries between January 1, 2012 and December 31, 2017. The conservative approach was based on physical examination, hemogram follow-up and hemodynamic evaluation. Results: Totally 177 (81.6%) cases of 217 patients were followed conservatively while 25 cases were operated at early (1-8 hours) and 15 were operated at late (9-48 hours) periods. Two patients who underwent surgery in the early period and two patients who underwent surgery in the late period were accepted as negative laparotomy while 1 patient in the late operated group was regarded as non-therapeutic laparotomy. Diagnostic laparoscopy was performed in 81 cases. Complications developed in 7 patients who were operated in the early period and 10 patients who were operated in the late period. The mean hospital stay period was 5.3 days (1-33) in all cases, 4.5 days (2-20) in conservative treatment group and 8.4 days (3-33) in the operated patients; and the difference was statistically significant. Conclusions: Detailed physical examination, accurate assessment and effective use of different diagnostic methods reduce the frequency of negative and non-therapeutic laparotomies in abdominal stab wound injuries.

1. Introduction

Peritoneal penetration is not absolute after abdominal (DCII) [1]. Emergency laparotomy is a common practice in patients with penetrating abdominal trauma who are hemodynamically unstable or showing signs of peritoneal irritation[2,3]. Conservative approach is preferred in the last decades in abdominal stabbing cases without the signs of peritoneal irritation and who are hemodynamically stable[4-11]. The conservative approach can reduce unnecessary laparotomies (38%-40%) and the associated postoperative morbidities by 16% to 3%(12-15).

There is still a debate about when the surgery should be done in abdominal stab wound injuries. Conservative approach rates can be increased by adding ultrasonography, tomography, ultrasound-guided sampling, angiography, echocardiography, endoscopic...

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procedures and diagnostic laparoscopy to the physical examination. The aim of this study is to evaluate the effects of conservative approach and timing of the operation on the morbidity of patients with abdominal stab wound injuries.

2. Materials and methods

Initially, cases were evaluated according to advanced trauma life support protocols[16]. Foley catheter and tetanus prophylaxis were applied in all cases. Patients were divided into 3 main groups according to the injured areas:

1) The anterior wall of the abdomen: The arc of costae on the upper side, the symphysis pubis at the bottom, and the mid-axillary line at both sides.
2) Lower thoracic region: Forth intercostal space on the upper side, the arc of costae at the bottom, and the mid-axillary line at both sides.
3) Back region: The lower line of scapula at the top, gluteal folds at the bottom, and the mid-axillary line at both sides.

Local exploration was performed after local anesthesia in the injuries of the anterior abdominal wall. All injuries were sutured as primarily after initial evaluation. Asymptomatic, hemodynamically stable cases were hospitalized and those who had no problems with oral intake after 48 hours of investigation were discharged.

Omentum or bowel herniation was not regarded as immediate surgical indication. Laparotomy was applied to cases that could not be pushed in. Physical examination was used as a primary indicator in the conservative approach. In addition, other radiological methods were used.

2.1. Assessment methods and special diagnostic techniques

• Serial physical examination-leukocyte count: All patients were followed up with close follow-up and serial physical examination. After admission to the hospital, leukocyte count and physical examination were performed every four hours.
• Diagnostic laparoscopy: In lower thoracic region injuries, it was applied in patients who did not provide definitive laparotomy findings to exclude diaphragmatic injury.
• Diagnostic thoracoscopy: It was performed in order to control the diaphragmatic injury in patients with lower thoracic region and splenic injuries but without subtle laparotomy findings.
• Imaging methods and other investigations: Ultrasound was applied to all patients. Computerized tomography was performed routinely in cases of back injury. In other cases, ultrasound was withdrawn when intraabdominal free fluid was detected. Computerized tomography was performed by oral, rectal and intravenous contrast applications.
• Recently, sampling under ultrasound guidance is preferred instead of diagnostic peritoneal lavage. Sampling was performed under local anesthesia to determine the character of the fluid seen on emergency ultrasound performed on bedside of the patients. This liquid was tested for transudate-exudates differentiation and for gram staining and culture. Bilirubine and amylase were also studied from this fluid in suspected cases.

Rectosigmoidoscopy was performed on those with back injuries having suspected colonic damages. Echocardiography was performed to evaluate pericardial fluid in left lower thoracic region injuries. PA chest X-ray was obtained to evaluate hemothorax and pneumothorax.

2.2. Classification according to operation schedule

Patients were categorized according to the time they were taken to the operating room from the time of the application.

a) Emergency laparotomy: Patients who were immediately operated since the patients were in a state of shock or if the organs cannot be thrown into the womb. This group of patients was excluded from the study.

b) Early laparotomy: Patients who were operated in first 8 hours after admission.


c) Late laparotomy: Patients who were operated later than the 8th hour after admission.

2.3. Laparotomy classification

a) Therapeutic laparotomy: The abdominal injury requires repair;
b) Non-therapeutic laparotomy: An abdominal injury is present but an intervention is not required (non-bleeding liver-spleen injury, serosal bowel injury and non-growing retroperitoneal hematoma);
c) Negative laparotomy: Laparotomies without any injuries determined.

2.4. Data collection and statistical analysis

All clinical data were collected and recorded in a database. The degree of the injury was analyzed according to the Penetration Abdominal Trauma Index (PATI)[17]. Practically, the PATI score examines fourteen organs and assigns a risk factor from 1-5 (eg, pancreas=5, spleen=3, bladder=1) to each organ. Injuries to any organ are graded by severity from 1 for minimal injury (eg, tangential wound to the pancreas) to 5 for maximal injury (eg, pancreatic proximal duct disruption). The severity grade is multiplied by the risk factor. The final penetrating score is obtained by summing the individual organ score. Patient demographics, injury localization, laboratory data, physical examination findings, results of diagnostic methods, follow-up period, treatment plan, unnecessary laparotomies and complications were included in the evaluated data. For statistical analyses, Windows for SPSS (version 15.0; SPSS Inc, Chicago, IL, USA) was performed.
3. Results

Totally 418 cases with abdominal injuries (lower thoracic region, abdominal wall and back) among 1 128 cases with DCI who were admitted to the Health Sciences University, Bakırköy Dr. Sadi Konuk Training and Research Hospital, General Surgery Emergency Surgery Unit, between January 2012 and December 2017, were investigated retrospectively. One hundred and seventy three patients without penetration during local wound exploration were excluded. Ten patients who did not accept the treatment and 18 patients who were operated very urgently were also excluded from the evaluation.

Detailed information of these cases is summarized in Table 1. Of the remaining 217 cases, 209 were male and 8 were female and the mean age was 28.6 (range 13-75) years. In 87 (40%) cases, lower thoracic, in 61 (28%) cases anterior abdominal wall, in 39 (37) (18%) patients the back region, in 13 (6%) cases the back and lower thoracic region and in 17 (8%) patients lower thoracic and anterior abdominal wall injuries were determined. Totally 177 cases (81.5%) were followed with conservative approach while 25 cases were operated at early (1-8 hours) and 15 were operated at late (9-48 hours) periods. Negative laparotomy was determined in 4 cases, 2 in early and 2 in the late operated groups. One patient in the late operated group was regarded as non-therapeutic laparotomy (Table 1).

Diagnostic laparoscopy was performed in 81 patients. Diaphragmatic injuries were detected and repaired in 37 of the cases with diagnostic laparoscopy. Repair was performed thoracoscopically in 4 of the cases with diaphragmatic injuries. There were complications determined in 7 cases operated in the early period and 9 cases operated in the late period. The mean hospital stay was 5.1 days (1-33) in all cases, 4.3 days (2-20) in conservative approach group, and 8.2 days (3-33) in patients underwent surgery. This was statistically significant difference (P=0.009).

Unnecessary laparotomy was determined in 8% of patients who had early surgery and 20% of patients who had late surgery (Table 1).

After DCI, 15 cases (7%) were admitted to the Emergency Department with evisceration. Of these, 11 had omentum, 3 had small bowel, and 1 had sigmoid colon evisceration. Five of the eviscerated cases that developed acute abdomen in their follow-ups were operated.

In 163 cases that were evaluated with ultrasound, the findings were normal. Of 54 patients with abnormal ultrasonographic findings, 31 were found to have organ injury, while 12 of them were solid. In 23 patients, intraabdominal free fluid was detected. These 23 patients had three contrast-enhanced CT. Of 23 patients who had CT, any pathology was not determined in 6 patients, 4 patient had grade I liver injury, 3 patients had grade- II splenic injury, 1 patient had liver laceration, 3 patients had grade- III liver injury, 1 patient had grade- II splenic injury, 1 patient had retroperitoneal hemorrhage, while grade-III liver + grade- II right kidney injury was present in 1 patient, grade II hepatic and grade- II splenic injury in one patient, and transverse muscle injury in two patients was detected. Pericardial ultrasonography was applied to 23 patients with left lower thoracic region injuries. Pleural effusion was found in one of these patients. Echocardiography was performed in 7 patients. No pathology was detected.

Rectosigmoidoscopy was performed on 7 patients with back injuries. No pathology was detected.

One of 10 cases, who had cranial tomography, had left temporal fracture and pneumocephaly and one of them only had pneumocephaly. These additional trauma findings did not prolong the patient's hospital stay.

Urine tests were performed in a total of 44 patients with back injuries and hematuria were detected in 6 patients. In 1 of these 6 patients, hematuria was macroscopic and grade- II right kidney injury was detected. Control urine test was delivered twelve hours klater and it was normal in remaining 5 patients.

4. Discussion

Patients with minimal or asymptomatic abdominal stab wound injuries still remains challenging in terms of approach to trauma surgeons in the emergency department. Although there is no doubt that any complication in terms of hemodynamic instability or peritoneal irritation deserves the urgent laparotomy, it is now possible to make the right decision about the most challenging diagnostic problems. Surgeons need to decide which abdominal stab wound injury patient needs laparotomy, when patients should be treated, and which diagnostic procedure should be used. Some current guidelines recommend the follow-up of hemodynamically stable patients with DCII without peritonitis[18,19]. The aim of diagnosis and approach is to be able to identify what is necessary while reducing the ratio of unnecessary laparotomies.

Nonselective laparotomy in the trunk DCII causes negative laparotomy in 38% of patients and morbidity in approximately 40% of patients[13,20-22]. Complication rates in non-therapeutic laparotomies can also be up to 41%[19,23,24]. Complications of negative laparotomy can be severe. In post-traumatic laparotomies, the mortality rate is between 0% and 6% and negative laparotomy has a complication rate of 5%-22%[14,13,14,22,25]. According to a previous study, when exploration is a routine procedure, the rates of negative and non-therapeutic laparotomy are 12% and 23% respectively[26]. When the selective approach is the routine procedure in the next period of study, these rates fall to 7% and 4%, respectively[26]. Conservative approach was reportedly not to increase mortality and morbidity[22,27,28]. In another study, a strong correlation was found between the increase in the rates of conservative management and the decrease in non-therapeutic laparotomy rates in recent years, but failure in the conservative approach has been found to increase mortality[29]. Failure rate in conservative approach is found between
Table 1

Patients operated at early period.

| Injured organ                               | Operation indication | PATI Positive CT findings | Morbidity                  | Laparotomy classification |
|---------------------------------------------|----------------------|---------------------------|---------------------------|---------------------------|
| Small bowel                                | Acute abdomen        | 2                         | Contrast leakage          | Absent                    | Therapeutic               |
| Spleen-diafragm                             |                      | 6                         | Grade 4 spleen damage     | Absent                    | Therapeutic               |
| Stomach, kidney, ureter, small bowel        | Acute abdomen        | 20                        | Kidney damage             | Atelectasis               | Therapeutic               |
| Stomach                                    | Acute abdomen        | 2                         | PX, Contrast leakage      | PX after tube withdrawal  | Therapeutic               |
| Small bowel                                | Acute abdomen        | 12                        | No finding                | Absent                    | Therapeutic               |
| Small bowel                                | Acute abdomen        | 6                         | Intra-abdominal fluid     | Absent                    | Therapeutic               |
| Kidney diafragm                             | Acute abdomen        | 3                         | Kidney damage             | Absent                    | Therapeutic               |
| Stomach transverse colon, pancreas         | Shock                | 29                        | Stomach and pancreas      | Atelectasis, fistula, nasal pneumonia + depression | Therapeutic               |
| Stomach intercostal artery                 | Shock                | 8                         | Absent                    | Absent                    | Therapeutic               |
| Small bowel                                | Acute abdomen        | 7                         | Absent                    | Sub-ileus                 | Therapeutic               |
| Absent                                     |                      | 0                         | Absent                    | Absent                    | Negative                  |
| Lung                                       | Shock                | 0                         | Contusion in lung         | Absent                    | Therapeutic               |
| Colon                                      | Acute abdomen        | 12                        | Absent                    | Wound infection, nasal pneumonia | Therapeutic               |
| Absent                                     |                      | 0                         | Absent                    | Absent                    | Negative                  |
| Liver-small bowel                          | Acute abdomen        | 23                        | Liver Grade 4 laceration  | Absent                    | Therapeutic               |
| Transverse muscle                          | Decrease in hematocrit | 0                        | Absent                    | Absent                    | Therapeutic               |
| Lung                                       | Decrease in hematocrit | 0                        | Absent                    | Absent                    | Therapeutic               |
| Small bowel                                | Acute abdomen        | 0                         | Intra-abdominal fluid     | Absent                    | Therapeutic               |
| Liver-lung                                 | Shock                | 8                         | Liver and Lung damage     | Absent                    | Therapeutic               |
| Small bowel                                | Acute abdomen        | 4                         | Intra-abdominal fluid     | Absent                    | Therapeutic               |
| Small bowel-colon                          | Acute abdomen        | 12                        | Intra-abdominal fluid     | Absent                    | Therapeutic               |
| Absent                                     |                      | 0                         | Absent                    | Absent                    | Therapeutic               |
| Liver                                      | Decrease in hematocrit | 0                        | Liver Grade 2 laceration  | Absent                    | Therapeutic               |
| Small bowel-colon                          | Acute abdomen        | 14                        | Intra-abdominal fluid     | Absent                    | Therapeutic               |
| Small bowel                                | Acute abdomen        | 4                         | Intra-abdominal fluid     | Wound infection, nasal pneumonia | Therapeutic               |
| Absent                                     |                      | 0                         | Absent                    | Absent                    | Negative                  |
| Absent                                     |                      | 0                         | Absent                    | Emphyema                  | Non therapeutic           |
| Small bowel and meso                       | Acute abdomen        | 6                         | Intra-abdominal fluid     | Wound infection           | Therapeutic               |
| Liver                                      | Acute abdomen        | 8                         | Liver Grade 3 laceration  | Atelectasis               | Therapeutic               |
| Absent                                     |                      | 0                         | Intra-abdominal fluid     | Absent                    | Negative                  |
| Stomach-liver                              | Acute abdomen        | 6                         | Intra-abdominal fluid,    | Absent                    | Therapeutic               |
| Small bowel-colon                          | Acute abdomen        | 18                        | Intra-abdominal fluid     | Absent                    | Therapeutic               |
| Lung                                       | Decrease in hematocrit | 0                        | Pnomothorax               | Absent                    | Therapeutic               |
| Colon                                      | Acute abdomen        | 0                         | Intra-abdominal fluid     | Wound infection           | Therapeutic               |
| Diaphragm                                  | Decrease in hematocrit | 0                        | Absent                    | Absent                    | Therapeutic               |
| Stomach pancreas                           | Acute abdomen        | 23                        | Intra-abdominal fluid     | Atelectasis               | Therapeutic               |
| Liver small bowel                          | Acute abdomen        | 23                        | Intra-abdominal fluid     | Evisceration              | Therapeutic               |
| Stomach                                    | Acute abdomen        | 4                         | Intra-abdominal fluid     | Absent                    | Therapeutic               |
| Liver-gall bladder                         | Acute abdomen        | 10                        | Intra-abdominal fluid,    | Wound infection           | Therapeutic               |
| Stomach dialfragm                           | Decrease in hematocrit | 2                        | Intra-abdominal fluid     | ARF-pneumonia             | Therapeutic               |
| Absent                                     |                      | 0                         | Absent                    | Absent                    | Negative                  |
| Absent                                     |                      | 0                         | Absent                    | Emphyema                  | Non therapeutic           |
| Small bowel and meso                       | Acute abdomen        | 6                         | Intra-abdominal fluid     | Wound infection           | Therapeutic               |
| Liver                                      | Acute abdomen        | 8                         | Liver Grade 3 laceration  | Atelectasis               | Therapeutic               |
| Absent                                     |                      | 0                         | Intra-abdominal fluid     | Absent                    | Negative                  |
| Stomach - liver                            | Acute abdomen        | 6                         | Intra-abdominal fluid,    | Absent                    | Therapeutic               |
| Small bowel-colon                          | Acute abdomen        | 18                        | Intra-abdominal fluid     | Absent                    | Therapeutic               |
| Lung                                       | Decrease in hematocrit | 0                        | Pnomothorax               | Absent                    | Therapeutic               |
| Colon                                      | Acute abdomen        | 0                         | Intra-abdominal fluid     | Wound infection           | Therapeutic               |
| Diaphragm                                  | Decrease in hematocrit | 0                        | Absent                    | Absent                    | Therapeutic               |
| Stomach pancreas                           | Acute abdomen        | 23                        | Intra-abdominal fluid     | Atelectasis               | Therapeutic               |
| Liver Small bowel                          | Acute abdomen        | 23                        | Intra-abdominal fluid     | Evisceration              | Therapeutic               |
| Stomach                                    | Acute abdomen        | 4                         | Intra-abdominal fluid     | Absent                    | Therapeutic               |
| Liver – Gall bladder                       | Acute abdomen        | 10                        | Intra-abdominal fluid,    | Liver grade 3 laceration  | Therapeutic               |
| Stomach dialfragm                           | Decrease in hematocrit | 2                        | Intra-abdominal fluid     | ARF-pneumonia             | Therapeutic               |
10%-20%[19,24,30]. Again, it has been suggested that failure rates in
the conservative management of abdominal DCII are higher in severe
injuries requiring blood transfusion and splenic injuries[29]. Totally
177 (81.5%) patients were followed up conservatively. Twenty-five
patients (11.5%) were operated at early period (1-8 hours) and 15
patients (7%) in the late period (9-48 hours). The rate of unnecessary
laparotomies including very urgent laparotomies was 2%. The rate
of unnecessary laparotomies was 8% in patients operated at early
periods and this ratio was 20% in late operated group.

One of the suggestions of Shaftan’s study in 1960 was that with
physical examination, laparotomy requirement could be predicted
safely and securely in abdominal trauma patients[4]. Many different
studies have published similar results with Shaftan’s work[19,21-34].
Following the implementation of the standard resuscitative protocol
as an initial approach in all patients, our algorithm is based on
leukocyte count, serial physical examinations and other diagnostic
tests. In the course of this algorithm, the occurrence of widespread
peritonitis findings, as in previous studies, was accepted as a fine
indicator for laparotomy decision[30,35]. In a recent study, Clarke and
colleagues found that conservative management was a safe method
for patients with DCII[3]. There are also studies showing that the
conservative approach reduces negative laparotomy[24,36-38]. In our
study, 2 of the early laparotomy group and 4 of the late laparotomy
group; to perform laparotomy was decided with only results of
physical examination. Therapeutic and non-therapeutic laparotomy
rates were equal in both groups and negative laparotomy was present
in only 1 patient. Nevertheless, we emphasize that the physical
examination should be combined with other diagnostic procedures.

The traditional recommendation is to operate all patients with
DCII having evisceration[8,39,40]. In a prospective study, Kimberly
and colleagues found that laparotomy was necessary in 77% of
patients with omental evisceration and 80% of patients with visceral
evisceration. In a similar study, it was emphasized that conservative
treatment may be appropriate for selected patients with omental
evisceration[20,41]. Neither omental nor intestinal evisceration in
our study was an absolute indication for laparotomy. Fifteen cases
(7%) were admitted to the emergency department with evisceration
after DCII. Of these, 11 had omentum, 3 had small bowel, and 1
had sigmoid colon evisceration. Five of the eviscerated cases that
developed acute abdomen in their follow ups were operated.

In the last few decades, DPL was accepted as the gold standard
in the evaluation of blunt abdominal trauma[42] and in the 1980s
it was adopted in the assessment of penetrated injuries[43,44]. Thal
published the first report on selective approach using peritoneal
lavage in abdominal DCII[5]. As other diagnostic modalities evolved,
DPL was almost abandoned as the first approach. In a recent study,
Gonzales and colleagues found that patients with less than 1,000
erthrocytes in cell counts after DPL had negative local wound
exploration or were having minor abdominal knife injuries, so
they could safely be sent home immediately from the emergency
department[45]. In a recent study, Hashemzadeh and colleagues have
proposed that DPL can be used diagnostically for thoracoabdominal
stabs with new threshold values[46]. However, new and increasingly
divergent diagnostic methods have led to the gradual elimination
of DPL from routine practice[19,29]. Although DPL has been a
routine procedure for all patients with peritoneal penetration in our
institution in the past, it has been abandoned since 1998[26]. DPL has
been applied until recently, to the hemodynamically stable patients
with symptoms of suspected peritonitis, loss of consciousness due to
head trauma, and/or progressive peritonitis. But in our study, DPL
was not performed.

Diagnostic laparoscopy is currently being used not only for
diagnostic purposes but also for therapeutic purposes, and many
interventions can be done in this way[47-51]. Diagnostic laparoscopy
(DL) in penetrating trauma was first reported in 1977 by Carnevale
et al[52]. Although DL has a limited role in anterior abdominal
injuries, the thoracoabdominal region is suitable for laparoscopic
evaluation and for intervention when needed[47,54-56]. However,
in detecting diaphragm injuries, the increasing sensitivity of CT
which is in use more commonly in thoraco-abdominal stabs helps
to make the operation decision[57]. We recommend the use of DL in
the management of anterior abdominal anomalies in the evaluation
of peritonitis without an indication of laparotomy or in cases of
selected omental or luminal organ herniations. At the same time, we
prefer DL to catch all suspected diaphragm injuries to all patients
with left thoraco-abdominal injuries. In our study, no negative or
non-therapeutic laparotomy was performed after DL. Diagnostic
laparoscopy was performed in 81 patients. Diaphragmatic injuries
were detected and repaired in 37 of the cases with diagnostic
laparoscopy[58].

The use of USG in blunt trauma has been routine since the 1980s[59]
and it was reported to have 81%-88% sensitivity and 97%-100%
specificity[60-63]. In some recent studies, authors have pointed out
the benefits of FAST in penetrating abdominal trauma[64-66]. In fifty
% of the FAST images, we have performed, there were free fluid in
the abdomen; and spleen, liver or kidney injuries were detected, and
at the same time we were able to take samples for macroscopic and
microscopic analysis from the fluid under USG guidance.

Although FAST alone did not mandate laparotomy, it was used
as an indicator of the injuries that required surgery. Udabi et al
suggested that FAST should be used earlier in the algorithm, but
emphasize that it is not as reliable as in blunt trauma and has a 15%
negative laparotomy rate. Therefore, when selecting patients with
penetrating abdominal trauma for laparotomy, FAST should be
combined with other diagnostic modalities[64-67].

Combined with emerging imaging technologies and whole-body
scanning techniques, CT has become more widely used in trauma
patients[68-70]. Although the diagnostic value of CT in different
traumas has not been discussed, in some studies, it was reported
as not highly required in DCII[29,70]. Nevertheless, a recent meta-
analysis showed that CT could detect 94.7% of laparotomy
requirements in hemodynamically stable penetrating abdominal
trauma patients(71). Current studies on the efficacy of tomography emphasize that CT should be in the first diagnostic steps(19,72-74). Back injuries should not be assessed with local wound exploration due to thick paraspinal muscles in this region. Three contrasted CT and / or colonoscopy will give enough information about the damage(18,66,75-78). We enrolled CT in 60 patients with back injury and having intraabdominal free fluid detected in ultrasound. We found solid organ injuries in 13 patients. Although it is difficult to perform endoscopy in an unplaned colon, we do at least Rectosigmoidoscopy after an enema in left-sided injuries. In this study, rectosigmoidoscopy was performed on 7 patients.

In conclusion, the use of physical examination and / or different diagnostic methods allows for a reduction in the number of non-therapeutic laparotomies and non-appearance of negative laparotomy. The surgeon must make vital decisions to perform appropriate choice among various diagnostic techniques in the nonoperative approach of abdominal stab wound injuries.

Conflict of interest statement

We declare that we have no conflict of interest.

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