Clinical predictors of intra-abdominal lesions in blunt abdominal trauma patients with the conservative treatment

I Gede Parwata,1 Ketut Wiargitha,1 Nyoman Golden,1 Desy Permatasari2*

ABSTRACT

Background: Blunt abdominal trauma has a high rate of morbidity and mortality. Assessment of specific clinical symptoms such as abdominal traces, abdominal pain, gross hematuria, pelvic fracture, systolic blood pressure and pulse rate in blunt abdominal trauma patients can predict the presence of intra-abdominal injury, so the use of CT Scan in diagnostics may be selective. The purpose of this study was to determine the predictors of intra-abdominal lesions in patients with blunt abdominal trauma who were treated conservatively.

Material and Method: This study used a cross-sectional design. Samples were taken from the medical records, from January 2015 to December 2016. The total sample was 124 patients, were analyzed using Chi-square and logistic regression. This study has passed ethical clearance from the institutional review board of our University.

Result: The results showed the mean age of patients was 33 years, the majority of patients were male (74.2%), and a negative CT scan was 39.5%. The clinical predictors of intra-abdominal lesions in CT scan of blunt abdominal trauma patients were: abdominal traces (OR: 11.252; 95% CI: 3.257-38.867; p <0.001), abdominal pain with VAS≥5 (OR : 92.968; 95% CI: 14.604-591,837; p <0.001); and gross hematuria (OR: 9.377; 95% CI: 1.539-57.115; p = 0.015). Pelvic fracture, systolic blood pressure, and pulse rate were not statistically proven.

Conclusion: Abdominal traces, abdominal pain, and gross hematuria are clinical predictors of intra-abdominal lesions. Predictors should be taken into consideration in decision making to perform an abdominal CT scan in blunt abdominal trauma patients treated conservatively.

Keywords: Clinical predictors, blunt abdominal trauma, intra-abdominal injury in CT scan


INTRODUCTION

Abdominal trauma is an emergency case with a high level of morbidity and mortality. Diagnostics and management are still a challenge for surgeons around the world. Abdominal trauma is the third cause of death in trauma patients and has been found in 7–10% of the total cases of trauma. The incidence of blunt abdominal trauma is found to be about 80% of all abdominal trauma.1

Physical examination is an important part of the initial evaluation of patients with blunt abdominal trauma. One study said that physical examination had an accuracy rate of 65% in detecting the presence or absence of intra-abdominal lesions. Whereas other studies suggested that as many as 40% of hemoperitoneum sufferers showed significant clinical findings at initial physical examination.2

CT scan is diagnostic support that is routinely used and has become a protocol in the management of blunt abdominal trauma with stable hemodynamics in several trauma center hospitals. A study by Deunk et al, in 2010, found that CT scan did not provide a clear picture of patients with non-specific clinical signs. This opinion is also supported by other studies, that clinical predictors are very accurate to be used to assess whether patients need an abdominal CT scan or not.3

Increased use of routine CT scan, without paying attention to the patient’s clinical condition, causes more negative results to be found on CT scan. Besides that, it would also increase hospital fees, and referral fees and increase the risk of radiation exposure. To reduce the cost of care and reduce the effects of radiation from CT scan in assessing blunt abdominal trauma patients, a CT scan must be done selectively. The ability to assess the clinical predictors of intra-abdominal injury greatly determines whether or not the patient requires a CT scan. Surgeons in remote areas without CT scan facilities must be able to assess these clinical predictors so that a CT scan is performed on selective indications.4

METHODS

This study used a cross-sectional design and was carried out through the observational of the patient’s medical records from our hospital from January 2015 to December 2016. The inclusion criteria are all patients over 12 years old who experienced blunt abdominal trauma who were treated conservatively and underwent an abdominal CT scan. While the
exclusion criteria are pregnant patients, patients who came unconscious, patients with a history of intoxication at admission, patients with unstable hemodynamics or with signs of peritonitis that require immediate laparotomy surgery, patients with incomplete medical records. The minimum number of samples for research was 44 people. The independent variables in this study were traces in the abdominal region, abdominal pain (VAS ≥ 5), gross hematuria, pelvic fracture, systolic blood pressure <100 mmHg, pulse frequency ≥ 100 bpm. While the dependent variable was intra-abdominal lesions seen on abdominal CT scan.

RESULTS

There were 124 blunt abdominal trauma patients who fulfilled the inclusion and exclusion criteria, who at the beginning were decided to be treated conservatively. Following is the sample characteristics table:

Table 1 shows that the age range of the sample in the study was between 13 - 81 years. The average sample age was 33 years old (mean ± SD = 33.6 ± 11.6) and most of them were male, 74.2%. There were 79% of samples who had lesions in the abdominal region, and those with abdominal pain with a VAS value of ≥ 5 were 75%. Gross hematuria was found in only 22.6% of the sample and it was found that 30.6% had pelvic fractures. The systolic blood pressure ranges from 70 - 140 mmHg, with an average of 99.6 mmHg, while the pulse frequencies found in the sample are between 86 - 120 bpm, with an average of 100.2 bpm, and standard deviation of 12.0. CT scan performed on all samples resulted that in 60.5% of patients intra-abdominal lesions were found and in 39.5% of patients, intra-abdominal lesions were not found. Of all patients who experienced intra-abdominal injury, spleen injuries were found most at 45.3%, followed by liver injury (24%), kidney (22.7%), bladder (5.3%), and pancreas (2.7%).

Table 2 shows that the variables of traces in the abdominal region, abdominal pain and gross hematuria related to the occurrence of intra-abdominal lesions with p-value < 0.001. Likewise, systolic blood pressure and pulse frequency were also found to have a significant association with the presence of intra-abdominal lesions with p-value = 0.001 (<0.005). Meanwhile, the pelvic fracture was found to have no significant association with the occurrence of intra-abdominal lesions, with p-value 0 of 0.429 (> 0.005).

After bivariate analysis on all variables considered to be associated with intra-abdominal lesions, we continued by conducting a multivariate analysis to look for factors that had an independent effect on the presence of intra-abdominal lesions. The independent variables analyzed multivariately on intra-abdominal lesions were variables that had a p-value of <0.25 in bivariate analysis, namely traces in the abdominal region, abdominal pain and gross hematuria with p-values <0.001 and systolic blood pressure and pulse frequency with p-values = 0.001. After elimination using the enter method, the results of the multivariate analysis are shown in Table 3.

Table 3 shows that after multivariate analysis, only the variables of traces in the abdominal region, abdominal pain, and gross hematuria were associated with the presence of intra-abdominal lesions.
After the multivariate test, the relationship between traces in the abdominal region with intra-abdominal lesions was statistically significant after controlling for the influence of other variables (AOR: 11.252; 95% CI: 3.257-38.867; p <0.001). The relationship of variable abdominal pain (VAS ≥ 5) with the presence of intra-abdominal lesions in multivariate analysis was also found to be statistically significant after controlling the influence of other variables (AOR = 9.377; 95% CI: 1.539-57.115; p = 0.015). Whereas the systolic blood pressure in the multivariate test was found to have no association with intra-abdominal lesions (AOR: 0.000; 95% CI: 0.000 - ; p = 0.999). Likewise, the pulse frequency variable, after multivariate analysis, did not have significant relationship (AOR = 5.1 x 10^9; 95% CI: 0.000 - -; p = 0.999). The pelvic fracture was already determined to have no association with the presence of intra-abdominal lesions from the bivariate test (OR: 0.732; 95% CI: 0.337-1.588; p <0.429), so it was not included in the multivariate test.

**Table 3**  Multivariate analysis of the relationship between abdominal injury, abdominal pain, gross hematuria, systolic blood pressure, a frequency of pulse to intra-abdominal lesions

<table>
<thead>
<tr>
<th>Variable</th>
<th>Adjusted OR</th>
<th>95% CI</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdominal Traces (There is trace)</td>
<td>11.252</td>
<td>3.257-38.867</td>
<td>&lt; 0.001*</td>
</tr>
<tr>
<td>Abdominal Pain (VAS ≥ 5)</td>
<td>92.968</td>
<td>14.604-591.837</td>
<td>&lt; 0.001*</td>
</tr>
<tr>
<td>Gross hematuria (Ada)</td>
<td>9.377</td>
<td>1.539-57.115</td>
<td>0.015*</td>
</tr>
<tr>
<td>Systolic Pressure (&lt;100mmHg)</td>
<td>0.000</td>
<td>0.000 - -</td>
<td>0.999</td>
</tr>
<tr>
<td>Pulse Frequency (≥ 100 times/minute)</td>
<td>5.1 x 10^9</td>
<td>0.000 - -</td>
<td>0.999</td>
</tr>
<tr>
<td>Pulse Frequency (&lt;100 times/minute)</td>
<td>5.1 x 10^9</td>
<td>0.000 - -</td>
<td>0.999</td>
</tr>
</tbody>
</table>

After the multivariate test, the relationship between traces in the abdominal region with intra-abdominal lesions was statistically significant after controlling for the influence of other variables (AOR = 9.377; 95% CI: 1.539–57.115; p < 0.001). Whereas the systolic blood pressure in the multivariate test was found to have no association with intra-abdominal lesions (AOR: 0.000; 95% CI: 0.000 - ; p = 0.999). Likewise, the pulse frequency variable, after multivariate analysis, did not have significant relationship (AOR = 5.1 x 10^9; 95% CI: 0.000 - ; p = 0.999). The pelvic fracture was already determined to have no association with the presence of intra-abdominal lesions from the bivariate test (OR: 0.732; 95% CI: 0.337-1.588; p < 0.429), so it was not included in the multivariate test.

**Table 2**  Bivariate analysis of the relationship between abdominal injury, abdominal pain, pelvic fracture, gross hematuria, systolic blood pressure, a frequency of pulse to intra-abdominal lesions

<table>
<thead>
<tr>
<th>Variable</th>
<th>Intraabdominal lesson on CT scan</th>
<th>Crude OR</th>
<th>95% CI</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdominal Traces</td>
<td>Yes</td>
<td>67 (68.4%)</td>
<td>31 (31.6%)</td>
<td>4.863</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>8 (30.8%)</td>
<td>18 (69.2%)</td>
<td></td>
</tr>
<tr>
<td>Abdominal Pain</td>
<td>VAS ≥ 5</td>
<td>72 (77.4%)</td>
<td>21 (22.6%)</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>VAS &lt; 5</td>
<td>3 (9.7%)</td>
<td>28 (90.3%)</td>
<td></td>
</tr>
<tr>
<td>Gross Hematuria</td>
<td>Yes</td>
<td>25 (89.3%)</td>
<td>3 (10.7%)</td>
<td>7.667</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>50 (52.1%)</td>
<td>46 (47.9%)</td>
<td></td>
</tr>
<tr>
<td>Pelvic Fracture</td>
<td>Yes</td>
<td>21 (55.3%)</td>
<td>17 (44.7%)</td>
<td>0.732</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>54 (62.8%)</td>
<td>32 (37.2%)</td>
<td></td>
</tr>
<tr>
<td>Systolic Pressure</td>
<td>&lt;100 mmHg</td>
<td>25 (43.1%)</td>
<td>33 (56.9%)</td>
<td>0.242</td>
</tr>
<tr>
<td></td>
<td>≥100 mmHg</td>
<td>50 (75.8%)</td>
<td>16 (24.2%)</td>
<td></td>
</tr>
<tr>
<td>Pulse Frequency</td>
<td>≥100 times/min</td>
<td>27 (45.8%)</td>
<td>32 (54.2%)</td>
<td>0.299</td>
</tr>
<tr>
<td></td>
<td>&lt;100 times/min</td>
<td>48 (73.8%)</td>
<td>17 (26.2%)</td>
<td></td>
</tr>
</tbody>
</table>
DISCUSSION

Age and sex do not affect the occurrence of intra-abdominal lesions in a patient of blunt abdominal trauma. In this study 74.2% with male sex, the average age of 30 years. In accordance with several studies in the world about blunt abdominal trauma, it is stated that the average age of patients who experience blunt abdominal trauma is between 20-35 years and more male sex than women. Productive age and male sex are associated with a higher rate of motor vehicle use in young men than old age. The most intra-abdominal organ lesions found on CT scan were spleen rupture (45.3%), followed by liver injury, then kidney injury, and the remainder bladder and pancreatic injuries. Several studies have revealed that solid organs such as the spleen and liver are the organs most often affected by blunt abdominal trauma. Another study of blunt abdominal trauma states that the organs most commonly affected are the spleen around 40% - 55%, liver 35% - 45% and small intestine 5% -10%.8,10

Traces in the abdominal region were found in most patient of blunt abdominal trauma in this study, which was 79% and associated with the presence of intra-abdominal lesions. Traces in patients with blunt abdominal trauma can be lacerations, ecchymosis or hematomas found in the abdominal region that arise due to trauma with high energy. Farrath, et al. Examined the relationship between abdominal physical examination findings in blunt abdominal trauma with intra-abdominal injury, stating that abnormal abdominal physical examination including the presence of abdominal injury increased the risk of intra-abdominal injury. Other studies also support, that patients with lesions in the abdominal region in this case in the form of Seat Belt Sign (SBS) after a driving accident are more likely to have an intra-abdominal injury than patients without SBS.10

Another clinical sign that is found in patients with blunt abdominal trauma is abdominal pain assessed by the Visual Analogue Scale (VAS). In this study, the rate of abdominal pain with a VAS value of ≥ 5, was 75% and had a significant relationship with the presence of intra-abdominal lesions. Some studies suggest that clinical symptoms of abdominal pain are an important symptom for predicting intra-abdominal injury. Abdominal pain is almost found in all patients who experience blunt abdominal trauma with good awareness. In his research, Neeki said that mild abdominal pain in blunt abdominal trauma was associated with a low rate of laparotomy splenectomy. Other studies reveal that abdominal pain in blunt abdominal trauma is associated with laparotomy, where the absence of abdominal pain in abdominal trauma reduces the number of surgical interventions performed to save patients. Gross hematuria is a sign of urogenital organ injury, starting from the kidneys, ureter, bladder, and urethra. In this study, it was found that the number of patients who experienced gross hematuria was only 22.6%, and had a significant relationship with the presence of intra-abdominal lesions. Gross hematuria in blunt abdominal trauma is associated with injury to the urogenital organs, including the kidneys, ureters, bladder and urethra and is usually often accompanied by pelvic fractures. Most kidney trauma occurs with symptoms of hematuria (95%). Other studies suggest that patient of blunt abdominal trauma with gross hematuria without hypovolemic shock, after being seen by radiographic examination, are mostly found in the presence of contusions in the kidneys, and a small part is found in bladder injury. In this study, the pelvic fracture was found to be 30.6%, but after statistical analysis, it did not have a significant association with the occurrence of intra-abdominal lesions. Based on several studies, the stability of the pelvic fracture is related to the level of organ injury that occurs. Pelvic fractures in this study did not distinguish between stable and unstable fractures. In theory, unstable pelvic fractures more often injure organs in the pelvic cavity, such as the bladder, female genitals, and urethra compared to stable pelvic fractures. Fragment of fractures in unstable pelvic fractures can directly tear intra-pelvic organs. Research in America shows that patients with pelvic fractures and found clinical signs such as suprapubic lesions, pain, and gross hematuria, are very high - risk factors for bladder injury. While stable pelvic fractures and the absence of gross hematuria are associated with a low rate of urinary tract injury. This study did not distinguish between stable and unstable fractures, and medical records did not explain the type and classification of pelvic fractures, thus affecting the results of the study.

In this study, systolic blood pressure and pulse frequency were not variables that were independently associated with intra-abdominal lesions. The average systolic blood pressure in this study sample was 99.6 mmHg, and the number of patients who experienced systolic blood pressure <100 mmHg at the time the patient arrived at the emergency unit was 46.8%. While the frequency of pulse ≥ 100 times/minute was obtained in 47.6% of the 124 patients who became the study sample. Fast and weak pulses are often used as indicators of patients experiencing hemodynamic shock due to intra-abdominal organ injury.
frequency of pulse can be caused by shock due to bleeding and also because of pain or the patient is in the anxious state. Several studies have shown that blood pressure and heart rate have negative predictive values that are poor in assessing shock due to bleeding because shock in the early stages causes the body’s compensation response. Another study states that blood pressure cannot be relied upon to evaluate patients in a pre-shock state and cannot evaluate cardiac output during resuscitation. Systolic blood pressure and pulse frequency cannot be used as absolute guidelines in assessing bleeding in intra-abdominal injury.3,21

On the abdominal CT scan, 60.5% experienced intra-abdominal lesions, and as many as 30.5% found negative results. In several studies, negative CT scan was often found in patients with blunt abdominal trauma, this is because CT scan are used routinely in some trauma flashlights to see intra-abdominal injury in blunt abdominal trauma with stable hemodynamics, regardless of specific clinical parameters.3,22

This study analyzes clinical parameters that can be used as a basis for selective abdominal CT scan in blunt abdominal trauma patients. Of the six variables of a physical examination which are clinical signs of blunt abdominal trauma patients, three clinical parameters can be used as predictors of the occurrence of intra-abdominal lesions, namely abdominal injury, abdominal pain with VAS ≥ 5, and gross hematuria. Evidence-based research has been carried out in various countries in selective use of CT scan to determine the presence of intra-abdominal lesions in blunt abdominal trauma patients. Some authors have evaluated several parameters that can be used as a basis for the selection of patients who will undergo an abdominal CT scan, ranging from the clinical, laboratory, and radiological parameters. Selective use of CT scan in the management of blunt abdominal trauma is very important to control medical costs and reduce radiation exposure.3,23

CONCLUSION

Traces in the abdominal region, abdominal pain with VAS ≥ 5 and gross hematuria are associated with the occurrence of intra-abdominal lesions in blunt abdominal trauma patients. The presence of lesions in the abdominal region increases the risk of intra-abdominal lesions. Pelvic fractures, systolic blood pressure, and pulse frequency were not associated with the occurrence of intra-abdominal lesions in blunt abdominal trauma patients. Traces in the abdominal region, abdominal pain with VAS ≥ 5, and gross hematuria found in patients with blunt abdominal trauma can be used as clinical predictors in performing abdominal CT scan to determine the presence of intra-abdominal lesions.

REFERENCES


