Original Contribution

Comparison of conservative management and laparotomy in the management of stable patients with abdominal stab wound

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Abstract

Introduction: The management of the hemodynamically stable patients with penetrating abdominal stab wounds is a problematic issue among trauma surgeons.

Methods: In a retrospective study, we analyzed stable patients with anterior abdominal stab wound from August 2009 to 2010. The patients who were hemodynamically unstable or had developed peritonitis were excluded. In our center, the patients are treated through conservative or operative management depending on the protocol of management of the stable penetrating abdominal stab wound in our center. We compared the effectiveness, mean duration of hospital admission, and the time of starting diet in 2 groups.

Results: There were 99 cases including 47 patients in the conservative group and 52 in the laparotomy group. The laparotomy was negative in 73% and positive in 27% of the patients. In the conservative group, all the patients remained asymptomatic and stable except for 6 patients who needed subsequent laparotomy. The maximum period between admission and delayed laparotomy in these 6 patients was 17 hours. The mean length of hospital stay and the time of starting diet were 70.4 vs 43 hours and 42.3 vs 30.6 hours in the operative group and conservative group, respectively. \( P < .05 \) was considered significant.

Conclusion: Our study showed that conservative management of asymptomatic and stable patients with anterior abdominal stab wound with physical examination can decrease the rate of normal laparotomy and the length of hospitalization and help to start diet earlier. This study made this hypothesis that after 17 hours of observation, diet can be started for the stable asymptomatic patients. © 2012 Elsevier Inc. All rights reserved.

1. Introduction

Trauma is the leading cause of mortality and morbidity all over the world. It is obvious that hemodynamically unstable patients with penetrating abdominal injuries or patients with any sign of peritonitis require immediate laparotomy [1].
However, management of the stable abdominal stab wound patients (SASWPs) with anterior penetrating abdominal wounds has remained controversial, and different protocols have been used in different trauma centers [1]. That is, hemodynamically stable patients with abdominal stab wound are mainly treated by 2 methods, that is, conservative management (CM) (together with using diagnostic peritoneal lavage, computed tomographic scan, or ultrasonography) or operative management (OM), depending on the accepted protocol of the trauma center. As our protocol was somehow different from the management protocols used by developed centers due to the high load of trauma patients and inadequate accessible equipment in our center, we aimed to perform this study to evaluate and compare the 2 approaches of managing patients with anterior abdominal stab wounds. More importantly, there was an attempt to find the appropriate time to start diet in the CM group.

2. Method

This was a retrospective study performed in Nemazee hospital trauma center (our level 1 trauma center), which is the trauma referral center in the south of Iran. We reviewed the data of hemodynamically stable patients with anterior abdominal stab wound from August 2009 to August 2010. All the patients were examined by senior surgical residents. Unstable patients, penetrating injury due to gun shut or shut gun, thoracoabdominal and back injury, peritonitis (rigidity, rebound tenderness), and associated head or spinal cord injury, as presented in Table 1, were excluded from the study. Hemodynamically stable condition was defined as systolic blood pressure higher than 90 mm Hg and the heart rate less than 100 beats per minute. Stable abdominal stab wound patients who were admitted on even days (Saturdays, Sundays, and Mondays) were managed by CM (according to Fig. 1). However, the patients transferred to our emergency department (ED) on the rest of the days were managed by OM.

Our protocol of managing hemodynamically stable patients with anterior abdominal stab wound in our center is shown in Fig. 1. In our protocol, the patients in the CM group were closely monitored in the ED with serial physical examination every 2 hours together with checking complete blood cell count every 6 hours. The attending surgeon was called in cases that developed symptoms or leukocytosis. The patients were immediately transferred to the operation room. The difference of our protocol with those used in developed trauma centers was related to not performing CT scan, ultrasonography, or diagnostic peritoneal lavage (Fig. 2). As we observed these patients only with serial physical examination and complete blood cell count, the patients were nil per os (NPO) for 36 hours. If they remained asymptomatic and, after 36 hours, did not develop complications (Table 2), especially increase in white blood cell (WBC) greater than 12000/dL and/or developing peritoneal signs, diet was started and regularly advanced. Then, if the patients were asymptomatic and did not develop any complications (Table 2), they were discharged with close follow-up. However, during the period of observation, if any of the complications (Table 2) developed, CM shifted to OM.

In the OM group, the patients were scheduled for open drainage. The results of explorations were categorized into 1 of 2 categories: negative or positive. Laparotomies were considered negative if no organ injury was reported in operation findings. Otherwise, the result was considered positive. In cases of positive laparotomy, the injured organ was also specified. All the decisions including the type of management and time of discharge were made by the attending surgeons according to protocol (Fig. 1). The operations were performed by senior general surgery residents under guidance of the attending surgeons.

We compared the effectiveness, complications, and outcome of the CM and OM in this study. We also compared the length of hospital stay and the time of starting diet in the 2 groups. The length of hospital stay was described as the time between admission and discharge. The time of starting diet was described as the time between admission and starting diet. Data were analyzed using SPSS software (SPSS, Chicago, IL). The chi² test was used to compare the number of males and females in the 2 groups. t Test was used to analyze and compare the mean age of the patients, mean duration of hospital stay, and the time of starting diet. To find out the optimal time of starting diet in asymptomatic patients in the CM group, we considered the time between admission and developing complications in the CM group as the optimal time to start diet.

3. Results

Of a total of 200 cases of penetrating abdominal stab wound, 101 cases were excluded from our study, considering the exclusion criteria (Table 1), and 99 cases were enrolled in our study. The CM group consisted of 47 patients (40 males and 7 females) with the mean age of 26.4 years. The OM group was composed of 52 patients (49 males and 3 females) with the mean age of 27.1 years.

The results of laparotomy in the OM group were negative in 73% (38/52) of the patients. Only in 27% (14/52) of the patients, organ injury was reported in the findings of the

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<th>Table 1 Exclusion criteria</th>
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<td>1. Unstable patients</td>
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<td>2. Penetrating injury due to gun shut or shut gun</td>
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<td>3. Thoracoabdominal and back injury</td>
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<td>4. Peritonitis (rigidity, rebound tenderness)</td>
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<td>5. Associated head or spinal cord injury</td>
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operations. The types of injured organs in patients with positive laparotomy were as follows: small intestine \((n = 5)\), large intestine \((n = 2)\), liver \((n = 2)\), stomach \((n = 1)\), large intestine and left kidney \((n = 1)\), inferior vena cava \((n = 1)\), and other vessels \((n = 2)\).

Of the patients, 87.2\% (41/47 patients) in the CM group remained asymptomatic and stable during 36 hours of observation in ED. All the 41 patients tolerated the diet and were discharged with good clinical condition. None of them developed complication during the follow-up period. However, in 12.8\% of the patients in the CM group (6/47 patients), CM shifted to OM between 12.5 and 17 hours after admission. The reason was increase of WBC greater than 12 000/dL in 5 cases with negative laparotomy results and developing peritoneal signs in 1 patient for whom spleen injury was reported in laparotomy finding.

The average duration of hospital admission was 70.4 hours (12.2-164.5 hours) in the OM group and 43 hours (6.25-
127 hours) in the CM group ($P = .002$). The time of starting diet was 42.3 hours (12-128 hours) in the OM group and 30.6 hours (6.2-66.5 hours) in the CM group ($P = .048$). None of our patients needed intensive care unit admission.

4. Discussion

It is believed that hemodynamically unstable patients and those with any sign of peritonitis require immediate laparotomy [1,2]. However, management of asymptomatic SASWPs has still remained a challenge among trauma surgeons. In recent studies, serial clinical examination [3], laparotomy [1,4], and diagnostic peritoneal lavage [5,6] were the main suggestions to manage SASWPs. Some studies recommended diagnostic peritoneal lavage to select patients who needed subsequent laparotomy [5,6]. However, recent studies are against the routine use of diagnostic peritoneal lavage due to high false-positive and false-negative rates [7,8]. Nonselective exploratory laparotomy for all the patients with abdominal stab wounds

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**Table 2** Complications that caused CM shift to laparotomy in CM group

| 1. Increasing abdominal tenderness away from the wound, tachycardia, abdominal distension, or vomiting |
| 2. Patients who developed peritonitis |
| 3. Patients who became unstable despite of fluid therapy |
| 4. Hemoglobin drop |
| 5. Rise of white blood cell count >10,000/dL |
was associated with 38% negative laparotomy and 40% morbidity rate [9,10].

Recently, some authors have evaluated the noninvasive management of stable patients with abdominal stab wound, that is, conservative approach. In a study on 322 patients with abdominal stab wounds, 120 patients (38%) underwent laparotomy including 87 therapeutic (73%) and 33 normal laparotomy (27%). Two hundred two patients (62%) were managed with serial physical examination, and for 9 patients, CM shifted to laparotomy during the observation [1]. In a recent study, Clarke et al [2] reported CM of the patients with abdominal stab as a safe strategy. Using CM to manage stable patients with abdominal stab wound will result in decrease in the rate of negative laparotomy [11,12].

However, these protocols used diagnostic tests such as ultrasonography [13] or CT scan [14] in their protocol to manage asymptomatic SASWPs. We are in favor of this strategy; however, as our center is the only trauma referral center in the south of Iran with 30 000 trauma patients admission annually [15], it is not practical for us to do CT scan for all the patients. Moreover, CT scan is not accessible in many of our hospitals. We think that each center should design its protocol of managing trauma patients based on its accessible medical equipment and trained personnel [15], considering advanced protocols used in developed centers. According to our protocol, the patients in the CM group were NPO for 36 hours, and they were only observed with physical examination and laboratory data without requesting any further investigations such as CT scan, ultrasonography, or diagnostic peritoneal lavage.

Our study indicated that in the OM group, laparotomy was negative in 73% of patients. However, unnecessary laparotomy was prevented in 87.2% of the patients in the CM group (41/47 patients). In a multicenter study by Biffl et al [13], 12% (3/26 patients) of the CM group were discharged from the ED, and the rest of the patients were observed with sonography, local wound exploration, or CT scan. Finally, the authors concluded requesting additional tests to detect intraperitoneal injuries led to increasing number of negative laparotomy and complications. In a similar study like our study, Navsaria et al [16] managed asymptomatic SASWPs with serial abdominal examination without using any additional tests. There was 6.8% normal laparotomy in the OM group. Of the patients in the CM group, 11% (12/112) needed delayed laparotomy. The result of laparotomy was negative in 1 patient and positive in the rest (hollow viscus injury). In our study, the rate of delayed laparotomy in the CM group (12.7%; 6 patients of 47) was similar to that of previous studies. As our study, the authors reported no complications in the patients who needed delayed laparotomy [13]. The authors declared that CM approach was not associated with increase in mortality or morbidity [3,17-19].

In our study, the reason that CM converted to OM in the 6 patients was increase in WBC greater than 12 000/dL in 5 patients and developing peritoneal signs in 1 patient. We think that WBC greater than 12 000/dL was not a reliable indicator to change CM to laparotomy management. Further studies are needed to evaluate this finding. However, the result of laparotomy was positive in the patient who developed peritoneal signs. Finding more organ injuries in the OM group does not necessarily mean that organ injuries were more prevalent in the OM group, as there might be some patients in this group who might have had injuries, which has remained asymptomatic. That is, some of organ injuries might be managed by CM if they remain asymptomatic. As our study, in previous studies [13,16], developing peritonitis in the SASWPs during observation period was a good indicator to do laparotomy.

The other useful aspect of CM strategy was that diet was started earlier in the CM group compared with the OM group (30.6 vs 42.3 hours; \( P = .048 \)). Moreover, the length of hospital admission in the CM group was significantly less than that of the OM group (43 vs 70.4 hours; \( P = .002 \)). The shorter duration of hospital stay in the CM group is helpful because the patients can return to their normal life earlier, and also, it might decrease the financial cost imposed on the system. The authors reported that CM strategy resulted in a cost-effectivity of US $2800 for each patient [20,21].

We failed to reach a common idea about the optimal time to observe and start diet for asymptomatic SASWPs in previous studies. A consensus time of 24 hours for observation before feeding was mentioned as the best choice by Clarke et al [22]. Some studies showed that the time between admission and delayed laparotomy was between 24 and 48 hours [1,2], Alzamel and Cohn [23] showed that the optimal time to discharge the asymptomatic SASWPs was 12 hours after admission. However, Biffl et al [13] found that stable patients might need delayed laparotomy during the maximum time of 8 hours after admission. We considered the time between admission and delayed laparotomy in the CM group as the optimal time to start diet. Our study showed that the maximum time that the patients in the CM group needed for delayed laparotomy was 17 hours (range, 12.5-17 hours). However, this finding was based on only 6 patients, so it is a hypothesis that diet can be started for patients who remain asymptomatic and stable after 17 hours of observation period. It is necessary to perform a prospective study to evaluate this finding more carefully. Based on the results of our retrospective study, from August 2010 in a prospective study, we have managed 100 SASWPs with CM, and diet was started after 17 hours of admission (Fig. 2). Interestingly, none of the patients developed complication during the follow-up.

In conclusion, we suggest that managed stable and asymptomatic anterior abdominal stab wound patients should be managed through CM strategy. Conservative management is not appropriate for unstable patients, gun shot or shut gun injuries, thoracoabdominal and back injury, peritonitis, associated head or spinal cord injury, and in cases with communication problems. Moreover, we propose that after 17 hours of observation, diet can be started for the asymptomatic stable patients.
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References