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SELECTIVE APPROACH IN THE MANAGEMENT OF ANTERIOR ABDOMINAL STAB WOUNDS

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Introduction: *The approach to anterior abdominal penetrating wounds remains controversial. Military experience during this century led to a policy of mandatory exploration for all penetrating abdominal wounds, which resulted in improved survival. In civilian experience, stab wounds that strike the anterior abdominal wall less often penetrate the peritoneal cavity and even with confirmed penetration, often do not result in serious intra-abdominal injury. The appropriate strategy as such is to diagnose and treat stab wounds, which have resulted in serious intra-abdominal injury, while keeping negative laparotomy, with its associated morbidity, to a minimum. There is a growing body of evidence that a selective approach based on careful clinical evaluation best serves this purpose and does not incur undue risk due to missed injuries.*

Objective: *To evaluate the safety of a policy of selective non-operative management either with local wound exploration or serial physical examinations in patients with anterior abdominal stab wounds.*
Patients and Methods: *During the period between September 1998 and January 2001, 57 patients with anterior abdominal stab wounds presented to accident and emergency unit in Ain Shams University Hospitals. Seven patients were operated upon on emergency basis and excluded from the present work. The remaining 50 patients were divided into two equal groups. The patients in the first group (A) were clinically observed, including those with eviscerated omentum and air under the diaphragm. Patients in the other group (B) underwent wound exploration under local anesthesia in the operative theater, with the intention to do laparotomy for those with peritoneal penetration.*

Results: *Laparotomy was mandated in 5 patients (20%) in group A. Positive laparotomy was obtained in 4 patients (16%). The positive predictive value for detection of stab wounds necessitating positive laparotomy applying the method of solo physical observation was 80%. There was no morbidities or mortalities associated with the "delayed" positive laparotomies in this group. The peritoneum was violated in 15 patients (60%) in group B. Laparotomy was conducted in these 15 patients, but only 4 (16%) showed lesions for which the procedure was truly indicated. The positive predictive value for detection of stab wounds necessitating laparotomy using local wound exploration was 26.7%. The mean hospital stay was 46 and 73 hours for group A and B, respectively. This was statistically significant with $p<0.05$.*

Conclusion: *Selective non-operative management in the form of local wound exploration and serial physical examination is a safe method for managing patients with anterior abdominal stab wounds. It reduces significantly the rate of unnecessary laparotomy and hospital stay especially if both methods are used in combination.*

Keywords: Stab wands – trauma.

INTRODUCTION

Before World War II, penetrating abdominal trauma was managed by observation only. During that war, early laparotomy improved the survival rate from 28% to 47%. During the 1950s, better availability of antimicrobials, better understanding of fluid replacement, and faster hint from the scene improved survival rates even more. By the late 1950s, mandatory laparotomy was the rule for the management of patients with abdominal penetrating trauma. [1]

In 1960, observations made by Shaftan[2] of civilian penetrating abdominal trauma showed that patients with penetrating abdominal wounds have a likelihood of

therapeutic laparotomy of 50% or less. Therefore, selective approach was management for patients with these types of injuries was advocated.[2] Penetrating abdominal wounds are divided into, gunshot wounds, stab wounds and others, such as impalement injuries. Some trauma centers will observe certain gunshot wounds to the abdomen and chest, but this should only be done in experienced centers.[3] However, patients sustaining anterior abdominal stab wounds are well suited to a selective non-operative approach, as some have wounds that penetrate the peritoneum but do not cause any organ injury while others have an intact peritoneum.[4]

The methods used to determine the need for laparotomy in patients with anterior abdominal stabs include selective observation (repetitive physical examination in alert patients) [4&5] or evaluation of the wound for peritoneal penetration (local wound exploration [LWE]), and diagnostic peritoneal lavage [DPL] if penetration occurs.[6,7,8] Others have used computed tomography (CT) and laparoscopy. [9]

The incidental finding of pneumoperitoneum, which mandates laparotomy in patients with blunt trauma, has marginal value in patients with penetrating trauma. Because the abdominal cavity has already been violated, the presence of free intraperitoneal air does not necessarily mean that a hollow viscus injury is present.[10]

Posterior, or flank, wounds are a bit different. It has been suggested that many of these asymptomatic cases can be observed with serial physical examinations.[7&11] but many institutions prefer the use of abdominal CT,[12&13] later refined to triple contrast CT (3-CT, defined as intravenous, oral, and rectal contrast), to look for intra-abdominal and retroperitoneal injuries.[14,15&16] Stable patients with penetrating flank wounds can be divided into low, moderate, or high risk, based on 3-CT findings. Low-risk 3-CTs are those showing no penetration or subcutaneous tissue penetration only. The moderate-risk group shows penetration into muscle or a retroperitoneal hematoma not near a critical structure. Finally, the high-risk 3-CT group demonstrates extravasation of contrast from the colon or kidney, hematoma near a major vessel, fluid in the peritoneal cavity, free air in the retroperitoneal space, or injury above and below the diaphragm. [15]

No single course of action is the best for every patient. We prospectively based our surgical decision for a laparotomy on clinical observation or local wound exploration in patients, who are alert, not intoxicated, and have no other serious distracting injuries. Our hypothesis is that selective non-operative management is safe, prevents unnecessary negative laparotomies, and decreases the length of hospital stay and therefore should become the standard of care for the management of stab wounds penetrating anterior abdominal wall.

PATIENTS AND METHODS

This prospective study was conducted in Ain Shams University Hospitals in the period between September 1998 and January 2001. All adult patients who were admitted at our accident and emergency department with an anterior abdominal stab wounds were included. The patients were examined and assessment of airway, breathing and circulation was done. A large bore 16 gauge intravenous line was inserted in the antecubital fossa. A blood sample was withdrawn and saline infusion started. Cross matching, erect chest x-ray, baseline complete blood count (CBC), electrolytes, glucose, urea and creatinine were requested. The wound was flushed with saline and covered. The following therapeutic plan was carried out: (1) Patients who had unequivocal positive physical examination or were unconscious were taken for surgery after resuscitation. These patients were excluded from the study. (2) Conscious patients who were hemodynamically stable and had no signs of peritonitis were divided into two groups. In one group, the wound was explored in the theater using local anesthesia and the patient was explored if the peritoneum was breached. The other group was simply observed without exploring the wound. The latter group of observation included patients with eviscerated omentum and air under the diaphragm.

Anterior abdominal stab wounds were defined as wounds bounded by the costal margins superiorly, anterior axillary lines laterally, and groin creases inferiorly. Patients selected for non-operative management were admitted for observation for 24-48 hours. In this period, the same team performed clinical examinations frequently. The positive predictive value (patients who truly need exploration) was calculated for each procedure. Statistical significance of the difference between means was performed using paired Student's t-test.

RESULTS

Of 57 patients with abdominal stab wounds initially included in this trial, four underwent an emergency laparotomy for evidence of internal hemorrhage, two were urgently explored for peritonitis and one patient was explored because of loss of consciousness after head trauma and his need for sedation and intubation. These seven patients were excluded from further analysis. Thus, our sample size consisted of 50 patients with single anterior abdominal stab and was divided into two equal groups (Table 1).

Group A consists of 25 patients kept under clinical observation. 2 patients (8%) showed air under diaphragm and 3(12%) presented with omental evisceration. A delayed laparotomy (12-16 hours after admission for observation)

was indicated in 5 cases (20%). The indication for delayed laparotomy was the appearance of peritonitis in 3 cases (12%) with one patient with previous air under diaphragm. Small intestinal perforation was the intraoperative finding in 2 patients (8%) and they were primarily closed. The exploration in the third patient was negative (4%). Unexplained drop in blood pressure was the reason for exploration in 2 cases (8%) and the source of bleeding was found to be a lacerated mesentery. The positive predictive value for serial physical examination was thus 80%. The mean hospital stay was 46 hours (Table 2).

Group B consists of 25 patients having their wound explored. The peritoneum was intact in 10 patients (40%) and they were discharged with a mean hospital stay of 2 hours. The remaining 15 patients were explored. The laparotomy was therapeutic in 4 patients (16%). They all suffered small bowel injury necessitating primary closure of the defect. The laparotomy was unnecessary in 11 patients (44%). Of these 11 patients, no intraabdominal injuries were found in 9 (36%) and the injuries found did not require intervention in 2 (8%). The positive predictive value for local wound exploration was 26.7% (Table 3).

The mean hospital stay for patients in this group was 73 hours. There were no operative or postoperative mortalities. Simple wound infection occurred in the laparotomy wound in 5 and 2 patients in group A and B, respectively.

Table (1): *Summary of the hospital stay (hours), incidence of positive, negative and unnecessary laparotomy*

	Positive (immediate and delayed†) laparotomy	*Negative and unnecessary* laparotomy*	*Missed injuries*	*Hospital stay (mean hours ± SEM)•*
Serial examinations (n=25)	4(16%†)	1(4%)	_	46±7.8
Wound exploration (n=25)	4(16%)	9(36%) 2(8%)*	_	73± 11.8

†patiens in the clinical observation group

*non-bleeding liver lacerations

•P<0.05

Table2: *Results of Observation (group A)*

Clinical observation	*Laparotomy indicated*	*Laparotomy not indicated*	*Total*
Positive	4	1	5
Negative	0	20	20
Total	4	21	25

Table 3: *Results of local wound exploration (group B)*

Local wound exploration	*Laparotomy indicated*	*Laparotomy not indicated*	*Total*
Positive	4	11	15
Negative	0	10	20
Total	4	21	25

DISCUSSION

The management of blunt and penetrating abdominal trauma has evolved dramatically during the past 20 years. In the midst of major changes related to improvements in resuscitation and surgical techniques, antibiotic management, and monitoring equipment, selective non-operative management emerges probably as the single most

significant advancement. The ability to manage patients safely and reliably without operating on them when an operation is not needed seems not only scientifically correct but also ethically justified.[17] In approaching the management of penetrating abdominal wounds, the clinician is faced with three fundamental tasks. The first and most prevailing is to determine whether clinical indications exist that predict with high likelihood the need for laparotomy. The presence of one or more of these indications, particularly in the context of an unstable patient, sets the course to demanding operation. However, if none is found, the clinician may address the second issue of whether the peritoneal cavity has been violated. If it can be definitively demonstrated that it has not, no further diagnostics are required, and the patient may be discharged. If it has or if it cannot be determined, that it has not, the third question is pursued: does visceral injury exist and, if so, is laparotomy required? [18&19]

The preeminent indication for the need for laparotomy is hemodynamic compromise, which is the most likely reason that a patient will be taken urgently to the operating room without preliminary diagnostic studies.[18] There is considerable debate over the reliability of peritoneal signs, particularly in the early post injury period. Among physical examination findings, unequivocal peritoneal signs have the highest positive predictive value, whereas an entirely normal examination has the greatest negative predictive value for therapeutic laparotomy.[20]

In this series 50 patients with single stab wound to the anterior abdominal wall presented with stable hemodynamic status and no signs of peritonitis. They were considered for selective management based on either serial physical examination or wound exploration. Serial physical examination has not gained wide popularity despite reports of its efficacy. Zubowski et al.[21] Demetriades and Rabinowitz.[4] and Lee et al.[22] have provided data to support serial clinical examination as a reliable means of practicing selective conservatism. They reported an incidence of 0.9-6.4% and 0-6.4% for negative laparotomy and unnecessary laparotomy, respectively. In our series, the incidence was 4% for negative laparotomy in the physically observed patients. This low incidence is in agreement with that reported by the previous authors.

The decision of mandatory laparotomy based on the isolated clinical finding of omental evisceration is controversial. Both a selective and mandatory operating approaches have been taken up.[23] The negative laparotomy rate after mandatory laparotomy for evisceration was significant as has been shown in different series.[21,24,25]

In the present series three patients presented with omental evisceration were clinically observed for 48 hours. They were discharged with impunity. Therefore, it may be necessary to reconsider the approach to patients with eviscerated omentum and an otherwise unremarkable examination following an anterior abdominal stab wound.

If clinical indications for laparotomy- as mentioned- are absent, a logical next step is assessing the wound tract itself. There is great value in establishing that a wound tract is superficial to the peritoneum. In this event, the patient can be discharged from the hospital after receiving appropriate wound care.[10] Local wound exploration (LWE) has been demonstrated to be an effective tool in determining the depth of the stab wound tract.[7]

We explored the wounds of 25 patients in the present work, the peritoneum was definitely intact in 40% of the cases, and they were discharged after a mean hospital stay of 2 hours and were saved unnecessary admission and laparotomy. Of the 60% proved to have peritoneal violation only 4 (16%) had a positive laparotomy. This made a significant difference in the hospital stay between this group of patients and those who were merely observed. The positive predictive value for this procedure lags far behind that for the observation group (26.7% versus 80%, respectively).

The pneumoperitoneum is a dangerous and unreliable test. A finding of intraperitoneal free air on an upright chest or a lateral decubitus abdominal film generally establishes that the knife has entered the peritoneal cavity and drawn air in with it, has disrupted a hollow viscus, or both. In addition, though rarely, a false-positive determination of peritoneal entry can be made when the actual source of intraperitoneal free air is the pulmonary tract.[26] CT has exquisite sensitivity in detecting intraperitoneal free air. However, it can be a false-positive finding and is otherwise unnecessary in most abdominal stab wounds.[27] We encountered 2 patients with upper abdominal stab wounds with air under diaphragm. They were observed with one who eventually developed frank peritonitis and small intestinal injury was found. The other patient after an observation period of 48 hours was discharged with no adverse consequences.

Obviously, the greatest concern related to a policy of serial physical examination is the complications produced by delays in operating on patients who, despite the absence of signs and symptoms, have an intraabdominal injury requiring repair.[28] In our series, 4 patients under observation needed a "delayed" laparotomy for intestinal perforation and mesenteric bleeding. There was no observed complications that would have been avoided if they were immediately explored. It could be cautiously stated that these patients can be safely managed by undergoing the operation at the time symptoms appear.

Based on the findings in this study, we suggest local wound exploration for all stable patients with anterior

abdominal stab wound. When there is no peritoneal violation, the patients are early discharged. If there is peritoneal penetration as proved by local wound exploration, omental evisceration or pneumoperitoneum in clinically stable patients, clinical observation is highly recommended.

CONCLUSION

Most serious intra-abdominal injuries will declare themselves on initial clinical assessment. The remainder, if any, are less severe injuries and these patients can be safely observed without undue sequelae due to delay. Serial physical examination as the dominant component has proved highly effective in predicting positive visceral injuries. On the other hand a negative local wound exploration saved the patients not only non-indicated laparotomy but also, unnecessary hospital stay. Therefore, we conclude that physical examination and local wound exploration are regarded as a "happy combination" that is incorporated into a specific program for selective management of stab wounds to the anterior abdomen. Patients with intact peritoneum can be discharged while those with peritoneal violation are observed.

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