Conservative management of posterior abdominal stab wounds: a prospective study

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Background
The impetus for selective nonoperative management comes largely from the significant rates of nontherapeutic laparotomies following penetrating trauma and the high incidence of complications accompanying nontherapeutic laparotomy. Multiple diagnostic modalities were introduced to select patients indicated for surgery. These modalities included serial clinical examination, focused assessment with sonography for trauma, triple-contrast computed tomography abdomen/pelvis, and finally diagnostic laparoscopy.
Patients and methods
Patients present to the emergency unit of KasrAlAiny University Hospitals with posterior abdominal-wall stab wounds. Hemodynamically stable patients with no abdominal signs of peritonitis are chosen. CT abdomen with oral, rectal, and IV contrast is done to exclude patients with no intraperitoneal or retroperitoneal organ injury requiring laparotomy. Patients are admitted under conservative management in the ward for at least 3 days. Patients who develop vital-sign derangement or peritonitis are explored.
Results
The mean age of the study population 29.02 ± 9.2 years. In total, 37 (92%) patients were successfully managed conservatively. Three (8%) patients were explored after developing hemodynamic instability. A colonic injury was found in one patient, bleeding from posterior abdominal wall was found in one patient, and one patient had a nontherapeutic laparotomy. The triple-contrast CT had a sensitivity of 100% (2/2), specificity of 76.3% (29/38), positive predictive value of 18.2% (2/11), negative predictive value of 100% (29/29), and accuracy of 77.5% (31/40). There was a statistically significant relation (*P*=0.0167) between success of conservative management and CT findings.
Conclusion
Hemodynamically stable patients who presented with penetrating PASWs with no evisceration or signs of peritonitis can be managed conservatively when their triple-contrast CT images show no evidence of intraperitoneal or retroperitoneal organ injury requiring laparotomy.

Keywords:
computed tomography, conservative management, penetrating, posterior abdominal wall, stab wound, vitally stable

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Introduction

Stab wounds are of the most common forms of penetrating trauma globally. The organs most commonly injured with posterior abdominal stab wounds are the colon, rectum, kidneys, pancreas, spleen, duodenum, and small bowel [1].

In the 19th century, penetrating abdominal wounds were managed nonoperatively with associated morbidity and mortality rates of over 70% [2].

Experience gained during both world wars and the Korean conflict led to an aggressive approach of operative management for all penetrating abdominal wounds [3].

The afforded availability of antimicrobials, better understanding of fluid replacement, faster transport from the scene along with introduction and refinement of diagnostic procedures, and imaging studies such as peritoneal lavage, laparoscopy, computed tomography (CT), and FAST have influenced the evolution of penetrating abdominal-trauma management.

CT abdomen can be used efficiently along with physical examination as an initial diagnostic tool in stable patients with abdominal stab wounds with a sensitivity of 94.2% and positive-predictive value of 98.8% [4].

High-volume centers report good outcomes for conservative treatment in penetrating trauma for hemodynamically stable patients without peritonitis [5].

Selective nonoperative therapy of stab wounds to the abdomen has become standard in many trauma centers, with reports of ~50% of anterior stab wounds and 85% of posterior stab wounds safely managed nonoperatively. Nonoperative therapy for penetrating abdominal trauma is feasible as long as appropriate resources are available, such as 24-h access to CT scanning, resident evaluation, and immediate operating-room access [6].

Patients and methods

(1) A prospective study.
(2) Conducted on 40 patients presenting to the Emergency Surgery Department, Kasr Al Ainy teaching hospitals, from February 2020 to August 2020.
(3) Patients presented to the Emergency Department of the Cairo University Hospitals with posterior abdominal-wall stab wounds and evaluation and resuscitation were started promptly.
(4) Initial assessment followed the ATLS protocol with the primary survey consisting of evaluating the airway, breathing, circulation, disability, and exposure.
(5) Secondary survey consisted of a focused and detailed history regarding the time, site of stab, and sharp object used along with a full physical examination, including signs of peritonitis.
(6) Hemodynamically stable patients with no abdominal signs of peritonitis were chosen.
(7) CT abdomen with oral and IV and rectal contrast was done and excluded intra-abdominal solid/hollow organ injury requiring laparotomy. Patients were admitted under conservative management in the ward for at least 3 days with oral intake allowed.
(8) Patients had their wound closed, then IV fluids, antibiotics (secondgeneration Cephalosporins) PPIs, and analgesics were given.
(9) They were followed up by vital signs, serial abdominal examinations, CBC, and FAST for patients with collections in the CT.
(10) In case of vital signs, derangement, or development of peritonitis, immediate surgical intervention was decided.

Result

Demographic data

Sex distribution

Of the 40 patients who presented to us, three (8%) were female and 37 (92%) were males.

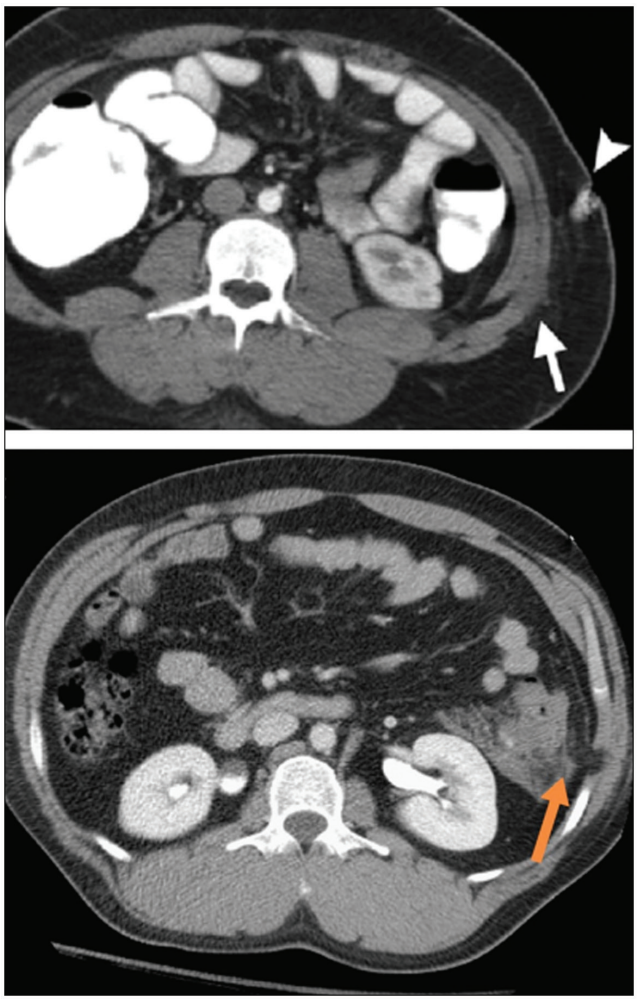
Age distribution

The age of our patients ranged from 19 to 54 years with a mean of 29.02 ± 9.2 years.

Intra-abdominal injuries found in two of three explored patients

(1) Regarding the patient with transverse colon injury, no collection was there, and the injury was repaired primarily in one layer with interrupted polyglactin 3-0 sutures as the perforation was minute and no intra-abdominal soiling.
(2) Regarding the patient with bleeding from posterior abdominal wall, hemostasis was done using running suture with polyglactin 0 (Fig. 1).

Figure 1



Computed tomography findings in explored vs nonexplored patients.

The CT had a sensitivity of 100% (2/2), specificity of 76.3% (29/38), positive predictive value of 18.2% (2/11), negative predictive value of 100% (29/29), and accuracy of 77.5% (31/40). There was a statistically significant relation (*P*=0.0167) between success of conservative management and CT findings.

Length of hospital stay

There was a statistically significant difference between hospital stay between explored and nonexplored patients. Regarding the nonexplored group, one patient left the hospital against medical advice (the minimum value of 1). The mean for this group was 3.02 ± 0.44. Regarding the explored group, the minimum value was 5 days and the mean was 5.

Discussion

The impetus for selective nonoperative management comes largely from the significant rates of nontherapeutic laparotomies following penetrating trauma and the high incidence of complications accompanying nontherapeutic laparotomy. The incidence of complication as illustrated by Demetriades and colleagues ranges from 8.6 to 25.9%.

Multiple diagnostic modalities were introduced to select patients indicated for surgery. These modalities included serial clinical examination, focused assessment with sonography for trauma, triple-contrast CT abdomen/pelvis, and finally diagnostic laparoscopy.

For patients undergoing the selected nonoperative management with serial abdominal examination, the repeated examination should be done ideally by a single dedicated team.

The physical examination is complemented by changes in temperature, blood pressure, heart rate, and serial laboratory examination.

The use of laparoscopy has been evaluated. In general, laparoscopy is highly sensitive for detection of peritoneal violation and diaphragmatic injuries and is not sensitive for detection of hollow viscous or retroperitoneal injuries. Clinical examination is not reliable after laparoscopy due to the effect of general anesthesia.

Because of the morbidity and cost associated with unnecessary laparotomies, many strategies have been adopted by many trauma centers to avoid nontherapeutic laparotomies and prevent morbidities from delayed intervention.

It is helpful to divide the abdomen into regions: the anterior abdomen (from xiphoid to pubis, between the anterior axillary lines), the flank (the area between anterior axillary lines and posterior axillary lines), the back (the area medial to posterior axillary lines extending from the tip of the scapula to iliac crests), and the thoraco-abdomen (from the nipple line to the costal margin).

(1) Our prospective study was conducted on 40 patients who presented to the Cairo University Hospitals with posterior abdominal-wall stab wound from February 2020 to August 2020. About 92% were males, while 8% were females with a mean age of 29.02 ± 9.2 years. Most studies showed a lopsided majority for male-gender victims. About 91.9, 94, and 91% were the figures shown for male victims in Navsaria *et al*. [7], Pham *et al*. [8], and Herfatkar *et al*. [9] (Table 1).
(2) In our study, the CT had a sensitivity of 100% (2/2), specificity of 76.3% (29/38), positive predictive value of 18.2% (2/11), negative predictive value of 100% (29/29), and accuracy of 77.5% (31/40). In total, three (8%) patients were explored and 37 (92%) were not explored. One of the explored patients had a nontherapeutic laparotomy (Table 2).
(3) There was a statistically significant relation (*P*=0.0167) between success of conservative management and CT findings (Table 2).
(4) Larger prospective study done by Shanmuganathan *et al*. [10] showed that CT had 97% sensitivity, 98% specificity, and 98% accuracy. Laparotomy based on CT findings was considered therapeutic in 87% and nontherapeutic in 8% and had negative results in 5%. So, the triple-contrast CT was considered accurate in demonstrating intraperitoneal organ injuries.

Table 1 Age distribution of patients

	Mean	SD	Median	Minimum	Maximum
Age	29.02	9.2	26.0	19.0	54.0

Table 2 Computed tomography findings in explored vs nonexplored patients

CT findings	Number of cases	Exploration
No intra-abdominal fluid, no organ injury	29	Not explored
Abdominal-wall hematoma	2	2 Not explored
Mild pelvic fluid, no organ injury	3	2 Not explored
		1 Explored
Mild left pneumothorax	1	Not explored
Retroperitoneal hematoma	3	1 Explored
		2 Not explored
Retroperitoneal fluid	2	1 Explored
		1 Not explored

CT, computed tomography.

Table 3 Length of hospital stay

	Explored					Not explored					*P* value
	Mean	SD	Median	Min	Max	Mean	SD	Median	Minimum	Maximum	
Hospital stay in days	5	-	5	5	5	3.02	0.44	3.00	1	3.00	0.00036

Morbidity in explored vs nonexplored patients. No morbidity or mortality detected in our study.

(5) Goodman and colleagues performed a meta-analysis to determine the predictive value of CT for laparotomy. The pooled sensitivity, specificity, negative predictive value, positive predictive value, and accuracy were 94.90, 95.38, 98.62, 84.51, and 94.70%, respectively. So, the CT in patients with penetrating abdominal trauma has high sensitivity, specificity, negative predictive value, and accuracy, but has lower positive predictive value in determining the need for laparotomy, for which it is concluded that CT is an indispensable tool in predicting the need for laparotomy in these patients, but still has room for improvement.

(6) In another study done by Pham *et al*. [8], they evaluate the CT for stab wounds of the back and flank that had 100% sensitivity and specificity of 96% and it concluded that the CT is valuable in lowering the rate of nontherapeutic laparotomies. And in Beekley *et al*. [11], the CT had sensitivity 97.8% and specificity of 84.8%.

(7) There was a statistically significant difference between hospital stay between explored and nonexplored patients (*P*=0.00036). Regarding the nonexplored group, one patient left the hospital against medical advice (the minimum value of 1). The mean for this group was 3.02 ± 0.44. Regarding the explored group, the minimum value was 5 days and the mean was 5 (Table 3).

(8) In comparison, the mean length of hospital stay was 2.9 and 1.79 days for the laparotomy and conservative groups, respectively (*P*=0.002), in a study by Paydar *et al*. [12]. Also, the study done by Kirton *et al*. [13] showed that low-risk patients had an average stay of 1.73 days, whereas high-risk patients were in hospital for 4.16 days.

(9) Friedmann [14] stated that the enthusiasm for nonoperative management in patients with penetrating abdominal trauma is based on a relatively high incidence of nontherapeutic or negative laparotomy from civilian low-velocity injuries. Reports on the incidence of unnecessary laparotomies range from 23 to 53% for patients with stab wounds.

(10) It is safe to manage hemodynamically stable patients with penetrating posterior abdominal-wall stab wounds with no evisceration or signs of peritonitis nonoperatively with the triple-contrast CT images showing no evidence of intraperitoneal or retroperitoneal organ injuries with 92% of the patients successfully managed nonoperatively (Tables 4 and 5).

Table 4 Percentage of explored patients

	Count	%
Explored	3	8.0
Not explored	37	92.0

Table 5 Abdominal injuries found in explored patients

	Count	%
Negative	1	33.33
Two small perforations in the antimesenteric border of mid transverse colon	1	33.33
Bleeding from posterior abdominal-wall vessels	1	33.33

(11) Most studies demonstrated findings proving successful nonoperative management of posterior abdominal-wall stab wounds such as Navsaria *et al*. [7] (89.3%) [15], (85%), and [11] (59%).

Conclusion

(1) patients with stab wounds to the back and flank who present vitally stable, with no evisceration or signs of peritonitis, can safely be managed nonoperatively when their triple-contrast CT images show no evidence of intraperitoneal or retroperitoneal organ injury. The recommended observation period is 72 h with oral feeding allowed and IV fluids, antibiotics, PPIs, and analgesics prescribed.

(2) Monitoring the vital signs and serial abdominal examination every 8 h is sufficient for the follow-up of the patients.

(3) For those who develop vital instability or signs of peritonitis, exploration should be undertaken with no delaying investigations.

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Conflicts of interest
There are no conflicts of interest.

References

1 Lozano J, Munera F, Anderson S, Soto J, Menias C, Caban K. Penetrating wounds to the Torso: evaluation with triple-contrast multidetector CT. Radiographics 2013; 33:341–359.

2 Como J, Bokhari F, Chiu W, Duane T, Holevar M, Tandoh M, *et al*. Practice management guidelines for selective nonoperative management of penetrating abdominal trauma. J Trauma 2010; 68:721–733.

3 Holcomb JB, Stansbury LG, Champion HR, Wade C, Bellamy RF. Understanding combat casualty care statistics. J Trauma Acute Care Surg 2006; 60:397–401.

4 Lee G, Son G, Yu B, Lee J, Chung M. Efficacy of computed tomography for abdominal stab wounds: a single institutional analysis. Eur J Trauma Emerg Surg 2014; 41:69–74.

5 Sander A. 2019. Penetrating abdominal trauma: spectrum of disease in a level 1 trauma centre (doctoral dissertation). Faculty of Health Sciences.

6 Hope W, Smith S, Medieros B, Hughes K, Kotwall C, Clancy T. Non-operative management in penetrating abdominal trauma: is it feasible at a level II trauma center?. J Emerg Med 2012; 43:190–195.

7 Navsaria PH, Nicol AJ, Edu S, Joosten H, Almgla N, Sobnach S, *et al*. Outcomes of failure of selective nonoperative management of penetrating abdominal trauma [HREC/REF: 679/2013]. S Afr J Surg 2017; 55:65.

8 Pham TN, Heinberg E, Cuschieri J, Bulger EM, O'Keefe GE, Gross JA, Jurkovich GJ. The evolution of the diagnostic work-up for stab wounds to the back and flank. Injury 2009; 40:48–53.

9 Herfatkar MR, Mobayen MR, Karimian M, Rahmanzade F, Gilani SBM, Baghi I. Serial clinical examinations of 100 patients treated for anterior abdominal wall stab wounds: a cross sectional study. Trauma Mon 2015; 20:4.

10 Shanmuganathan K, Mirvis SE, Chiu WC, Killeen KL, Hogan GJ, Scalea TM. Penetrating torso trauma: triple-contrast helical CT in peritoneal violation and organ injury—a prospective study in 200 patients. Radiology 2004; 231:775–784.

11 Beekley AC, Blackbourne LH, Sebesta JA, McMullin N, Mullenix PS, Holcomb JB. and 31st Combat Support Hospital Research Group. Selective nonoperative management of penetrating torso injury from combat fragmentation wounds. J Trauma Acute Care Surg 2008; 64:S108–S117.

12 Paydar S, Salahi R, Izadifard F, Jaafari Z, Abbasi HR, Eshraghian A, *et al*. Comparison of conservative management and laparotomy in the management of stable patients with abdominal stab wound. Am J Emerg Med 2012; 30:1146–1151.

13 Kirton OC, Wint D, Thrasher B, Windsor J, Echenique A, Hudson-Civetta J. Stab wounds to the back and flank in the hemodynamically stable patient: a decision algorithm based on contrast-enhanced computed tomography with colonic opacification. Am J Surg 1997; 173:189–193.

14 Friedmann P. Selective management of stab wounds of the abdomen. Arch Surg 1968; 96:292–295.

15 Demetriades D, Rabinowitz B, Sofianos C, Charalambides D, Melissas J, Hatzitheofilou C, Da Silva J. The management of penetrating injuries of the back. A prospective study of 230 patients. Ann Surg 1988; 207:72.