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The utility of diagnostic laparoscopy in the evaluation of anterior abdominal stab wounds

Tammy R. Kopelman, M.D., F.A.C.S.[a,*], Patrick J. O'Neill, Ph.D., M.D., F.A.C.S.[a], Luis H. Macias, M.D.[a], Jordy C. Cox, M.D., F.A.C.S.[a], Marc R. Matthews, M.D., F.A.C.S.[a], David A. Drachman, Ph.D.[b]

[a]Division of Burns, Trauma Surgery and Surgical Critical Care, Department of Surgery, and [b]Department of Research, Maricopa Medical Center, Phoenix, AZ 85008, United States

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Serial abdominal examinations;
Therapeutic

Abstract

BACKGROUND: To assess if diagnostic laparoscopy (DL) is superior to nonoperative modes (serial abdominal examination with/without computed axial tomography [CAT] and diagnostic peritoneal lavage) in determining the need for therapeutic laparotomy (TL) after anterior abdominal stab wound (ASW).

METHODS: Retrospective review of ASW patients. Patients were divided into group A (DL/exploratory laparotomy) to identify peritoneal violation (PV) and group B (initial nonoperative modes).

RESULTS: Seventy-three patients met inclusion criteria. In group A (n = 38), 29 patients (76%) had PV by DL and underwent exploratory laparotomy. Only 10 (35%) underwent TL (sensitivity for PV = 100%; specificity and positive predictive value of PV in determining need for TL = 29% and 33%, respectively). In group B (n = 35), 7 patients (20%) underwent TL, yielding an improved specificity (96%) and positive predictive value (88%).

CONCLUSIONS: We find no role for DL in the evaluation of ASW patients solely to determine PV.

There is little argument that patients who present with abdominal stab wounds (ASWs) and hemodynamic compromise, evisceration, or generalized peritonitis require immediate laparotomy. However, only approximately one third of patients presenting with anterior ASWs actually sustain an injury that requires surgical intervention. This finding is related to the fact that >25% of anterior ASWs do not penetrate the peritoneal cavity,[1] and only approximately one half of wounds that do violate the peritoneum cause visceral injury requiring surgical repair.[2] In contrast, major complications and significant mortality rates caused by missed injuries after penetrating abdominal trauma may be as high as 83% and 17%, respectively.[3] Therefore, the decision to operate on the asymptomatic patient after anterior ASW injury remains a challenge.

The efficacy of diagnostic laparoscopy in decreasing nontherapeutic rates by excluding peritoneal violation has been studied in patients with abdominal ballistic injuries of uncertain trajectory.[4] Using diagnostic laparoscopy, evi-

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* Corresponding author. Tel.: +1-602-344-5637; fax: +1-602-344-5705.

E-mail address: tammy_kopelman@medprodoctors.com

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dence of peritoneal violation reliably confirmed the need for therapeutic laparotomy in 82% of patients and drastically decreased the incidence of negative laparotomy to 1.2%. This approach produced a positive predictive value of a surgical abdomen in a patient sustaining a ballistic injury to 97.6%.[4] Since that time, many centers have attempted to expand the indication of diagnostic laparoscopy to include the evaluation of anterior ASWs with the similar goal of using peritoneal violation to determine the need for further exploration.[5–8] The use of diagnostic laparoscopy, however, still exposes the patient to general anesthesia and the risk of iatrogenic injury during exploration, not to mention a great monetary cost burden. Thus, even minimally invasive diagnostic laparoscopy is not without finite risk.

To be successful, the optimal diagnostic evaluation for patients sustaining anterior ASWs must accomplish 2 things: First, negative laparotomy rates should be minimized, and second, sensitivity for surgically significant intra-abdominal injury must be maximized to avoid delays in diagnosis and subsequent morbidity and mortality. The optimal "nonoperative" method to accomplish this goal will likely include a multitude of diagnostic modalities. With this in mind, the objective of this study was to assess if diagnostic laparoscopy to assess for violation of peritoneum would be superior to nonoperative modes (serial abdominal examination with/without computed axial tomography (CAT) and diagnostic peritoneal lavage [DPL]) for determining which patient sustaining anterior ASW injury would require therapeutic laparotomy.

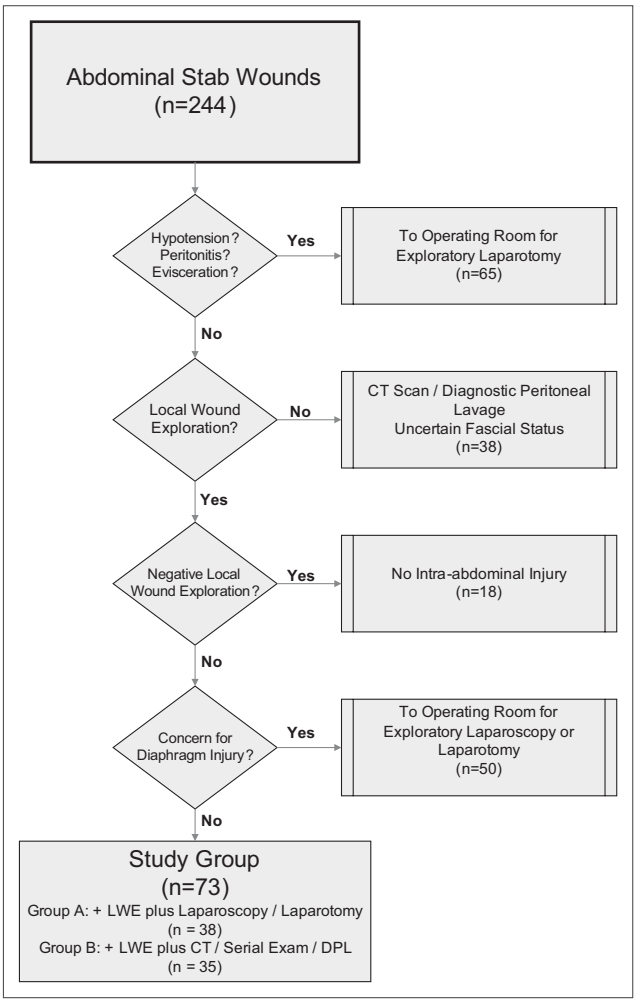

Figure 1 Flow diagram of study patients. +LWE: positive local wound exploration.

Methods

This is a retrospective cohort study performed at a 449-bed urban teaching level I adult and pediatric trauma center. After obtaining Institutional Review Board approval, the trauma registry was queried for all anterior ASW patients presenting during a 4-year period (October 2003 to 2007) (Fig. 1). The anterior abdomen was defined as the area bordered by the costal margins superiorly, the inguinal ligaments inferiorly, and the anterior axillary lines laterally. Patients were excluded on the following basis: (1) indication for emergent laparotomy (ie, hemodynamic instability, peritonitis, evisceration, etc); (2) lack of evidence indicating anterior fascial violation (either by failure to perform or by identifying a negative local wound exploration); or (3) concern for left-sided diaphragm injury. Patients were then divided into 2 groups based on their diagnostic evaluation and positive local wound exploration. Group A included those patients who underwent diagnostic laparoscopy or exploratory laparotomy to identify peritoneal violation. Group B included patients whose initial nonoperative management was composed of serial physical examination and/or CAT as well as DPL.

After we identified the final study groups, a systematic review of electronic medical records was performed. De-identified demographic data were gathered using a closed-response data collection form that included patient demographics, physical examination and laboratory findings, non–psychiatric-influenced length of stay (LOS), intra-abdominal injuries, complications, and hospital charges. DPL was performed in the emergency department by way of a percutaneous method. A positive lavage was signified by aspiration of 10 mL gross blood, an effluent erythrocyte count greater than or equal to 20,000 cells/mm^3, leukocyte count $\geq$500 cells/mm^3, and/or the presence of bacteria on Gram's stain. CAT was performed by certified technologists with a helical 16-detector scanner (GE LightSpeed 16 Pro, Waukesha, Wisconsin). Intravenous contrast (150 mL Omnipaque) was injected by a power injector at a rate of 3 mL/s with a scanning delay of 60 seconds. Oral contrast was not administered. Radiographic interpretations were performed by in-house, attending radiologists.

Diagnostic laparoscopy was performed in the standard fashion with an initial infraumbilical 5- or 12-mm camera port. Negative diagnostic laparoscopy was defined as the absence of peritoneal penetration, whereas positive diagnostic laparoscopy noted the presence of peritoneal penetration.