
The Management of Penetrating Injuries of the Back

A Prospective Study of 230 Patients

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This is a prospective study of 230 patients with penetrating injuries of the back. The decision to operate or observe was taken exclusively on the abdominal physical findings. One hundred ninety-five patients (85%) did not require operation, 30 (13%) underwent a therapeutic laparotomy, four (1.7%) an unnecessary operation, and one patient (0.4%) had a completely negative laparotomy. The diagnosis and management was delayed in five (2.2%) patients with no serious consequences. Mortality rates were not recorded in this series. The initial physical examination was accurate in 95.2% of the patients. We suggest that penetrating injuries of the back should be assessed in the same way as anterior abdominal injuries. Physical abdominal examination is reliable in detecting significant intra-abdominal injuries.

WE HAVE PREVIOUSLY SHOWN that many anterior abdominal penetrating injuries can safely be managed exclusively on abdominal physical examination. Evisceration, paracentesis positive for blood, free air under the diaphragms, and shock on admission are not absolute indications for surgery.^{1,2} Penetrating wounds in the back are generally considered as a distinct form of abdominal trauma.³ The vertebral column and the thick musculature provide a better protective barrier than the anterior abdominal wall, and retroperitoneal injuries may not be clinically detectable in the early stages. In the present study we report our experience with this type of trauma.

Patients and Methods

A prospective study over a 15-month period (1986–1987) took place in three of five surgical units at Baragwanath Hospital, Johannesburg. The back was defined as the area between the tips of the scapulae, the iliac crests, and both midaxillary lines. Patients with superficial wounds, as shown by digital exploration, were not included in the study.

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Patients with signs of an acute abdomen (severe tenderness, guarding, or rebound tenderness) were operated on immediately. Patients with no abdominal signs or minimal ones (mild, local tenderness) were chosen for conservative management. Following physical examination (which included auscultation of the renal regions for a bruit) erect chest and abdominal x-rays were taken, and urine was tested for blood. In the presence of a bruit or gross hematuria an intravenous pyelogram (IVP) was done. A renal arteriogram was obtained if the kidney was not visualized on IVP. All patients had a nasogastric tube inserted and were put on hourly blood pressure and pulse checkings for 24 hours. The abdomen was assessed clinically every 3 to 4 hours. No prophylactic antibiotics were given, except in the presence of an intercostal drain for an associated hemopneumothorax. If signs of peritonitis developed, an operation was carried out; otherwise, the patients were discharged, usually in 2 to 3 days.

Results

There were 230 patients (202 men and 28 women) with a mean age of 26 years. Twenty-three per cent of the patients had multiple wounds in the back. The weapon was a knife in 97% of the cases, and a gun in 3%. The victims reached the hospital in a mean time of 90 minutes after the injury.

Initial Assessment

Thirty-five patients (15.2%) had signs of an acute abdomen on admission and were operated on immediately. The remaining 195 (84.8%) were selected for observation. Microscopic hematuria was present in 57 (25%) and gross hematuria in 8 (3.5%) patients. An IVP was obtained only in the 16 patients with gross or 4+ hematuria on dipstick, and abnormalities were demon-

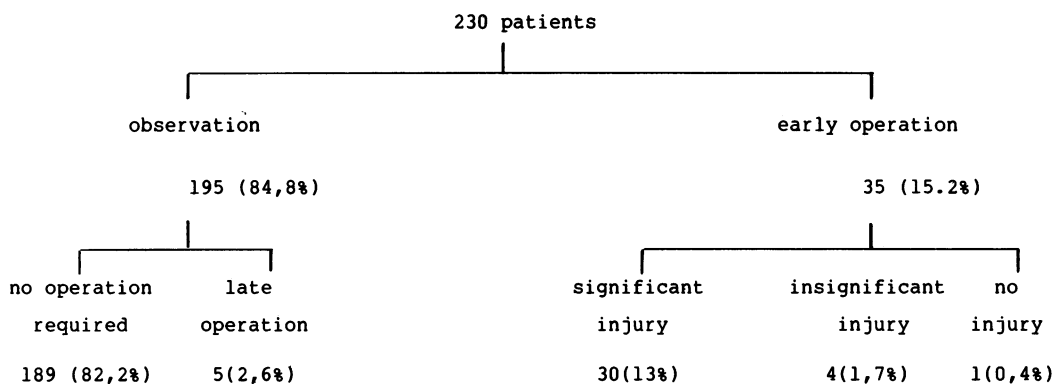


FIG. 1. Management of 230 patients.

strated in four patients. However, the IVP did not directly influence the emergency management in any of our patients. An abdominal x-ray was obtained in all patients, but it was diagnostic in only six cases (2.6%) where it showed free air under the diaphragm. Five patients had signs of an acute abdomen, and they would have been operated on irrespective of radiologic findings. The most common associated injury was a hemopneumothorax (32% of the patients) followed by a head injury (6%).

Results of Treatment (Fig. 1)

Of the 35 (15.2%) patients who were operated on immediately 30 (13%) had serious intra-abdominal injuries requiring repair, 4 (1.7%) had nonsignificant injuries (*i.e.*, retroperitoneal hematomas, small liver lacerations), and one (0.4%) had a completely negative laparotomy. The injured viscera in the patients with a positive celiotomy included nine colons, five kidneys, five diaphragms, four small bowel, two livers, two stomachs, two spleens, and one pancreas. No mortality rate or significant intra-abdominal complication was recorded in the group of patients who underwent an early operation. The average hospital stay was 7 days.

In the group of 195 (84.8%) patients who were initially selected for observation, five (2.2%) developed signs of peritonitis and were operated on, but retrospectively the operation was necessary in only four (1.7%). Another patient developed a bruit over the kidney and a false aneurysm was diagnosed on angiography. A partial nephrectomy was performed (Table 1). There was no mortality rate, but there was one pancreatic fistula that closed spontaneously. In the remaining 190 patients who were managed nonoperatively there was no mortality rate. The average hospital stay was 2.4 days. One patient was readmitted 8 weeks after discharge with a right subdiaphragmatic abscess that was drained percutaneously.

Discussion

The assessment of penetrating injuries of the back is generally considered more difficult than assessment of

injuries of the anterior abdomen. The confinement of the damage to the retroperitoneum may result in delay of the diagnosis and management of a serious injury. Missed colonic or duodenal perforations may prove catastrophic. For these reasons concern has been expressed about the safety of conservative management of penetrating wounds of the back.

Routine exploration is associated with an unacceptably high incidence of unnecessary operations. The thick musculoskeletal wall of the back provides a good protective barrier to the intra-abdominal structures. In this study only 34 patients (14.8%) had a significant intra-abdominal injury requiring surgical intervention. Other series reported similar findings.^{4,5} In anterior abdominal wounds this figure is 52%.¹ A negative laparotomy performed under emergency conditions, often by junior staff, poses significant risks. Because of these problems, most trauma centers apply some form of selective conservative management. Physical examination, local exploration of the wound for peritoneal penetration, peritoneal lavage, and sophisticated contrast-enhanced CT enemas have all been used to identify the patients requiring surgery.

The diagnostic accuracy of the initial abdominal physical examination has been reported to be between 72 and 92%.^{3,4,6} Our experience has demonstrated reliability with an overall accuracy of 95.2% (false-positive, 2.6%; false-negative, 2.2%). We have reported similar results for anterior abdominal wounds (651 patients: overall accuracy, 94%; false-positive, 3.2%; and false-negative, 2.9%) (Table 2).¹ We attribute our high accuracy to three factors: (1) selective conservatism has been extensively used at our hospital for more than 25 years;

TABLE 1. Five Late Operations

Delay	Operative Findings	Complications	Hospital Stay (d)
36 h	Pancreatic injury	Fistula	25
48 h	Retroperitoneal hematoma		6
4 h	Small bowel		7
6 h	Colon (primary repair)		7
10 d	Renal aneurysm (partial nephrectomy)		7

TABLE 2. Accuracy of Physical Examination in Anterior and Posterior Abdominal Wounds

	No. of Patients	False-positive Initial Physical Examination (%)	False-negative Initial Physical Examination (%)	Accuracy of Physical Examination (%)
Anterior abdominal wounds	651	3.2	2.9	93.9
Posterior abdominal wounds	230	2.6	2.2	95.2

* Demetriades and Rabinowitz.¹

(2) we see large numbers of patients with penetrating trauma; and (3) experienced surgeons are always present on a 24-hour basis.

Local exploration of the wound has been used as a screening method for identifying patients requiring surgery.⁶ However, exploration through the thick musculature of the back is a difficult task. Furthermore, deep penetration does not mean serious intra-abdominal injury. We have shown that 30% of the patients with proven peritoneal penetration do not have significant intra-abdominal injuries requiring surgery.¹

Peritoneal lavage has been advocated in the assessment of these patients.^{3,4,6} We believe that lavage has no place in the management of penetrating injuries of the back. If the injury is confined in the retroperitoneum, the lavage will be falsely negative. A lavage positive for blood is not an absolute indication for surgery. Free blood may have originated from the abdominal wall wound or from a superficial liver laceration. We have shown that many penetrating liver injuries can be managed nonoperatively.⁷ The dangers associated with peritoneal lavage in the presence of a colonic perforation cannot be overemphasized.

Phillips et al.⁴ used contrast-enhanced CT enemas to detect significant visceral or vascular injuries. The procedure includes a gastrographin meal, a gastrographin enema, and intravenous diatrizoate, combined with an abdominal CT scan. This expensive and time-consuming investigation had a yield of less than 2%, and there is no data to support that it detects small retroperitoneal perforations of the colon or duodenum. Further assessment of this technique is necessary.

The value of the plain abdominal x-ray seems to be very limited. We have a positive yield of 2.6%, and in no case did the radiologic findings directly influence the decision to operate or observe. Free air under the diaphragm is not in itself an absolute indication for operation. Although these cases are assessed with great caution, the final decision to observe or operate is taken exclusively on the abdominal physical examination. The free intraperitoneal air may have originated from outside through the abdominal wound or from an associated right pneumothorax with perforation of the right diaphragm.

We have previously reported 16 such patients treated conservatively.¹ Chest x-rays are essential in the diagnosis of a hemopneumothorax or diaphragmatic injuries. An elevated left diaphragm or suspicion of viscus in the chest should be further investigated by means of screening, contrast studies, or laparoscopy in the appropriate cases. The role of the IVP in the assessment of penetrating injuries of the back is not clear. Some authors recommend routine IVP irrespective of urinalysis.³ Others reserve this investigation for patients with microscopic or gross hematuria. We perform IVPs only for wounds over the kidneys associated with gross hematuria or 4+ hematuria on dipstick. Coppa et al.³ recommended exploration of all penetrating renal injuries. We reserve operative intervention only for pedicle injuries or uncontrollable hemorrhage. Any other kidney injuries are managed conservatively. Follow-up of these patients for late development of false aneurysms or arteriovenous fistule is imperative.

In conclusion, we believe that penetrating injuries of the back should be assessed in the same way as those of the anterior abdomen. Physical abdominal examination is reliable in detecting significant intra-abdominal injuries. There is no need for any special diagnostic procedures except for a chest x-ray, urinalysis, and an IVP in the appropriate cases.

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