ABDOMINAL TRAUMA

Andrew Cope, William Stebbings

The aim of this article is to enable all those concerned with the management of patients with abdominal trauma to perform a thorough examination and assessment with the help of diagnostic tests and to institute safe and correct treatment.

Intra-abdominal injuries carry a high morbidity and mortality because they are often not detected or their severity is underestimated. This is particularly common in cases of blunt trauma, in which there may be few or no external signs. Always have a high index of suspicion of abdominal injury when the history suggests severe trauma. Traditionally, abdominal trauma is classified as either blunt or penetrating, but the initial assessment and, if required, resuscitation are essentially the same.

Blunt trauma

Road traffic accidents are one of the commonest causes of blunt injuries. Since wearing seat belts was made compulsory the number of fatal head injuries has declined, but a pattern of blunt abdominal trauma that is specific to seat belts has emerged. This often includes avulsion injuries of the mesentery of the small bowel. The symptoms and signs of blunt abdominal trauma can be subtle, and consequently diagnosis is difficult. A high degree of suspicion of underlying intra-abdominal injury must be adopted when dealing with blunt trauma. Blunt abdominal trauma is usually associated with trauma to other areas, especially the head, chest, and pelvis.

Penetrating trauma

Stab wound.

Penetrating wounds are either due to low velocity projectiles such as knives or hand gun bullets or high velocity projectiles such as rifle bullets and shrapnel from bombs or blasts. With the increasing prevalence of civilian violence penetrating injuries, especially those due to stabbing, are encountered increasingly in accident and emergency departments. Visceral injury occurs in 80-90% of bullet wounds but only 30% of stab wounds. Penetrating wounds may seem easy to diagnose, but it is difficult to assess whether peritoneal penetration has occurred. About a third of abdominal stab wounds with serious visceral injury at operation have virtually no physical signs.

Assessment

Remember the A, B, C of the primary survey

To evaluate the abdomen Look, Feel, and Listen

Doctors must perform the primary survey—namely, airway management with protection of the cervical spine, breathing, and circulatory evaluation. The circulation may be compromised if there is concealed intra-abdominal bleeding. The usual diagnostic pathway of taking the history, physical examination, and special investigations cannot always be followed as resuscitation is the highest priority. The sequence of look, feel, and listen will help in the rapid initial evaluation of the abdomen.

Procedure

Information required in patients with abdominal trauma

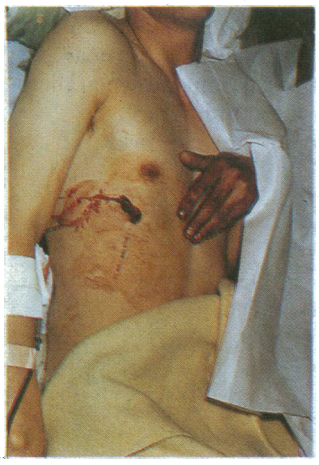
From the patient or relatives and friends:

- Medical history
- Current medication
- History of allergies
- History of alcohol or drug misuse

From the police and ambulance crew:

- Speed of the vehicle
- Nature of the impact
- Evidence of deformation of the vehicle
- Evidence of steering wheel injury
- Whether a seat belt was worn
- Injuries to other victims

Seat belt injury.



Anterior stab wound.

Signs of urethral injury

Blood at external meatus
High riding prostate
Bruised scrotum
Bruised perineum

Take a careful history

The patient may have limited recall of the injury owing to loss of consciousness, alcohol intoxication, or hysteria. Relatives and friends can provide information regarding medical conditions, current drugs, allergies, and alcohol or drug misuse.

In victims of road traffic accidents further information on the type of injury with regard to the speed of the vehicle, the nature of the impact, evidence of a steering wheel injury, whether seat belts were worn, and the condition of the other victims should be sought from the police and ambulance crews.

Useful information in patients with penetrating injuries includes their position when shot or stabbed and the length of the blade or the type of gun and the number and range of shots fired.

Perform a thorough examination

Look—You cannot perform an adequate assessment without exposing the patient fully; therefore you must remove all of the patient's clothes. Look systematically at the anterior structures, including the urethral meatus in men, the flanks, and the posterior structures—the back, buttocks, and perineum—for bruises, lacerations, entry and exit wounds, and impressions of seat belts or tyres. Any abnormality should be recorded.

Feel—Palpation, both superficial and deep, should include all abdominal structures. The abdomen starts at the level of the fifth rib, and therefore penetrating wounds of the lower chest can enter the abdominal cavity. The assessment of blunt trauma is difficult to interpret as muscle guarding results from intraperitoneal injury but can also be due to injury to the abdominal wall. Signs of peritoneal irritation after rupture of a hollow viscus can be slow to develop, and consequently the physical signs must be re-evaluated repeatedly. Abdominal rigidity usually indicates visceral injury; percussion and tenderness on coughing are also useful indicators of intraperitoneal injury. Instability of the pelvic ring can be confirmed by applying direct pressure in two planes to both anterior superior iliac spines. The superior pubic rami should be palpated in addition to the symphysis. Retroperitoneal injuries are difficult to diagnose but should be considered if there is a spinal deformity or paravertebral haematoma or if the mechanism of the injury suggests possible damage to retroperitoneal structures.

Listen—The presence or absence of bowel sounds and their quality if present should be recorded. The presence of bowel sounds does not exclude major peritoneal injury.

Rectal examination—Rectal examination is essential. Loss of integrity of the rectal wall and the presence of blood indicate trauma of the large bowel; a high lying prostate indicates urethral damage.

Vaginal examination—Disruption of the pubic rami or symphysis may cause vaginal injury, therefore, vaginal examination is mandatory, not only to confirm the integrity of the vaginal wall but also to detect obvious pelvic fractures, particularly of the inferior rami.

Examination of urethral meatus—In men the meatus should be examined for evidence of urethral injury. If there is blood at the meatus a urethral catheter should not be passed, and a urologist's opinion should be requested.

Once again the doctor must ensure that airway management with protection of the cervical spine, breathing, and circulation are adequate before proceeding to the special investigations.

Special investigations

Baseline blood tests

- Send a blood sample for cross matching, specifying the number of units required
- Measure haemoglobin concentration, white cell count, and packed cell volume
- Measure serum urea and electrolyte concentrations, serum amylase activity, and arterial blood gas tensions

Perform baseline tests

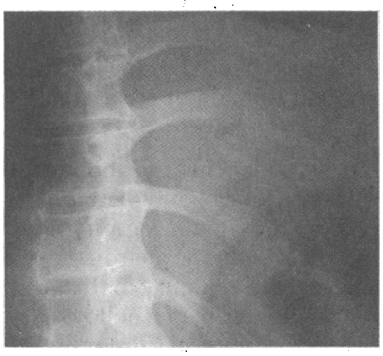
Determination of baseline haemoglobin concentration, white cell count, packed cell volume, and cross matching is essential in all victims of trauma. Blood for these tests may be obtained while an intravenous cannula of gauge 14 is being inserted. As a general rule it is safer to overestimate the amount of cross matched blood required. Biochemical measurements that should be made include urea and electrolyte concentrations, serum amylase activity, and blood gas tensions.

Pass a nasogastric tube

A nasogastric tube will not only empty the stomach contents but may also suggest upper gastrointestinal injury if blood is aspirated. The tube should be passed orally if there is a suggestion of a fracture of the cribriform plate.

Insert a urethral catheter

A urethral catheter is mandatory in all patients with severe trauma except those in whom urethral injury is suspected, when the suprapubic route should be used.

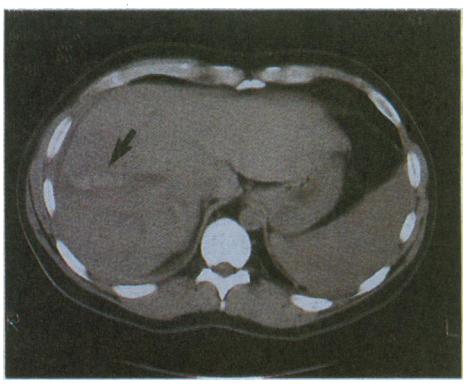


Fractures of the 10th and 11th ribs.

Perform radiography of the chest and abdomen

An erect chest radiograph is preferable to a supine abdominal film for excluding the possibility of free intraperitoneal air. Abdominal radiographs may show fractures of lower ribs, which may be the only sign of intra-abdominal damage, or fractures of the transverse processes, which may suggest ureteric injury. They can also confirm the presence of opaque foreign bodies (for example, bullets), confirm the position of the nasogastric tube, and show acute gastric dilatation.

In multisystem trauma radiography of the lateral cervical spine and pelvis is also performed.



Computed tomogram showing liver laceration.

Additional imaging

Imaging techniques such as ultrasonography and computed tomography are not usually available for routine diagnosis in an accident and emergency department. Centres that have portable ultrasonic facilities should consider using them to assess possible subcapsular splenic haematomas or renal injuries. They should be used only after initial stabilisation and when there is no indication for immediate laparotomy. Computed tomography is valuable in diagnosing pancreatic and other retroperitoneal injuries.

Indications for laparotomy

Indications for laparotomy

- Unexplained shock
- Rigid silent abdomen
- Evisceration
- Radiological evidence of free intraperitoneal gas
- Radiological evidence of ruptured diaphragm
- All gunshot wounds
- Positive result on peritoneal lavage

If laparotomy is to be performed notify the most senior surgeon present and the anaesthetist immediately and alert the staff of the operating theatre.

Urgent laparotomy is required for profound hypovolaemia due to haemorrhage that persists despite adequate replacement of fluid volume when there is no overt cause (for example, haemothorax or a pelvic fracture).

Peritoneal lavage

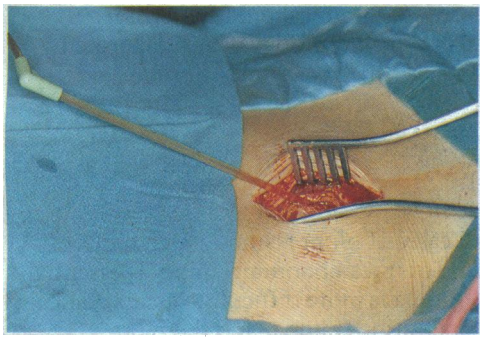
Indications for peritoneal lavage

- Equivocal clinical abdominal examination
- Difficulty in assessing the patient because of alcohol, drugs, or head injury
- Persistent hypotension despite adequate fluid replacement
- Multiple injuries, particularly if they include injuries of the chest, pelvis, or spinal cord
- Stab wounds where the peritoneum is breached

If there is no indication for an urgent laparotomy peritoneal lavage may help you decide which patients subsequently require surgical assessment by laparotomy.

Contraindications

The only absolute contraindication for lavage is if there is already an indication for urgent laparotomy. Relative contraindications are pregnancy and previous lower abdominal surgery.



Peritoneal lavage.

Bag and giving set after drainage of saline. The result was positive.

Procedure

(1) Explain the procedure to the patient if he or she is conscious
(2) Ensure that a urethral or suprapubic catheter and a nasogastric tube are in place
(3) Prepare the patient's abdominal skin with antiseptic, and drape sterile towels over the abdomen
(4) Infiltrate the skin with a solution of 1% lignocaine and 1 in 200 000 adrenaline
(5) Make a vertical subumbilical incision in the midline 5 cm in length.
(6) Under direct vision divide the linea alba and identify the peritoneum
(7) Make an incision into the peritoneum and insert a peritoneal dialysis catheter (without an introducer) towards the pelvis
(8) Aspirate any free blood or enteric contents. If more than 5 ml of blood is aspirated an urgent laparotomy is indicated
(9) If no blood is aspirated infuse 1 litre of warm (37°C) physiological saline
(10) Allow the saline to equilibrate for three minutes and then place the bag and giving set on the floor with the tap open and drain as much of the original 1 litre as possible
(11) Send a 20 ml sample to the laboratory for measurement of white and red blood cell counts and for microscopic examination.

Positive result (one of the following)

Red blood cell count >100 000/mm³
White blood cell count >500/mm³
Presence of bile, bacteria, or faecal material

Interpretation of results

If >5 ml of blood or enteric contents is aspirated laparotomy is mandatory. If fluid from peritoneal lavage is obtained from either the urinary catheter or a chest drain an urgent laparotomy is essential.

Patients with a positive result must have a laparotomy. Patients with a negative result may be managed conservatively and should be frequently re-examined by the surgeon responsible for the case.

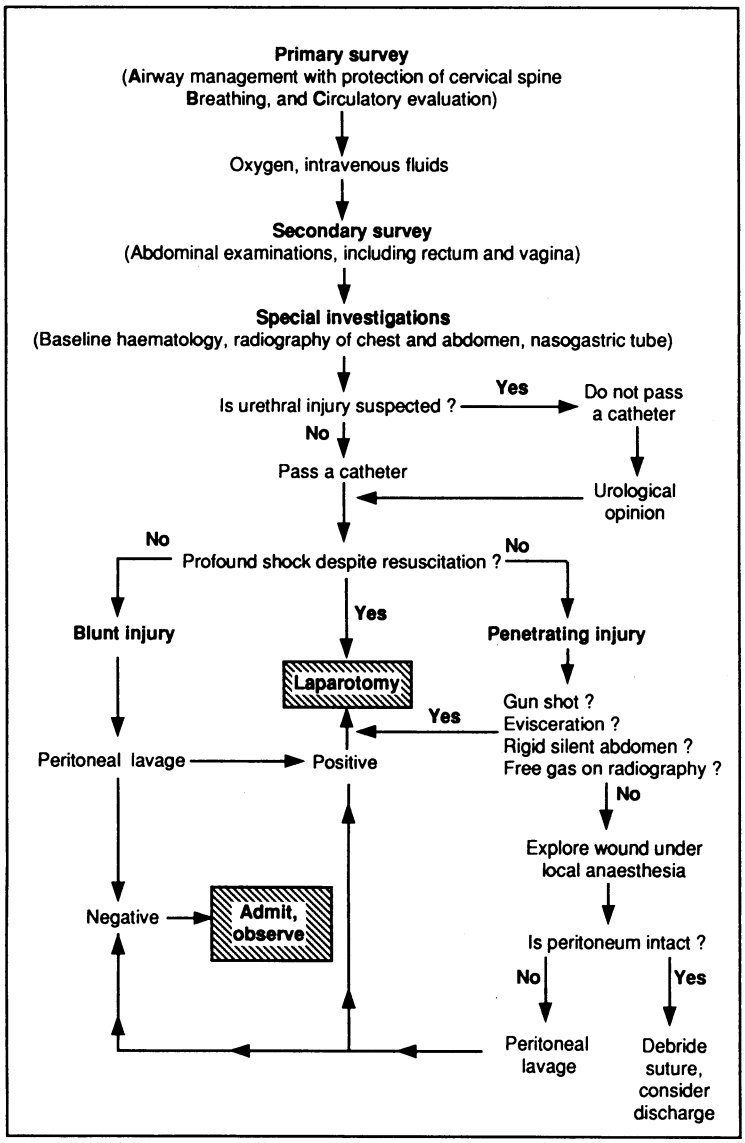
Complications are rare but may include:

- Perforation of a viscus—for example, bladder or bowel
- Haemorrhage from mesenteric vessels
- Infection

False positive results occur in about 2% of cases, particularly when the lavage is performed blind, and are caused either by trauma to vessels in the abdominal wall or by perforating a viscus with the trochar.

False negative results also occur in about 2% of cases. Most of these are thought to be attributable to injury to retroperitoneal structures and, occasionally, to diaphragmatic injuries.

Considerations for management



Penetrating trauma

All patients with gunshot wounds, regardless of the muzzle velocity of the gun, must have a laparotomy.

The tracks of stab wounds should be explored (not probed) to show the integrity of the peritoneum. If the peritoneum is not intact a laparotomy is required.

Lower chest wounds can be managed conservatively with careful monitoring, assuming that the results of lavage are negative.

Flank and back wounds are difficult to assess even with the aid of peritoneal lavage, ultrasonography, or computed tomography, and therefore laparotomy should be considered.

Evisceration of bowel warrants laparotomy.

Blunt trauma

In all cases of blunt trauma a high index of suspicion of intra-abdominal injury is essential. Blunt trauma is more difficult to assess clinically than penetrating trauma, and therefore diagnostic peritoneal lavage is helpful in evaluating the need for laparotomy.

If laparotomy is not required

Consider admission for all patients with suspected intra-abdominal injuries so that observation can continue. Such admissions will normally be to the general surgical ward, unless the patient's other injuries require intensive care.

Conclusion

Abdominal injuries should never be underestimated. In a recent retrospective study of 1000 deaths due to injury 43% of the deaths not related to the central nervous system were judged to have been potentially preventable. Among the commonest missed diagnoses were those of ruptured liver and ruptured spleen.[1] Thorough initial assessment and repeated re-evaluation with appropriate investigations are of prime importance for detecting these injuries.

The photograph of the trauma team was supplied by the department of education and medical illustration services, St Bartholomew's Hospital, and that depicting blunt trauma is reproduced from the advanced trauma life support™ (ATLS™) slide set by kind permission of the American College of Surgeons' committee on trauma.

Mr Andrew Cope, FRCS, is senior registrar in accident and emergency medicine, St Bartholomew's Hospital, London, and Mr William Stebbings, FRCS, is senior registrar in general surgery, St Bartholomew's Hospital, London.

The ABC of Major Trauma has been edited by Mr David Skinner, FRCS; Mr Peter Driscoll, FRCS; and Mr Richard Earlam, FRCS.

1 Anderson ID, Woodford M, de Dombal T, Irving M. Retrospective study of 1000 deaths from injury in England and Wales. *Br Med J* 1988;**296**:1305-8.

MATERIA INDOMEDICA

Systems management

Jargon, in any field, puzzles, confuses, and, at times, infuriates the uninitiated. The jargon of "business management" (itself a phrase that prompts inquiry) has invaded medicine in India over the past few years. Increasingly we learn of efficient techniques in hospital management that can be practised only by those undergoing special courses run by management experts. Looking at such courses and programmes through the window, I wonder if much that is so commonly lauded in "business management" would not have been grouped by Hans Christian Andersen under the category of the emperor's new clothes. In my innocence much of what is preached seems to be common sense clothed in high falutin' terminology.

Perhaps this is what it all boils down to. Individuals, departments, and institutions have to understand the workings of the system and then devise means for making it work for them. In politics and commerce every means—fair or foul—is used in the process. As doctors, inheritors of the mantles of Caraka, Susruta, Hippocrates, Osler, and Schweitzer (to name but a few), we are limited by ethics and the ultimate goals of doing good to our patients and advancing our science. One could turn to systems management and efficiency experts with profit but I, for one, prefer to consult wisdom and common sense. —SUNIL PANDYA