Penetrating Abdominal Trauma

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INTRODUCTION

Penetrating abdominal trauma is not uncommon and is usually associated with stab wounds, impalement and less commonly bullet wounds or explosions. The mortality associated with penetrating trauma can be low if cases are managed promptly and appropriately.

MANAGEMENT

The history and physical examination give a very good indication of the presence of significant visceral injury. Initially, management should include simultaneous evaluation and treatment, and begins with ABC's.[1] The key factor in deciding the immediate management of a case of penetrating abdominal trauma is the patient's haemodynamic stability.[1] Regardless of injury type, if the patient is haemodynamically unstable, they should be given aggressive fluid resuscitation, intubated and taken to theatre. Haemodynamically stable patients can be managed more selectively.[2]

MECHANISM OF INJURY

Knife Wounds

Stab wounds are more common than bullet wounds and are generally less lethal, unless they enter the retroperitoneal space to injure the great vessels or pancreas. For many years, a laparotomy was deemed mandatory following any form of penetrating abdominal trauma. However recently, trauma centres have been using a more selective approach, particularly in management of stab wounds and even gunshot injuries.[3] This is partly due to the increased frequency of and therefore experience with penetrating trauma. It is also related to the greater accessibility and quality of imaging techniques.[4] It has been found that 66% of stabbings enter the peritoneal cavity but less than 50% result in a visceral injury necessitating operative repair.[1] Therefore adoption of a policy of 'expectant observation' can be utilised. That is, observe the patient carefully and regularly for signs of internal haemorrhage or peritonitis, and if present, laparotomy should be performed immediately.[5]

Penetrating flank wounds are associated with injury to the colon, duodenum, kidney and major vascular structures. Therefore life-threatening injuries may exist despite haemodynamic stability and negative diagnostic peritoneal lavage (DPL, below). In this situation most surgeons have a low threshold for early abdominal exploration, particularly if the injury is thought to encroach on significant retroperitoneal structures as indicated by radiological imaging.[1]

Bullet Wounds

Injuries due to firearms are related to the ballistics of the weapon, the trajectory of the missile and the tissues or organs involved. The wounding potential of bullets is determined largely by its kinetic energy (KE) on impact ($KE = mass \times velocity^2$). Bullet wounds can be divided into low velocity (civilian injuries) and high velocity (military weapons). Low velocity weapons mostly produce injury by direct crush and tearing mechanisms. This is in contrast with high velocity missiles that induce tissue cavitation and injure solid, inelastic organs such as the liver and spleen.[6]

Results have shown that civilian gunshots to the anterior abdomen enter the peritoneal cavity in 80% of cases and cause significant visceral injury in 95% of patients.[1] Thus laparotomy is usually performed for gunshot wounds that penetrate the peritoneum (as indicated by physical examination and/or biplanar x-ray). As mentioned above, more recently a selective approach to laparotomy for gunshot injuries, similar to that for stab wounds has been suggested, but is contraversial.[3]

DIAGNOSTIC PERITONEAL LAVAGE (DPL)

DPL has been used in the past as a safe and inexpensive method for rapidly identifying life threatening intraperitoneal injuries. It is being less relied upon with the advancement of ultrasound and computed tomography (CT). Briefly the procedure for DPL is to infuse 1litre of warmed normal saline into the peritoneal cavity through a catheter inserted via a small incision midway between the umbilicus and symphysis pubis. If the patient's condition permits, side-to-side movement can enhance sampling. The saline bag is then lowered to the floor for the return of lavage fluid by siphonage, after which it is sent to the laboratory for analysis of red cells, white cells, amylase, alkaline phosphatase and for the presence of bile. It has been suggested that using a threshold of over 1000RBC/mm^3 as an indication for laparotomy reduces the number of unnecessary operations an the overlooked injury rate.[1]

It must be remembered that some gas-

trointestinal perforations may become isolated leading to false negative results on DPL. Thus patients with a negative lavage should be admitted for observation for twenty-four hours, and undergo prompt laparotomy if signs of peritoneal irritation ensue.

PLAIN FILM OF ABDOMEN

The advantage of plain film x-rays are their virtual universal availability in hospital accident and emergency departments. Obtaining films in two planes allows localisation of the penetrating object. It may also reveal the presence of free air (on erect or lateral decubitus films), indicating bowel perforation and thus dictating the need for immediate laparotomy.

COMPUTED TOMOGRAPHY (CT)

CT imaging is continually improving with greater experience and technological advances. In the setting of penetrating abdominal trauma it is particularly useful for assessment of injuries to the retroperitoneum, when DPL is of no benefit.

LAPAROSCOPY

The application of laparoscopy to abdominal trauma was received with great enthusiasm. However, the requirements of a pneumoperitoneum and the possibility of missing injuries have meant that it has not been widely employed. It is likely that in future it will find application in well-defined situations.

EMERGENCY LAPAROTOMY

An emergency laparotomy is usually performed through a midline incision, thus allowing simple extension if greater access is required. The first priority is the control of haemorrhage. All of the abdominal organs must then be systematically and carefully inspected for injury. On completing the laparotomy, a thorough lavage with warm normal saline should be performed, especially if there has been any contamination with intestinal contents.

INFECTIOUS DISEASE

A study by Fullen et al. indicated that pre-operation antibiotics significantly reduced infection rates following penetrating abdominal wounds.[7] Their results showed infection rates of 7%, 33% and 30% if antibiotics were given pre-, intra- or post-operatively, respectively. If the colon was perforated in the injury, these infection rates increased to 11%, 57% and 70%, respectively. The same study advocated the use of broad-spectrum antibiotics. The duration of antibiotic administration for penetrating abdominal injuries was suggested to be twenty-four hours, since no additional benefit was found with prolonged therapy.[8]

An interesting aspect of management of penetrating abdominal wounds is that antibiotics may not reach therapeutic levels in people who are aggressively resuscitated with large volumes of crystalloid. Therefore, it has been suggested that doses should be adjusted depending on the volume of fluids required for resuscitation, to prevent sub-therapeutic treatment.[9] Tetanus prophylaxis should also be given following penetrating abdominal trauma.

CONCLUSION

The management of penetrating abdominal trauma is still evolving. The main challenge is to quickly and reliably differentiate between the patient with life-threatening injuries requiring immediate surgery, and those that can be safely managed conservatively, thus avoiding the potential complications of surgery.

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