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ABDOMINAL INJURIES

1. Introduction

Trauma is the leading cause of morbidity and mortality among the population. Following the head and extremities, the abdomen is the third most commonly injured anatomic region. Abdominal trauma can be associated with significant morbidity and may have a mortality rate as high as 8.5%. The abdomen is the most common site of initially unrecognized fatal injury in traumatized individual. Abdominal injuries are caused by blunt or penetrating trauma and can involve internal bleeding or the exposure of the internal organs to air. Such injuries invariably affect vital organs. The first aid provider should be alert for shock due to internal bleeding regardless of the injury cause or whether there is a wound or not.

2. Epidemiology

Most deaths resulting from abdominal trauma are preventable; abdominal trauma is one of the most common causes of preventable, trauma-related deaths.Estimates indicate that by 2020, 8.4 million people will die yearly from injury, and injuries from traffic collisions will be the third most common cause of disability worldwide and the second most common cause in the developing world.

Data from the World Health Organization (WHO) indicate that falls from heights of less than 5 meters are the leading cause of injury, and automobile crashes are the next most frequent cause. These data reflect all injuries, not just blunt injuries to the abdomen.

Age-related differences in incidence

Most studies indicate that the peak incidence is in persons aged 14-30 years. A review of 19,261 patients with blunt abdominal trauma revealed equal incidence of hollow viscus injuries in both children (≤14 y) and adults.

Sex-related differences in incidence

According to national and international data, blunt abdominal trauma is more common in men. The male-to-female ratio is 60:40.

3. Classification based on etiology

Abdominal trauma is divided into blunt and penetrating types. While penetrating abdominal trauma (PAT) is usually diagnosed based on clinical signs, diagnosis of blunt abdominal trauma is more likely to be delayed or altogether missed because clinical signs are less obvious. Blunt injuries predominate in rural areas, while penetrating ones are more frequent in urban settings. Penetrating trauma is further subdivided into stab wounds and gunshot wounds, which require different methods of treatment.Motor vehicle collisions are a common source of blunt abdominal trauma. Seat belts reduce the incidence of injuries such as head injury and chest injury, but present a threat to such abdominal organs as the pancreas and the intestines, which may be displaced or compressed against the spinal column. Children are especially vulnerable to abdominal injury from seat belts, because they have softer abdominal regions and seat belts were not designed to fit them. In children, bicycle mishaps are also a common cause of abdominal injury, especially when the abdomen is struck by the handlebars. Sports injuries can affect abdominal organs such as the spleen and kidneys. Falls and sports are also frequent mechanisms of abdominal injury in children. Abdominal injury may result from child abuse and is the second leading cause of child abuse-related death, after traumatic brain injury.

Gunshot wounds, which are higher energy than stab wounds, are usually more damaging than the latter. Gunshot wounds that penetrate the peritoneum result in significant damage to major intra-abdominal structures in some 90 percent of cases.

Blunt injury	Penetrating injury
▪ **Falls**	**-Knife**
▪ **Motor vehicle collisions**	**-Gunshot wounds**
▪ **Pedestrian event**	**-Other missiles**
▪ **Assault with blunt object**	
▪ **Crush injuries explosions**	

4. Pathophysiology

Abdominal trauma can be life threatening because abdominal organs, especially those in the retroperitoneal space, can bleed profusely, and the space can hold a great deal of blood. Solid abdominal organs, such as the liver and kidneys, bleed profusely when cut or torn, as do major blood vessels such as the aorta and vena cava. Hollow organs such as the stomach, while not as likely to result in shock from profuse bleeding, present a serious risk of infection, especially if such an injury is not treated promptly. Gastrointestinal organs such as the bowel can spill their contents into the abdominal cavity.Hemorrhage and systemic infection are the main causes of deaths that result from abdominal trauma.

One or more of the intra-abdominal organs may be injured in abdominal trauma. The characteristics of the injury are determined in part by which organ or organs are injured.

Intra-abdominal injuries secondary to blunt force are attributed to collisions between the injured person and the external environment and to acceleration or deceleration forces acting on the person's internal organs. Blunt force injuries to the abdomen can generally be explained by 3 mechanisms.

4.1 Mechanism of injury

The first mechanism is **deceleration**. Rapid deceleration causes differential movement among adjacent structures. As a result, shear forces are created and cause hollow, solid, visceral organs and vascular pedicles to tear, especially at relatively fixed points of attachment. For example, the distal aorta is attached to the thoracic spine and decelerates much more quickly than the relatively mobile aortic arch. As a

result, shear forces in the aorta may cause it to rupture. Similar situations can occur at the renal pedicles and at the cervicothoracic junction of the spinal cord.

Classic deceleration injuries include hepatic tear along the ligamentumteres and intimal injuries to the renal arteries. As bowel loops travel from their mesenteric attachments, thrombosis and mesenteric tears, with resultant splanchnic vessel injuries, can result.

The second mechanism involves **crushing**. Intra-abdominal contents are crushed between the anterior abdominal wall and the vertebral column or posterior thoracic cage. This produces a crushing effect, to which solid viscera (eg, spleen, liver, kidneys) are especially vulnerable.

The third mechanism is **external compression**, whether from direct blows or from external compression against a fixed object (eg, lap belt, spinal column). External compressive forces result in a sudden and dramatic rise in intra-abdominal pressure and culminate in rupture of a hollow viscous organ (ie, in accordance with the principles of Boyle law).

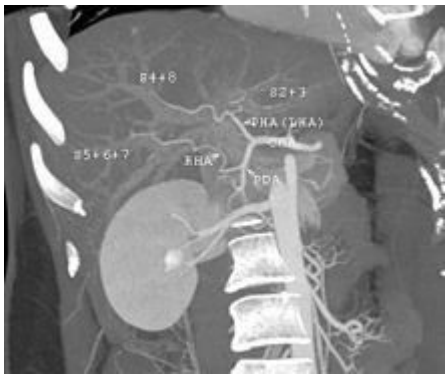
The liver and spleen seem to be the most frequently injured organs, though reports vary. The small and large intestines are the next most frequently injured organs. Recent studies show an increased number of hepatic injuries, perhaps reflecting increased use of CT scanning and concomitant identification of more injuries.

5. Pattern of Abdominal Organ Injury by Mechanism of Injury

Frequency of Organ Injury	Blunt	Penetrating
Liver	15%	22%
Spleen	27%	9%
Pancreas	2%	6%
Kidney	27%	9%
Stomach	1%	10%

Duodenum	3%	4%
Small bowel	6%	18%
Colon	2%	16%
Other	17%	6%

6. Diagnosis



CT scan showing the liver and a kidney

Diagnostic techniques used include CT scanning, ultrasound, and X-ray. X-ray can help determine the path of a penetrating object and locate any foreign matter left in the wound, but may not be helpful in blunt trauma. Diagnostic laparoscopy or exploratory laparotomy may also be performed if other diagnostic methods do not yield conclusive results.

a) CT

CT is only able to detect 76% of hollow viscous injuries and patients who have negative scans must often be observed and rechecked if they deteriorate. However, CT has been demonstrated to be useful in screening patients with certain forms of abdominal trauma in order to avoid unnecessary laparotomies, which can significantly increase the cost and length of hospitalizations. A meta-analysis of CT use in penetrating abdominal traumas demonstrated sensitivity, specificity and accuracy >= 95%, with a PPV of 85% and an NPV of 98%. This suggests that CT is excellent for avoiding unnecessary laparotomies but must be

augmented by other clinical criteria to determine the need for surgical exploration (23.37 positive likelihood ratio, 0.05 negative likelihood ratio).

b) Ultrasound

Ultrasound can detect fluid such as blood or gastrointestinal contents in the abdominal cavity and it is a noninvasive procedure and relatively safe for the patient.

c) Blood investigations

- Complete blood count
- Serum electrolyte measurements
- Serum glucose and carbon dioxide measurements
- Liver function tests- aspartate aminotransferase (AST) or alanine aminotransferase (ALT) level more than 130 U corresponds with significant hepatic injury.
- Coagulation profile
- Blood typing, screening, and cross-matching
- Arterial blood gas measurements
- Drug and alcohol screening
- Urine tests
- Urinalysis
- Diagnostic Peritoneal Lavage

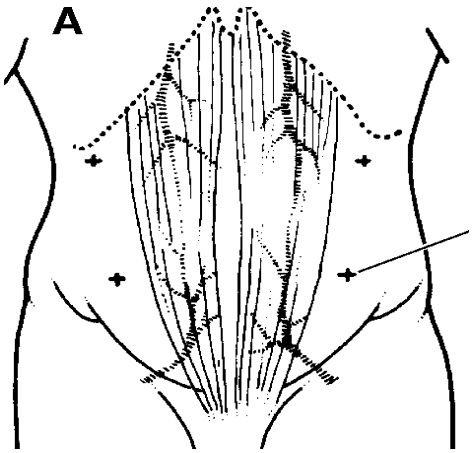
DPL is used as a method of rapidly determining the presence of intraperitoneal blood. It is particularly useful if the history and abdominal examination of an unstable patient with multisystem injuries are either unreliable (eg, because of head injury, alcohol, or drug intoxication) or equivocal (eg, because of lower rib fractures, pelvic fractures, or confounding clinical examination.Diagnostic peritoneal lavage is a controversial technique but can be used to detect injury to abdominal organs: a catheter is placed in the peritoneal cavity, and if fluid is present, it is aspirated and examined for blood or evidence of organ rupture. If this does not reveal evidence of injury, sterile saline is infused into the cavity and evacuated and examined for blood or other material. While peritoneal lavage is an accurate way to test for bleeding, it carries a risk of injuring the abdominal organs, may be difficult to perform, and may lead to unnecessary surgery;

d) Two tests for an abdominal injury

The patient's abdominal girth is being measured. She/he is being given oxygen. Note the bruise on the chest, the drip, and the sphygmomanometer. Saline is being introduced into her peritoneal cavity and returns, blood stained, under gravity.

e) Abdominal paracentesis

Aspirate from the abdominal quadrant to rule out ruptured bladder, liver injury, peritonitis.



7. Specific injuries

7.1 Esophageal trauma and perforations

Esophageal trauma or perforations are injuries to the esophagus caused by external or internal insult.

- **Pathophysiology and Etiology**

- External: stab or bullet wounds, crush injuries, blunt trauma.
- Internal:
    - Swallowed foreign objects (coins, pins, bones, dental appliances, caustic poisons).
    - Spontaneous or postemetic rupture—usually in the presence of underlying esophageal disease (reflux, hiatal hernia).

- Mallory-Weiss syndrome—nonpenetrating mucosal tear at the gastroesophageal junction, caused by an increase in transabdominal pressure from lifting, vomiting, or retching. Alcoholism is a predisposing condition.

➢ **Clinical Manifestations**

- Pain at the site of injury or impaction, aggravated by swallowing —chest pain, may be severe.
- Dysphagia or odynophagia.
- Persistent foreign object sensation.
- Subcutaneous emphysema and crepitus of face, neck, or upper thorax—noted in cervical, thoracic, and esophageal perforations.
- Temperature elevation occurring within 24 hours of trauma.
- Blood-stained saliva or excessive salivation.
- Hematemesis; previous history of vomiting or retching—Mallory-Weiss syndrome.
- Respiratory difficulty if there is pressure on the tracheobronchial tree from injury or edema.

➢ **Diagnostic Evaluation**

- History of recent esophageal trauma
- Chest X-ray to look for foreign body
- Esophagogram to outline trauma
- Endoscopy to directly visualize trauma

➢ **Management**

- Maintenance of adequate respiratory functioning; may require oxygen support or endotracheal intubation—to ensure an open airway in the presence of edema of the neck.
- Replacement of fluids. May need blood transfusion. Bleeding may stop spontaneously; if not, endoscopic hemostatic therapy or surgery is indicated.
- Restoration of the continuity of the esophagus by removing the cause.
- For external wound injury, emergency first-aid wound care and surgical repair may be indicated.

- For swallowed foreign bodies:
    - Barium swallow determines location of foreign body; usually removed through endoscopy.
    - Some patients with a history of food impaction may be treated with a spasmolytic such as I.V. glucagon.
- For chemical ingestion:
    - If lye or other caustic or organic solvent was swallowed, do NOT try to induce vomiting.
    - Treat with I.V. fluids and analgesics.
    - A gastrostomy may be performed, either as a temporary or a permanent means of feeding the patient.
    - Resulting strictures may be relieved by dilating the narrow esophagus.
    - Reconstructive surgery may be necessary to create a new passageway for food between pharynx and stomach.

➢ **Complications**

- Airway occlusion
- Shock
- Perforation with mediastinitis or pleural effusion
- Stricture formation
- Abscess or fistula formation

➢ **Nursing Assessment**

- Assess the following to determine status of patient:
    - Vital signs.
    - Respiratory status.
    - Bleeding.
    - Ability to swallow-choking, gagging.
- Monitor the patient for hypovolemic shock.

Nursing Diagnoses

- Deficient Fluid Volume related to blood loss from injury

- Imbalanced Nutrition: Less Than Body Requirements related to esophageal injury
- Ineffective Breathing Pattern related to pain and trauma
- Acute Pain related to injury

Nursing Interventions

Maintaining Fluid Volume

- Administer I.V. fluids and blood transfusion for volume replacement, if indicated.
- Monitor intake and output. Urine output should be greater than 30 mL/hour.
- Monitor laboratory results (electrolytes, hemoglobin, and hematocrit), and report abnormal findings.

Maintaining Nutritional Status

- Monitor daily weights and skin turgor.
- Administer parenteral hyperalimentation as prescribed—to prevent gastric reflux into the esophagus, which may occur with enteral feedings.
- Encourage progression of diet through NG, esophagostomy, or oral feedings when esophagoscopy or esophagogram reveals healing of the esophagus.
- Continue to monitor intake and output.

Maintaining Respiratory Function

- Auscultate the lungs and trachea for stridor, crackles, or wheezes. Assess respiratory rate, depth, use of accessory muscles, and skin color.
- Position the patient in semi-Fowler's position to facilitate breathing and reduce neck edema.
- Monitor vital signs frequently for signs and symptoms of shock and infection.
- Administer oxygen as prescribed.
- Have emergency airway equipment at bedside.

Reducing Pain

- Administer analgesics as prescribed—I.V. analgesia may be required to control pain and allow the esophagus to rest.
- Provide reassurance and support.

- Assess and record pain relief.
- Evaluate for symptoms that may indicate spillage of digestive contents into the mediastinum, pleura, or abdominal cavity—sudden onset of acute pain.

Patient Education and Health Maintenance

- Instruct the patient on the indications and adverse effects of analgesics.
- Inform the patient on the signs and symptoms to report on possible complications: increase in severity or nature of pain; difficulty breathing or swallowing.
- Teach the patient about tests or surgical procedures that may be performed.

7.2 Splenic injury

Spleen is the most common damaged organ in blunt abdominal trauma. The spleen is the second most commonly injured intra-abdominal organ in children. A laceration of the spleen may be associated with hematoma. Because of the spleen's ability to bleed profusely, a ruptured spleen can be life threatening, resulting in shock. However, unlike the liver, penetrating trauma to the spleen, pancreas and kidneys do not present as much of an immediate threat of shock unless they lacerate a major blood vessel supplying the organs, such as the renal artery. Fractures of the left lower ribs are associated with spleen lacerations in 20 percent of cases. Left rib fractures associated with a 4 times increased odds of splenic injury but if this is the only risk factor the incidence of splenic injury is low.

Etiology

- Minor trauma may cause injury to enlarged spleen (eg from malaria, lymphoma, haemolyticanaemia

Management

Immediate splenectomy indicated in patients with severe multiple injuries, splenic avulsion, fragmentation or rupture, extensive hilar injuries, failure of haemostasis, peritoneal contamination from GI injury or rupture of diseased spleen

Spleenectomy avoided in >90% of children (only 13-50% of adults).

- Polyvalent pneumococcal vaccine should be given after spleenectomy.

7.3 Hepatic injury

The liver, the most vulnerable abdominal organ to blunt injury because of its size and location (in the upper right quadrant of the abdomen), is injured in about five percent of all people admitted to a hospital for trauma. The liver is also vulnerable to penetrating trauma. Liver injuries present a serious risk for shock because the liver tissue is delicate and has a large blood supply and capacity. In children, the liver is the most commonly injured abdominal organ. The liver may be lacerated or contused, and a hematoma may develop. It may leak bile, usually without serious consequences.If severely injured, the liver may cause exsanguinations (bleeding to death), requiring emergency surgery to stop the bleeding.

- **Diagnosis**

  Made at laparotomy in unstable patients and by CT in stable patients. Latter enables conservative treatment in selected patients, particularly children. Patients should be stable, have no associated abdominal injuries, and be assessed repeatedly, including follow up CT.

- **Complications**
  - Early: relate to hypoperfusion or massive blood transfusion
  - Late: sepsis

Management

- Non-operative management,Criteria:
  - haemodynamically stable
  - absence of peritoneal signs
  - other intra-abdominal injury can be excluded with reasonable certainty
  - limited on-going transfusion requirements
- Operative management
  - Packing and limited surgery may be best initial procedure particularly when coagulopathy or hypothermia develops

7.4 GI tract injury

Etiology

More common following direct blow to epigastrium

Both DPL and CT may fail to diagnose duodenal perforation or haematoma. A high index of suspicion should be maintained in patients with persistent abdominal pain and tenderness

- duodenal rupture
    - classically encountered in the intoxicated unrestrained driver involved in a frontal impact RTA. 40% have associated injury
    - bloody NG aspirate should raise suspicion of injury
    - contrast CT are indicated in high-risk patient following completion of secondary survey. (Alternative: duodenal "C-loop" gastrograffin studies
- appearance of transverse linear ecchymosis on abdominal wall (seat belt sign) or presence of anterior lumbar compression fracture should raise suspicion of intestinal injury
- colon injury-rare following blunt trauma

Management

-Conservative management

-Depends upon the portion of the G.I tract involved.

7.5 Pancreatic injury

The pancreas may be injured in abdominal trauma, for example by laceration or contusion. Pancreatic injuries, most commonly caused by bicycle accidents (especially by impact with the handlebars) in children and vehicular accidents in adults, usually occur in isolation in children and accompanied by other injuries in adults. Indications that the pancreas is injured include enlargement and the presence of fluid around the pancreas.

- often associated with duodenal, hepatic and splenic trauma
- Clue to diagnosis is in history. Most often due to direct epigastric blow compressing pancreas against vertebral column.
- Also occurs in association with lower thoracic or upper lumbar vertebral.

- contrast CT most useful investigation but may not identify significant pancreatic trauma in the immediate post-injury period.
- Initial raised plasma amylase does not predict pancreatic or hollow viscus injury. Subsequent rise in amylase over next 24 h more useful

Treatment

- severe injuries to the body of the pancreas are best managed by distal pancreatectomy
- the majority of penetrating injuries can be managed with stump drainage alone.
- pancreaticoduodenectomy indicated in fewer than 5% of cases.

Complications

- fistulae
- abscess
- pseudocyst are common

7.6 Urinary tract and renal injury

a) Kidneys

The kidneys may also be injured; they are somewhat but not completely protected by the ribs. Kidney lacerations and contusions may also occur. Renal injury, a common finding in children with blunt abdominal trauma, may be associated with bloody urine. Kidney lacerations may be associated with urinoma, leakage of urine into the abdomen. A shattered kidney is one with multiple lacerations and an associated fragmentation of the kidney tissue.

Categories of Renal Injuries

Michael Federle placed renal injuries into four categories:

1. Minor injury:
    - renal contusion.
    - intrarenal and subcapsular hematoma.
    - minor laceration with limited perinephric hematoma without extension to the collecting system or medulla.
    - smallsubsegmental infarct.

2. Major injury:
    - major laceration into medulla or collecting system.
    - segmental infarct.
3. Catastrophical injury:
    - Maceration of the kidney
    - Total devascularization due tot arterial occlusion.
4. Rupture collecting system.

Identification and treatment of other major injuries takes precedence

- Gross haematuria requires investigation (CT is examination of choice if haemodynamically stable), while microscopic haematuria does not unless there is unexplained shock.
- Bladder rupture commonly associated with pelvic fractures
    - >95% have macroscopic haematuria
    - Retrograde cystography is investigation of choice
    - Intraperitoneal rupture requires operative repair while extraperitoneal rupture can be treated conservatively
- Urethral trauma should be suspected if there is blood at meatus, perineal injury or abnormal position of prostate.
- **Treatment**

  Suprapubic drainage and delayed definitive repair

7.7 Diaphragmatic injury

- <5% of cases of blunt trauma
- left sided in 80%
- Suspect with penetrating injury below 5th rib
- Diagnosis may be difficult, and may only become evident when ventilatory support withdrawn
- Ultrasound may be better than CT because of its variable angle of view. Laparoscopy provides good views of diaphragm
- Spontaneous healing does not occur

8. INJURIES TO THE BLADDER AND URETHRA

Injuries to the bladder and urethra commonly occur along with pelvic fracture or may be due to surgical interventions.

Pathophysiology and Etiology

- Bladder injuries are classified as follows:
    - Contusion of bladder
    - Intraperitoneal rupture
    - Extraperitoneal rupture
    - Combination intraperitoneal and extraperitoneal bladder rupture
- Urethral injuries (occurring almost exclusively in men) are classified as follows:
    - Partial or complete rupture
    - Anterior or posterior urethral rupture
- Injuries to the bladder and urethra are commonly associated with pelvic fractures and multiple trauma.
- Certain surgical procedures (endoscopic urologic procedures, gynecologic surgery, surgery of the lower colon and rectum) also carry a risk of trauma to the bladder and urethra.
- Intraperitoneal bladder rupture occurs when the bladder is full of urine and the lower abdomen sustains blunt trauma. The bladder ruptures at its weakest point, the dome. Urine and blood extravasate into the peritoneal cavity. These ruptures require surgical repair to prevent urine from leaking into the abdomen. The repair is performed by making an incision in the abdomen and then sewing the tear closed. A catheter is left in the bladder for a few days to rest the bladder after surgery.
- Extraperitoneal bladder rupture occurs when the lower bladder is perforated by a bony fragment during pelvic fracture or with a sharp instrument during surgery. Urine and blood extravasate into the pelvic cavity.These types of injuries can be managed with a urethral catheter, which is a tube inserted into the bladder through the urethra, to keep the bladder empty and allow the urine and blood to drain out into a collection bag. In most instances, a patient will heal within 10 days. However, large blood clots in the bladder or injuries involving the bladder neck require surgical repair.
- Urethral rupture occurs during pelvic fracture (posterior) or when the urethra or penis is manipulated accidentally during surgery or injury (anterior).

- Contusion Injury, in these types of injuries, the bladder wall is only bruised and does not rupture. Contusion injuries can be managed with a urethral catheter, which is a tube inserted into the bladder through the urethra, so that blood clots pass. Once the urine is clear and the patient stable, the catheter can be removed.

Clinical Manifestations

- Inability to void
- Gross hematuria; presence of blood at urinary meatus may indicate ruptured urethra
- Shock and hemorrhage—pallor, rapid and increasing pulse rate
- Suprapubic pain and tenderness
- Rigid abdomen—indicates intraperitoneal rupture
- Absence of prostate on rectal examination in posterior urethral rupture
- Swelling or discoloration of penis, scrotum, and anterior perineum in anterior urethral rupture

Diagnostic Evaluation

- Retrograde urethrogram—to detect rupture of urethra
- Cystogram—to detect and localize perforation/rupture of bladder
- Plain film of abdomen—may show associated pelvic fracture
- Abdominal CT with contrast—best study to evaluate extent of kidney injury
- Excretory urogram—to survey the kidneys and ureters for injury.

Management

If ruptured urethra is suspected, do not catheterize because doing so may complete a partial urethral rupture. Urethrogram must be done first to determine patency of urethra.

Bladder Injury

- Treatment instituted for shock and hemorrhage.
- Surgical intervention carried out for intraperitoneal bladder rupture. Extravasated blood and urine will first be drained and urine diverted with suprapubiccystostomy or indwelling catheter.
- Small extraperitoneal bladder ruptures will heal spontaneously with indwelling suprapubic or urethral catheter drainage.

- Large extraperitoneal bladder ruptures are repaired surgically.

Urethral Injury

- Immediate repair—urethra is manipulated into its correct anatomical position with reanastomosis after evacuation of hematoma.
- Delayed repair—suprapubiccystostomy drainage for 6 to 12 weeks allows the urethra to realign itself while hematoma and edema resolve; then surgical reanastomosis.
- Two-stage urethroplasty—reconstruction of the urethra occurs in two separate surgeries with urinary elimination diverted until final procedure.

Complications

- Shock, hemorrhage, peritonitis
- UTI
- Urethral stricture disease
- Impotence
- Incontinence

Nursing Assessment

- Obtain vital signs; assess for evidence of shock.
- Obtain detailed history of injury, if possible.
- Inspect urinary meatus for evidence of bleeding.
- Perform physical examination for symptoms of bladder rupture; dullness to palpation; rebound tenderness or rigidity.

Nursing Diagnoses

- Risk for Deficient Fluid Volume related to trauma and resulting hemorrhage
- Impaired Urinary Elimination related to disruption of intact lower urinary tract
- Acute Pain related to traumatic injury
- Fear related to traumatic injury and uncertain prognosis

Nursing Interventions

Stabilizing Circulatory Volume

- Monitor vital signs and CVP frequently as indicated by condition.
- Establish I.V. access, and replace blood and fluids as ordered.

Facilitating Urinary Elimination

- Inspect urethral meatus for blood, and, if present, do not catheterize, but prepare for diagnostic evaluation and suprapubiccystostomy.
- Obtain urine specimen, if possible, and assess for degree of hematuria and presence of infection.
- Prepare patient for surgical repair by assisting with preoperative workup and describing postoperative experiences.
- Postoperatively, maintain patency and flow of indwelling urinary catheters.
- Inspect suprapubic incision and Penrose drains from perivesical areas for bleeding, extravasation of urine, or signs of infection.

Controlling Pain

- Administer analgesics as ordered (when patient's vital signs are stable).
- Assess patient's response to pain-control medications.
- Position for comfort (usually semi-Fowler's position), if not contraindicated by other injuries, and prevent pulling of catheter tubing.

Relieving Fear

- Provide information to the conscious patient throughout the stabilization and evaluation phase; prepare for surgery if impending.
- Keep patient's family or significant others informed of condition and progress.
- Provide information on long-term outcome of treatment.

Patient Education and Health Maintenance

- Teach patient to care for indwelling catheters that will remain in place during healing or after surgery.
    - Empty catheter frequently.
    - Clean catheter and insertion area with soap and water.
    - Inspect urine for blood, cloudiness, or concentration.

    - Drink plenty of fluids to keep urine flowing.
- Teach patient to report signs and symptoms of UTI.
- Instruct patient (after surgical repair of bladder rupture) that bladder capacity may be temporarily decreased causing frequency and nocturia; this resolves over time.
- Explain possibility of recurrent urethral stricture disease to patients with urethral injury; instruct in daily self-catheterization to dilate urethra if prescribed.
- Support patient (after severe urethral injury) if there is a chance of impotence or incontinence.

9. Protruding organs

If a trauma injury has caused the victim's internal organs to protrude outside the abdominal wall, do not push them back in. Doing so will only cause greater complications - remember that preventing further injury is one of the aims of first aid.

Instead, have the person lie flat with their knees bent and cover the organs with a moist, sterile dressing composed of material that will not stick to the affected organs. Normally a special abdominal dressing is used, though large Telfa dressing will work well. Gauze can stick if it is dry - be careful to keep normal gauze moist if you do use it. Paper products like paper towel or toilet paper must never be used, as they will turn to pulp, causing major complications. Do not allow the victim to eat or drink, though they may complain of extreme hunger or thirst. Call an ambulance, treat for shock, and monitor ABCs until the emergency medical team arrives.

9.1 Internal Bleeding

If the abdominal injury does not cause an open wound, have the person lie flat with their knees bent and treat for shock until EMS arrives.

Signs and symptoms

People injured in motor vehicle collisions may present with a "seat belt sign," bruising on the abdomen along the site of the lap portion of the safety belt; this sign is associated with a high rate of injury to the abdominal organs.Seatbelts may also cause abrasions and hematomas; up to 30 percent of people with such signs have associated internal injuries. Early indications of abdominal trauma include nausea, vomiting, and fever.Blood in the urine is another sign. The

injury may present with abdominal pain, tenderness,distension, or rigidity to the touch, and bowel sounds may be diminished or absent. Abdominal guarding is a tensing of the abdominal wall muscles to guard inflamed organs within the abdomen. Pneumoperitoneum, air or gas in the abdominal cavity, may be an indication of rupture of a hollow organ. In penetrating injuries, an evisceration (protrusion of internal organs out of a wound) may be present.

Injuries associated with intra-abdominal trauma include rib fractures, vertebral fractures, pelvic fractures, and injuries to the abdominal wall.

Bowel

The small intestine takes up a large part of the abdomen ironically and is likely to be damaged in penetrating injury. The bowel may be perforated. Gas within the abdominal cavity seen on CT is understood to be a diagnostic sign of bowel perforation; however intra-abdominal air can also be caused by pneumothorax (air in the pleural cavity outside the lungs that has escaped from the respiratory system) or pneumomediastinum (air in the mediastinum, the center of the chest cavity). The injury may not be detected on CT. Bowel injury may be associated with complications such as infection, abscess, bowel obstruction, and the formation of a fistula.Bowel perforation requires surgery.

Treatment

Initial treatment involves stabilizing the patient enough to ensure adequate airway, breathing, and circulation, and identifying other injuries.Surgery may be needed to repair injured organs. Surgical exploration is necessary for people with penetrating injuries and signs of peritonitis or shock.Laparotomy is often performed in blunt abdominal trauma, and is urgently required if an abdominal injury causes a large, potentially deadly bleed.However, intra-abdominal injuries are also frequently successfully treated nonoperatively. The use of CT scanning allows care providers to use less surgery because they can identify injuries that can be managed conservatively and rule out other injuries that would need surgery.Depending on the injuries, a patient may or may not need intensive care.

Non-operative management

Angiography is a valuable modality in nonoperative management of abdominal solid organ injuries from blunt trauma in adults. It is used aggressively for nonoperative control of hemorrhage, thereby obviating nontherapeutic cost-inefficient laparotomies.

Surgical Management

- **Resuscitative thoracotomy**
- **Laparotomy and definitive repair**

Medical management

Nonsteroidal anti-inflammatory drugs (NSAIDs) probably should be avoided. Acetaminophen with or without small quantities of mild narcotic analgesics may be all that should be prescribed initially. Minimize use of analgesics in patients who are admitted for observation.

Patients who undergo laparotomy may require routine perioperative antibiotics. Patients with repaired hollow organ injury may require additional antibiotics.

Analgesics

Morphine-narcotic analgesic,

Ora:- 10-30 mg q4h

IV: 2.5-15 mg/70 kg infused over 3-5 minutes q4hr

Rectal: 10-20 mg q4hr

Epidural: 5-10 mg qDay

Intrathecal: 0.2-1 mg qDay + available infusion of naloxone

Acetaminophen with hydrocodone

Oral: 5/325mg, 7.5/325mg, 10/325mg, q4-6h

Antibiotics

Cephalexin: 250mg,q8h

This is a first-generation cephalosporin that inhibits bacterial replication by inhibiting bacterial cell wall synthesis. It is bactericidal and is effective against rapidly growing organisms forming cell walls.

Ceftrioxone: 500mg-1000mg,q8h

Cefotaxime is a third-generation cephalosporin with a broad gram-negative spectrum, lower efficacy against gram-positive organisms, and higher efficacy against resistant organisms. It acts by arresting bacterial cell wall synthesis by binding to one or more penicillin-binding proteins, which, in turn, inhibits bacterial growth.

Erythromycin: 400mg, q6h, orally for 10 days

Erythromycin is a macrolide that inhibits bacterial growth possibly by blocking dissociation of peptidyl t-RNA from ribosomes, causing RNA-dependent protein synthesis to arrest.

Prognosis

If abdominal injury is not diagnosed promptly, a worse outcome is associated.Delayed treatment is associated with an especially high morbidity and mortality if perforation of the gastrointestinal tract is involved.

Nursing Care Plan for Abdominal Trauma

- Acute pain
- Decreased cardiac output
- Deficient fluid volume
- Impaired gas exchange
- Ineffective tissue perfusion: Renal, cardiopulmonary, gastrointestinal
- Imbalanced nutrition: Less than body requirements
- Impaired skin integrity
- Anxiety
- Risk for infection
- Risk for post trauma syndrome

Nursing interventions Nursing Care Plan for Abdominal Trauma

- Provide emergency care, as needed, to support the patient's vital functions, maintain airway and breathing.
- Pain Management Alleviation of pain or a reduction in pain to a level of comfort that is acceptable to the patient
- Analgesic Administration Use of pharmacologic agents to reduce or eliminate pain
- Environmental Management Comfort Manipulation of the patient's surroundings for promotion of optimal comfort
- Hemodynamic Regulation Optimization of heart rate, preload, afterload, and contractility.
- Cardiac Care Limitation of complications resulting from an imbalance between myocardial oxygen supply and demand for a patient with symptoms of impaired cardiac function
- Circulatory Care Mechanical Assist Devices Temporary support of the circulation through the use of mechanical devices or pumps
- Fluid Management: Promotion of fluid balance and prevention of complications resulting from abnormal or undesired fluid levels
- Hypovolemia Management: Reduction in extracellular and/or intracellular fluid volume and prevention of complications in a patient who is fluid overloaded
- Shock Management Volume: Promotion of adequate tissue perfusion for a patient with severely compromised intravascular volume.
- Respiratory Monitoring Collection and analysis of patient data to ensure airway patency and adequate gas exchange
- Oxygen Therapy Administration of oxygen and monitoring of its effectiveness
- Airway Management Facilitation of patency of air passages
- Nutrition Management Assisting with or providing a balanced dietary intake of foods and fluids
- Wound Care Prevention of wound complications and promotion of wound healing, Wound Site Care Cleansing, monitoring, and promotion of healing in a wound
- Pressure Ulcer Care Facilitation of healing in pressure ulcers
- Anxiety Reduction Minimizing apprehension, dread, foreboding, or uneasiness related to an unidentified source or anticipated danger, Calming Technique: Reducing anxiety in patient experiencing acute distress

- Infection Protection Prevention and early detection of infection in a patient at risk
- Infection Control Minimizing the acquisition and transmission of infectious agents
- Infection Surveillance Purposeful and ongoing acquisition, interpretation, and synthesis of patient data for clinical decision making
- Coping Enhancement: Assisting a patient to adapt to perceived stressors, changes, or threats that interfere with meeting life demands and role, Identify supportive persons for client
- The patient's history reveals an accidental or forcibly inflicted abdominal injury. Symptoms vary with the degree of injury and the organs damaged. History of the mechanism of injury by including a detailed report from the pre-hospital professionals, witnesses, or significant others. The patient with a blunt or penetrating abdominal injury typically is in obvious discomfort or pain.

- Inspection pinpoints the type of abdominal injury and helps determine its severity. Depending on the severity of the injury, the patient may be pale, cyanotic, or dyspneic. Inspection of the patient with a blunt abdominal injury may also reveal bruises, abrasions, contusions and, possibly, distention, For a patient with a penetrating abdominal injury, inspection reveals the type of wound and associated blood loss. Internal bleeding caused by this type of trauma may be further determined by diagnostic tests. Gunshots usually produce both entrance and exit wounds, with variable blood loss, pain, and tenderness. The patient may also exhibit pallor, cyanosis, tachycardia, shortness of breath, and hypotension.
- Palpation may reveal the extent of pain and tenderness and, in blunt abdominal injuries, abdominal splinting or rigidity. Rib fractures commonly accompany blunt abdominal injuries.
- Auscultation may disclose tachycardia, decreased breath sounds, absent or decreased bowel sounds, or bowel sounds in the chest. Auscultate all four abdominal quadrants for 2 minutes per quadrant to determine the presence of bowel sounds. Although the absence of bowel sounds can indicate underlying bleeding, their absence does not always indicate injury

If the patient is hemorrhaging from a critical abdominal injury, he or she may be profoundly hypotensive with the symptoms of hypovolemic shock.

Patient Education

Proper adjustment of restraints in motor vehicles is an important aspect of patient education. The following are key recommendations:

- Wear lap belts in conjunction with shoulder restraints.
- Adjust lap belts so that they fit snugly, and place them across the lower abdomen and below the iliac crests.
- Wear restraints even in vehicles equipped with supplemental vehicle restraints (eg, airbags).
- Adjust seats and steering wheels so that the distance between the abdominal wall and the steering wheel is as wide as possible while still allowing proper control of the vehicle.

Advise patients to practice defensive driving by observing speed limits and keeping a safe distance between them and other automobiles on the road.

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