The Unkindest Cut of All

By Niru Prasad, M4 FAAP, FACEP

GIVEN THE tremendous increase in crime in the United States, it's likely you'll respond to more patients with stab wounds. Management of these patients can sometimes prove challenging, M Stabbing victims may have also suffered blunt trauma from being kicked or otherwise beaten.

PATHOPHYSIOLOGY

A stab wound is a penetrating injury that often results in hemorrhage from a major vessel or solid organ. Depending on the injury site(s), the patient may present with altered mental status, hypoxia, paralysis, shock and active major bleeding. Signs and symptoms depend on the involved areas of the body.

Head/Neck Area. Penetrating injury to the head often causes an altered level of consciousness, the hallmark of brain injury. A stab wound to the head may produce brain contusion, concussion and massive bleeding from epidural, subdural and subarachnoid hemorrhage.

Penetrating injury to the neck can cause hemorrhage from a lacerated major vessel, paralysis from a damaged spinal cord or fractured cervical vertebra, and/or hypoventilation from paralysis of intercostal muscles and involvement of C3-C5 spinal-cord segments.

Chest. A stab wound to the chest may cause tension pneumothorax, massive hemothorax, sucking chest wound, flail chest or cardia tamponade. The patient may experience severe respiratory distress due to hypoxia, which results from diminished blood volume; contusion of the lungs, leading to ventilatory failure; or changes in the pressure relationship within the pleural space, leading to displacement of mediastinal structures and lung collapse. Since
hypoxia is the most important feature of chest injury, early intervention must ensure oxygenation to the portions of the lung that are capable of normal ventilation and perfusion.

Tension pneumothorax develops when a stab wound to the chest creates a valve-like opening in the chest wall. The presence of air in the thoracic cavity causes collapse of the lung; mediastinal shift to the opposite side, resulting in interference with venous return; and compression of ventilation to the other lung. This ultimately impairs cardiac output. The patient will exhibit dyspnea, anxiety and restlessness.

Open pneumothorax (sucking chest wound) causes noisy breathing, as well as bubbling air and blood from the wound. Air is drawn through a hole in the chest wall into the pleural space by negative intrapleural pressure during inhalation. The larger the hole, the more serious the injury. Initial care is aimed at sealing the wound.

Massive hemothorax results when a stab wound disrupts the systemic or pulmonary vessel, and it occurs with a blood loss of 1,500 cc or more into the chest cavity. As more blood accumulates, the patient experiences dyspnea. His neck veins may be flat due to severe hypovolemia or distended as a result of the mechanical effects of a chest cavity full of blood. He may become severely hypotensive and show signs of shock.

Flail chest develops when the sternum and/or several ribs are fractured in more than one place, resulting in a lack of bony continuity in the thoracic cage. The unsupported portion of the chest wall moves paradoxically, expanding during exhalation and deflating during inhalation. The underlying lung will often suffer contusions, hindering oxygenation.

Cardiac tamponade may result from a stab wound to the anterior chest area. This penetrating heart wound causes bleeding into the pericardial sac and possible rupture of the aorta or cardiac muscle. As blood fills the sac, heart function is increasingly hampered. This is an extreme emergency, necessitating rapid transport to the hospital.

Other potentially lethal chest injuries include pulmonary contusion, disruption of the aorta, tracheobronchial disruption, esophageal disruption, traumatic diaphragmatic hernia and myocardial contusion.
Abdomen. A stab wound to the abdomen frequently leads to hemorrhage from the penetration of major vessels or solid organs, such as the liver or spleen. Patients may also suffer perforation of a bowel segment, evisceration of bowel content, or injury to the kidneys, stomach, ureters or pancreas.

Remember to check the patient's back for stab wounds. Wounds to the kidneys are ominous. You may also find a stab wound that has completely penetrated the torso, with an entrance wound in front and exit wound in back (or vice versa). If you fail to check for posterior wounds, the patient can quickly exsanguinate.

Extremities. Stab wounds to the upper and lower extremities may lead to life-threatening conditions such as massive open fracture, with ragged, dirty wounds; vascular injuries, with or without fracture, proximal to the knee or elbow; traumatic amputation of an arm or leg; or penetrating injury to the pelvic organs. Limb-threatening injuries include lacerations of the knee or hip; open fractures of the wrist or forearm, with circulatory impairment; amputation (complete or incomplete); and crush injuries.

EMS RESPONSE

As with any other patient, the stab victim requires prompt identification and treatment of life-threatening conditions. It's essential for you to recognize prehospital priorities.

EMS dispatchers essentially perform the first patient assessment by attempting to determine the nature and severity of the injury. They must then alert and mobilize EMS units, as well as notify police that a stabbing has occurred. Because a stabbing is a violent crime, you must exercise caution when responding. Request police backup before approaching the patient. Once police have secured the scene, you may treat the victim.

Primary Survey. Your primary survey must identify and treat the most life-threatening emergencies. With a stabbed patient, the ABCs are paramount.
Airway. Start by asking the patient if he's OK. If he can speak, his airway is patent, breathing is intact and cerebral circulation is adequate. If he's unresponsive, gently open the airway with a chin-lift or jaw-thrust maneuver, with gentle in-line traction of the cervical spine, and remove any foreign debris from the mouth or nose.

In a conscious, breathing patient, give supplemental oxygen (10 L/min) by face mask. If respiratory efforts are inadequate or the airway is unprotected by gag reflex due to CNS depression or flail chest, maintain ventilation with oxygen delivered by bag-mask device at a high flow rate (15 L/min, or as close to 100% oxygen as possible) until tracheal intubation is performed. In patients with suspected neck injury, the neck should be immobilized with a rigid cervical collar, tape and neck rolls, while your partner provides axial head traction.

Nasotracheal or orotracheal intubation should be performed in the unconscious, noabreathing patient by qualified personnel. Following intubation, ventilate with 100% humidified oxygen through the bag-valve-mask device.

Breathing. Completely expose the patient's chest to assess ventilatory exchange. Perform a careful physical examination with the look, listen and feel technique. Look for any obvious respiratory distress, cyanosis, tachypnea and inadequate chest expansion. Listen for breath sounds in both lung fields. Feel for any crepitus or bony deformity.

If the patient has suffered a sucking chest wound or is actively bleeding, seal the wound at three points with an occlusive dressing. Control hemorrhage by applying a firm dressing and pressure to the area. If excessive hemorrhage persists, the wound may need to be sealed with bulky dressings.

If the patient has a flail chest, the segment should be stabilized properly. Apply constant, firm manual pressure, or use pillows. The patient can sometimes help by holding a pillow firmly against the chest wall.

If the patient is intubated and breath sounds are diminished on one side, withdraw the ET tube 2-3 cm., to ascertain if the tip is residing in the right mainstem bronchus, and recheck breath sounds. Persistent diminished unilateral breath sounds imply pneumothorax If this patient is hypotensive, shocky and in severe respiratory distress- and if local protocols allow
the appropriate personnel to do so-decompress the chest with a 14-gauge angiocatheter inserted into the second intercostal space in the midclavicular line on the side of the pneumothorax.

Circulation with hemorrhage control. Determine the adequacy of peripheral perfusion and oxygenation by checking the patient's pulse, skin color and capillary refill time. Assess the pulse for quality, rate and regularity. Check the heart sounds. Muffled heart tones indicate cardiac tamponade. Hook up the patient to a cardiac monitor.

Occult hemorrhage into the thoracic cavity, abdominal cavity or muscle surrounding a fracture can account for substantial blood loss. Exsanguinating hemorrhage should be identified and controlled by applying direct pressure to the wound. Abdominal or lower-extremity hemorrhage can be controlled with MAST trousers. Be concerned if you find a stab wound through and through. Turn the patient over with a logroll to ensure control of hemorrhage. Attempt to start two large-bore IVs with 16-gauge needles, while drawing blood for type and cross match, as well as baseline hematologic and chemical studies. IV fluids of choice for stab victims in hypovolemic shock are isotonic normal saline and Ringer's lactate. Don't delay transport if you're unable to start the IV.

Brief neurologic evaluation. After completing the primary survey, assess the level of consciousness (LOC) and determine pupillary size and reaction.

The level of consciousness is determined by AVPU: A (alertness), V (responds to vocal stimuli), P (responds to painful stimuli and U (unresponsiveness). A decreased LOC indicates impaired cerebral oxygenation and perfusion, and immediate reevaluation of the patient's oxygenation and ventilatory status is indicated.

Secondary Survey. If the stab victim has sustained life-threatening injuries, immediate resuscitation and transport to the hospital take priority over the secondary survey. Make immediate contact with medical control, and prepare to transport your patient.

If time permits, you can perform the secondary survey—a complete head-to-toe examination of the patient. This includes:
* Head. Examine the head for bruises, deformity and scalp wounds. Impaled knives should be left alone, and bandages should be applied around the wound. Secure objects with tape and dressing to ensure they won’t move.

If a stab wound to the scalp area has caused extensive laceration, the flap of skin should be gently replaced over the wound. Apply compression with a dry, sterile bandage. Once bleeding is controlled, the dressing can be secured with a soft roller bandage.

* Face. Look for maxillofacial trauma, loose teeth, blood and leakage of cerebrospinal fluid from the nose and ears.

* Spine and neck. Carefully examine the neck for cervical-spine fracture by gently palpating for crepitus, tenderness or step-off deformity. Control active bleeding with pressure dressings.

* Chest area. Thorough examination of the anterior and posterior areas will reveal a sucking chest wound, stab entrance and exit wounds, or a large flail chest. Breath sounds are auscultated at the apex for pneumothorax or at the base for hemothorax. Distant heart tones and engorged neck veins indicate cardiac tamponade.

* Abdomen. Examine the abdomen for distension and abdominal-wall wounds. Palpate the liver and spleen for tenderness, guarding and rigidity, and listen for bowel sounds. Examine the back area for bruises, lacerations or any abnormal findings.

* Extremities. Check the extremities and pelvic area for any obvious wounds, bleeding, bony deformity or crepitus. If the patient is hypotensive, apply MAST trousers.

* Neurologic exam. Frequently evaluate the patient’s neurologic condition—not only motor and sensory evaluation of the extremities, but also level of consciousness and score on Glasgow coma scale.
PREPARING FOR TRANSPORT

Before transport, transfer the patient to a long or short spine board, with adequate immobilization. All serious injuries should have been stabilized, and you must continue to assure the adequacy of the patient’s vital signs through periodic monitoring. If a life-threatening injury is present, however, current trauma protocols suggest that you "load and go" with the patient, without delay.

The patient should be adequately ventilated with humidified oxygen, W fluids should be running, and the cardiac monitor should be in place. All bleeding should be properly controlled.

Carefully record all findings and treatment. Repeat assessments must also be documented. The progression of vital signs and neurologic status is especially important to ED personnel.

Obtain a history from the patient or relatives regarding allergies, medications, and alcohol or drug abuse.

En route to the hospital, be sure to monitor vital signs and continue support of respiratory and circulatory systems, including blood-volume replacement.