Primary survey for TRAUMA patients

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American college of surgeons

When treating injured patients, clinicians rapidly assess injuries and institute life-preserving therapy. Because timing is crucial, a systematic approach that can be rapidly and accurately applied is essential.

This approach, termed the “initial assessment,” includes the following elements:

- Preparation ; (prehospital phase & hospital phase)
- Triage
- Primary survey (ABCDEs) with immediate resuscitation of patients with life-threatening injuries
- Adjuncts to the primary survey and resuscitation
- Consideration of the need for patient transfer
- Secondary survey (head-to-toe evaluation and patient history)
- Adjuncts to the secondary survey
- Continued postresuscitation monitoring and reevaluation
- Definitive care

■ **FIGURE 1-1 Prehospital Phase.** During the prehospital phase, personnel emphasize airway maintenance, control of external bleeding and shock, immobilization of the patient, and immediate transport to the closest appropriate facility, preferably a verified trauma center.

■ **FIGURE 1-3** Trauma team members are trained to use standard precautions, including face mask, eye protection, water-impervious gown, and gloves, when coming into contact with body fluids.

Primary Survey with Simultaneous Resuscitation

The primary survey encompasses the ABCDEs of trauma care and identifies life-threatening conditions by adhering to this sequence:

- Airway maintenance with restriction of cervical spine motion
- Breathing and ventilation
- Circulation with hemorrhage control
- Disability(assessment of neurologic status)
- Exposure/Environmental control

Clinicians can quickly assess A, B, C, and D in a trauma patient
(10-second assessment) by identifying themselves, asking the patient for his or her name, and asking what happened.

An appropriate response suggests that there is no major airway compromise (i.e., ability to speak clearly), breathing is not severely compromised (i.e., ability to generate air movement to permit speech), and the level of consciousness is not markedly decreased (i.e., alert enough to describe what happened).

Failure to respond to these questions suggests abnormalities in A, B, C, or D that warrant urgent assessment and management.

During the primary survey, life-threatening conditions are identified and treated in a prioritized sequence based on the effects of injuries on the patient's physiology, because at first it may not be possible to identify specific anatomic injuries.

AIRWAY MAINTENANCE WITH RESTRICTION OF CERVICAL SPINE MOTION

Upon initial evaluation of a trauma patient, first assess the airway to ascertain patency.

This rapid assessment for signs of airway obstruction includes

- inspecting for foreign bodies;
- identifying facial, mandibular, and/or tracheal/laryngeal fractures
- suctioning to clear accumulated blood or secretions that may lead to or be causing airway obstruction.

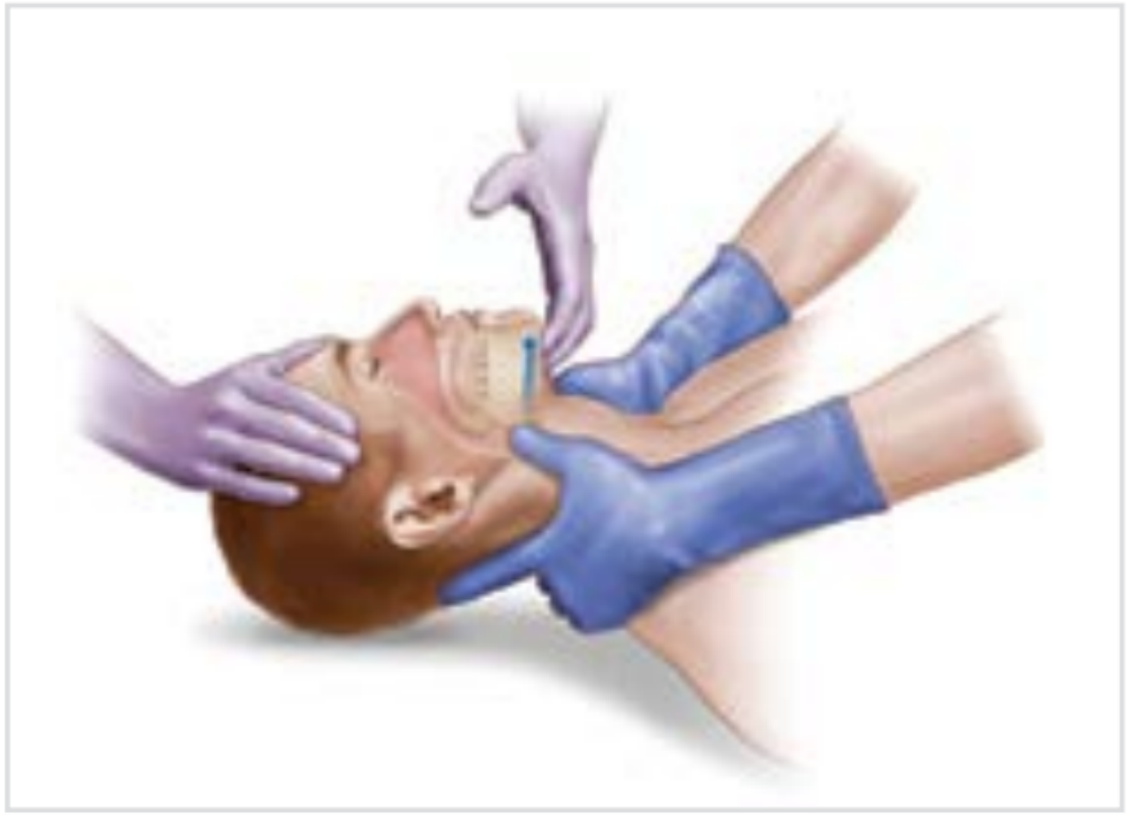
Begin measures to establish a patent airway while restricting cervical spine motion.

If the patient is able to communicate verbally, the airway is not likely to be in immediate danger; however, repeated assessment of airway patency is prudent. In addition, patients with severe head injuries who have an altered level of consciousness or a Glasgow Coma Scale (GCS) score of 8 or lower usually require the placement of a definitive airway (i.e., cuffed, secured tube in the trachea).

Initially, the jaw-thrust or chin-lift maneuver often suffices as an initial intervention.

If the patient is unconscious and has no gag reflex, the placement of an oropharyngeal airway can be helpful temporarily.

Establish a definitive airway if there is any doubt about the patient’s ability to maintain airway integrity



■ **FIGURE 2-5 The Chin-Lift Maneuver to Establish an Airway.** Providers should avoid hyperextending the neck when using this maneuver.

■ **FIGURE 2-6 The Jaw-Thrust Maneuver to Establish an Airway.** Avoid extending the patient's neck.

While assessing and managing a patient's airway, take
movement of the cervical spine.

Based on the mechanism of trauma, assume that a spin
Neurologic examination alone does not exclude a diag

The spine must be protected from excessive mobility t
progression of a deficit.

The cervical spine is protected with a cervical collar.

When airway management is necessary, the cervical cc
manually restricts motion of the cervical spine.

■ **FIGURE 2-6 The Jaw-Thrust Maneuver to Establish an Airway.**
Avoid extending the patient's neck.

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While every effort should be made to recognize airway promptly and secure a definitive airway, it is equally ir recognize the potential for progressive airway loss.

Frequent reevaluation of airway patency is essential to patients who are losing the ability to maintain an adequ

Establish an airway surgically if intubation is contraind accomplished

■ **FIGURE 2-6 The Jaw-Thrust Maneuver to Establish an Airway.** Avoid extending the patient's neck.

BREATHING ANI

■ **FIGURE 2-6 The Jaw-Thrust Maneuver to Establish an Airway.**
Avoid extending the patient's neck.

Airway patency alone does not ensure adequate ventila
Adequate gas exchange is required to maximize oxyge
elimination.

Ventilation requires adequate function of the lungs, che
therefore, clinicians must rapidly examine and evaluate

■ **FIGURE 2-6 The Jaw-Thrust Maneuver to Establish an Airway.**
Avoid extending the patient's neck.

To adequately assess jugular venous distention, positio
expose the patient’s neck and chest.

Perform auscultation to ensure gas flow in the lungs.

Visual inspection and palpation can detect injuries to tl
ventilation.

Percussion of the thorax can also identify abnormalitie
evaluation may be inaccurate.

FIGURE 2-6 The Jaw-Thrust Maneuver to Establish an Airway.
Avoid extending the patient’s neck.

Injuries that significantly impair ventilation in the shor
pneumothorax, massive hemothorax, open pneumotho
injuries.
These injuries should be identified during the primary
immediate attention to ensure effective ventilation.

Because a tension pneumothorax compromises ventila
dramatically and acutely, chest decompression should
suspected by clinical evaluation.

■ **FIGURE 2-6 The Jaw-Thrust Maneuver to Establish an Airway.**
Avoid extending the patient's neck.

Every injured patient should receive supplemental oxy

If the patient is not intubated, oxygen should be delive
device to achieve optimal oxygenation.

Use a pulse oximeter to monitor adequacy of hemoglol

Simple pneumothorax, simple hemothorax, fractured ri
pulmonary contusion can compromise ventilation to a
identified during the secondary survey.

■ **FIGURE 2-6 The Jaw-Thrust Maneuver to Establish an Airway.**
Avoid extending the patient's neck.

A simple pneumothorax can be converted to a tension p
a patient is intubated and positive pressure ventilation
decompressing the pneumothorax with a chest tube.

■ **FIGURE 2-6 The Jaw-Thrust Maneuver to Establish an Airway.**
Avoid extending the patient's neck.

CIRCULATION WITH HE

■ **FIGURE 2-6 The Jaw-Thrust Maneuver to Establish an Airway.**
Avoid extending the patient's neck.

Hemorrhage is the predominant cause of preventable d

Identifying, quickly controlling hemorrhage, and initia
assessing and managing such patients.

Once tension pneumothorax has been excluded as a ca
following injury is due to blood loss until proven other

Rapid and accurate assessment of an injured patient's h

The elements of clinical observation that yield importa
consciousness, skin perfusion, and pulse.

■ **FIGURE 2-6 The Jaw-Thrust Maneuver to Establish an Airway.**
Avoid extending the patient's neck.

- Level of Consciousness — When circulating blood v
  perfusion may be critically impaired, resulting in ar

- Skin Perfusion — This sign can be helpful in evaluat
  A patient with pink skin, especially in the face and
  hypovolemia after injury.
  Conversely, a patient with hypovolemia may have
  extremities.

- Pulse—A rapid, thready pulse is typically a sign of h
  pulse (e.g., femoral or carotid artery) bilaterally fo
  Absent central pulses that cannot be attributed to lo
  for immediate resuscitative action.

FIGURE 2-6 The Jaw-Thrust Maneuver to Establish an Airway.
Avoid extending the patient's neck.

Identify the source of bleeding as external or internal.

External hemorrhage is identified and controlled durin

Rapid, external blood loss is managed by direct manua

Tourniquets are effective in massive exsanguination fr
to that extremity.

Use a tourniquet only when direct pressure is not effec

Blind clamping can result in damage to nerves and vei

■ **FIGURE 2-6 The Jaw-Thrust Maneuver to Establish an Airway.**
Avoid extending the patient's neck.

The major areas of internal hemorrhage are the chest, a
bones.

The source of bleeding is usually identified by physica
pelvic x-ray, focused assessment with sonography for t
[DPL]).

Immediate management may include chest decompress
device and/ or extremity splints.

Definitive management may require surgical or interve
long-bone stabilization.

Initiate surgical consultation or transfer procedures ear

■ **FIGURE 2-6 The Jaw-Thrust Maneuver to Establish an Airway.** Avoid extending the patient's neck.

Definitive bleeding control is essential, along with app

Vascular access must be established; typically two larg
administer fluid, blood, and plasma.

Blood samples for baseline hematologic studies are ob
of childbearing age and blood type and cross matching

To assess the presence and degree of shock, blood gase

When peripheral sites cannot be accessed, intraosseous
cutdown may be used depending on the patient's injuri

■ **FIGURE 2-6 The Jaw-Thrust Maneuver to Establish an Airway.**
Avoid extending the patient's neck.

Aggressive and continued volume resuscitation is not a

Shock associated with injury is most often hypovolemi

In such cases, initiate IV fluid therapy with crystalloid

All IV solutions should be warmed either by storage in
98.6°F to 104°F) or administered through fluid-warmi

A bolus of 1 L of an isotonic solution may be required
patient.

If a patient is unresponsive to initial crystalloid therapy

■ **FIGURE 2-6** **The Jaw-Thrust Maneuver to Establish an Airway.** Avoid extending the patient's neck.

Fluids are administered judiciously, as aggressive resu
demonstrated to increase mortality and morbidity.

Severely injured trauma patients are at risk for coagulc
resuscitative measures.

This condition potentially establishes a cycle of ongoir
can be mitigated by use of massive transfusion protocc
predefined low ratios.

One study that evaluated trauma patients receiving flui
resuscitation of more than 1.5 L independently increas

■ **FIGURE 2-6 The Jaw-Thrust Maneuver to Establish an Airway.**
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Some severely injured patients arrive with coagulopathy already established, which has led some jurisdictions to administer tranexamic acid preemptively in severely injured patients.

European and American military studies demonstrate improved survival when tranexamic acid is administered within 3 hours of injury.
When bolused in the field follow up infusion is given over 8 hours in the hospital.

DISABILITY (NEUROLOGIC EVALUATION)

A rapid neurologic evaluation establishes the patient's level of consciousness and pupillary size and reaction; identifies the presence of lateralizing signs; and determines spinal cord injury level, if present.

The GCS is a quick, simple, and objective method of determining the level of consciousness.

The motor score of the GCS correlates with outcome.

A decrease in a patient's level of consciousness may indicate decreased cerebral oxygenation and/or perfusion, or it may be caused by direct cerebral injury.

An altered level of consciousness indicates the need to immediately reevaluate the patient's oxygenation, ventilation, and perfusion status.

Hypoglycemia, alcohol, narcotics, and other drugs can also alter a patient's level of consciousness.

Until proven otherwise, always presume that changes in level of consciousness are a result of central nervous system injury.

Remember that drug or alcohol intoxication can accompany traumatic brain injury.

Primary brain injury results from the structural effect of the injury to the brain.

Prevention of secondary brain injury by maintaining adequate oxygenation and perfusion are the main goals of initial management.

Because evidence of brain injury can be absent or minimal at the time of initial evaluation, it is crucial to repeat the examination.

Patients with evidence of brain injury should be treated at a facility that has the personnel and resources to anticipate and manage the needs of these patients.

When resources to care for these patients are not available arrangements for transfer should begin as soon as this condition is recognized.

Similarly, consult a neurosurgeon once a brain injury is recognized.

Exposure and Environmental Control

During the primary survey, completely undress the patient, usually by cutting off his or her garments to facilitate a thorough examination and assessment.

After completing the assessment, cover the patient with warm blankets or an external warming device to prevent him or her from developing hypothermia in the trauma receiving area.

Warm intravenous fluids before infusing them, and maintain a warm environment.

Hypothermia can be present when the patient arrives, or it may develop quickly in the ED if the patient is uncovered and undergoes rapid administration of room-temperature fluids or refrigerated blood.

Because hypothermia is a potentially lethal complication in injured patients, take aggressive measures to prevent the loss of body heat and restore body temperature to normal.

The patient's body temperature is a higher priority than the comfort of the healthcare providers, and the temperature of the resuscitation area should be increased to minimize the loss of body heat.

The use of a high-flow fluid warmer to heat crystalloid fluids to 39°C (102.2°F) is recommended.

When fluid warmers are not available, a microwave can be used to warm crystalloid fluids, but it should never be used to warm blood products.

Primary Survey: Life-Threatening Injuries

- Airway Obstruction
- Tracheobronchial Tree Injury
- Tension Pneumothorax
- Open Pneumothorax
- Massive Hemothorax
- Cardiac Tamponade

All these major problems should be corrected as they are identified.

Tracheobronchial Tree Injury

Injury to the trachea or a major bronchus is an unusual but potentially fatal condition.

The majority of tracheobronchial tree injuries occur within 1 inch (2.54 cm) of the carina.

These injuries can be severe, and the majority of patients die at the scene.

Those who reach the hospital alive have a high mortality rate from associated injuries, inadequate airway, or development of a tension pneumothorax or tension pneumopericardium.

Tracheobronchial Tree Injury

Rapid deceleration following blunt trauma produces injury where a point of attachment meets an area of mobility.

Blast injuries commonly produce severe injury at air-fluid interfaces.

Penetrating trauma produces injury through direct laceration, tearing, or transfer of kinetic injury with cavitation.

Intubation can potentially cause or worsen an injury to the trachea or proximal bronchi.

Tracheobronchial Tree Injury

Patients typically present with hemoptysis, cervical subcutaneous emphysema, tension pneumothorax, and/or cyanosis.

Incomplete expansion of the lung and continued large air leak after placement of
a chest tube suggests a tracheobronchial injury, and placement of more than one chest tube may be necessary to overcome the significant air leak.

Bronchoscopy confirms the diagnosis.
If tracheobronchial injury is suspected, obtain immediate surgical consultation.

Tracheobronchial Tree Injury

Immediate treatment may require placement of a definitive airway. Intubation of patients with tracheobronchial injuries is frequently difficult because of anatomic distortion from paratracheal hematoma, associated oropharyngeal injuries, and/or the tracheobronchial injury itself.

Advanced airway skills, such as fiber-optically assisted endotracheal tube placement past the tear site or selective intubation of the unaffected bronchus, may be required. For such patients, immediate operative intervention is indicated.

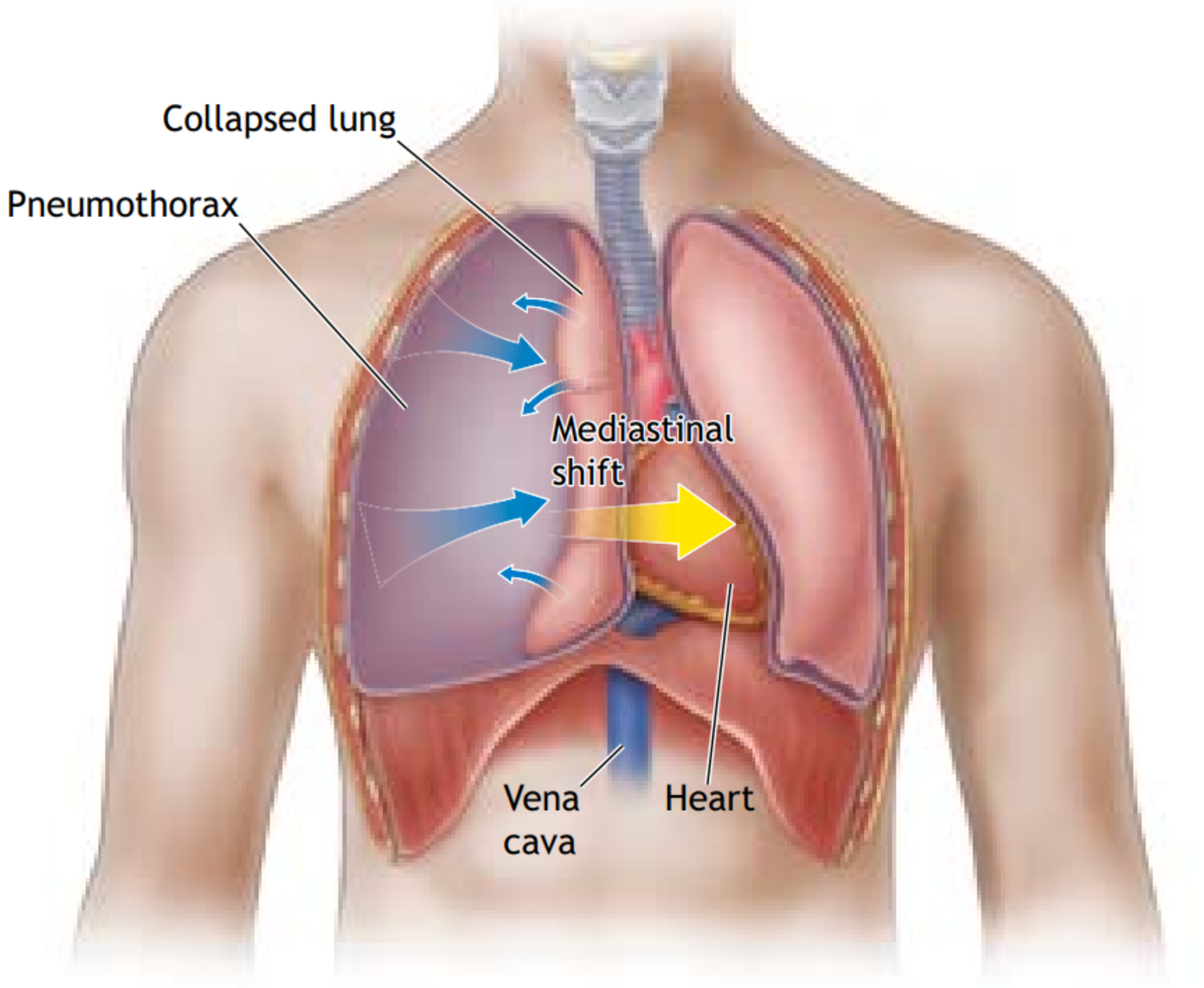
In more stable patients, operative treatment of tracheobronchial injuries may be delayed until the acute inflammation and edema resolve.

Tension Pneumothorax

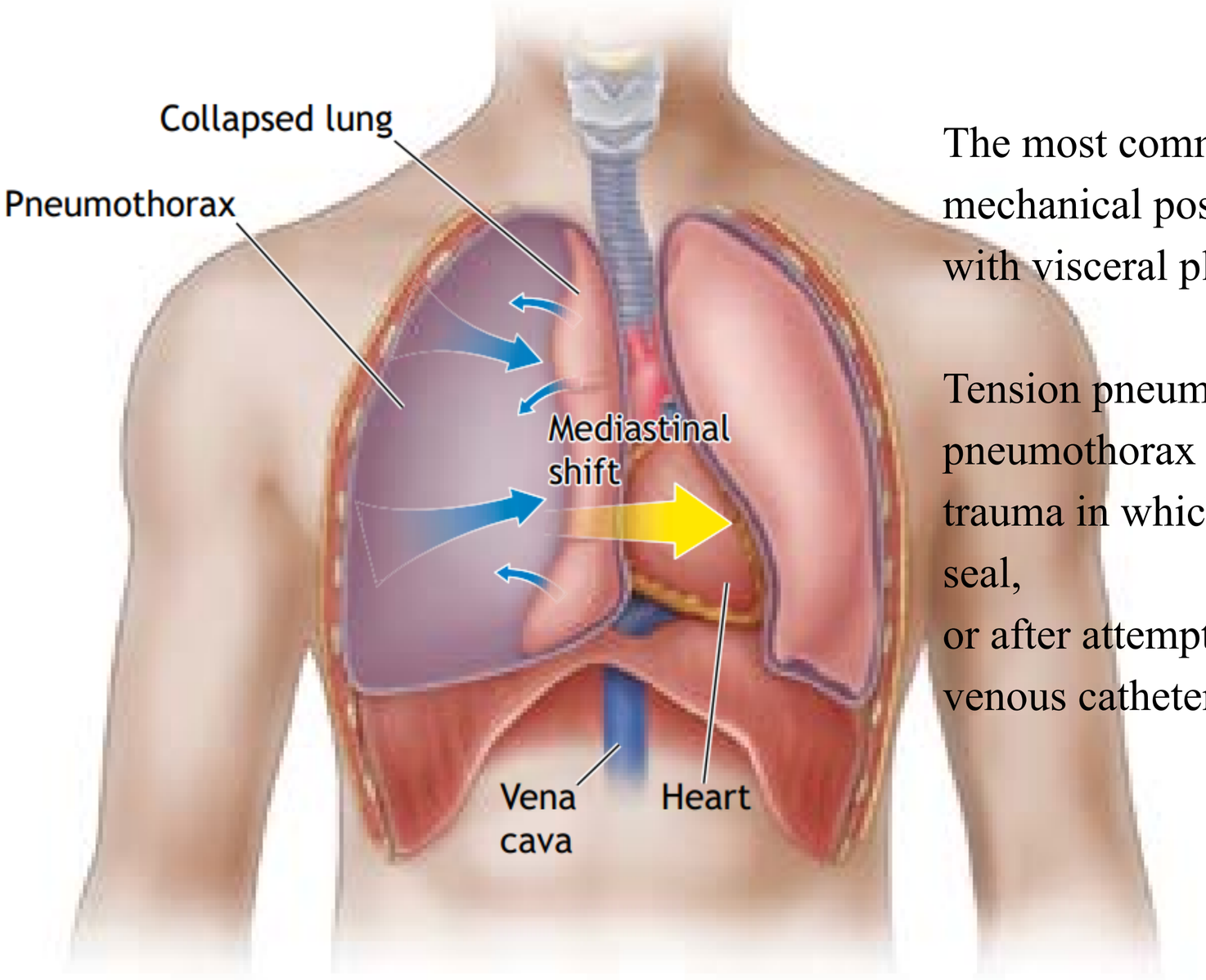
Tension pneumothorax develops when a “one-way valve” air leak occurs from the lung or through the chest wall.
Air is forced into the pleural space with no means of escape, eventually collapsing the affected lung.

The mediastinum is displaced to the opposite side, decreasing venous return and compressing the opposite lung.

Shock (often classified as obstructive shock) results from marked decrease in venous return, causing a reduction in cardiac output.



■ **FIGURE 4-1 Tension Pneumothorax.** A "one-way valve" air leak occurs from the lung or through the chest wall, and air is forced into the thoracic cavity, eventually collapsing the affected lung.



The most common cause of tension pneumothorax is mechanical positive-pressure ventilation in patients with visceral pleural injury.

Tension pneumothorax also can complicate a simple pneumothorax following penetrating or blunt chest trauma in which a parenchymal lung injury fails to seal,
or after attempted subclavian or internal jugular venous catheter insertion.

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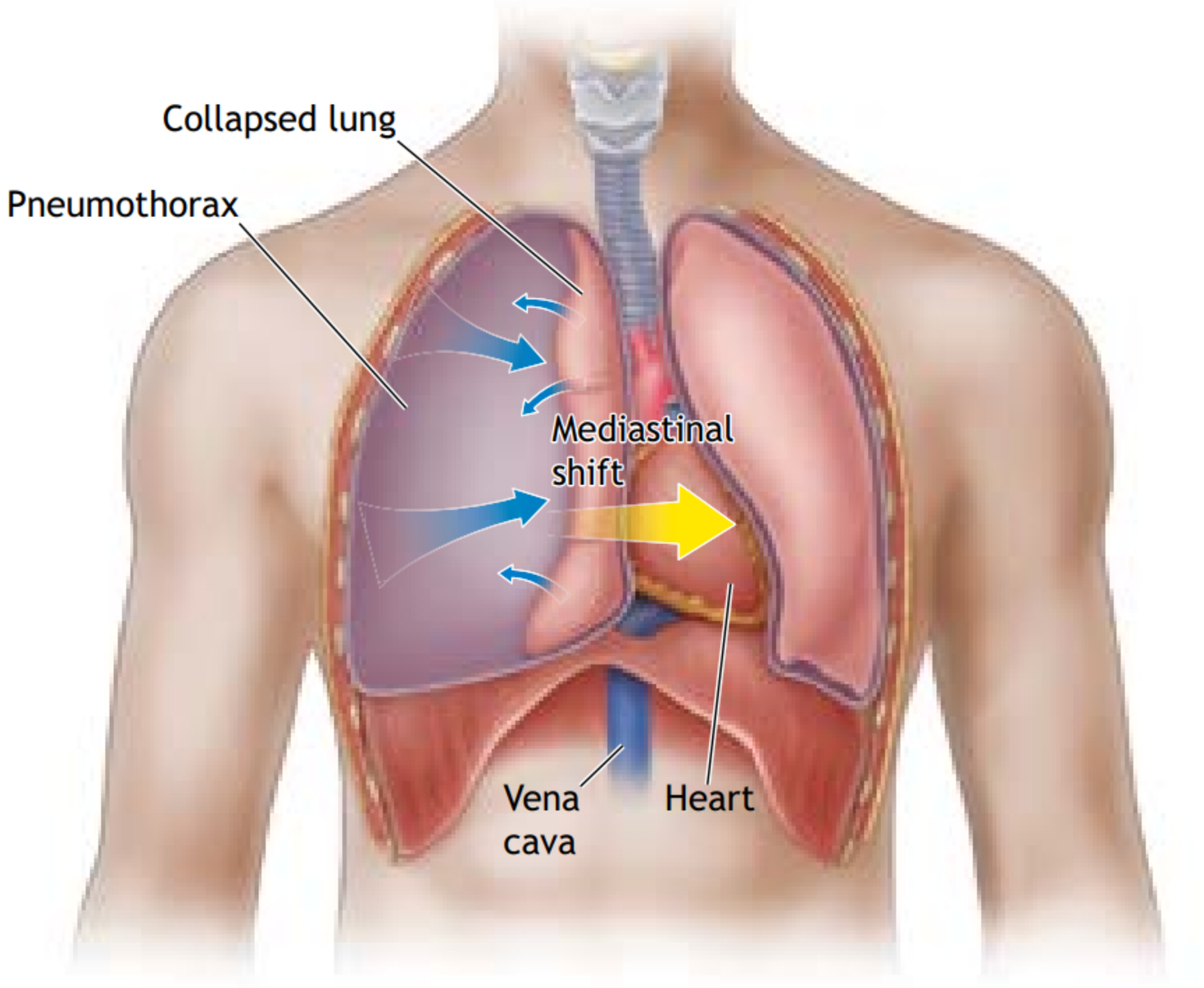

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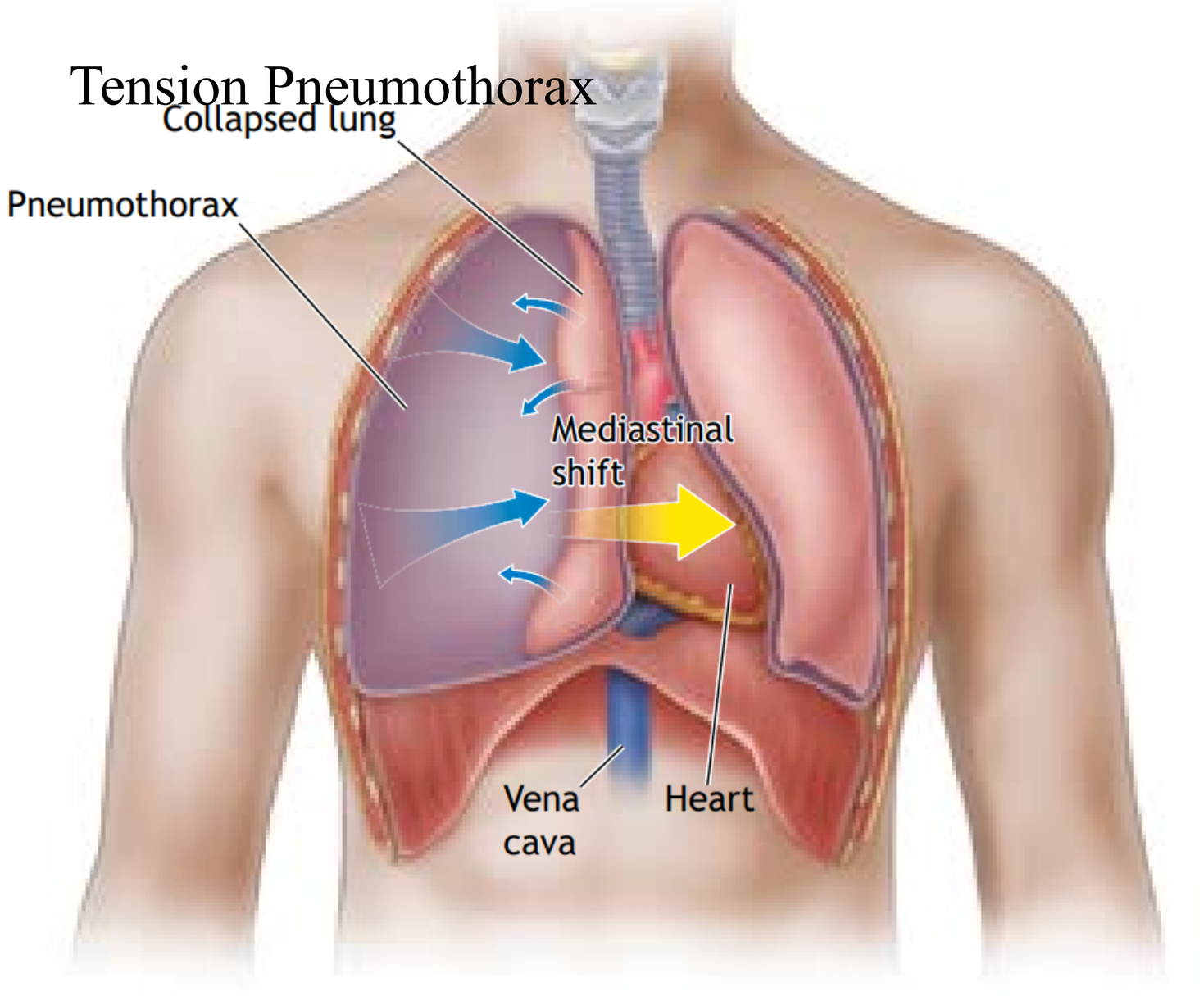

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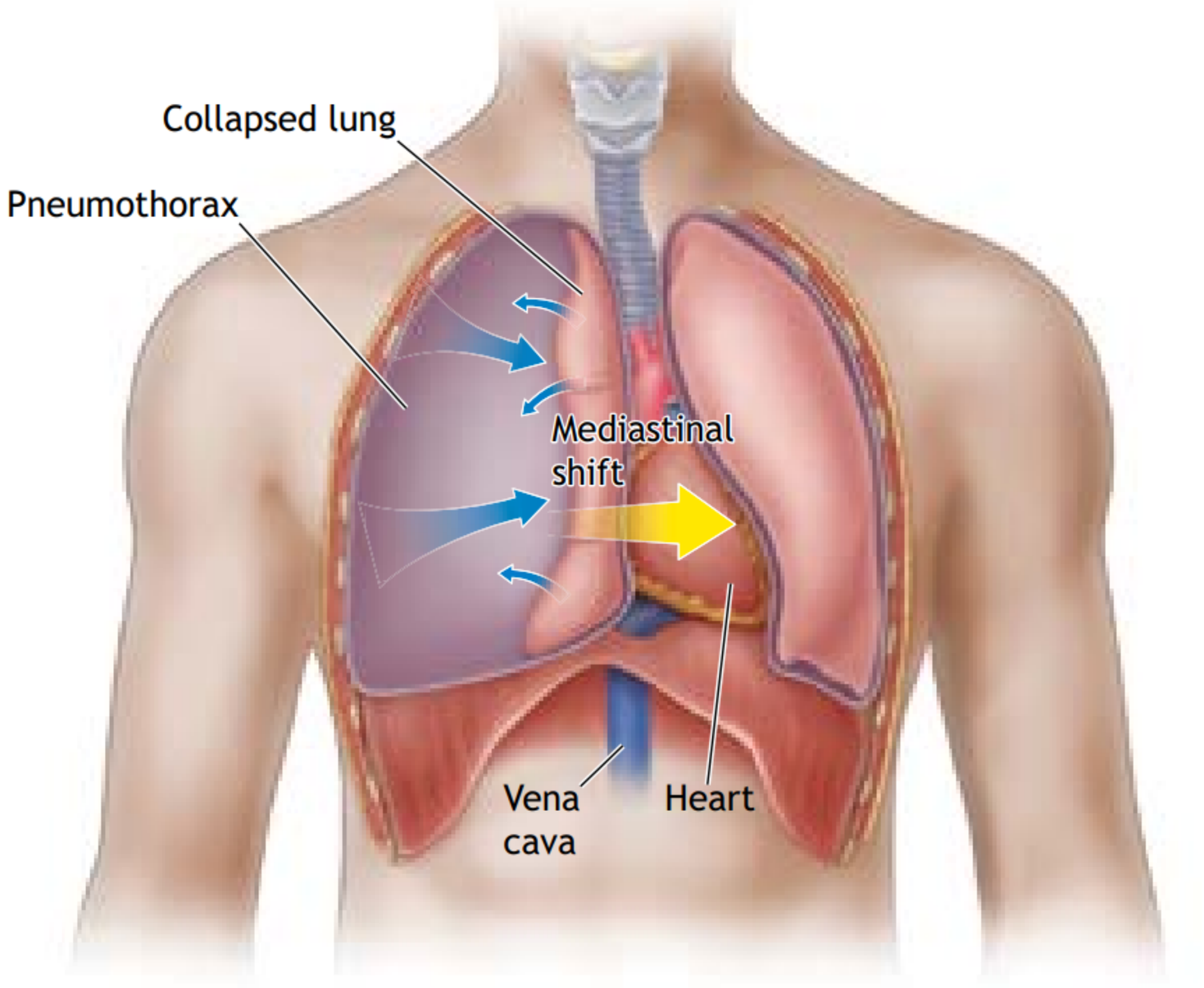

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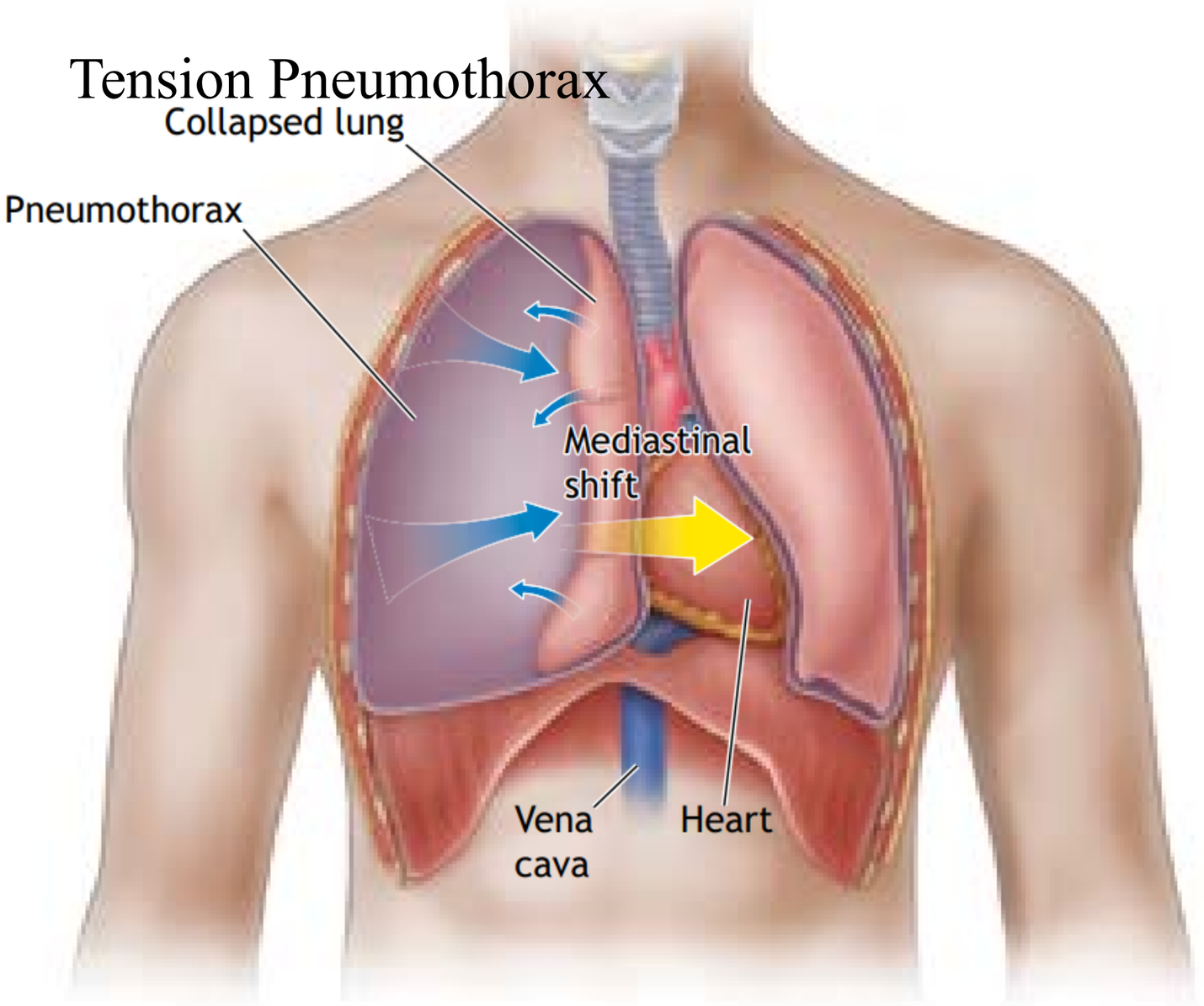

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FIGURE 4-2 Finger Decompression. Tension pneumothorax can be managed initially by rapidly applying the finger decompression technique.

Tension Pneumothorax

Chest wall thickness influences the likelihood of success with needle decompression. Evidence suggests that a 5-cm over-the-needle catheter will reach the pleural space >50% of the time, whereas an 8-cm over-the-needle catheter will reach the pleural space >90% of the time.

Recent evidence supports placing the large, over-the-needle catheter at the fifth interspace, slightly anterior to the midaxillary line

Tension Pneumothorax

Successful needle decompression converts tension pneumothorax to a simple pneumothorax.

However, there is a possibility of subsequent pneumothorax as a result of the maneuver, so continual reassessment of the patient is necessary.

Tube thoracostomy is mandatory after needle or finger decompression of the chest.

Open Pneumothorax

Open pneumothorax is commonly found and treated at the scene by prehospital personnel.

The clinical signs and symptoms are pain, difficulty breathing, tachypnea, decreased breath sounds on the affected side, and noisy movement of air through the chest wall injury.

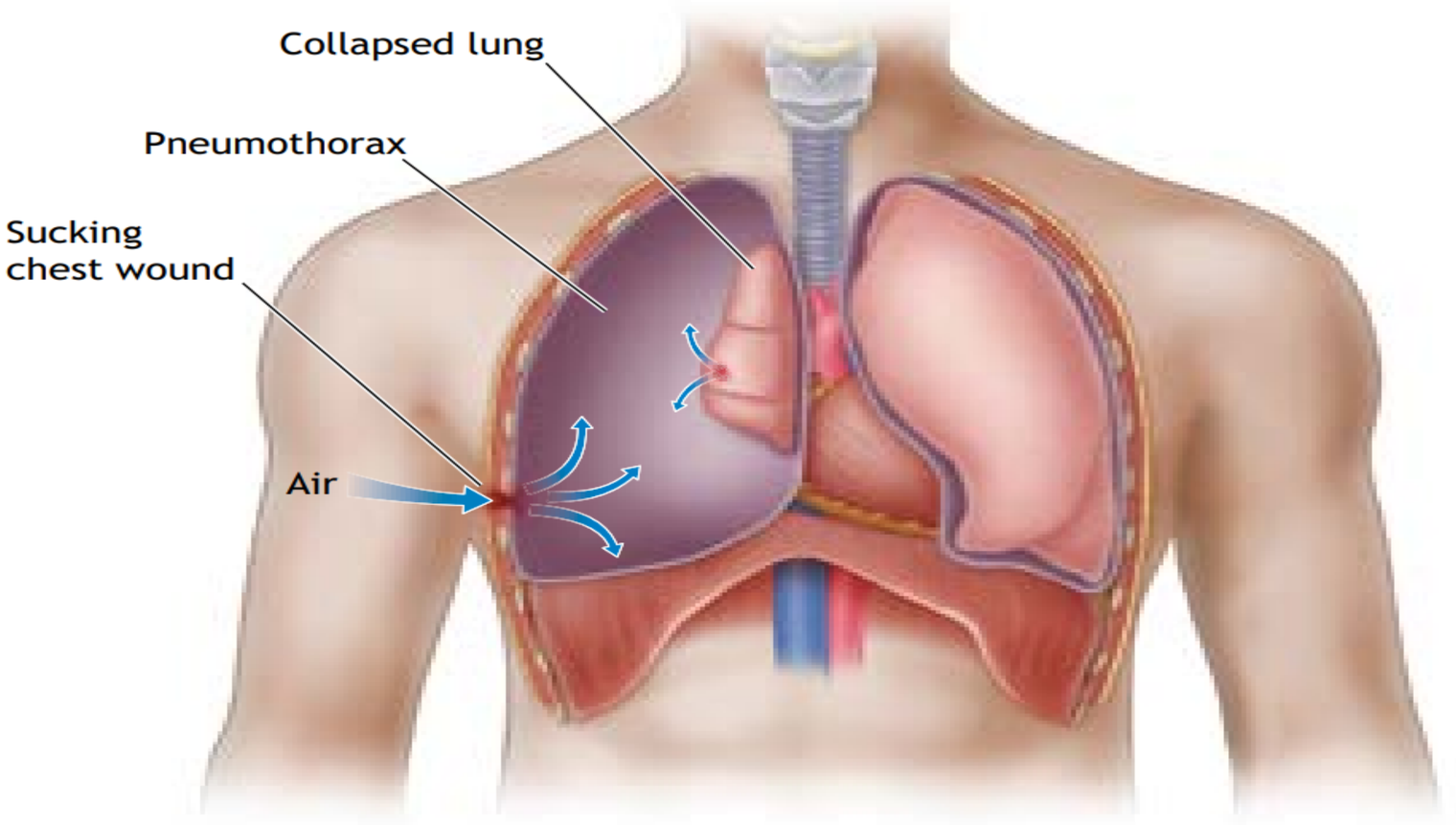
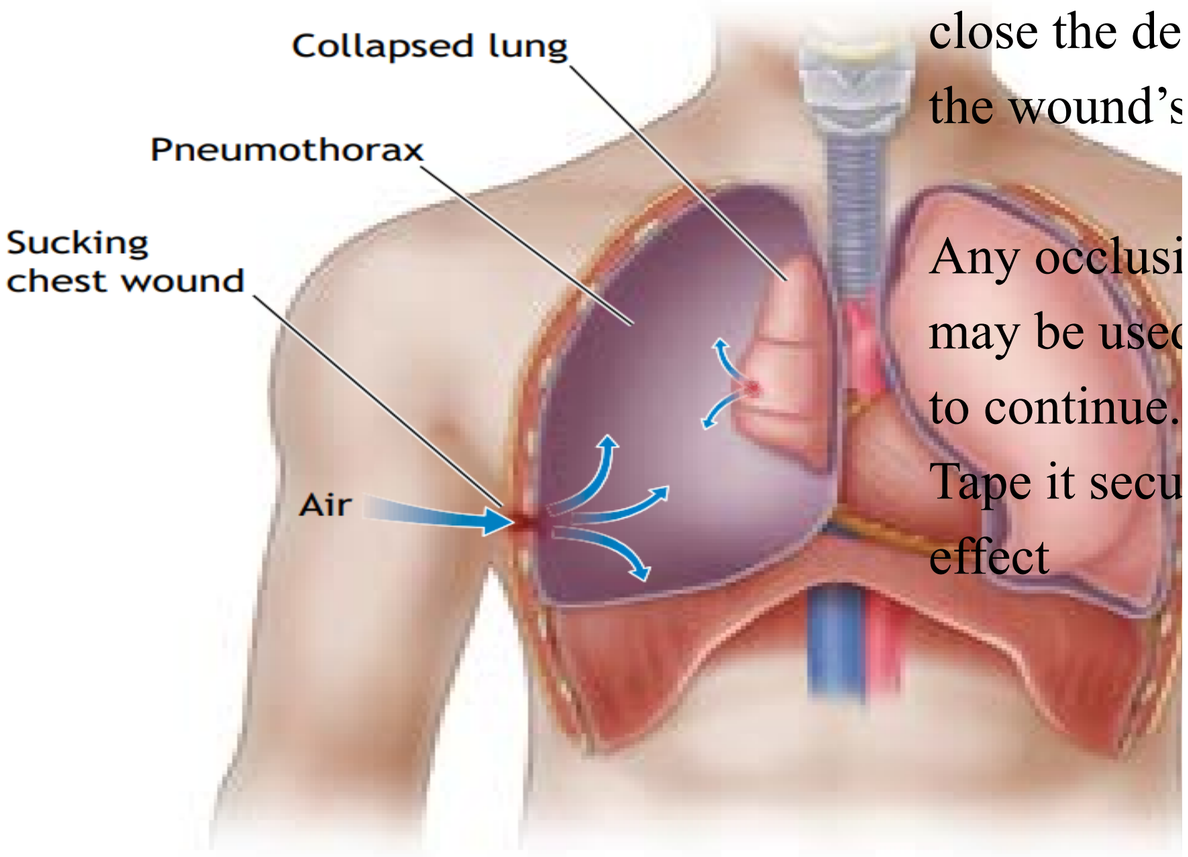


FIGURE 4-3 Open Pneumothorax. Large defects of the chest wall that remain open can result in an open pneumothorax, or sucking chest wound.

Open Pneumothorax



For initial m
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Any occlusi
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■ **FIGURE 2-6** The Jaw-Thrust Maneuver to Establish an Airway. Avoid extending the patient's neck.

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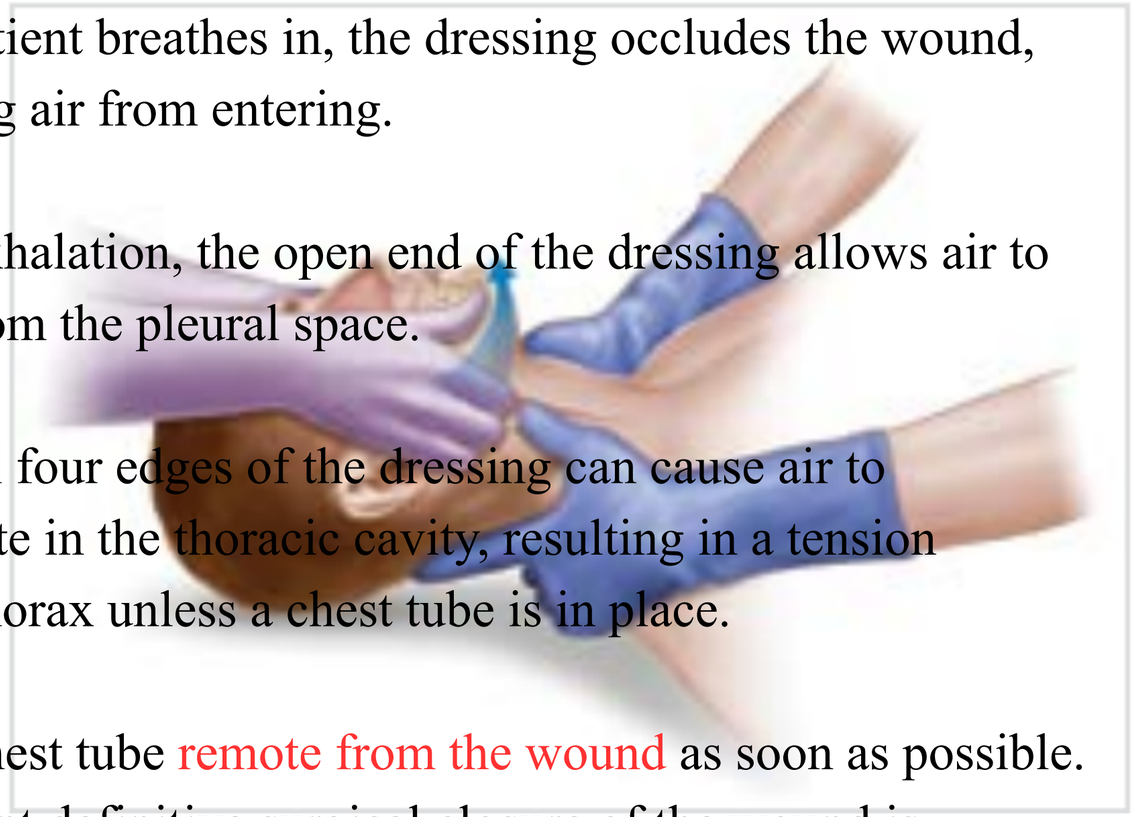
Open Pneumothorax

As the patient breathes in, the dressing occludes the wound, preventing air from entering.

During exhalation, the open end of the dressing allows air to escape from the pleural space.

Taping all four edges of the dressing can cause air to accumulate in the thoracic cavity, resulting in a tension pneumothorax unless a chest tube is in place.

Place a chest tube remote from the wound as soon as possible. Subsequent definitive surgical closure of the wound is frequently required.



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Massive Hemothorax

Massive hemoth
than 1500 mL of
volume in the ch

It is most comm
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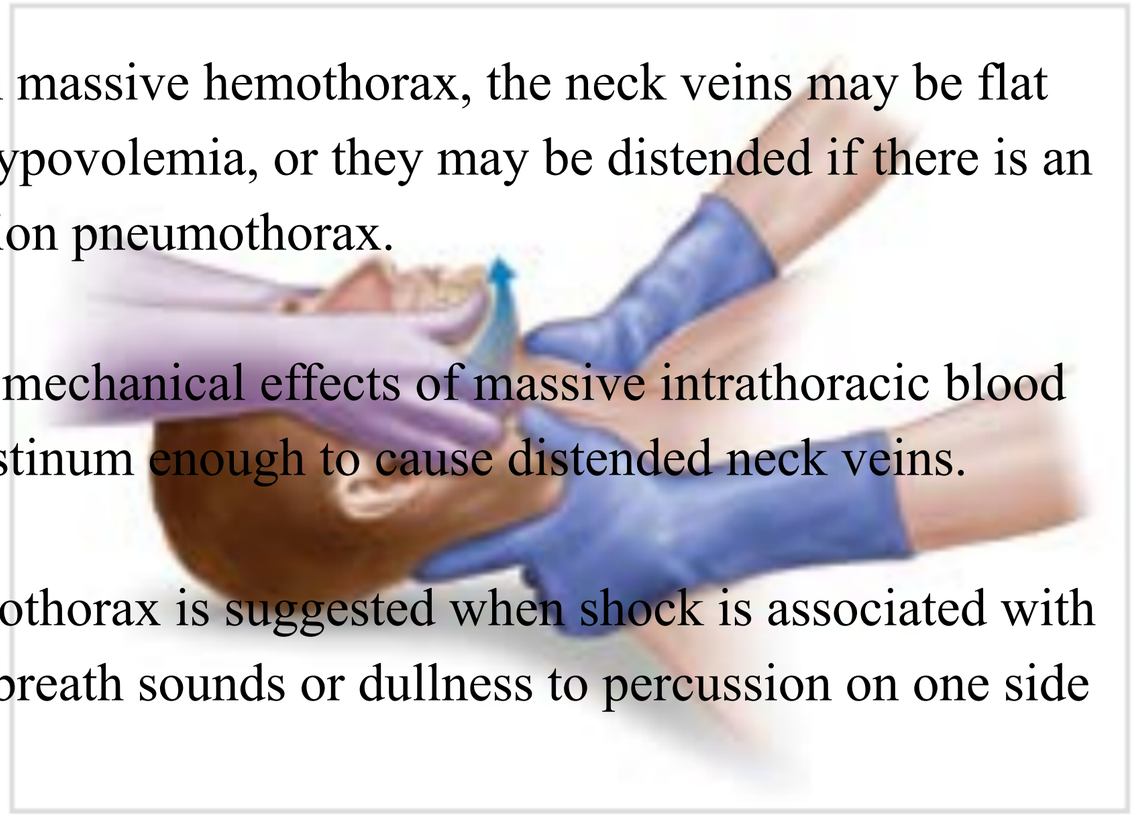
Massive Hemothorax

In patients with massive hemothorax, the neck veins may be flat due to severe hypovolemia, or they may be distended if there is an associated tension pneumothorax.

Rarely will the mechanical effects of massive intrathoracic blood shift the mediastinum enough to cause distended neck veins.

A massive hemothorax is suggested when shock is associated with the absence of breath sounds or dullness to percussion on one side of the chest.



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Massive Hemothorax

Massive hemotho
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Establish large-ca
transfusion of unc
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When appropriate
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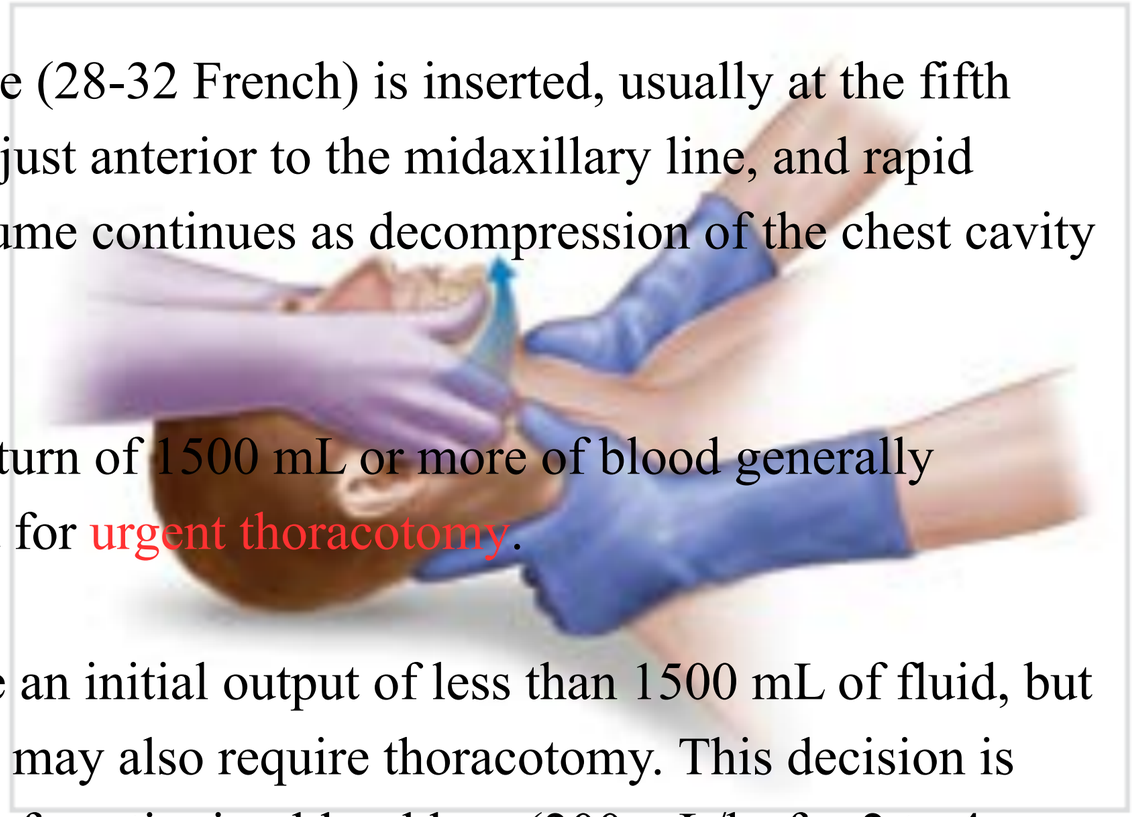
FIGURE 2-6 The Jaw-Thrust Maneuver to Establish an Airway.
Avoid extending the patient's neck.

Massive Hemothorax

A single chest tube (28-32 French) is inserted, usually at the fifth intercostal space, just anterior to the midaxillary line, and rapid restoration of volume continues as decompression of the chest cavity is completed.

The immediate return of 1500 mL or more of blood generally indicates the need for urgent thoracotomy.

Patients who have an initial output of less than 1500 mL of fluid, but continue to bleed, may also require thoracotomy. This decision is based on the rate of continuing blood loss (200 mL/hr for 2 to 4 hours), as well as the patient's physiologic status and whether the chest is completely evacuated of blood.



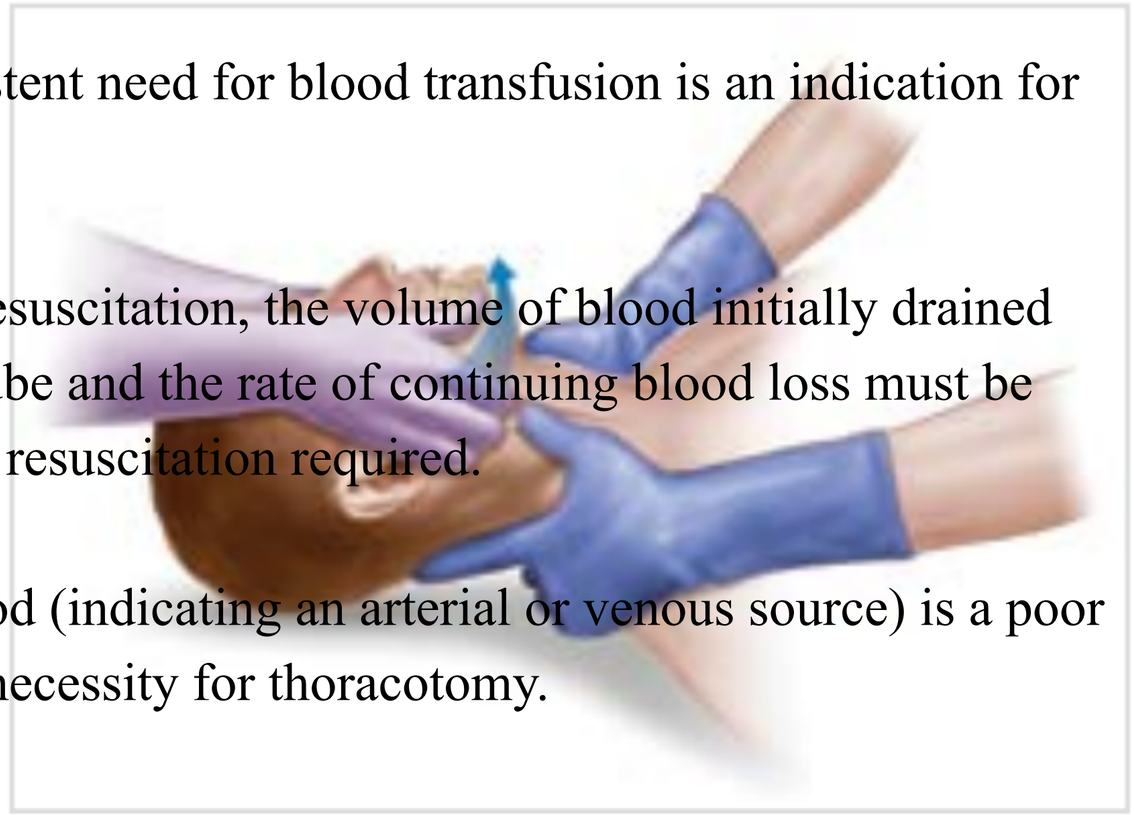
■ FIGURE 2-6 The Jaw-Thrust Maneuver to Establish an Airway. Avoid extending the patient's neck.

Massive Hemothorax

Again, the persistent need for blood transfusion is an indication for thoracotomy.

During patient resuscitation, the volume of blood initially drained from the chest tube and the rate of continuing blood loss must be factored into the resuscitation required.

Color of the blood (indicating an arterial or venous source) is a poor indicator of the necessity for thoracotomy.



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Massive Hemothorax

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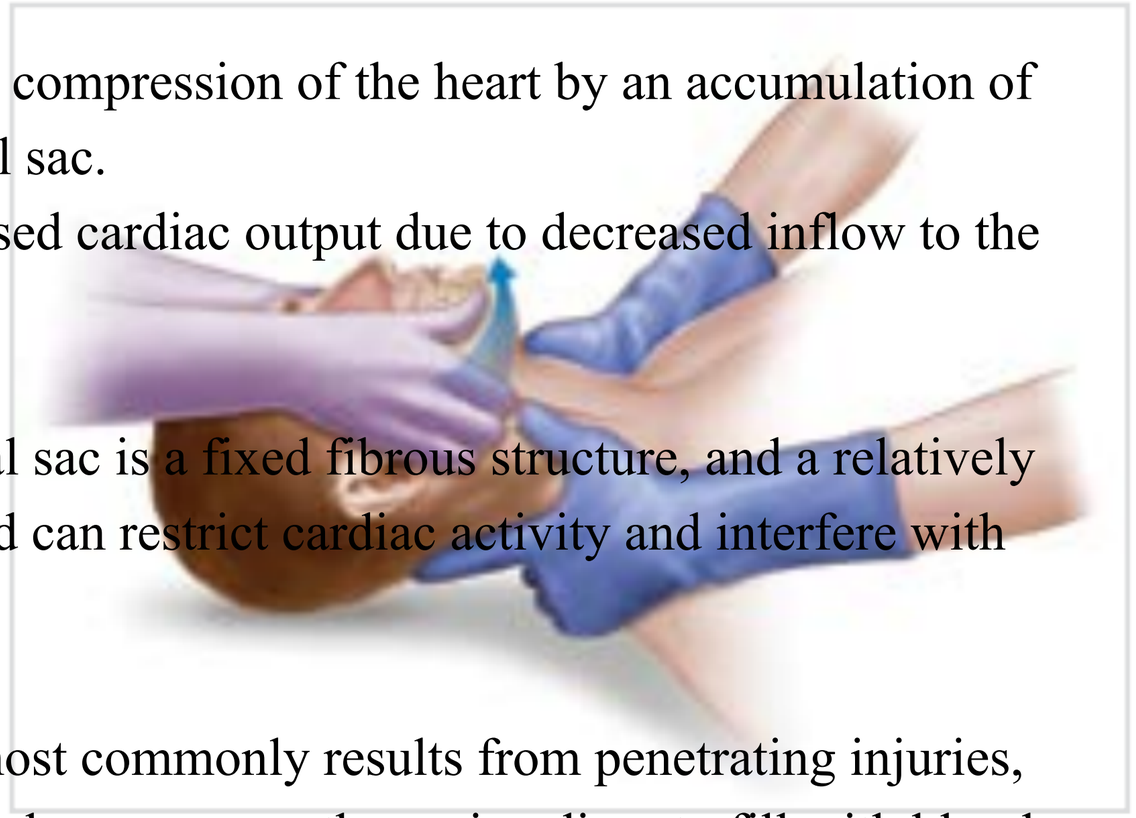
Cardiac Tamponade

Cardiac tamponade is compression of the heart by an accumulation of fluid in the pericardial sac.
This results in decreased cardiac output due to decreased inflow to the heart.

The human pericardial sac is a fixed fibrous structure, and a relatively small amount of blood can restrict cardiac activity and interfere with cardiac filling.

Cardiac tamponade most commonly results from penetrating injuries, although blunt injury also can cause the pericardium to fill with blood from the heart, great vessels, or epicardial vessels.



Cardiac Tamponade

Cardiac tamponade
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The classic clinical
distended veins is n
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FIGURE 2-6 The Jaw-Thrust Maneuver to Establish an Airway.
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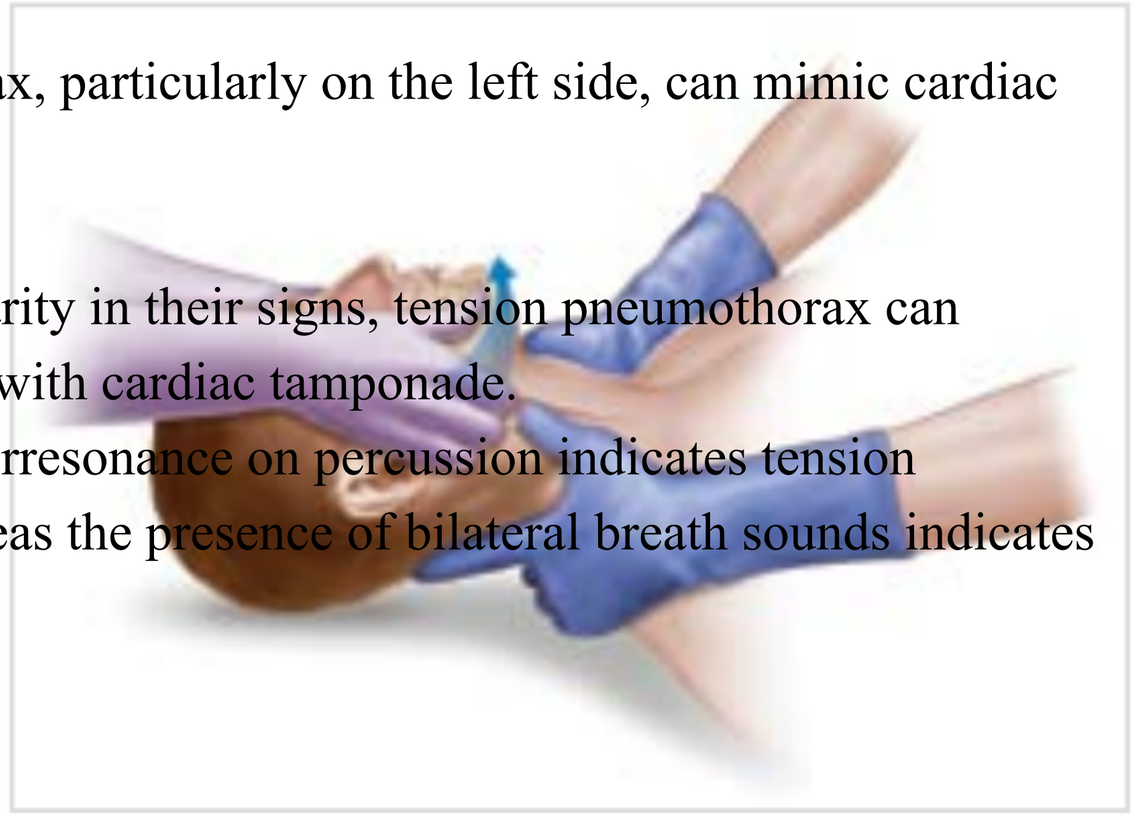
Cardiac Tamponade

Tension pneumothorax, particularly on the left side, can mimic cardiac tamponade.

Because of the similarity in their signs, tension pneumothorax can initially be confused with cardiac tamponade.
The presence of hyperresonance on percussion indicates tension pneumothorax, whereas the presence of bilateral breath sounds indicates cardiac tamponade.



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Cardiac Tamponade

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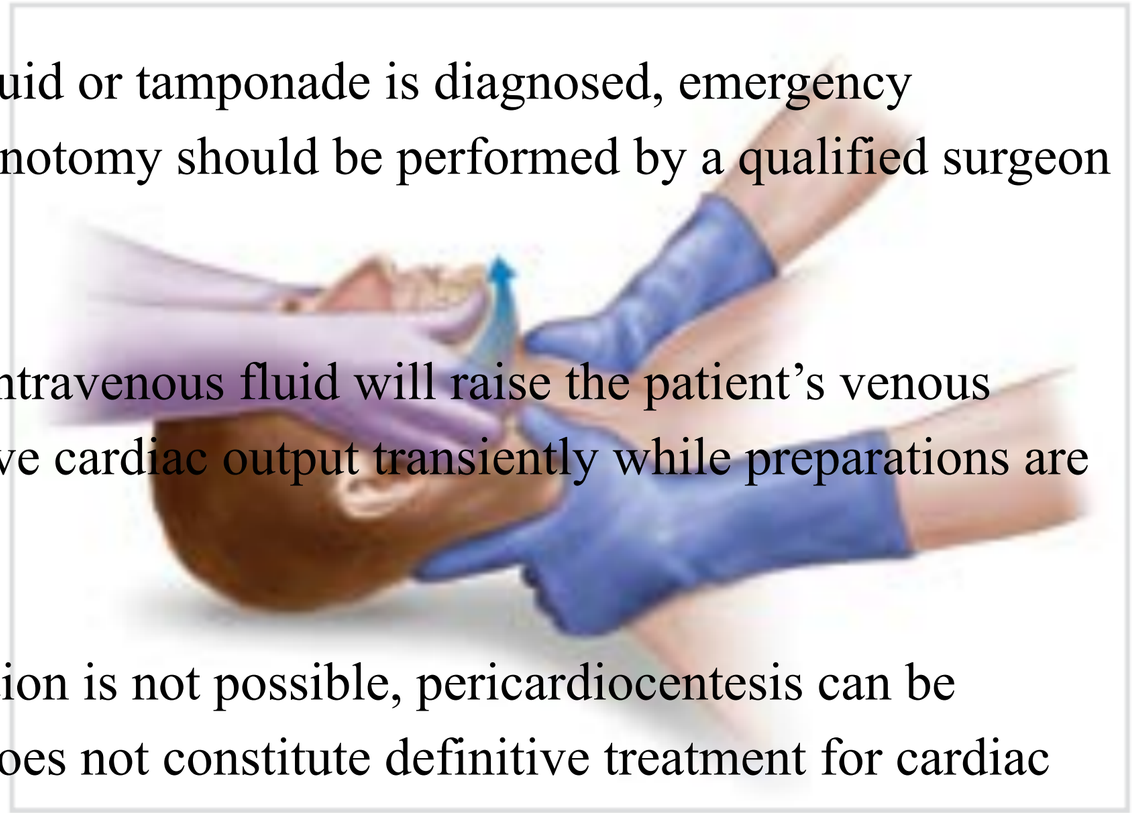
■ **FIGURE 2-6 The Jaw-Thrust Maneuver to Establish an Airway.**
Avoid extending the patient's neck.

Cardiac Tamponade

When pericardial fluid or tamponade is diagnosed, emergency thoracotomy or sternotomy should be performed by a qualified surgeon as soon as possible.

Administration of intravenous fluid will raise the patient's venous pressure and improve cardiac output transiently while preparations are made for surgery.

If surgical intervention is not possible, pericardiocentesis can be therapeutic, but it does not constitute definitive treatment for cardiac tamponade.



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Cardiac Tamponade

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