

Trauma Clinical Guideline

Initial Management of Blunt Thoracic Aortic Injury

The Trauma Medical Directors and Program Managers Workgroup is an open forum for designated trauma services in Washington State to share ideas and concerns about providing trauma care. The workgroup meets regularly to encourage communication among services, and to share best practices and information to improve quality of care. On occasion, at the request of the Emergency Medical Services and Trauma Care Steering Committee, the group discusses the value of specific clinical management guidelines for trauma care.

The Washington State Department of Health distributes this guideline on behalf of the Emergency Medical Services and Trauma Care Steering Committee to assist trauma care services with developing their trauma patient care guidelines. Toward this goal, the workgroup has categorized the type of guideline, the sponsoring organization, how it was developed, and whether it has been tested or validated. The intent of this information is to assist physicians in evaluating the content of this guideline and its potential benefits for their practice or any particular patient.

The Department of Health does not mandate the use of this guideline. The department recognizes the varying resources of different services, and that approaches that work for one trauma service may not be suitable for others. The decision to use this guideline depends on the independent medical judgment of the physician. We recommend that trauma services and physicians who choose to use this guideline consult with the department regularly for any updates to its content. The department appreciates receiving any information regarding practitioners' experience with this guideline. Please direct comments to 360-236-2874.

This is a trauma assessment and management guideline. It was adapted from professional literature. The workgroup reviewed the guideline, sought input from trauma care physicians throughout Washington State, and used that input to make changes. Both the Emergency Medical Services and Trauma Care Steering Committee and the Department of Health Office of Community Health Systems endorsed the guideline. This guideline has not been tested or validated.

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The problem

Thoracic aortic trauma is a common cause of death in patients. It usually results following blunt mechanisms of injury where there is significant force and deceleration such as motor vehicle crashes (MVC), motorcycle crashes (MCC), vehicle versus pedestrian incidences, crush injuries, and falls from heights. Injuries to the thoracic aorta commonly occur in the proximal descending aorta at the ligamentum arteriosum. Injuries of the thoracic aorta commonly are associated with an 80 percent mortality rate before reaching the hospital. Of those who reach the hospital, it is likely that up to 50 percent will die from their injuries. Those surviving the initial phases of this injury may have incomplete lacerations of the aorta, which results in very subtle signs of the injury. Given this information, the provider caring for these patients should have a high index of suspicion based on the mechanism of injury and prehospital report. Based on these grim mortality rates, it is vital that patients at risk for thoracic aortic injury be rapidly transported, assessed, and receive the appropriate interventions discussed in this guideline.

Assessment

The mechanisms of injury associated with thoracic aortic injury frequently result in other body system injuries. Some of these associated injuries may be more life-threatening than the thoracic injury. To ensure injuries are identified appropriately a systematic approach should be taken when assessing these patients. This systematic approach should follow the advanced trauma life support (ATLS) process, which includes the primary and secondary survey. In the severely injured patient, examination of the thoracic cavity should be performed as part of the primary survey and occur within the first minutes of the patient's arrival in the emergency department (ED). Life-threatening injuries identified in the primary survey should be addressed before moving on to the secondary survey. The thorax should be visually inspected for significant abrasions and contusions along with bilateral rise and fall of the chest. Bilateral chest auscultation should be performed to help identify hemo/pneumothorax. The thorax should also be palpated with special emphasis placed on identifying fractures of the first and second ribs, sternum, and scapula, which often occur in conjunction with aortic injury. The patient may have symptoms of hypovolemic shock resulting in hypotension if significant bleeding is occurring. It may be helpful to assess and compare the blood pressure in the upper extremities to the lower extremities (may have higher SBP in the upper extremities).

If it is determined through assessment, or if the provider is concerned about a possible aortic injury, a surgical consult should be obtained as soon as possible. If there are no surgical services available, the patient should be rapidly transferred to a higher level designated trauma service with surgical services capable of treating this injury.

Diagnostics

A chest X-ray should be obtained as part of the primary survey especially if there is potential for aortic injury. Chest X-ray findings may include:

- normal chest X-ray
- widened mediastinum
- tracheal deviation
- loss of anterior/posterior (AP) window or aortic knob
- apical capping
- depression of left mainstem bronchus
- widening of superior vena caval shadow

There is a significant risk for blood loss with aortic injury, which may result in the need for a blood transfusion. A blood type and cross match along with a complete blood count (CBC) should be obtained as soon as possible but should not delay blood transfusion.

If the patient is hemodynamically stable a computed tomography (CT) angiography (CTA) of the chest with contrast should be obtained. The CTA is the diagnostic tool of choice for determining if aortic injury exists. If the patient is hemodynamically unstable the patient should be resuscitated before going to CT.

Interventions

Patients with suspicion of aortic injury who are hemodynamically unstable with severe hypotension should be resuscitated and immediately transferred to the operating room (OR). If pulselessness occurs, emergent ED thoracotomy may be performed if qualified personnel are available. The massive transfusion protocol (MTP) should be activated in an attempt to restore circulating blood volume. ([MTP guideline Link](#)).

If hemothorax has occurred the patient should receive a thoracostomy (chest tube). If the initial chest tube output is greater than 1000-1500cc, or there is continued bleeding with output greater than 250cc per hour, a thoracotomy may be indicated. In pediatrics, thoracotomy is indicated when the initial chest tube output is greater than or equal to 20 to 30 percent of the calculated blood volume (i.e. 15 mL/kg), when the output is greater than 2 to 3 mL/kg/hour over the following six hours or when significant bleeding occurs, resulting in hemodynamic compromise. Thoracotomy should be performed only by trained providers familiar with the procedure and the post-procedure intensive care that is required.

Patients who are stable and have positive findings on CT for aortic injury should receive an immediate surgical consult or be transferred.

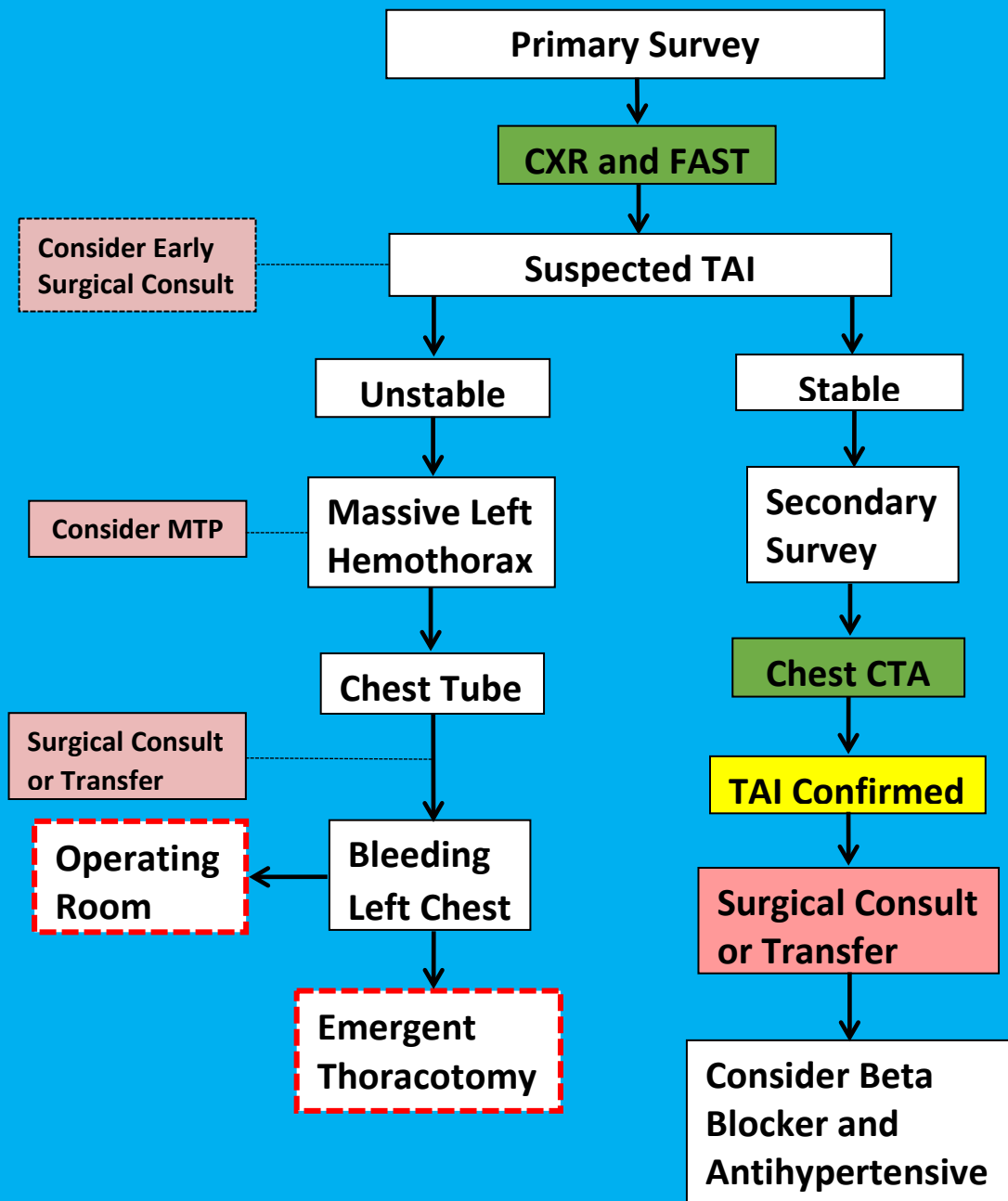
To limit the effects of intimal vessel injury (dissection), it may be necessary to lower the patient's heart rate and blood pressure with beta blockers and antihypertensive medications. Patients receiving these medications should be closely assessed and monitored before and after administration to prevent excessive hypotension. Patients who are in hypovolemic should not receive these medications.

Patients with identified with stable aortic injuries should receive expert consultation from a vascular service to help guide treatment.

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Physical Findings

- Discrepancy >20mmHg SBP in upper extremities
- Diminished femoral pulses
- Sternum and left sided rib fractures, flail ribs segment

CXR Findings

- Normal x-ray
- Widened mediastinum
- Tracheal deviation
- Loss of AP window or aortic knob
- Apical capping
- Depression of left mainstem bronchus
- Widening of superior vena caval shadow

Key Points

- Suspect TAI in high velocity MOI.
- TAI occurs in the setting of high velocity injury and thus other life threatening injuries must be assessed first.
- Emergent thoracotomy should only be performed by qualified personnel in a facility with surgical service available.
- Consider emergent thoracotomy if loss of pulse occurred within 10 minutes of arrival to the hospital for blunt injuries and 15 minutes for penetrating injuries.
- Thoracotomy indicated if initial chest tube output >1000-1500cc or ongoing bleeding >250cc/hr.
- Ensure adequate volume resuscitation prior to initiation of beta blockers.
- Use beta blockers with caution in severe brain injury (avoid hypotension).