Washington State Department of Health, Office of Community Health Systems
Emergency Medical Services & Trauma Section

Trauma Rehabilitation
Clinical Guideline

Autonomic Dysreflexia

The Rehabilitation Technical Advisory Committee (TAC) is an open forum for designated trauma rehabilitation services in Washington state that shares ideas and concerns about providing rehabilitation care for trauma patients. The TAC 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 Trauma Care Steering Committee, the group discusses the value of specific clinical management guidelines for trauma rehabilitation care.

The Washington State Department of Health distributes this guideline on behalf of the Emergency Medical Services and Trauma Care Steering Committee and Rehabilitation TAC to assist rehabilitation services with developing patient care guidelines. The workgroup has categorized the type of guideline, the sponsoring organization, how it was developed, and whether it has been tested or validated. This information will assist rehabilitation services in evaluating the content of this guideline, and its potential benefits for their practice and patients.

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 rehabilitation service may not be suitable for others. The decision to use this guideline in any particular situation always depends on the independent medical judgment of the physician providers and clinical staff. We recommend that rehabilitation 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' experiences with this guideline. Please direct comments to 360-236-2874.

The workgroup has reviewed the guideline, sought input from rehabilitation clinical providers and staff throughout Washington state, and used that input in developing this guideline. The guideline was endorsed by both the Emergency Medical Services and Trauma Care Steering Committee and the Department of Health Office of EMS/Trauma Section. This guideline has not been tested or validated.

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Autonomic Dysreflexia

Introduction

Autonomic dysreflexia (AD) occurs in patients with spinal cord injuries (SCI) at or above the sixth thoracic vertebra (T6). Some occurring as low as T8 are also at risk for AD. AD is a life-threatening complication of spinal cord injury caused by noxious stimuli below the level of injury, resulting in acute uncontrolled hypertension. Generally, systolic and/or diastolic pressures are elevated 20-40 mmHg above the patient's baseline in adults and 10-15 mmHg above in children. This syndrome is not the same as the autonomic dysfunction or autonomic storming seen in people with very severe brain injury.

Spinal cord injury above the T6 level results in loss of inhibitory impulses to the sympathetic nerves below. When sensory nerves below the level of injury transmit noxious afferent impulses to the spinal cord, sympathetic neurons are stimulated. This results in severe vasoconstriction in the splanchnic bed, which can cause a sudden elevation in blood pressure.

In response to the hypertension, there is an increase in parasympathetic stimulation (via the vagus nerve) to the heart, often resulting in relative slowing of the heart rate, although it may not reach true levels of bradycardia (<60 bpm).

A second compensatory reflex is sympathetic inhibitory outflow above the level of injury, but due to the SCI, cannot pass the level of injury and cannot dilate the splanchnic bed. This may result in sweating, vasodilation, skin flushing, and nasal congestion above the level of injury. The body's response to pain in SCI patients is described in Appendix A.

Important Considerations

AD is a medical emergency. The sudden onset of severe hypertension has been associated with seizures, intracerebral hemorrhage, and death. The aim of AD treatment is directed at understanding the signs and symptoms, identifying potential causes, and lowering the blood pressure to prevent further harm.

The most common causes of AD are a distended bladder or distended rectum, but any noxious stimulus can trigger it.

Assessment

A patient may have one or more of the following signs and symptoms when experiencing AD. The primary symptom will be a rise in blood pressure. One or more of the following symptoms may be present but in some cases they may be absent.

Common symptoms:

- Elevated systolic and/or diastolic blood pressure 20 to 40 mmHg above baseline in adults and 10 to 15 mmHg above baseline in children; commonly associated with bradycardia (normal adult systolic blood pressure in SCI patients is 90-110)
- Pounding / severe headache

- Profuse sweating especially above the level of SCI commonly seen in the face, neck, and shoulders
- Blurred vision
- Flushing of the skin usually above the level of SCI
- Piloerection (goose flesh)
- Nasal congestion
- Feelings of apprehension or anxiety
- Minimal or no symptoms despite significantly elevated blood pressure (silent AD)
- Bradycardia or relative slowing of the heart rate
- Cardiac arrhythmias (atrial fibrillation, premature ventricular contractions, and conduction abnormalities)

Causes

The primary treatment aim of AD is to rapidly identify a potential cause, provide interventions to resolve the episode, and prevent further episodes from occurring in the future. There are a variety of potential causes of AD but the primary sources stem from the bladder or bowel.

Primary Causes:

Bladder

- Bladder distension
- Bladder infection
- Blocked urinary catheter
- Catheterization
- Kidney stones
- Urological procedures

Bowel

- Bowel distention
- Impaction

Gastrointestinal

- Appendicitis
- Gallstones
- Hemorrhoids
- Ulcers

Lesser causes:

- Alcohol intake
- Caffeine intake
- Constrictive clothing, shoes, or appliances
- Deep vein thrombosis
- Extremity trauma
- Fractures
- Ingrown toenails
- Menstruation
- Pregnancy
- Pressure ulcers

- Pulmonary emboli
- Sexual intercourse
- Sexually transmitted diseases
- Sharp object contact
- Skin injury from burns, frostbite, or insect bites
- Stimulants
- Surgical procedures

Interventions

Immediate initial interventions (performed by nurse, family, or provider):

- Sit the patient up if supine and if in a wheelchair, transfer to bed with head of bed elevated at least 45 degrees. If the patient is reclined for interventions, sit the patient up after intervention is completed.
- Check skin, loosen or remove any clothing, diaper, abdominal binder, compression stockings, or splints.
- Quickly survey the patient for instigating causes. If history of a recent acute injury such as fracture or a painful procedure, proceed immediately to administration of oral or IV fast-acting opioid (see pharmacologic interventions below), then continue to evaluate for other causes.
- Urological
    - If an indwelling urinary catheter is not in place, catheterize the patient.
    - Consider performing a bladder scan.
    - If unable to pass catheter, consider attempting to pass Coude' catheter or consult Urology.
    - If an indwelling urinary catheter is in place, check the system along the entire length for kinks, folds, constrictions or obstructions, and correct problem if found.
    - If the catheter appears to be blocked, gently irrigate the bladder with 10-15 ml of normal saline and withdraw. Stop if more than mild resistance is encountered and change the catheter.
- If symptoms persist, suspect fecal impaction. Perform digital rectal exam and remove any stool.
    - If AD worsens with manual evacuation, stop. Using a gloved finger, coat the external surface of the anus with 2 percent lidocaine jelly and insert a small amount into the rectum. Wait two minutes to remove stool. Use more lidocaine jelly as lubricant for rectal check.
    - If the patient has a known history of AD during bowel program, use lidocaine as above to perform rectal check and removal of stool.

Monitoring:

- Check the blood pressure and heart rate every three to five minutes until the AD has resolved.
- When systolic blood pressure normalizes, recheck vital signs every 15 minutes for one hour and again at two hours.

Pharmacologic intervention:

- First line medications

    - If the patient has had an acute injury such as fracture, surgery, or painful medical procedure, or if the patient has used phosphodiesterase-5 inhibitors in the past 24 hours, proceed to second line pharmacologic interventions (below).
    - Nitroglycerin: Apply ½ to 1 inch of nitroglycerin 2 percent topical ointment on hairless skin of upper chest or arm. This has very rapid onset of action and can be wiped off with rapid cessation of action.
    - If after 10 minutes blood pressure is still above baseline parameter, apply an additional ½ to 1 inch of nitroglycerin 2 percent topical ointment, to another area of hairless skin on upper chest or arm.
    - If systolic blood pressure remains elevated after application of the second dose of nitroglycerin 2 percent topical ointment, escalate care and proceed to second line pharmacologic interventions.
    - With gloves, wipe off nitroglycerin ointment when systolic blood pressure falls below 100 mm Hg (remove Tegaderm and measuring paper, use dry cloth or 4x4 to remove ointment from skin).
- Second line medications
    - Hydralazine: If two doses of nitroglycerin 2 percent topical ointment have failed to lower blood pressure, or if the patient has used a phosphodiesterase-5 inhibitor such as sildenafil, tadalafil, vardenafil, or avanafil in the past 24 hours, administer oral hydralazine 0.25 mg/kg (max dose 10 mg). Hydralazine may be repeated in 10 minutes if the blood pressure remains elevated.
    - If the patient has an acute injury (e.g. fracture) or has had a medical or surgical procedure that could cause pain in a sensate person, administer oral or IV fast acting opioid.

An algorithm that highlights the common symptoms and interventions is in Appendix B.

Diagnostics

Perform a bladder scan to assess the degree of bladder distension.

Special Populations

Pediatrics
The pathophysiology, signs and symptoms, and management of AD in children and adolescents with SCI are similar to those of the adult SCI population. The major differences relate to developmental variations in blood pressure in children and adolescents, appropriate sizing of blood pressure cuffs, the relative inability of children to communicate the symptoms, and the varying dependence of children upon their parents/guardians. Patients with SCI have baseline blood pressures that run lower than predicted by age. Typical systolic blood pressures for children with SCI average 90 to 110 mmHg where adults with range from 110 to 130 mmHg.

Elevations of systolic blood pressure in young patients with SCI that may be a sign of AD:

- Adolescents: more than 15-20 mmHg above their baseline
- Children: more than 15 mmHg above their baseline

Online Resources

Christopher Reeve Foundation (https://www.christopherreeve.org)

- Wallet Card (adult) (espanol)
- Wallet Card (pediatric) (espanol)
- Paralysis Resource Guide

Paralyzed Veterans of America (https://pva.org)

- Clinical Practice Guidelines
- Acute Management of Autonomic Dysreflexia Guideline

Seattle Children's Hospital

- Autonomic Dysreflexia Pathway

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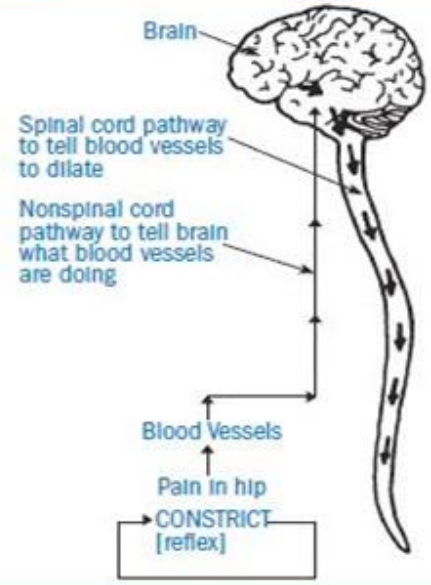
Appendix A. The Body's Response To Pain

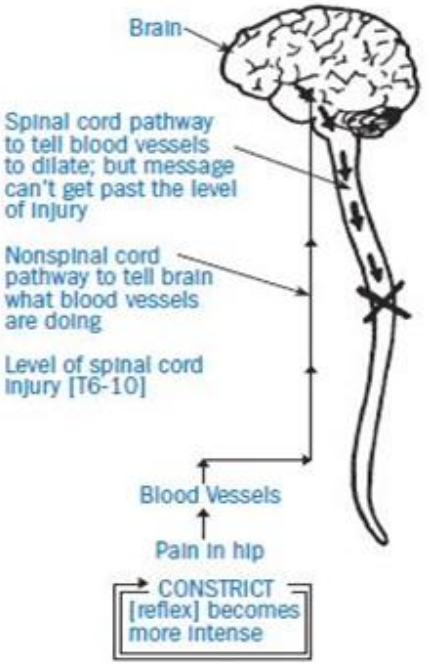
BEFORE SCI

1. Blood vessels constrict by reflex action in response to pain and raise your blood pressure.
2. Nerves send messages up to your brain through your spinal cord, and you feel the pain.
3. Your brain senses that the blood vessels are constricting and your blood pressure is too high.
4. Your brain sends a message down through the spinal cord to dilate [open up] your blood vessels, which lowers your blood pressure.



AFTER SCI

1. Blood vessels constrict by reflex action in response to pain and raise your blood pressure [same as before SCI].
2. You will most likely not feel the pain because the messages can't pass through the injured spinal cord and up to your brain.
3. Your brain senses that the blood vessels are constricting and blood pressure is too high [same as before SCI].
4. The area from T7 to T10 of the spinal cord sends messages to many of the blood vessels in your body. If your injury is at or above T6 level, your brain can't get the dilation message back down to the blood vessels below your injury. Your blood pressure stays high because the shut-off valve to lower it doesn't get the signal.



Appendix B. Autonomic Dysreflexia Treatment Algorithm