

RANCHO LOS AMIGOS
NATIONAL REHABILITATION CENTER



Autonomic Dysreflexia & Management of Acute Episode

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Learning Objectives

What you will learn today:

1. What is autonomic dysreflexia ?
 - Clinical presentation
 - What are the most common causes
2. Who is at risk?
3. Clinical management of Acute episode of AD



What is Autonomic Dysreflexia (AD)

- **Autonomic dysreflexia (AD)** is a syndrome characterized by a sudden **rise in systolic and diastolic blood pressure** in response to noxious stimuli below the level of injury.
 - Elevation of blood pressure: range from 20 mmHg above baseline (systolic & diastolic) to over 200 mmHg in systolic and 100 mmHg in diastolic.
- **Common symptoms:** sudden onset of pounding headache, sweating, flushing above the level of injury, nasal congestion, piloerection, anxiety, and rarely, visual disturbances
- **Mostly associated** with reflex bradycardia
 - Tachycardia or other cardiac arrhythmia are possible.



Autonomic Dysreflexia (AD)

- **Medical emergency** due to life threatening episodes of hypertension
- **Untreated AD** can lead to intracerebral hemorrhage, MI, retinal detachment, seizure, and death.
- **Incidence:** varies between 18% to 85% of tetraplegic and high paraplegic patients
- **Timing:** usually happens after the period of neurogenic shock is over, about 5 weeks to 2 months post injury.
- **Pathophysiology:** acute syndrome of massive sympathetic discharge that occurs as a result of noxious stimuli in person with spinal cord lesions above the level of the sympathetic splanchnic outflow, about T6. The noxious stimuli causes a sudden reflex sympathetic activity, uninhibited by supraspinal centers, resulting in profound vasoconstriction and other autonomic responses.
- **Individuals at risk:** SCI patients with cervical and high thoracic injury above T6 level
 - T10 neurological level during labor was reported, less common



Blood pressure in individuals with SCI

- Blood pressure in individuals with cervical and high-thoracic SCI is **lower** than that in able-bodied subjects
- **Normal systolic blood pressure** in individuals with spinal cord injury:
 - about 110 mmHg in supine
 - 90-100 mmHg in seated position
- **Hypertension**: 20 mmHg higher than baseline



What are the common causes of AD

- **Most common** - **Bladder** and bowel distension
- Pressure sores, ingrown toenails, tight clothing, tight shoes and leg bag straps, urinary tract infection, uterine contractions in pregnant women
- Any invasive procedure: such as, bladder catheterization, rectal stimulation, cystometrogram, and extracorporeal shock wave lithotripsy etc.

TABLE 55-2 Stimuli Which Can Provoke Autonomic Dysreflexia

Urological
Bladder distention, spontaneous or induced (irrigation)
Bladder instrumentation (catheterization, cystoscopy, cystometry, cystourography, conduit loopography)
Urinary tract infection or other mucosal irritation
Hemorrhagic cystitis
Genital
Testicular torsion
Epididymitis
Testicular pressure
Sexual intercourse
Uterine contractions
Vaginal examination
Renal distention
Gastrointestinal
Rectal examination
Fecal impaction
Enemas
Instrumentation
Acute abdominal syndromes
Operative interventions
Exposure to cold or high temperature
Other
Decubitus ulcers
Anesthesia
Thrombophlebitis
Pulmonary infarction
Restraints
Tight clothing
Hypotension

From Sutin JA, de Greco F: Blood pressure disorders in the disabled. In Green D (ed): Medical Management of Longterm Disability. Stoneham, Mass, Butterworth-Heinemann, 1990.



Management of acute episode of AD

- **Recognize the symptoms of AD**
 - Sudden onset of Hypertension
 - AD associated symptoms
- **First action**
 - Raise the head of patient's bed or sit patient up
 - Monitor blood pressure every 5 min
- **Identify and remove the trigger(s)**
 - Bladder catheterization (IC), irrigation, changing Foley
 - Rectal manual evacuation of stool
 - Apply 2% Lidocaine gel first to minimize stimulation
 - Loosen any tight clothing or restrictive devices (abdominal binder, TED hose).
 - In most cases, identifying the noxious stimuli and removing it resolve the episode, often quickly
- **Pharmacological management**



Pharmacological intervention

- Medication may be necessary to the lower the blood pressure
 - If SBP is above 150 mmHg and
 - the precipitant cause can not be readily identified and treated, and the symptoms persist
- Medications may be used: Refer to table on the right (ref.1)
 - **First line treatment:** 2% Nitroglycerin ointment: we start with 1”
 - Rapid onset, can be removed easily
 - Nifedipine: SL: **NOT** recommended
- If AD can not be controlled
 - consider admission to ICU for iv Nitroglycerine

Appendix 2
Medications Used for Autonomic Dysreflexia

Name of Drug	Dose and Route of Administration	Onset of Action	Duration of Action	Precautions ⁴
2% Nitroglycerin ointment ^{1,2} - first-line treatment	Spread thin layer of 0.5 to 2 inches (1.25 to 5 cm) topically on clean, dry, hair-free site on chest or back	15 to 30 minutes	7 hours	- Do not administer within 24 hours of sildenafil or vardenafil or within 48 hours of tadalafil - Avoid in individuals with severe anemia - Avoid in individuals with increased intracranial pressure
Captopril	25 mg sublingually once	Within 15 minutes (peaks at 1 to 2 hours)	2 to 6 hours (prolonged in renal impairment)	- Avoid in individuals with renal failure, inability to predict effect
Clonidine	0.1 - 0.2 mg orally	30 to 60 minutes (oral) (peaks at 1 to 3 hours)		- Avoid in individuals with severe renal impairment and with a history of cerebral vascular disease, recent myocardial infarction, or severe heart failure
Hydralazine	10 - 20 mg orally once	20 to 30 minutes (peaks at 1 to 2 hours) - affected by food	2 to 4 hours, although some sources state up to 12 hours (hypotension may last longer)	- Avoid in individuals with renal failure - Avoid in individuals with coronary artery disease or rheumatic heart disease - Avoid in individuals with acute stroke - Avoid in individuals with congestive heart failure
Nifedipine IR ³	10 mg orally or sublingually* once	~20 minutes (oral) ~10 minutes (sublingual) (peaks at 0.5 to 2 hours)	8 hours	- Avoid in individuals with symptoms of acute angina or coronary artery disease - Avoid in elderly individuals - Avoid in individuals with hepatic disease

Note: These drugs are not presented in the recommended order in which they should be used; rather, they have all been effective in treating increased blood pressure (BP) due to autonomic dysreflexia.

Sources: Clinical Pharmacology and Lexicomp monographs for each of the drugs in the table.

1. Nitropaste is not available in some countries.
2. Prior to the use of nitropaste or any other agent containing nitrate, first inquire whether the individual has recently taken a phosphodiesterase inhibitor (PDEi). Use of nitropaste when an individual has recently taken a PDEi is contraindicated because a combination of the 2 drugs can cause a sudden severe drop in BP.
3. Sublingual nifedipine has variable and unpredictable absorption and is not recommended because there is little difference in bioavailability when compared with swallowing nifedipine whole.
4. During post-treatment with pharmacological agents, it is important to monitor BP for possible hypotension (if this occurs, see Section 7, Orthostatic Hypotension) or recurrence of hypertension as the pharmacological agent wears off.



Case discussion - M&M

- 23 yo male with PMH of incomplete tetraplegia secondary to a GSW on 3/14/2021, Neurogenic bowel and bladder, sacral decubitus ulcer, and history of urethra injury s/p suprapubic catheter placement. Admitted to Rancho for inpatient rehab on 8/5/2022 from HUCLA. Dx: **SCI, incomplete tetraplegia, C3 ASIA B**, baseline bp: 90s/50s to 100s/60s, HR 60 – 70s bpm.
- 03:00 (8/9): Patient was complaining of a **7/10 headache**. Oxycodone 5 mg was given.
- 04:00 Patient was still complaining of a headache. **BP 185/101**. RN removed heel protectors, dressings, and gown. Manual stool evacuation was done with a medium size stool removed. RN notice patient is leaking from his **suprapubic stoma**. Try to flush stoma but was unable to due to a **possible clog**. Unable to do IC due to Hx of urethra injury.
- 04:40 bp 166/92, Called on call physician, he prescribed **hydralazine** 10 mg PO x 1.
- 05:17 Patient's BP remain high (bp 179/100) after taking hydralazine. RN spoke with on call MD, he prescribed 2% nitroglycerin ointment. **1" 2% Nitroglycerine ointment (Nitro-past)** applied to upper chest
- 05:30 Patient abdomen looked distended; **bladder scan showed there was about 658 ml of urine in bladder**. Called on call urologist who instructed RN to **replace the suprapubic catheter**. When RN removed catheter and urine started to squirt out from the stoma. After inserted the new catheter, about 400 ml of urine was collected. Patient started to complain that he felt dizzy. BP was checked again and **dropped to 58/41**. Patient was arousable but would fall right back asleep.
- 05:50 Patient BP continue to drop, and a **rapid response was called**.
- Patient was placed in Trendelenburg position; 1 L NS bolus was given. no other acute issue reported
- 0720 bp 109/55, HR 72,
- 0900 repeated bp 68/?, patient continued stay in Trendelenburg position, IVF was given.
- Medical day



Case discussion – what did we do wrong

- Headache: **did not check blood pressure**
- When bp 185/101, assumed AD was diagnosed:
 - was given **oral hydralazine**, instead of giving first line medication 2% Nitroglycerine ointment (Nitro-past)
 - **Predisposed patient for hypotension**
- When BP remained high after given oral hydralazine (onset 20 to 30 min, peak 1-2 hr) for 37 min
 - 2nd agent was given: 2% Nitroglycerine ointment (Nitro-past)
- **Bladder volume was not checked** in the beginning of suspected AD, until 1:30 min later when hypertension was noted, and suspected suprapubic catheter blocking
- Consequences:
 - Led to miss out opportunity to diagnose AD and to intervene in a timely manner, led to profound hypotension when trigger of AD was removed, because of over-correction of hypertension with oral medication.
 - As result of above suboptimal management, patient needed to be treated for hypotension (could be avoidable) and lost a therapy day.



Case discussion – Correct Approach

- 23 yo male with **cervical SCI, C3 ASIA B** secondary to a GSW on 3/14/2021, Neurogenic bowel and bladder, sacral decubitus ulcer, and history of urethra injury s/p suprapubic catheter placement. baseline blood pressure: 90s – 100s/50s – 60s, HR 60 – 70s bpm. Admitted to Rancho on 8/5/2022 (about 1.5 years after initial SCI).
 - At high risk for autonomic dysreflexia
- 0300 (8/9): Patient was complaining of a **7/10 headache**. ~~Oxycodone 5 mg was given.~~
 - Check bp,
 - Sit patient up if sbp > 20 mmHg of his baseline, e.g.: sbp 140 mmHg, (Diagnosed with AD)
 - To identify trigger cause: Check bladder volume by bladder scan, loosen clothing
 - Bladder volume likely is high: 400 ml to 653 ml - **may already identify cause of the AD**
 - monitor bp while trying to empty bladder
- 0400 (1 hr after onset of HA): Patient was still complaining of a **headache**. **BP 185/101**. **clogged suprapubic stoma was suspected**. **Unable to do IC due to Hx of urethra injury**.
 - Apply 1” 2% Nitro past to upper chest
 - monitor blood pressure
 - Call Urologist for management of clogged suprapubic catheter in order to empty the bladder
 - Move the clogged suprapubic catheter, and replace a new catheter to empty the bladder
 - – **may have resolved AD at this time**
 - Remove Nitro Past when blood pressure dropped to 130 mmHg, and AD resolved – **treatment completed**
- Continue to monitor blood pressure for the next 2 hrs to ensure bp remains stable



Case discussion – Difference that made with proper acute AD management:

- Likely resolved AD in 30 to 60 minutes
 - Avoid delay in diagnosis and treatment
 - Avoid worsening of hypertension
 - Avoid over correct and sudden drop in blood pressure with oral anti-hypertensive medication
 - Avoid rapid response call
 - Avoid unnecessary treatment of hypotension due to over correction of hypertension.
 - Avoid losing of a therapy day



Case discussion – Take Home Message

- **Be familiar** with AD associated symptoms
- **Be Vigilant** for AD if patient with cervical or high thoracic (above T6) SCI complaint of AD associated symptoms
 - Headache, sweating, flushing above the level of injury, nasal congestion, piloerection, anxiety, etc.
- If AD suspected, **check blood pressure**, HR
 - Sit patient up and raise head of the bed if blood pressure is high
 - Monitor blood pressure if bp is high
- If AD diagnosed, identify trigger(s) in order to manage blood pressure
 - Quickly survey for triggers
 - Start with **bladder**: IC, check Foley for blocking, kink, etc.
 - Check stool to r/o stool impaction, etc.
 - Loosen any tight clothing or restrictive devices (abdominal binder, TED hose).
- If Pharmacological management is needed
 - **2% Nitroglycerine ointment (Nitro Past) is the first line medication**
 - Rapid onset
 - can be easily removed when AD resolved, and hypertension improved



AD Card


AUTONOMIC DYSREFLEXIA

Autonomic Dysreflexia is an abnormal overreaction of the nervous system to noxious Stimuli in individuals with spinal cord injury at levels T6 and above.

- Fast increase in blood pressure
20-40 mm Hg systolic higher than normal.
- Sweating above level of injury.
- Red or flushed skin above level of injury.
- Stuffy nose.

**COMMON WARNING
SIGNS**

- Pounding headache.
- Blurred vision.
- Goose bumps above level of injury.

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What to do:

- **Sit up**-sit or raise head 90 degrees.
- **Check blood pressure**- every 5 minutes.
- **Check bladder**-empty bladder or check indwelling catheter for kinks/blockage.
- **Check bowel**-Check for stool and empty if needed.
- **Check clothing**-loosen or take off any tight clothing.
- **Check skin**-look for new cuts, pressure ulcers, wounds, burns, insect bites, etc.
- **Find any other source**- Look for any other source of painful stimuli if not resolved.
- **Get help**- If unable to resolve symptoms, call 911 or go to the nearest emergency room.

Attention Physician

The following are some common treatments for AD.

- Monitor BP every 2-3 minutes.
- Assess abdomen for distended bowel/bladder.
- Check indwelling catheter for kink/obstruction.
- Monitor symptoms and BP 2 hours after resolution of AD episode.
- If SBP > 150mm Hg-apply 1" Nitro paste every 30 minutes, above level of spinal cord injury. Hold if patient has taken PDE inhibitors within 24 hours.



References

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2. Autonomic dysreflexia after spinal cord injury: Systemic pathophysiology and methods of management

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- DOI: [10.1016/j.autneu.2017.05.002](https://doi.org/10.1016/j.autneu.2017.05.002)
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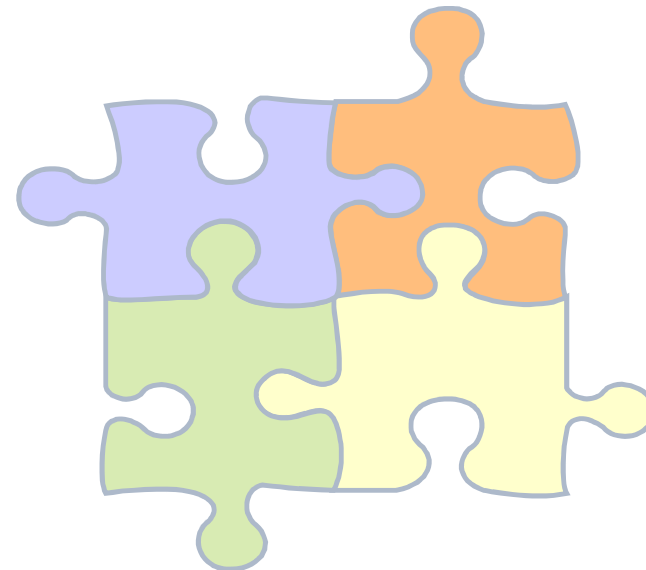
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The End

Questions?





תודה
Dankie Gracias شكراً
Спасибо Merci Takk
Köszönjük Terima kasih
Grazie Dziękujemy Dékojame
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Thank You Tak
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ありがとうございます
Tack