

Autonomic Dysreflexia and Other Autonomic Dysfunctions Following Spinal Cord Injury

1.0 Chapter Summary

What is autonomic dysreflexia?

Autonomic dysreflexia (AD) is a potentially life-threatening condition that can affect people who have had a spinal cord injury *at the level of T6 or above* (sometimes as low as T8, though rare – nerves from T6 control a large group of blood vessels that supply the lower body and many of the organs of the abdomen, such as the stomach and intestines; generally speaking, the higher the level of injury, the more likely it is that the circulatory system will be affected^{1,2,3}). People with complete injuries are more often affected than people with incomplete injuries.

AD is a medical emergency that requires an immediate response. It occurs more often in the long term phase of SCI, but can happen in the first few months after injury as well. Episodes of autonomic dysreflexia are usually brief in duration and in most cases have an identifiable trigger that causes the episode^{3,4,5,6}.

What are the signs and symptoms of autonomic dysreflexia?

The main sign of autonomic dysreflexia is a sudden rise in blood pressure. An increase of 20 to 30 mmHg above your patient's normal *systolic blood pressure* is considered to indicate autonomic dysreflexia. Since the normal blood pressure of a person with a spinal cord injury can often be 15 to 20 mmHg lower than a person without a spinal cord injury, blood pressure can be in the range of 'normal' or 'slightly elevated' and still indicate an episode of AD.

This rise in blood pressure is usually accompanied by other symptoms. These can range from not feeling anything or having some mild discomfort and a headache to a life-threatening emergency where symptoms can be severe. Symptoms can range from not feeling

Signs and symptoms of autonomic dysreflexia:

- Sudden rise in blood pressure of 20 to 30 mmHg above the person's normal *systolic blood pressure* (main symptom)
- Change in heart rate – usually a slow heart rate which can sometimes become rapid or irregular
- Pounding or throbbing headache
- Profuse sweating, flushing or blotching of the skin above the level of injury
- Goosebumps or hair standing on end above the level of injury
- Dry and pale skin below the level of injury
- Increased number and severity of muscle spasms
- Metallic taste in the mouth
- Feeling anxious or a feeling of impending doom
- Nasal congestion
- Blurred vision
- Seeing spots
- Nausea
- Difficulty breathing or a feeling of chest tightness

anything or having some mild discomfort and a headache to a life threatening emergency where symptoms can be severe. It is important for patients and clinicians to be able to recognize the symptoms of AD so you can act accordingly. Clinicians should also be aware that in some individuals with SCI, AD could occur without any symptoms and this condition known as a silent or asymptomatic AD ^{7,8}.

While autonomic dysreflexia happens most often in the long term stage after injury, it can happen on occasion in the immediate post-injury period.

Why does autonomic dysreflexia happen?

Autonomic dysreflexia is the result of overactivity of the sympathetic nervous system in response to a strong sensory stimulus below the level of injury. This stimulus is often something that is noxious or irritating, such as a wound or tight clothing, but can also be a normal function of the body, such as an overly full bladder or bowel. In response to this stimulus, the sympathetic nervous system signals the arteries to constrict, which increases blood pressure. This increase in blood pressure is followed by a slowing of the heart rate which can then sometimes become irregular. Because of the damage to the spinal cord, the body can't effectively control the blood pressure and restore it to normal, resulting in autonomic dysreflexia. The most common trigger is irritation of the bladder or bowel.

Triggers of autonomic dysreflexia

Bladder issues

- Urinary tract infection
- Urinary retention
- Blocked catheter
- Overfilled collection bag

Skin issues

- Pressure ulcers
- Extreme heat or cold
- Pressure or pinching of the skin
- Ingrown toenails
- Burns
- Tight clothing
- Any direct irritant below the level of the injury

Other causes

- Heterotopic ossification
- Acute abdominal conditions (such as ulcers)
- Fractures

Bowel issues

- Distention or irritation of the bowel
- Constipation or impaction of the bowel
- Hemorrhoids
- Infection or irritation of the bowel

Sexual activity and reproductive processes

- Overstimulation
- Reproductive activity
- Menstrual cramping
- Labor and delivery

What should I do if my patient has an episode of Autonomic Dysreflexia?

Autonomic Dysreflexia is a medical emergency and requires immediate treatment. The most effective treatment strategy is to identify the trigger of the episode and reduce the stimulation that is causing it. The goal of intervention is to alleviate symptoms and avoid the complications associated with uncontrolled hypertension^{9,10,11,12}.

If the conservative treatments for autonomic dysreflexia are not effective in reducing blood pressure and it remains at or above 150 mmHg, drug treatments are used. This involves the use of fast-acting anti-hypertensive drugs to rapidly lower the elevated blood pressure.

Which prevention methods are effective?

Preventing an AD episode is far more effective than treating one¹³. Researchers have done studies on a number of different treatments to see which ones are helpful in preventing incidents of autonomic dysreflexia^{14,15}.

Capsaicin: Studies have shown that administering the chemical compound Capsaicin, and its more concentrated cousin Resiniferatoxin, into the bladder by a catheter, can decrease the number of episodes of AD during bladder procedures^{16,17,18}.

Surgical bladder augmentation: Some early evidence suggests that surgery to augment the bladder may also reduce or resolve episodes of AD^{19,20,21,22}.

Sacral denervation: Sacral deafferentation surgery may reduce bladder-related episodes of AD^{23,24}.

Botulinum toxin: One study has demonstrated that injections of Botulinum toxin into the muscles of the bladder is effective in reducing episodes of AD²⁵, which is supported by previous findings^{26,27,28,29,30}.

Anticholinergic medications: The use of anticholinergic medications does not appear to be effective in preventing AD during bladder procedures³¹.

Lidocaine: A lidocaine anal block has been found to limit the AD response in patients undergoing anorectal procedures. Topical lidocaine may prevent AD during digital bowel stimulation, but not during anorectal procedures^{32,33,34}.

Anesthesia for use during pregnancy and labour: Studies have found that the use of adequate anesthesia (spinal or epidural if possible) is needed with vaginal, Caesarean, or instrumental delivery to prevent AD during labour. Epidural anesthesia is preferred and effective for most women with SCI^{35,36,37,38}.

What to do if your patient has autonomic dysreflexia

1. Move patient into an upright sitting position
2. Check blood pressure, and re-check every 5 minutes
3. Loosen tight clothing
4. Search for and eliminate the cause of the incident where one can be identified
 - a. Check bladder
 - b. Check bowel
 - c. Check skin
5. Seek medical attention if there is no reduction in blood pressure after following these steps

Source: [Consortium for Spinal Cord Medicine 2001](#)).

Anesthesia for use during general surgery: Anesthesia should be used during surgery for people with SCI despite the apparent lack of sensation, in order to prevent AD. Anesthesiologists and surgeons dealing with patients with SCI need to be able to recognize, prevent and manage it^{39,40}.

Topical anesthesia during functional electrical stimulation (FES) treatment: Studies have found that the application of topical anesthesia is not effective in preventing AD during FES treatment. More research is required to understand how to prevent AD during FES⁴¹.

Stoma surgery: There is preliminary evidence that stoma surgery may reduce the number of incidents of autonomic dysreflexia, if other treatments have failed to improve management of neurogenic bowel⁴².

Where can I find more information?

For more information please click through the rest of the Autonomic Dysreflexia chapter (<https://scireproject.com/evidence/rehabilitation-evidence/autonomic-dysreflexia-re/>) and consult a Doctor who specializes in SCI and/or Cardiovascular issues.

References

1. Krassioukov AV, Furlan JC, Fehlings MG. Autonomic dysreflexia in acute spinal cord injury: an under-recognized clinical entity. *J Neurotrauma* 2003; 20: 707-16.
2. Curt A, Nitsche B, Rodic B, Schurch B, Dietz V. Assessment of autonomic dysreflexia in patients with spinal cord injury. *J Neurol Neurosurg Psychiatry* 1997; 62: 473-477.
3. Mathias CJ, Frankel HL. Cardiovascular control in spinal man. *Ann Rev Physiol* 1988; 50: 577-592.
4. Teasell RW, Arnold JM, Krassioukov A, Delaney GA. Cardiovascular consequences of loss of supraspinal control of the sympathetic nervous system following spinal cord injuries. *Arch Phys Med Rehabil* 2000;81:506-516.
5. Karlsson AK. Autonomic dysreflexia. *Spinal Cord* 1999; 37: 383-391.
6. Elliott S, Krassioukov A. Malignant autonomic dysreflexia in spinal cord injured men. *Spinal Cord* 2006; 6: 386-392.
7. Eklund M, Krassioukov A, McBride KE, Elliott SL. Incidence of autonomic dysreflexia and silent autonomic dysreflexia in men with SCI undergoing sperm retrieval: Implications for clinical practice. *J Spinal Cord Med* 2008; 30: 43-50.
8. Linsenmeyer TA, Campagnolo DI, Chou IH. Silent autonomic dysreflexia during voiding in men with spinal cord injuries. *J Urol* 1996; 155: 519-22.
9. Vallès M, Benito J, Portell E, Vidal J. Cerebral hemorrhage due to autonomic dysreflexia in a spinal cord injury patient. *Spinal Cord* 2005;43:738-740.
10. Eltorai I, Kim R, Vulpe M, Kasravi H, Ho W. Fatal cerebral hemorrhage due to autonomic dysreflexia in a tetraplegic patient: case report and review. *Paraplegia* 1992; 30: 355-360.
11. Pine ZM, Miller SD, Alonsa JA. Atrial fibrillation associated with autonomic dysreflexia. *Am J Phys Med Rehabil* 1991; 70: 271-273.
12. Yarkony GM, Katz RT, Wu Y. Seizures secondary to autonomic dysreflexia. *Arch Phys Med Rehabil* 1986; 67: 834-835.
13. Braddom RL, Rocco JF. Autonomic dysreflexia. A survey of current treatment. *Am J Phys Med Rehabil* 1991; 70: 234-241.
14. Courtois F, Rodrigue X, Cote I, Boulet M, Vezina J-G, Charvier K, Dahan V. Sexual function and autonomic dysreflexia in men with spinal cord injuries: How should we treat?. *Spinal Cord* 2012; 50: 869-877.
15. Krassioukov A, Warburton DE, Teasell R, Eng JJ. A systematic review of the management of autonomic dysreflexia after spinal cord injury. *Arch Phys Med Rehabil* 2009; 90: 682-695.
16. Igawa Y, Satoh T, Mizusawa H, Seki S, Kato H, Ishizuka O, Nishizawa O. The role of capsaicin-sensitive afferents in autonomic dysreflexia in patients with spinal cord injury. *BJU Int* 2003; 91: 637-641.
17. Kim JH, Rivas DA, Shenot PJ, Green B, Kennelly M, Erickson, JR, O'Leary M, Yoshimura N, Chancellor MB. Intravesical resiniferatoxin for refractory detrusor hyperreflexia: a multicenter, blinded, randomized, placebo-controlled trial. *J Spinal Cord Med* 2003; 26: 358-363.
18. Giannantoni A, Di Stasi SM, Stephen RL, Navarra P, Scivoletto G, Mearini E, Porena M. Intravesical capsaicin versus resiniferatoxin in patients with detrusor hyperreflexia: a prospective randomized study. *J Urol* 2002; 167: 1710-1714.
19. Ke QS, Kuo HC. Transurethral incision of the bladder neck to treat bladder neck dysfunction and voiding dysfunction in patients with high-level spinal cord injuries. *Neuro Uro* 2010; 29: 748-752.

20. Perkasch I. Transurethral sphincterotomy provides significant relief in autonomic dysreflexia in spinal cord injured male patients: Long-term followup results. *J Urol* 2007; 177: 1026-1029.
21. Sidi AA, Becher EF, Reddy PK, Dykstra DD. Augmentation enterocystoplasty for the management of voiding dysfunction in spinal cord injury patients. *J Urol* 1990; 143: 83-85.
22. Barton CH, Khonsari F, Vaziri ND, Byrne C, Gordon S, Friis R. The effect of modified transurethral sphincterotomy on autonomic dysreflexia. *J Urol* 1986; 135: 83-85.
23. Hohenfellner M, Pannek J, Botel U, Bahms S, Pfitzenmaier J, Fichtner J, et al. Sacral bladder denervation for treatment of detrusor hyperreflexia and autonomic dysreflexia. *Urol* 2001; 58: 28-32.
24. Kutzenberger J. Surgical therapy of neurogenic detrusor overactivity (hyperreflexia) in paraplegic patients by sacral deafferentation and implant driven micturition by sacral anterior root stimulation: methods, indications, results, complications, and future prospects. *Acta Neurochir Suppl* 2007; 97: 333-339.
25. Fougere RJ, Currie KD, Nigro MK, Stothers L, Rapoport D, Krassioukov AV. Reduction in Bladder-Related Autonomic Dysreflexia after OnabotulinumtoxinA Treatment in Spinal Cord Injury. *J Neurotrauma*. 2016;33(18):1651-7.
26. Chen SF, Kuo HC. Improvement in autonomic dysreflexia after detrusor onabotulinumtoxinA injections in patients with chronic spinal cord injuries. *Tzu Chi Medical Journal* 2012; 24: 201-204.
27. Chen SL, Bih LI, Huang YH, Tsai SJ, Lin TB, Kao YL. Effect of single botulinum toxin A injection to the external urethral sphincter for treating detrusor external sphincter dyssynergia in spinal cord injury. *J Rehabil Med* 2008; 40: 744-748.
28. Kuo HC. Satisfaction with urethral injection of botulinum toxin A for detrusor sphincter dyssynergia in patients with spinal cord lesion. *Neurourol Urodyn* 2008; 27: 793-796.
29. Schurch B, Stohrer M, Kramer G, Schmid DM, Gaul G, Hauri D. Botulinum-A toxin for treating detrusor hyperreflexia in spinal cord injured patients: a new alternative to anticholinergic drugs? Preliminary results. *J Urol* 2000; 164: 692-697.
30. Dykstra DD, Sidi AA, Scott AB, Pagel JM, Goldish GD. Effects of botulinum A toxin on detrusor-sphincter dyssynergia in spinal cord injury patients. *J Urol* 1988; 139: 919-922.
31. Giannantoni A, Di Stasi SM, Scivoletto G, Mollo A, Silecchia A, Fuoco U, Vespasiani G. Autonomic dysreflexia during urodynamics. *Spinal Cord* 1998;36:756-860.
32. Furusawa K, Sugiyama H, Tokuhira A, Takahashi M, Nakamura T, Tajima F. Topical anesthesia blunts the pressor response induced by bowel manipulation in subjects with cervical spinal cord injury. *Spinal Cord* 2009;47:144-148.
33. Cosman BC, Vu TT. Lidocaine anal block limits autonomic dysreflexia during anorectal procedures in spinal cord injury: a randomized, double-blind, placebo-controlled trial. *Dis Colon Rectum* 2005; 48: 1556-1561.
34. Cosman BC, Vu TT, Plowman BK. Topical lidocaine does not limit autonomic dysreflexia during anorectal procedures in spinal cord injury: a prospective, double-blind study. *Int J Colorectal Dis* 2002; 17: 104-108.
35. Skowronski E, Hartman K. Obstetric management following traumatic tetraplegia: case series and literature review. *Aust N Z J Obstet Gynaecol* 2008; 48: 485-491.
36. Cross LL, Meythaler JM, Tuel SM, Cross LA. Pregnancy, labor and delivery post spinal cord injury. *Paraplegia* 1992; 30: 890-902.
37. Cross LL, Meythaler JM, Tuel SM, Cross AL. Pregnancy following spinal cord injury. *West J Med* 1991; 154: 607-611.
38. Hughes SJ, Short DJ, Usherwood MM, Tebbutt H. Management of the pregnant woman with spinal cord injuries. *Br J Obstet Gynaecol* 1991; 98: 513-518.

39. Eltorai IM, Wong DH, Lacerna M, Comarr, AE, Montroy R. Surgical aspects of autonomic dysreflexia. *J Spinal Cord Med* 1997; 20: 361-364.
40. Lambert DH, Deane RS, Mazuzan JE. Anesthesia and the control of blood pressure in patients with spinal cord injury. *Anesth Analg* 1982; 61: 344-348.
41. Matthews JM, Wheeler GD, Burnham RS, Malone LA, Steadward RD. The effects of surface anaesthesia on the autonomic dysreflexia response during functional electrical stimulation. *Spinal Cord* 1997; 35: 647-651.
42. Coggrave MJ, Ingram RM, Gardner BP, Norton CS. The impact of stoma for bowel management after spinal cord injury. *Spinal Cord* 2012; 50: 848-852.