

# Autonomic dysreflexia in spinal cord injury patients: an overview

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## Introduction

As chiropractors, we pride ourselves in our knowledge of the nervous system. An autonomic nervous system condition common to patients with spinal cord injury (SCI) is autonomic dysreflexia (AD).<sup>1</sup> It is a syndrome of massive imbalanced reflex sympathetic discharge occurring in patients with SCI above the splanchnic sympathetic outflow (T5-T6).<sup>2</sup> Chiropractors can play an important role in detecting and managing a potentially fatal AD episode in evolution.<sup>3</sup> A patient may not be aware of the potential for AD in SCI, therefore risk factors for AD should be discussed in a thorough history of any SCI patient presenting to a clinical setting.<sup>4</sup> Any treatment, including chiropractors care, could potentially trigger an AD event in a vulnerable patient.<sup>5</sup> It is common for healthcare providers to miss an AD episode in evolution.<sup>4</sup>

## Mobility Clinics and Chiropractors

Adults with disabilities are high users of primary care.<sup>6</sup> They make three times as many visits to the family physician as their non-disabled contemporaries, and yet they report three times as many unmet needs.<sup>7</sup> There are 86,000 Canadians currently living with SCI and 4,300 new cases in Canada each year.<sup>8</sup> At the outset, the most obvious primary effects of SCI are not being able to walk or use the arms. However, there are a number of possible secondary complications including autonomic dysfunction (e.g. bladder function, bowel function, sexuality),

skin wounds, and respiratory issues.<sup>9</sup> When surveyed with respect to quality of life issues, SCI patients consider alleviation of autonomic dysfunction higher in their priority when compared to walking.<sup>10</sup>

Physiatrists often help manage the specialized health care needs of persons with SCI. However, there are only 340 physiatrists in Canada, not all of whom are in active clinical practice.<sup>11</sup> As a result, the bulk of medical care to disabled persons is delivered by family physicians who often have limited training, if any, with this group.<sup>11</sup>

To better service this population in primary care, The Centre For Family Medicine (CFFM) Family Health Team in Kitchener, Ontario has developed an inter-professional clinic for patients with mobility issues due to physical challenges. Since 2010, this “Mobility Clinic” has provided primary care for these patients including those with SCI. Specialized equipment including a ceiling lift, high/low examination table, and wheelchair scale make the clinic accessible and facilitate transfers. The goal is to “level the field” and have equal access to primary care for persons with mobility challenges. The inter-professional team includes a family physician, occupational therapist, physiotherapist, clinical pharmacist, social worker, nurse, and a chiropractor.

The chiropractic contribution at the mobility clinic is not unique and this has been done on purpose. The goal of the mobility clinic is to make the concept transferable to other family health teams (FHT) with the greatest of

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**Funding:** No funds were received for the preparation of this manuscript. The Centre For Family Medicine Mobility Clinic receives funding from the Ontario Neurotrauma Foundation. Dr. Riva is funded by an award from the NCMIC foundation. Dr. Bauman and Dr. Riva are members of the McMaster Chiropractic Working Group, which receives in-kind support from the Canadian Chiropractic Association.

**Competing Interests:** None

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ease. Different FHTs have different resources and professionals available and this must be considered. Therefore a physiotherapist could also fulfill the required skills. All team professionals require extra training in health issues related to SCI and continuing education has a strong emphasis with our group.

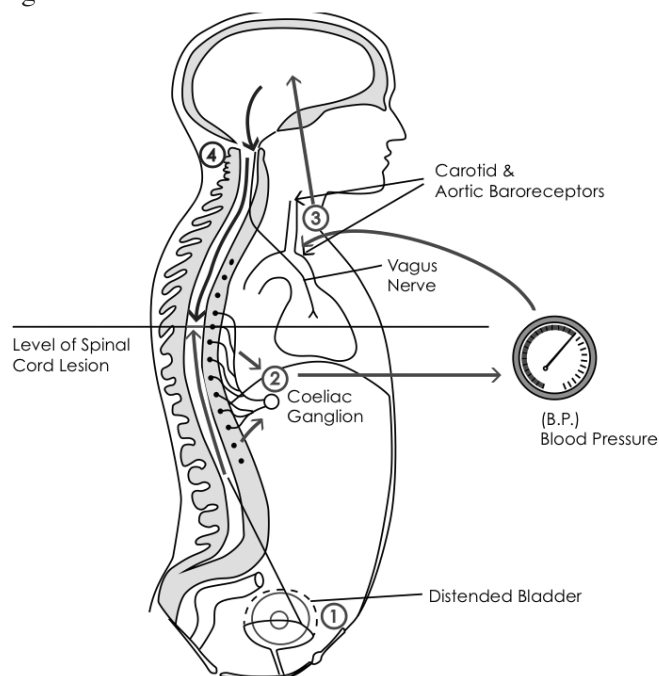
The CFFM is an academic teaching centre and as such has many learners from various disciplines (medicine, nursing, social work, pharmacy, chiropractic, optometry). AD is one of our key learning objectives for visiting learners. The goal at the Mobility Clinic is to increase knowledge of AD with health professionals and this includes chiropractors. Surprisingly, even some hospital emergency departments are not aware of this condition.<sup>1</sup> As a result we advise patients to carry prescribed medication, a wallet card with them that explains AD, and a medic alert bracelet.<sup>12</sup>

### AD Pathophysiology

AD is a condition of autonomic dysfunction commonly seen with SCI (see Figure 1).<sup>13</sup> Although it can be asymptomatic, the signs and symptoms of AD generally include a sudden increase in blood pressure, altered heart rate (reflex bradycardia or sometimes tachycardia),<sup>14</sup> anxiety, blurred vision, headache, flushing, and sweating above the level of injury.<sup>15</sup> Below the lesion level, skin pallor and piloerection are seen.<sup>16</sup> In serious cases, the paroxysmal hypertension can result in loss of consciousness,<sup>1</sup> cerebral and spinal subarachnoid hemorrhage, seizures, and pulmonary edema.<sup>10</sup> It is a potentially life-threatening episodic hypertension that develops in 50-90% of people with tetraplegia or high paraplegia.<sup>1</sup> AD is often seen in cases of a complete or incomplete spinal cord injury<sup>14</sup> to the T6 level or higher,<sup>12</sup> although it has been reported with as low as T8 injuries.<sup>17</sup> Incomplete SCI may allow the patient to walk and thus SCI would not be suspected, so a complete history is required. It is caused by spinal reflex mechanisms that remain intact despite the patient's injury.<sup>14</sup>

A nociceptive stimulus below the SCI level is transmitted up the spinal cord and triggers widespread reflex activity of the thoracolumbar sympathetic nervous system.<sup>2,12,16</sup> The most common noxious causes include bladder (distended or severely spastic bladder, urinary tract infection, bladder or kidney stones, urological procedure or even inserting a catheter), bowel (constipation, fecal

Figure 1



- 1) Strong sensory stimulus from below level of lesion (eg distended bladder) conveyed into spinal cord.
- 2) Signals transmitted up spinal cord initiate massive reflex sympathetic activation, causing widespread vasoconstriction (involving splanchnic blood vessels), and resulting in severe hypertension.
- 3) Brain detects a sudden rise in blood pressure (via signals from baroreceptors in aortic and carotid vessels carried in CNs IX and X).
- 4) Brain responds and attempts to control BP sending descending primary inhibitory impulses from brainstem via spinal cord (which are blocked). Impulses travelling through the vagus nerve cause secondary bradycardia.

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impaction, rectosigmoid gaseous distension, rectal irritation eg. enema or manual evacuation, hemorrhoids), and skin issues (ingrown toenail, burns, pressure area, tight clothing).<sup>16</sup> Any stimulus (menstruation, sexual intercourse, sunburn)<sup>15</sup> could cause an episode and this may potentially include chiropractic manual therapy or another

iatrogenic source.<sup>16</sup> The stimulation results in overactivity of the sympathetic nervous system and the release of nor-adrenaline and dopamine.<sup>16</sup> This causes vasoconstriction below the SCI that greatly increases blood pressure<sup>14</sup> and causes a pounding headache.<sup>16</sup> With lesions at T6 or higher, the critical mass of blood vessels constricts, including the splanchnic vascular bed, to cause hypertension.<sup>17</sup>

Raised blood pressure is sensed by baroreceptors in the aortic arch and carotid bodies.<sup>16</sup> This stimulates the parasympathetic nervous system via cranial nerves IX and X and results in bradycardia.<sup>16</sup> Descending sympathetic inhibitory outflow from the vasomotor centres in the brainstem cause vasodilation, also creating a headache and nasal congestion.<sup>14</sup> The resulting flushing and sweating occur only above the SCI level because the injury stops the inhibitory signals from being transmitted further down the spinal cord.<sup>16</sup> These vasodilation effects above the level of the lesion are not sufficient to lower the blood pressure.<sup>2</sup> The sympathetic ganglia below the SCI level remain uncontrolled and thus dangerous hypertension results.<sup>16</sup> To summarize, the sympathetics prevail below the level of neurologic injury, and the parasympathetic nerves prevail above the level of injury.<sup>2</sup> AD usually resolves with the removal of the precipitating stimulus.<sup>15</sup> In some cases, episodes do not resolve with removal of the stimulus.<sup>15</sup> The challenge is to identify the cause and fix it fast, because time is short. In severe cases with a persisting noxious stimulus, medication or transfer to an emergency department maybe required.<sup>14</sup>

### Managing Emergent AD

If an AD episode occurs in your presence, do not leave the patient alone<sup>12</sup> and ask if they know the cause.<sup>16</sup> Sit the patient upright if they are lying down (this position helps to lower blood pressure), loosen tight clothing and binders, and check their urine drainage bag.<sup>14</sup> If full, empty and monitor.<sup>1</sup> If empty, ask when was it last emptied and check for kinks in the tubing.<sup>1</sup> When did the patient last have bowel care?<sup>1</sup> Monitor the blood pressure every 2 to 5 minutes.<sup>14</sup> Ask the patient their normal resting blood pressure. 90-100/60 mmHg or lower is typical in an SCI patient.<sup>14,16</sup> A rise of 20 mmHg above resting defines an AD episode<sup>13</sup> so 120/80 mmHg, typical of the rest of the population, could be elevated for the patient.<sup>14</sup> Blood pressure can go as high as 250-300/200-220 mmHg.<sup>5</sup> If systolic blood pressure remains at or above 150 mmHg, call 911

for an ambulance to take the patient to the emergency room.<sup>14</sup> The patient may have medication that they can take on their own until they get to the Emergency Room (ER).<sup>1</sup> At the ER, medications like nifedipine, captopril, nitro paste, or sodium nitroprusside can be administered to lower blood pressure.<sup>1,3,14</sup> Make sure male patients tell the ER if they use sildenafil (Viagra) for erectile dysfunction as a combination with nitrates can cause a dangerous drop in blood pressure.<sup>14</sup>

Currently, prevention is the best approach for AD.<sup>10</sup> This means the patient and health professionals must closely monitor the bladder, bowel, skin, and other potential precipitants previously described. AD and its symptoms must be covered in a history with all SCI chiropractic patients.<sup>4</sup> Make sure the patient discusses AD with their family physician, if it is suspected and not diagnosed.

### Chiropractic with Spinal Cord Injured Patients

We are unaware of any scholarly literature regarding chiropractic care, spinal cord injured patients, and autonomic dysreflexia. Theoretically it is possible that all afferent stimulation below the lesion may induce a dysreflexia reaction.<sup>5</sup> This potentially could include any chiropractic treatment (ie soft tissue therapy, ultrasound, adjustment). AD episodes have been reported during such iatrogenic procedures such as urodynamic evaluation, extracorporeal shock wave lithotripsy, and percutaneous nephrolithotomy operations.<sup>5</sup> Fertility treatments including electroejaculation and vibrator stimulation have been reported to be associated with increased blood pressure assumed to be part of a dysreflexia reaction.<sup>5</sup> Functional electrical stimulation of paralysed legs to increase muscle size and improve metabolism may be associated with AD reactions.<sup>5</sup> A less common cause of AD during physical therapy treatment may originate with muscle stretching, either from range of motion or passive stretching.<sup>2</sup> Some of the treatments between physiotherapy and chiropractic care are similar, so the potential of an AD reaction is possible. If the patient develops AD during the chiropractic session, treatment should immediately be stopped to allow the patient to stabilize and recover.<sup>2</sup> The AD reaction should be treated as a medical emergency<sup>2</sup> and the previously stated steps followed.

### Conclusion

Chiropractors should have an awareness of the signs and

symptoms of AD in SCI patients that present to their office. They need to be cognizant of the triggers, potentially even the chiropractic treatment itself. If AD occurs, the patient needs close monitoring and the search and relief of the noxious stimulus can be attempted.<sup>18</sup> If the source of the emergent case of AD cannot be removed and the episode stopped, urgent referral to the ER offers these patients the best opportunity for a favourable prognosis.

### Take Home Points

- 1: Autonomic dysreflexia is a serious medical condition in some spinal cord injury patients.
- 2: AD causes a dangerous rise in blood pressure.
- 3: Engage the Emergency Medical System if blood pressure can not be quickly lowered.
- 4: Chiropractic treatment could potentially cause an AD episode, so we must be aware of the symptoms.

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