W6: Autonomic Dysreflexia (AD): a serious, rather underestimated condition
Workshop Chair: Charalampos Konstantinidis, Greece
03 September 2019 10:00 - 11:00

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**Aims of Workshop**

Autonomic Dysreflexia (AD) is a common complication among patients with Spinal Cord Lesion (SCL) located above the T6 level. Various stimuli below the spinal cord lesion may initiate the onset of AD. In most cases, the phenomenon subsides after the removal of the initial stimuli but sometimes is rapidly reactivated and progressive overexpressed causing uncontrolled blood hypertension with the severe danger of stroke or other cardiovascular accidents (CVAs).

The establishment of adequate awareness among the health care providers and the individuals with SCL is our main goal which may occur by the deep understanding of the pathophysiology of AD. The proper prevention and management of the syndrome are essential for our patient’s life.

**Learning Objectives**

- Understanding the pathophysiology of Autonomic Dysreflexia (AD)
- Recognizing the signs and symptoms of an AD episode.
- How to manage AD episodes.
- How to assess AD episodes and educate patients with SCL.

**Target Audience**

Rehabilitation team working with patients with spinal cord injury, physicians and therapists.

**Advanced/Basic**

Intermediate

**Suggested Learning before Workshop Attendance**

http://www.isaarsci.ir/internetscifolder/Acute%20Management%20of%20Autonomic%20Dysreflexia.PDF
“Cardiovascular system and autonomic function”

Prof. Pierre Denys, PRM physician, France
Chairman of Neuro urology Unit, Hospital Raymond Poincaré APHP, Université de Versailles Saint Quentin
UMR 1179, Paris, France
Member of Neuro-Urology Promotion Committee of ICS

The cardiovascular system is under the control of a complex regulation by the autonomic system. Heart receive innervation from both parasympathetic and sympathetic system and blood vessels receive predominantly sympathetic innervation. This regulation is not under the control of volition. Cardiac muscle has an automatic function that permits to have a rhythmic contraction. Both sinoatrial and atrioventricular nodes are responsible for this rhythmic automatic activity. But in another hand sympathetic and parasympathetic system can modulate, contractility of the cardiac muscle, frequency of heart rate in order to adapt the cardiac activity to various behaviors such as standing, physical activity, or sleeping. Sympathetic nervous stimulation increase rhythm cardiac and vascular contractility leading to an increase in blood pressure. Parasympathetic stimulation decrease heart rate and cardiomyocytes contractility with limited peripheral vascular effect except in some specific regions (brain, genitals).

This complex regulation involves multiple sites of the central and peripheral nervous system and various reflexes. Neurological disorders and spinal cord injury may modify cardiovascular regulation that is severe enough to increase the risk of cardiac arrest, rhythmic abnormalities, hypotension or Autonomic Dysreflexia (AD).

Cardiovascular dysregulation is an important topic to understand and to consider for all physicians in charge of such patients. Depending on the level and the extent of the lesion the type and severity of cardiovascular symptoms are predictable and accessible to treatment and prevention.

“Pathophysiology of Autonomic Dysreflexia”

Prof. Giulio Del Popolo, Urologist, Italy
Head of Department of Neuro-Urology & Spinal Unit, Careggi University Hospital, Florence, Italy
Member of Neuro-Urology Promotion Committee of ICS

Autonomic dysreflexia (AD) is a clinical event which can be potentially a life-threatening medical emergency. It occurs mainly as a consequence of uncontrolled sympathetic activity in patients with spinal cord lesion (SCL) at or above T6 due to stimuli under the lesion level, from the bladder, bowel or any others from the sub-lesioned body. The autonomic response is reflex bradycardia and vasodilatation which can only occur in areas which are under suprapontine control above the lesion. Symptoms are characterized by acute severe paroxysmal hypertension associated with throbbing headaches, profuse sweating, nasal stuffiness, flushing of the skin above the level of the lesion, bradycardia, apprehension, and anxiety, sometimes with cognitive impairments. On the other hand, signs, and symptoms of AD sometimes may be minimal or absent despite significant hypertension. This may lead to underestimate AD and delay the appropriate management. The vasodilation induces headache, red skin of the face and superior thorax and can lead to cerebral oedema and, in severe cases, also to death. Patients showing AD may develop verbal or cognitive impairments as an acute consequence of the cerebral effects. This inadequate patient’s communication for temporary cognitive deficits can lead to a delay in diagnosis and treatment of AD. Awareness of this condition is consequently of paramount importance to all emergency department staff, careers of spinal cord-injured patients, urologists, and patients themselves.

AD occurs in up to 85% of patients with SCI. A study of 48 patients with SCI level above T6 undergoing urodynamics reported significantly elevated systolic and diastolic blood pressure (BP) on bladder filling, although only 20 had a BP rise above 150/100 mmHg. This was observed more frequently in patients with cervical lesions compared with lower lesions. Other authors have similarly reported a higher incidence of AD with cervical spine injuries (60%) compared with the thoracic spine (20%); in addition, the incidence of AD in women with spinal injuries has been reported by the same authors as 60%, whereas 46% of men are affected. AD has been reported in both complete and incomplete lesions of the spinal cord, although incomplete spinal lesions show milder forms of AD. It’s useful to monitor the blood pressure during urodynamic evaluation to understand the impact of bladder filling to provoke AD. The AD attacks are often provoked by urological invasive investigations and treatments. All professional figures involved to the management and treatment of spinal cord injured patients should know the existence of this severe complication, aware of the risk and be prepared to properly prevent and promptly treat an AD attack.

“Iatrogenic Autonomic Dysreflexia”

Dr. Charalampos Konstantinidis, Urologist, Greece
Head of Urology and Neuro-urology Unit, National Rehabilitation Center, Athens, Greece
Member of Neuro-Urology Promotion Committee of ICS
Urological procedures and bowel investigations or evacuation management can cause Autonomic Dysreflexia (AD) in individuals who are candidates for AD.

Already in 1996 Linsenmeyer et al. found urodynamics as an excellent tool in detecting both symptomatic and silent AD in men with SCI above T6 [1]. Research activities in the last years yielded important new insights about the frequency and severity of AD triggered by diagnostic and therapeutic interventions in the LUT and in the bowels such as urodynamics, cystoscopy, transurethral lithotripsy, ESWL, sperm retrieval, bowel evacuation by digital rectal stimulation, and transanal irrigation. The incidence of AD varies mainly according to the density of receptors stimulated. The receptor density is high in the area of the bladder neck, prostate, and posterior urethra and in the anal canal, but less in the bladder and the colon. AD is reported with urodynamics in-between 45-78%, with cystoscopy in 80% in cervical and less frequent, in 24-77% resp. 10-40%, in thoracic lesions above T6.

As urodynamics are performed more often than cystoscopies in SCI patients, they are an important screening tool for AD. Curt et al. (1997) reported that urodynamic examination may be an effective and standardized diagnostic procedure for provoking signs of AD [2]. In their study only half of the patients, who showed signs of AD during an examination, presented also with clinical symptoms, the other half had “silent” AD, only diagnosed at the basis of systolic blood pressure (sBP) increase. Therefore, cardiovascular monitoring is mandatory to detect AD using urodynamics as a screening test.

The increase in sBP was also used to compare the severity of AD between urodynamics and cystoscopy. The sBP change was greater during cystoscopy than in urodynamics, indicating that stimulation of the bladder neck, urethra, and prostate area is more potent than just bladder filling. On the other side, if urodynamics cause a severe increase in sBP, the risk for AD in other situations is high.

Bowel management may cause AD, as well. The increase in sBP is low with transanal irrigation compared to evacuation by digital rectal assistance in which the increase in sBP is comparable to that with cystoscopy [3]. As the 60-70% of SCI patients use digital anorectal stimulation for bowel evacuation, at least those with significant AD should use transanal irrigation instead [4]. The occurrence of AD episodes in connection with diagnostic and therapeutic procedures in the LUT and in the bowels can be used as an excellent tool in detecting both symptomatic and silent AD in patients with SCI above T6. Recent studies in this field allow nowadays better interpretation of these findings regarding the risk for AD, thus also counseling of the patient is improved.

References


“Prevention, treatment and awareness programs”

Dr. Christina-Anastasia Rapi, PRM Physician, Greece
PRM Department, General Hospital "G.Gennimatas", Athens, Greece
Golden member of ICS

Autonomic Dysreflexia (AD) is a consequence of spinal cord injury (SCI) above T6 neurotome and usually is within the range of maladaptive neuroplasticity. AD is a syndrome unknown to many physicians, nurses, and other healthcare professionals, not specialized in SCI. Persons with SCI, even with high SCI, in danger to present AD episodes, are not always familiar with symptoms and management of AD. Family and caregivers may also be unaware of AD.

Recognizing AD and the underlying cause is mandatory. Delayed diagnosis of an AD episode either by the person with SCI, family, caregivers or by health professionals may lead to serious life-threatening side-effects. Early diagnosis and prompt treatment of an AD episode is important in order to minimize side-effects.

Prevention of AD episodes is the best treatment, this can be achieved by education and awareness on AD, and adequate management of usual triggering causes i.e. neurogenic bladder & bowel dysfunction, skin lesion, etc.

Mild symptoms of an AD episode which is just starting may have sometimes, a functional use i.e. to a person with complete tetraplegia and no bladder sensation. AD could be the awareness of bladder filling, informing the person to empty the bladder.
Lack of knowledge concerning AD, leads to delayed or inappropriate treatment of persons with SCI attending general hospitals under emergency circumstances. According to different triage systems in emergency departments, patients presenting urine retention, the most common reason leading to AD, are categorized to a group which denotes that the ideal maximum time to first contact with the clinician will be up to 60 min (according to the Manchester Triage System this is the yellow group). An AD episode is not just “urgent” but “very urgent”. Patients with SCI and AD may be stable on arrival and this may be misleading. Around 40% of high-risk for AD persons with SCI, and 40% of health staff at emergency departments have no knowledge of AD. There is a need to improve knowledge and management of AD among healthcare professionals, patients, family members, and caregivers.

A series of strategies may contribute to improve knowledge, prevention and management of AD:

- Patients’, family members’ and caregivers’ structured education concerning AD during rehabilitation and during follow-up by the rehabilitation team.
- Seminars on AD targeting healthcare professionals, not specialized in SCI, in general hospitals, and in the community.
- Use of supporting material with information on AD:
  - Printed leaflets for clinicians and consumers
  - Printed posters for health departments
  - Videos
  - Internet
- Use of a medical emergency AD card. This card is carried by persons with SCI and AD and has information on a short summary of causes, diagnosis, symptoms, signs and management of AD.
- Adequate follow-up post SCI with appropriate bladder and bowel routine, pressure ulcer prevention, and identification and management of specific triggers for AD.

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Christina-Anastasia (Annie) RAPIDI, MD, PhD, SFEBPRM
Head of PRM Department, General Hospital “G. Gennimatas”,
Athens, Greece

Nothing to disclose

1969, Frankel scale
1996, ISNCSCI
Somatic Nervous System
(8th edition: 2019)

Autonomic function testing following SCI?

2009, Spinal Cord
Complete/Incomplete lesion
Somatomotoric
Somaticsensory
Visceroanatomic

2012, ISAFSCI
Autonomic Dysreflexia
Awareness needed

In 2019, ISAFSCI is still a relatively novel tool with limited use by clinicians
There is need of less ambiguity with simplification and the addition of clarification of assessment tests and self-reported ANS system dysfunction in SCI

Autonomic dysreflexia
Prevention
Awareness Programs
Treatment
Prevention

AD is the unopposed sympathetic response after a noxious or non-noxious stimuli injury level, including increase in BP>20mmHg above baseline, and may include one or more of following symptoms: headache, flushing and sweating above lesion level, vasoconstriction below lesion level, or dysrhythmias. May or may not be symptomatic can occur at any time following SCI.

Prevention of triggering stimuli from:
• Bladder
• Bowel
• Skin
• Musculo-skeletal health

Prevention

Recognize the signs of AD: Check BP

Sudden, significant* increase in both the systolic and diastolic BP above baseline levels, frequently associated with bradycardia, may be a sign of AD.

*Adults: above baseline** systolic BP >20 - 40mmHg
Adolescents: above baseline systolic BP >15 - 20mmHg
Children: above baseline systolic BP >15mmHg

**Persons with SCI >T6 have normal/baseline systolic blood pressure in the 90-110mmHg range.

Recognize the Signs: Check BP

Severity of AD episode

Prevention of a mild AD episode to become severe AD episode

• Mild/partial AD: SBP increase <40mmHg
• Moderate AD: SBP increase >40mmHg, but SBP<180mmHg
• Severe AD: SBP>180mmHg

Silent AD:
Minimal or no symptoms, despite a significantly elevated BP

Incidence of AD episodes may be under-estimated due to:
• The phenomenon of “silent” AD (raised BP without other symptoms)
• Continuous versus intermittent monitoring are more likely to report greater changes in systolic blood pressure
• False diagnosis of ‘normal’ BP

Ageing = Deterioration as time passes

“In the long term, treatment strategy of neurogenic bladder (& bowel) dysfunction in patients with SCI had to be modified in almost all patients.”

Regular follow-up in SCI specialized clinics
• Bladder (balanced management)
• Bowel (balanced management)
• Skin (thorough examination)
• Musculo-skeletal health (scoliosis, fragile fractures, charcot arthropathy, etc.)

Educational programs for self management and awareness of persons with SCI/caregivers
Initially nonpharmacologic measures

- Sit patient upright (not lying down)
- Remove tight clothes, etc. below lesion level
- Find and eliminate the triggering (Quick exam to include abdomen for distended bladder or bowel, lower limits for skin lesion, fractures, etc. in order to reveal the stimulus that caused AD and treat it. If indwelling urinary catheter is in place, check for obstructions)
- Monitor blood pressure (BP) every 3-5 min

• Bladder
• Bowel
• Skin
• Musculo-Skeletal health

• If an indwelling catheter is not in place, catheterize the patient using anesthetic jelly
ATTENTION: If there is a need to check bowel, this must be done using anesthetic jelly

• If IV antihypertensives are needed, this should be done only in a monitoring setting of ICU

>150mmHg in an adult
>140mmHg in an adolescent
>130mmHg in a child 6 to 12y
>120mmHg in a child under 5y

• If BP despite previous management is high*, give an antihypertensive with rapid onset and short duration (e.g. sublingual nifedipine), may repeat in 20-30min, and continue investigate causes of AD

WARNING: BEFORE ADMINISTERING ANY ANTIHYPERTENSIVE MEDICATION, ALWAYS CHECK FOR RECENT USE OF MEDICATION FOR ERECTILE DYSFUNCTION.

DO NOT USE GTN (Nitrolingual) SPRAY, TABLETS OR PATCH IF SILDENAFIL (VIAGRA) OR VARDENAFIL (LEVITRA) HAS BEEN USED IN LAST 24 HOURS OR TADALAFIL (CIALIS) HAS BEEN TAKEN WITHIN LAST 4 DAYS!

Treatment

AD episodes are self-limited
If diagnosed in time and
After the removal of the underlying stimuli

Follow-up of AD episode is necessary
Misdiagnosed due to ...lack of awareness &

the triage system in emergency departments

• The Manchester Triage System is commonly used as the triage system in emergency departments of the UK.
• According to this system, patients presenting with retention of urine to the accident and emergency department are categorized as yellow, which denotes that the ideal maximum time to first contact with a treating clinician will be 60 min.

Evaluate knowledge of AD among patients / their caregivers / health personnel

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<th>Method / Aim</th>
<th>Results</th>
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<tr>
<td>CF McGillivray, et al. JSCM, 2009 Canada N=100 chronic SCI, 16 family members</td>
<td>self-report mail survey: a) evaluate knowledge of AD among SCI consumers and their family members and b) to identify the preferred format and timing of education on AD for these stakeholders.</td>
<td>High-risk group for AD, 41% of the sample had never heard of the condition.</td>
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<td>J Schottler, et al. Spinal Cord, 2009 USA N=215 (1-21 years old)</td>
<td>The incidence of knowledge of AD from patient and caregiver perspectives</td>
<td>48% of patients &amp; 44% of caregivers claimed symptoms of AD, and out of them 45% of patients &amp; 9% of caregivers did not know the definition of AD or did not recognize the term AD when first asked.</td>
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<td>CR Jackson, R Acland Emerg Med J, 2011 New Zealand N=70 (18 doctors, 52 nurses)</td>
<td>A questionnaire was designed to assess the knowledge of the ED staff on AD</td>
<td>41% of the staff in emergency department could not answer any questions.</td>
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Greek anecdotal data (2012); neuropathic bladder unit, 2nd PRM Department, National Rehabilitation Center, Athens, Greece

• 48 patients high-risk for AD: 30 tetra, 18 para
• 31.25% had not heard of AD
During initial rehabilitation
• During the initial rehabilitation process AD is inadequately emphasized by the Rehabilitation team (usually AD is a problem in more chronic phase)
• Patients with SCI and their caregivers are coping with the tremendous changes in their quality of life post injury; and have poor recognition of the symptoms and understanding of the causes of AD

AD is a syndrome that is still unknown to the general medical and nursing professions leading to delayed or inappropriate treatment when individuals with SCI have to be treated under emergency circumstances in general hospitals.

Awareness Programs
Early recognition and prompt treatment of this life-threatening, but easily recognized condition, is important in order to minimize effects of AD.

A series of strategies may contribute to improve knowledge and management of AD

A series of strategies
- Leaflets with medical information concerning AD in emergency rooms and GPs’ offices
- Education of patients, their families and care givers
- Web sites where health professionals and consumers can obtain information from one another.
- Carrying an AD medical emergency card

A series of strategies
- Campaign in general hospitals without experience in SCI rehabilitation
- Information in triage folders
- Educational courses on AD among healthcare professionals
- What is an AD card?
  - An AD card: an instruction card to explain dysreflexia to healthcare providers
  - A card that should carry patients who are susceptible to AD, an emergency medical card: some form of medical alert.
  - AD card should provide useful general & personalized information giving a short summary of previous causes and treatment.
AD cards have been developed by different countries, hospitals, associations

Need for a consensus for international use

- different countries, different languages
- cards in different sizes/shapes
- different information

Need of a Diary and a medical emergency AD card

Keeping data of the AD episodes & diary is helpful in the management of a forthcoming episode of AD.

History data are useful to be printed on the AD card for health professionals information everywhere.

Presenting signs and symptoms and their course.
Recordings of blood pressure and pulse.
Treatment instituted and response to it.
The cause of the episode that has been identified.
In Conclusion,
A series of strategies may contribute to improve knowledge, prevention and management of AD:

- Structured education for patients’, family members’ and caregivers’
- Seminars targeting healthcare professionals
- Supporting material
  - Printed leaflets for clinicians and consumers
  - Printed posters for health departments
  - Videos
  - Internet, e-learning
- Medical emergency AD card
- Follow-up post SCI

Take home messages

- AD episodes misdiagnosed and untreated may be life threatening
- AD episodes, if diagnosed and treated in time, are self-limited
- Awareness for early diagnosis and treatment
- Education of patients for using mild symptoms of an AD episode in a functional way substituting lack of sensation (for a person with complete tetraplegia, AD could be the awareness of bladder filling)