



## Autonomic dysreflexia occurs in spinal cord injury with neurological level below T6 during urodynamic examination

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### Abstract

**Aims:** To determine whether autonomic dysreflexia (AD) occurs in patients with spinal cord injury (SCI) with neurological level below thoracic (T) 6 during urodynamic examination.

**Design:** Cross sectional survey.

**Subject and methods:** The study was carried out in 56 patients with SCI below Th6 who were submitted to our center for a urodynamic examination from January to June 2020. The systolic blood pressure (SBP) and diastolic blood pressure (DBP) were measured and recorded at the beginning and every 100 ml infused during the filling phase of the urodynamic study. AD was defined as a rise in systolic blood pressure above 20mm Hg.

**Results:** Autonomic dysreflexia developed only in two of the 56 patients included into the study. One of the patient BP increased from 90/60 mmHg to 115/75 mmHg together with development of the AD symptoms, he was a 31 year old male with a neurological level at T8. The other BP increased from 105/71 mmHg to 131/86 mmHg without the development of the AD symptoms, he was a 56 year old male with a neurological level at T7. A significant difference was found between the mean SBP and the mean DBP values at the beginning and end of the filling phase in them.

**Conclusions:** It is rare, but possible that AD occurred in patients with lesions below T6, especially for those close to the T6 level. We recommend continuous cardiovascular monitoring during urodynamic investigation in the patients closer to T6 level for the detection of symptomatic and asymptomatic AD.

**Keywords:** dysreflexia, neurological, urodynamic, systolic

### Introduction

Autonomic dysreflexia (AD) occurs in subjects with spinal cord injury (SCI) as a response to a stimulus from below the level of lesion leading to an imbalanced reflex sympathetic discharge and is characterized as a sudden increase in the systolic blood pressure (SBP) [1]. It is not an all-or-none reaction and varies in intensity from asymptomatic to a life-threatening emergency [1-3]. The typical subjective signs of AD include a throbbing headache, tingling in the head or nasal congestion; sweating and flushing above the lesion and (if observed) papillary dilatation are clinical signs that prompt medical staff to measure blood pressure and to locate the source of sensory stimulation. However, there is no correlation between the magnitude of the hypertensive response and the headache [4]. Among the triggering events associated with AD, stimuli from the lower urinary tract are seen most commonly in 75% to 85% of cases [2, 5, 6]. Previous researchers investigated BP responses in urodynamic examinations to further understand AD reactions and associated factors [7, 11]. But very few have been done on whether AD develops during urodynamic investigation in SCI patients whose neurological level was below thoracic (T) 6. In this study we aimed to determine whether AD occurs in patients with SCI with neurological level below T6 during urodynamic examination.

### Results

Demographic and clinical features of the patients in the study were presented in Table 1.

Of the 56 patients, 34 were subacute and 22 chronic period SCI patients (0–1 months was evaluated as acute, 1–6 months subacute, and more than 6 months as chronic).

**Table 1:** Demographic and clinical features of the patients in the study (n = 56)

Age (year)	40.9(16-49)
SCI—time (months)	15.6 (1–254)
Gender (Male/female)	41/15
AIS classification - A/B/C/D	19/8/12/17
Level of lesion (T/L)	37/19
Level of injury - T7/T8/T9/T10/T11/T12/L1/L2/L3/L4/L5	4/3/5/14/8/3/11/3/5

T: Thoracic, L: Lumbar, AIS: ASIA (American Spinal Cord Injury Association) Impairment Scale

Mean SBP, DBP and HR at the beginning of filling phase was 117 ± 12 mmHg, 74 ± 9 mmHg and 76 ± 11 bpm respectively. Mean SBP, DBP and HR at the end of the filling phase was 121 ± 13 mmHg, 78 ± 11 mmHg, 75 ± 12 bpm respectively. Statistically significant differences were detected between the

mean SBP and DPB values at the beginning and end of the filling phase ( $P = 0.005$ ,  $P = 0.001$ , respectively).

However, there was no statistically significant difference

between the mean HR values at the beginning and end of the filling phase ( $P = 0.488$ ) (Table 2).

**Table 2:** Comparison of the blood pressure and heart rate values at the beginning and end of the filling Phase

	Beginning of the filling phase	End of the filling phase	P value
SBP (mmHg) (mean±SD, range)	115 ±13 (90–136)	120±12 (92–140)	<0.001
DBP(mmHg) (mean±SD, range)	73 ±10 (54–96)	77 ±10 (60–95)	<0.001

SBP: Systolic blood pressure, DBP: Diastolic blood pressure

Autonomic dysreflexia developed only in two of the 64 patients included into the study. One of the patient BP increased from 102/64 mmHg to 135/85 mmHg together with development of the AD symptoms, he was a 31 year old male with a neurological level at T8. The other BP increased from 115/85 mmHg to 135/98 mmHg without the development of the AD symptoms, he was a 56 year old male with a neurological level at T7.

### Discussion

Among the symptoms and signs of AD, blood pressure (BP) increase needs particular concern because of its unwanted consequence and the high incidence of silent AD (increased BP Without symptoms)<sup>[8]</sup>. However, there are no generally accepted criteria regarding systolic BP (SBP) increase in diagnosing AD. Some researchers have used dangerous levels of SBP reaching 150 or 160mm Hg and/or diastolic BP (DBP) reaching 90 or 100mm Hg<sup>[8, 9]</sup>. Others believe that an SBP increase of 20 to 40mm Hg or 20% to 30% of baseline is an AD reaction<sup>[1, 7, 12, 13]</sup>. According to guidelines from the Consortium for Spinal Cord Medicine, 20 to 40mm Hg higher than baseline may be a sign of AD [14].

In this study, we found a statistically significant increase between the SBP and DBP values at the beginning and end of the filling phase in our study population, but only two of these patients developed AD. This is similar to a previous report, in that study, Autonomic dysreflexia developed only in one of the 51 spinal cord injury patients with neurological level below T6. In our opinion the significant difference between the beginning and ending mean SBP and DBP is not surprising because the significant increase (20 mmHg or more) of SBP and DBP in the patient who developed AD, that would increase the mean ending BP values. We also think that the significant difference between the beginning and ending mean SBP and DBP observed in our study population may be an indicator of the occurrence of AD and possibly silent AD in SCI patients below T6 level. However new studies base on a large normal population should be carried out to monitor the SBP and DBP during urodynamic examination in order to clarify the changes of them.

According to the study we found that AD occurred not only in patients with lesions above T6, but also in those with lower lesion levels. Therefore, we suggest that the patients with a neurological level below T6 and especially closer to T6 level should be followed up in terms of development of AD.

### Conclusion

It is rare, but possible that AD occurred in patients with lesions below T6, especially for those close to the T6 level. We recommend continuous cardiovascular monitoring during urodynamic investment in the patients closer to T6 level for the detection of symptomatic and asymptomatic AD.

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