

# Autonomic dysreflexia during pregnancy in a woman with spinal cord injury: a case report

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## Abstract

We herein report a case involving a 35-year-old woman with spinal cord injury (SCI) in whom autonomic dysreflexia (AD) newly developed during pregnancy and resolved after delivery. The neurological level and severity of SCI according to the American Spinal Injury Association Impairment Scale (AIS) was T4 AIS-A. The patient had sustained an SCI 20 years prior. Upon presentation, she reported a newly developed increased need to empty her bladder, facial flushing, palpitation, sweating, and headache during pregnancy. She was hospitalized for careful observation at 33 weeks of gestation. The intensity and frequency of the symptoms of AD increased with time. She underwent a cesarean section under general anesthesia at 36 weeks of gestation. Three weeks after the delivery, her vital signs normalized and AD symptoms improved. This case indicates that careful evaluation and proper management of AD symptoms in pregnant women with SCI are essential. For proper prevention and management of AD, education about AD symptoms and supportive management to prevent AD symptoms are necessary for the patient, physician, and multidisciplinary approach team.

## Keywords

Anesthesia, autonomic dysreflexia, cesarean section, postpartum period, pregnancy, spinal cord injury

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## Introduction

The recent development of rehabilitation and assisted-reproduction techniques has increased the success rate of pregnancy

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among women with spinal cord injury (SCI). Various complications may occur during pregnancy in such patients, including complications involving the genitourinary, gastrointestinal, and cardiovascular systems. Autonomic dysreflexia (AD) is one of the most serious complications during pregnancy among women with SCI. AD is a pathological condition that commonly occurs in women with SCI, especially in those with SCI involving the cervical and upper thoracic levels above T6.<sup>1</sup> Clinical manifestations vary from mild, bothersome symptoms such as pallor, piloerection, headache, and sweating to acute life-threatening conditions such as severe hypertension, myocardial infarction, seizure, and cerebral hemorrhage.<sup>2</sup> Physicians should minimize the stimuli that cause AD and take prompt action when it occurs.<sup>3</sup> Appropriate multidisciplinary education is required among rehabilitation physicians, obstetricians, anesthesiologists, and related medical personnel involved in the management of pregnancy and delivery in women with SCI.

Although AD after pregnancy has been reported, only a few such cases have described the use of accurate evaluation methods and continuous follow-up during pregnancy and the postpartum period. We experienced a case of newly developed AD during pregnancy that resolved after delivery in a 35-year-old woman with SCI. Therefore, this case report is being presented to describe the continuous course of follow-up from the second trimester to the postpartum period in a woman with SCI.

## Case report

A pregnant woman with a history of SCI was referred to our rehabilitation medicine clinic at 15 weeks of gestation for an increased need to empty her bladder and headache before clean intermittent

catheterization (CIC). The woman had fallen and sustained an SCI 20 years prior. The neurological level and severity of the SCI according to the American Spinal Injury Association Impairment Scale (AIS) was T4 AIS-A. Before pregnancy, the woman was able to empty her bladder by CIC four to five times a day without discomfort. She performed bowel management using digital rectal stimulation. However, her daytime frequency had increased, and incontinence had developed after 3 months of pregnancy; additionally, she reported headaches before performing CIC or digital rectal stimulation. The frequency of CIC increased until she was performing CIC six times a day. She reported urinary incontinence, including urge and stress incontinence. The urinary incontinence occurred once or twice a week after the first trimester, and the frequency increased until the incontinence occurred almost every day. The woman was educated about AD symptoms, management, and coping methods in the case of danger, and she was followed up every month at an outpatient clinic.

The woman was hospitalized at 33 weeks of gestation for careful observation of the aggravated AD symptoms and delivery. Her blood pressure (BP) was 120/80, 117/68, and 105/54 mmHg at 19, 27, and 30 weeks of gestation, respectively, at the outpatient clinic. At the time of admission, her BP was 90/50 mmHg and heart rate (HR) was 88 beats/minute after a sufficient duration of rest. She complained of AD symptoms such as headache, facial flushing, palpitation, anxiety, goose bumps, and sweating at the time of bladder distension or a sudden change of position. Her BP at the time of symptom occurrence was elevated at 148/98 mmHg with a HR of 70 beats/minute. Twenty-four-hour ambulatory BP monitoring (ABPM) and the Autonomic Dysfunction Following Spinal Cord Injury (ADFSCI) questionnaire were used to accurately evaluate the AD symptoms.<sup>4</sup>

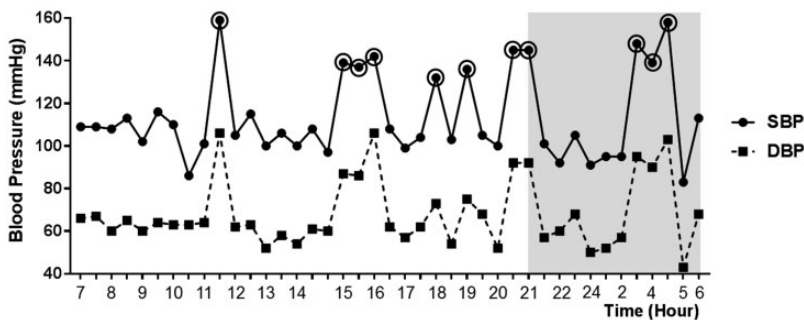
The 24-hour ABPM was performed using a BR-102 plus monitor (Schiller-Reomed AG, Baar, Switzerland). We divided 1 day into "daytime" (from 7:00 AM to 9:00 PM) and "nighttime" (from 9:00 PM to 7:00 AM of the next day). Systolic and diastolic BP and HR were measured every 30 minutes during the daytime and every 60 minutes during the nighttime. In the 24-hour ABPM, the mean systolic BP (SBP), diastolic BP (DBP), and HR were 112.7 mmHg, 67.7 mmHg, and 84.4 beats/min, respectively. The SBP, DBP, and HR were 112.0 mmHg, 67.3 mmHg, and 84.5 beats/minute during the daytime and 113.0 mmHg, 68.5 mmHg, and 84.2 beats/minute during the nighttime. The nighttime SBP and DBP were higher than the daytime values, indicating a loss of physiological nocturnal dipping.

The cut-off BP was calculated with reference to a previous study.<sup>4</sup> The baseline SBP and DBP were determined by calculating the average of three consecutive resting BPs first measured in the morning. AD was assumed to have occurred when the SBP increased by >20 mmHg from baseline. As a result of this calculation, 11 AD events occurred during a 24-hour period: seven events during the daytime and four events during the nighttime (Figure 1). According

to the ADFSCI questionnaire, the AD symptom score was 139 (Table 1).

After admission, a Foley catheter was inserted via the urethra for continuous urinary drainage. When the BP was elevated, nifedipine was administered orally. In addition, bowel management was performed using a suppository and magnesium hydroxide. At 35+3 weeks of gestation, the patient's BP increased to 172/94 mmHg and her HR was 63 beats/minute immediately before CIC or rectal stimulation; these values then normalized to 107/61 mmHg and 78 beats/minute, respectively, after CIC or rectal stimulation.

The obstetrician elected to perform a cesarean section because of the repeatedly elevated BP and persistent AD symptoms. The cesarean section was performed with the patient under general anesthesia at 36+0 weeks of gestation. Delivery was successful, and no postoperative complications occurred. After delivery, the patient complained of breast congestion and pain at the surgical site. Recurrent episodes of symptomatic AD (maximal SBP elevation of 167 mmHg, intermittent headache, and facial flushing) persisted following breastfeeding for 1 week after the cesarean section. Breastfeeding is not a common cause



**Figure 1.** Twenty-four-hour ambulatory blood pressure monitoring profiles in the prepartum period. Systolic and diastolic blood pressure recordings showed multiple episodes of autonomic dysreflexia and blood pressure instability from 83/43 to 159/106 mmHg. The shaded time section represents nighttime. SBP, systolic blood pressure; DBP, diastolic blood pressure.

**Table 1.** Results of 24-hour ABPM and ADFSCI questionnaire outcomes in the prepartum and postpartum periods.

	24-hour ABPM			ADFSCI questionnaire			
	Baseline SBP/DBP, mmHg	Highest SBP/DBP, mmHg	Number of AD events			Lowest SBP/DBP, mmHg	AD symptom score
			Total	Daytime	Nighttime		
Prepartum	108/64	159/106	11	7	4	83/43	139
Postpartum	102/67	112/72	0	0	0	90/66	0

ABPM, ambulatory blood pressure monitoring; SBP, systolic blood pressure; DBP, diastolic blood pressure; ADFSCI, Autonomic Dysfunction Following Spinal Cord Injury; AD, autonomic dysreflexia

of AD, but it may have contributed to the AD in this patient by acting as a painful stimulus.<sup>5</sup> Continuous pain management and BP control were performed. Eight days after the cesarean section, her BP had normalized to 109/69 mmHg and all AD symptoms had disappeared. Follow-up ABPM revealed no AD events, and the symptom score was 3 points in the ADFSCI questionnaire.

Two weeks after discharge, she visited the outpatient clinic for follow-up. At that time, her vital signs were normalized, with a BP of 102/67 mmHg and HR of 68 beats/minute. She could perform CIC four to five times without difficulty, and all of her AD symptoms had improved.

This study was carried out according to routine care procedures and was approved by the institutional review board of the hospital (2018-11-034). Verbal consent was obtained from the patient.

## Discussion

Women may experience temporary amenorrhea in the acute phase of SCI, but most recover their normal menstrual cycle within 6 months. Pregnancy rates in women with SCI in Korea have not been reported. However, the annual prevalence of pregnancy among women with SCI is 2.0% in the United States. This pregnancy

rate among reproductive-aged women with SCI is similar to those among other women with chronic mobility impairments in the United States.<sup>6</sup>

Various complications may occur during pregnancy in women with SCI. Urinary tract infection and bowel problems are the most common complications; other complications include respiratory problems, increased spasticity or pain, AD, and pressure sores.<sup>7</sup>

In the present case, the woman developed AD and presented symptoms in response to neurogenic lower urinary tract and bowel dysfunction on multiple occasions. The frequency of urge urinary incontinence episodes was reduced by increasing the frequency of CIC. However, the severity of AD and the appearance of accompanying symptoms such as headache, facial flushing, palpitation, and sweating that occurred during bladder distension increased over time. The ABPM results showed that the nighttime SBP and DBP were higher than the daytime values, indicating loss of physiological nocturnal dipping. Eleven AD events occurred during a 24-hour period (seven events during the daytime and four events during the nighttime). The highest and lowest SBP were 159 and 83 mmHg, respectively, and the SBP variability reached 76 mmHg. Considering that such variability in BP can be associated

with cardiovascular events and mortality, appropriate BP control was essential during pregnancy.

In addition to medical complications, obstetrical complications such as preterm labor and delivery have also been reported in patients with AD, and patients should be closely monitored for such complications. In one cohort study, pregnant women with SCI were more likely to give birth to premature and low-birthweight infants than were pregnant women in the general population.<sup>8</sup> Another study showed that most preterm deliveries occurred in the 32nd to 37th week of gestation.<sup>9</sup> For this reason, starting cervical examinations at 28 weeks of gestation and giving specific attention to warning signs of preterm labor at each visit during the third trimester are recommended.<sup>9</sup>

A unique indication for a cesarean section in women with SCI is intractable AD that is unresponsive to anesthetic manipulation.<sup>10</sup> The cesarean section can be performed with either regional or general anesthesia. In general, regional techniques are preferred for cesarean sections because of lower maternal and neonatal morbidity rates. For patients at risk of AD, such as the patient in the present case, general anesthesia is frequently considered to control the manifestations of hyperreflexia.<sup>11</sup> Our patient presented repetitive AD symptoms despite efforts to prevent such symptoms by regular CIC and use of suppositories. Because of the recurrent AD symptoms, the cesarean section was performed at 36+0 weeks of gestation under general anesthesia.

Postpartum exacerbations of AD are common in women with a history of this disorder and should be closely monitored.<sup>11</sup> The woman in the present case also complained of exacerbated headache and facial flushing, and her BP was elevated frequently after delivery. These episodes were thought to be due to bladder or bowel distension or breast congestion<sup>11</sup> and

postoperative pain. All postpartum AD events resolved spontaneously, but proper management including the use of antibiotics, analgesics, and antihypertensive medications and the avoidance of noxious stimuli was needed. We also found that the AD symptoms after pregnancy were improved in the outpatient follow-up 2 weeks after discharge.

This case indicates that careful evaluation and proper management of AD symptoms in pregnant women with SCI are essential. Most clinically employed treatments for AD involve antihypertensive medication use and prevention or removal of noxious stimuli. Appropriate education about AD symptoms and supportive management are necessary for the patient, physician, and multidisciplinary approach team to ensure prevention and proper management of AD.

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