

## Case Report

# Silent Beats : Spontaneous Recovery of Transient Ventricular Asystole following High Spinal Cord Injury

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**Background :** High Spinal Cord Injuries can give rise to various complications, including cardiovascular disturbances. One rare but critical manifestation following such injuries is transient ventricular asystole, characterized by a temporary absence of ventricular contractions. This case report presents a unique instance of transient ventricular asystole following a High Spinal Cord Injury (HSCI), highlighting its rarity and the remarkable spontaneous recovery observed without invasive cardiac intervention. The importance of vigilant monitoring and comprehensive assessment in Spinal Cord Injury (SCI) patients is emphasized without delaying definitive neurosurgical management.

**Case Presentation :** A 29-year-old female experienced a HSCI due to a road traffic accident. Cardiopulmonary resuscitation was performed upon arrival at the Emergency Department. Subsequent evaluations revealed hypotonia in all limbs and the patient was admitted to the Intensive Care Unit. Her Initial Electrocardiogram (ECG) showed ventricular asystole, but later ECGs displayed sinus rhythm with intermittent sinus tachycardia. Imaging confirmed cervical spine dislocation and kyphoscoliotic deformity. Remarkably, the patient's cardiac function rapidly recovered, eliminating the need for invasive cardiac treatment.

**Discussion :** Cardiac asystole is a rare complication after cervical spine trauma with High Spinal Cord Injuries. In this case, transient ventricular asystole likely resulted from a cervical vertebral fracture and manipulation during stabilization. The patient's spontaneous recovery without cardiac intervention highlights the importance of avoiding unnecessary cardiac workups that may delay definitive neurosurgical management.

**Conclusions :** Spinal Cord Injury impacts the autonomic nervous system, leading to cardiovascular changes like bradyarrhythmia. This case emphasizes the significance of meticulous monitoring and prompt neurosurgical intervention in HSCI cases while minimizing undue focus on invasive cardiac interventions.

[J Indian Med Assoc 2024; 122(5): 68-70]

**Key words :** Spinal Cord Injury, Bradyarrhythmia, Ventricular Asystole, High Cervical Cord Injuries.

Cardiac asystole is a rare occurrence following Cervical Spine Injury (CSI), observed in 15-16% of cases of high spinal cord injury approximately<sup>1</sup>. Though complications occur more frequently with severe cervical trauma, even low-impact injuries can also have been known to cause cardiac asystole. Furthermore, even minor fractures and cervical trauma can result in significant cardiovascular manifestations, particularly in elderly individuals and patients with congenital kyphoscoliosis or ankylosing spondylitis<sup>2</sup>. In some reported cases, cardiac arrest has been documented during C1 laminectomy for irreducible atlantoaxial subluxation, with spontaneous circulation returning upon interruption of the laminectomy procedure<sup>3</sup>. This case report highlights a unique instance of transient ventricular asystole following High Spinal Cord Injury (HSCI), which spontaneously recovered without the need for

### Editor's Comment :

- High spinal cord injuries frequently result in transient bradyarrhythmias caused by affection of the autonomic nervous system.
- It may be deemed of utmost importance to combine prompt neurosurgical intervention with meticulous observation.
- In order to prevent postponing definitive neurosurgical treatment of severe spinal cord injuries, the invasive cardiac evaluation should receive the least amount of attention.

pharmacological or invasive cardiac treatment. The avoidance of such interventions prevented any potential delay in definitive neurosurgical management for the patient.

### CASE PRESENTATION

A 29-year-old female had met with a road traffic accident after falling from a two-wheeler and suffering injuries to her neck. Upon reaching the emergency medical service department, she was reportedly found to have pulselessness, cold, clammy extremities and altered consciousness, and thus she received 3-5 minutes of Cardiopulmonary resuscitation. After the return of spontaneous circulation, she was intubated and shifted to the Intensive Care Unit (ICU) under the care of neurosurgery with inotropic support. She became conscious and was found to have hypotonia with zero

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Received on : 27/11/2023

Accepted on : 08/12/2023

power in all four limbs. Her initial labs, chest X-rays, and spine X-rays were taken. Initial Electrocardiogram (ECG) showed tall, peaked T waves with intermittent AV dissociation and a brief episode of Ventricular Asystole (Fig 1). After initial medical stabilization with inotropic support and mechanical ventilation, the patient was assessed for a suspected neck injury, which was stabilized with a brace. ECG later on showed sinus rhythm with intermittent episodes of sinus tachycardia but no episodes of bradyarrhythmias, which were evident initially (Fig 2). Her cervical spine X-ray (Fig 3) showed atlanto-axial dislocation, fusion of C5-C6 vertebrae, and lordosis was maintained with suspicion of fracture of the dens process. Dorsal vertebrae showed evidence of congenital thoracic kyphoscoliosis. Lab parameters were normal hence, under the cardiology supervision (bedside back up with temporary pacemaker and Atropine etc) it was decided to proceed with further neuro-imaging. A CT brain and spine with 3D reconstruction (Fig 4) was obtained and showed Kyphoscoliotic deformity of the thoracic spine with Os odontoidum, which is a anomaly of the second cervical vertebrae with separation of a part of the odontoid process from the body of axis vertebra (also called as dens), which sometimes may resemble like a fracture of the dens. There was evidence of an atlantoaxial dislocation with spinal cord compression and a prevertebral hematoma extending from the skull base to C6. The patient was shifted to a higher center for neurosurgical intervention, where posterior C1-C2 stabilisation was planned as a definite neurosurgical procedure.

In this case report, our patient experienced transient ventricular asystole which rapidly recovered and not needed further intervention for cardiac abnormalities of her Spinal Cord Injury (SCI). Thus, we should avoid aggressive or invasive cardiac workups, which may delay appropriate neurosurgical treatment in due course.

**DISCUSSION**

Cardiac asystole following cervical spine trauma is a relatively uncommon complication, observed in approximately 15-16% of patients with High Spinal Cord



Fig 1 — Initial ECG showing tall, peaked T waves with intermittent AV dissociation and a brief episode of ventricular asystole

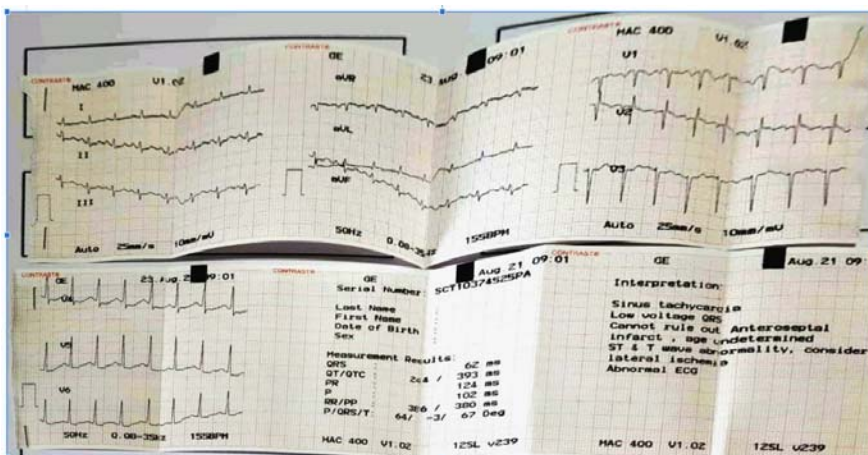


Fig 2 — ECG showing restoration of sinus rhythm with intermittent episodes of sinus tachycardia



Fig 3 — X-ray of cervical spine showing atlanto-axial dislocation, fusion of C5-C6 vertebrae and suspicion of fracture of the dens process with maintained lordosis

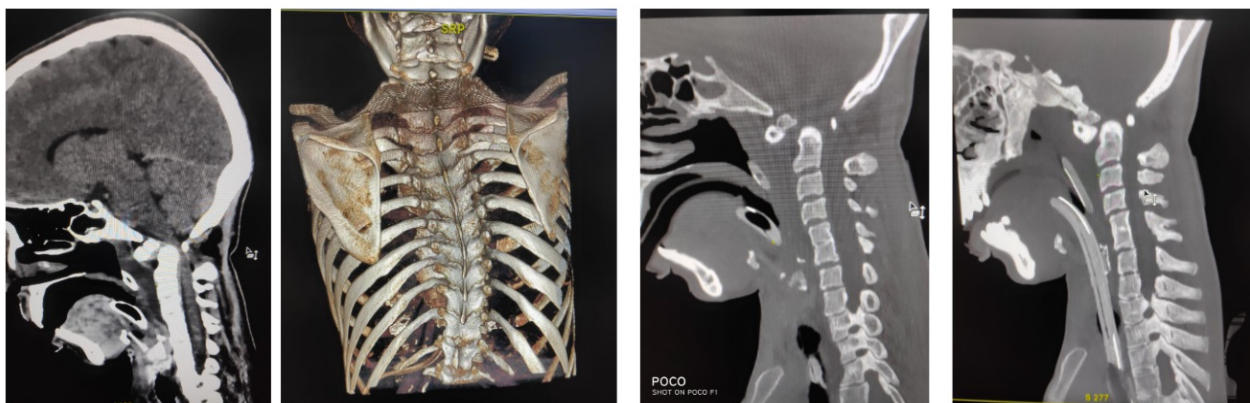


Fig 4 — CT brain and spine with 3D reconstruction showing Kyphoscoliotic deformity of the thoracic spine with Os odontoideum, which is an anomaly of the second cervical vertebrae which sometimes may resemble like a fracture of the dens due to separation of a part of the odontoid process from the body of axis vertebra.

Injuries (HSCI). It is believed to occur due to autonomic dysregulation following the initial injury<sup>4</sup>. However, the consensus was lacking in existing literature on the specific timing and duration of cardiac asystole following the initial trauma. In previous studies they have reported that incidence of bradyarrhythmia peaks between 2-7 days, but cardiac electrocardiographic abnormalities can persist upto 2-6 weeks after the initial injury<sup>5</sup>. Cardiac dysrhythmias can manifest as a result of Spinal Cord Injuries (SCI), with the occurrence varying based on the level and severity of the injury. Initially, these irregular heartbeats tend to be more severe in individuals with high-level SCIs, but they tend to lessen as the injury progresses. The dominance of the parasympathetic system results in neurogenic bradycardia (slow heart rate) and increased heart rate variability. The occurrence of bradyarrhythmias is a major concern during the acute phase of SCI, typically within the first 7 days. This is due to the spinal shock that follows the sudden loss of descending supraspinal input, causing an unregulated spinal sympathetic reflex circuit, thus resulting in an autonomic imbalance<sup>6</sup>.

In this case, our patient experienced transient ventricular asystole, likely attributed to a cervical vertebral fracture and neck manipulation during the initial stabilization process. Interestingly, she did not require pharmacological interventions or invasive cardiac treatments such as temporary pacemaker insertion. While a literature review suggests that oral albuterol may be effective in managing bradycardia during the acute phase post-spinal cord injury and cardiac pacemaker implantation may be useful for refractory bradycardia during this phase, these interventions were not necessary in our patient's case<sup>7</sup>.

## CONCLUSIONS

Spinal Cord Injury impacts the autonomic nervous system, leading to cardiovascular changes like significant bradyarrhythmia. This case emphasizes the significance of meticulous monitoring and prompt neurosurgical intervention in high Spinal Cord Injury cases, while minimizing undue focus on invasive cardiac interventions in cases of bradyarrhythmias where cardiovascular disturbances are usually transient.

**Funding :** None

**Acknowledgements :** NIL

## REFERENCES

- Hawayek B, Lucasti C, Patel D, Maraschiello M, Kowalski J — Cardiac asystole following high spinal cord injury: a case report. *J Spine Surg* 2021; **7(2)**: 233-7. doi: 10.21037/jss-20-669. PMID: 34296038; PMCID: PMC8261558.
- Mayà-Casalprim G, Ortiz J, Tercero A — Cervical spinal cord injury by a low-impact trauma as an unnoticed cause of cardiorespiratory arrest. *Eur Heart J Case Rep* 2020; **4**: 1-6. 10.1093/ehjcr/ytaa044.
- Shibao Y, Koda M, Nakayama K, Asada T, Sato K, Kono M, *et al* — A Case of Cardiac Arrest during C1 Laminectomy for Irreducible Atlantoaxial Subluxation. *Case Reports in Orthopedics*, vol. 2021, Article ID 6691426, 3 pages, 2021. <https://doi.org/10.1155/2021/6691426>.
- Kim SW, Park CJ, Kim K — Cardiac arrest attributable to dysfunction of the autonomic nervous system after traumatic cervical spinal cord injury. *Chin J Traumatol* 2017; **20**: 118-21. 10.1016/j.cjtee.2016.11.004.
- Shaikh N, Rhaman MA, Raza A — Prolonged bradycardia, asystole and outcome of high spinal cord injury patients: Risk factors and management. *Asian J Neurosurg* 2016; **11**: 427-32. 10.4103/1793-5482.146394.
- Wulf MJ, Tom VJ — Consequences of spinal cord injury on the sympathetic nervous system. *Front. Cell. Neurosci.* 2023. 17:999253. doi: 10.3389/fncel.2023.999253
- SCIRE Project — Acute Cardiovascular Care Following Spinal Cord Injury. 2022. Retrieved from [https://scireproject.com/wp-content/uploads/2022/02/acute-cardio\\_V7.pdf](https://scireproject.com/wp-content/uploads/2022/02/acute-cardio_V7.pdf)