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Original Research Article

Prevalence of resting bradycardia, resting hypotension and orthostatic hypotension in chronic spinal cord injury patients

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ABSTRACT

Background: Spinal cord injury (SCI) is a devastating event which usually leads to the impairment of autonomic nervous system and also causes many acute and chronic complications. There are very few clinical tests to assess the proper functioning of the autonomic nervous system. So, it is hypothesized to access the presence of resting bradycardia, resting hypotension and orthostatic hypotension and to use them as indirect indicators for the autonomic dysfunction in chronic spine cord injury (SCI) patients.
Methods: The study was an analytic cross-sectional study, to assess the prevalence of resting bradycardia, resting hypotension and orthostatic hypotension in the spinal cord injury patients.
Results: This study was conducted on 87 SCI patients, out of which 58 were paraplegics (21 having complete spinal cord injury, 37 with incomplete spinal cord injury) and 29 tetraplegics (13 with complete spinal cord injury, 16 with incomplete spinal cord injury). Orthostatic hypotension (67% vs 48.65%), resting hypotension (38.09% versus 29.7%) and resting bradycardia (33.33% versus 27.03%) were more amongst paraplegics patients with complete spinal cord injury as compared to paraplegics with incomplete spinal cord injury patients. All tetraplegic patients with complete spinal cord injury had resting bradycardia. Orthostatic hypotension, resting hypotension was found to be greater in tetraplegic patients with complete spinal cord injury.
Conclusions: Complications due to autonomic impairment pose day to day difficulties in life of chronic SCI patients hampering their quality of life. So, the assessment of autonomic functions must be a part of clinical evaluation of individuals with SCI and efforts must be made to tackle these complications in the best possible way.

Keywords: Chronic spinal cord injury patients, Orthostatic hypotension, Resting bradycardia, Resting hypotension

INTRODUCTION

Spine cord injury (SCI) is one of the most devastating of all traumatic events with an increasing incidence due to increase in high velocity injuries.[1,2] Cardiovascular dysfunctions and co-morbidities are very common consequences post SCI essentially due to the impairment of the autonomic nervous system.[3-6] These cardiovascular co-morbidities may present acutely as life threatening emergencies causing mortality in the immediate post injury phase or as chronic phase complications.[7,8] Impairment of control of autonomic nervous system in SCI patient may cause cardiac dysrrhythmias, especially bradyarrythmias, cardiac arrest and rarely tachycardia or tachyarrhytmias.[9] Disruption of autonomic pathways makes a highly unstable CV system which manifests in these patients as impaired blood pressure (BP) with sudden fluctuations (transient episodes of aberrantly low

and high BP) and impaired heart rate regulation which causes significant distress and problems in rehabilitation of the SCI patients.[10,11]

Autonomic nervous system is very vast and very complexly organized.[12] There are very few clinical tests to assess the proper function of the autonomic nervous system, so selecting appropriate autonomic function tests for individuals with SCI is difficult.[13] Proper treatment of cardiovascular dysfunctions pays an important role in the therapeutic management and rehabilitation of SCI patients. Orthostatic hypotension and autonomic dysreflexia being very common chronic complications after SCI. Autonomic dysreflexia is also a profoundly distressing chronic phase complication after SCI.[14-16] So it was hypothesized to access the presence of resting bradycardia (Decrease in HR to <60 beats per minute), resting hypotension (BP <90mmHg systolic and < 60 mmHg diastolic) and orthostatic hypotension (Sustained decrease in BP >20 mmHg systolic or >10 mmHg diastolic occurring within 3 min of attaining upright posture from supine position) amongst the SCI patients.[17,18] and use them as indicators for the autonomic dysfunction, to predict the severity of autonomic dysreflexia and to suggest and provide these patient with ways to minimize autonomic fluctuation and to provide them immediate relief in case recurrence of episodes of autonomic dysreflexia.[19,20]

METHODS

The study was an analytic cross-sectional study, to assess the prevalence of resting bradycardia, resting hypotension and orthostatic hypotension in the spinal cord injury patients and to access the correlation between these three things with the no. of documented episodes of the autonomic dysreflexia and completeness of spinal cord injury in these patients.

Inclusion criteria

- All spinal cord injury patients who gave consent for the study were allowed to take part in the study.

Exclusion criteria

- Patients having any previously known cardiac co-morbidity or disease prior to the spinal cord injury were not allowed to participate in the study
- Patients in neurogenic shock were not taken up for the study.

The study was conducted on 100 chronic spinal cord injury patients. The study was carried out in one of the premier tertiary care hospital in India, having an attached Spinal Cord Injury Centre (SCIC) and Paraplegic Rehabilitation Centre (PRC). The SCIC and the PRC also have an attached physiotherapy centre where the patient can exercise to their maximum physical activity limits on the daily basis in the presence of the physiotherapy experts. Along with physiotherapy there are various other physical activities and sports which are planned for these patients. These centers are a part of the hospital complex so the patients are in the approach of the hospital facilities whenever they require and there weekly and monthly health assessment is also done at the hospital. The consent was taken from the patients and the hospital authorities prior to the study.

Stastical analysis

The questionnaires marked by the patients will be filled and tabulated using MS Excel sheets. The data obtained was used to assess the prevalence of resting bradycardia, resting hypotension and orthostatic hypotension in the spinal cord injury patients.

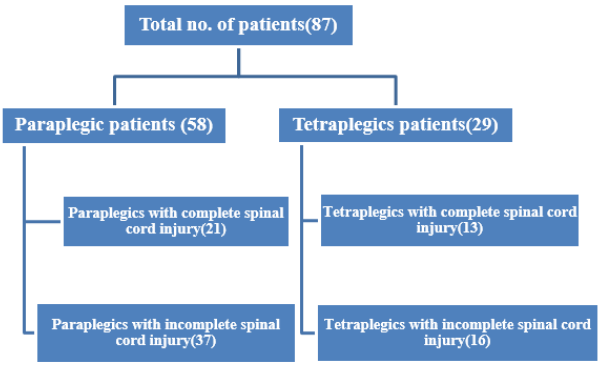

Figure 1: Categorization of spinal cord injury patients in this study.

RESULTS

This study was conducted on 87 SCI patients out of which 58 were paraplegics and 29 were tetraplegics. Among 58 paraplegic SCI patients, 21 were complete paraplegics with complete spinal cord injury and 37 were paraplegics with incomplete spinal cord injury, whereas in case of tetraplegic patients, 13 were tetraplegics with complete spinal cord injury and 16 were tetraplegic patients with incomplete spinal cord injury.

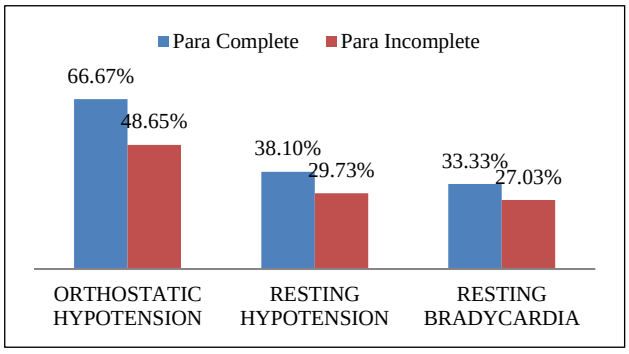

Figure 2: Prevalence of orthostatic hypotension, resting bradycardia and resting hypotension in paraplegics patients.

- Orthostatic hypotension was maximum among paraplegics patients with complete spinal cord injury as 14 out of 21 (67%) had orthostatic hypotension, while only 18 out of 37 (48.65%) paraplegics with incomplete spinal cord injury patients had orthostatic hypotension.
- Resting hypotension was also more in paraplegics with complete spinal cord injury as 8 out of 21 (38.09%) than in paraplegics with incomplete spinal cord injury where the prevalence of Resting hypotension was 29.7% (11 out of 37).
- Resting bradycardia showed similar results. It was maximum amongst paraplegic patients with complete spinal cord injury, i.e. 7 out of 21 patients (33.33%) whereas in case of paraplegic patients with incomplete spinal cord injury, only 10 on 37 (27.03%) had resting bradycardia.

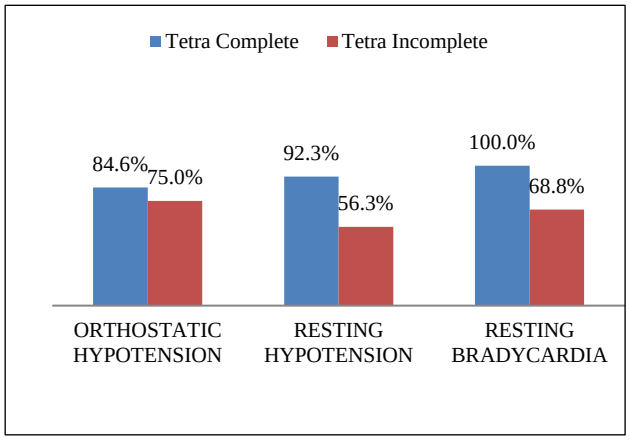

Figure 3: Prevalence of orthostatic hypotension, resting bradycardia and resting hypotension in tetraplegics.

- Orthostatic hypotension was found to be greater in tetraplegic patients with complete spinal cord injury where 11 out of 13 (85%) had orthostatic hypotension while the prevalence was 75% in tetraplegic patients with incomplete spinal cord injury.
- 12 out of 13 tetraplegic patients with complete spinal cord injury had resting hypotension as opposed to 9 out of 16 tetraplegics with incomplete spinal cord injury. This further indicates higher prevalence of resting hypotension among tetraplegic patients with complete spinal cord injury.
- All tetraplegic patients with complete spinal cord injury had resting bradycardia whereas the prevalence amongst tetraplegic patients with incomplete spinal cord injury was 68.75%.

On retrospective evaluation of the documents of the chronic spinal cord injury patient for last 2 years it was also seen that the number of documented episodes of severe autonomic dysreflexia posing as life threatening complication as considerably very high in tetraplegic patients with spinal cord complete spinal cord injury compared to others.

DISCUSSION

Orthostatic hypotension is one amongst the easily demonstrable clinical signs for the assessment of the general autonomic functions following SCI. The other signs are cardiac dysrhythmias, profuse sweating, neurogenic shock and temperature dysregulation. Neurogenic shock is rare in chronic SCI patients as it known to occur only in acute phase. Usually the assessment of autonomic functions is not an integral part of the clinical examination of the chronic spinal cord injury patients, but it should be incorporated in the clinical evaluation of individuals with SCI as the.[20]

The joint committee of the ASIA and ISCoS proposed that in the future, in addition to already established motor and sensory assessment standards, the assessment of autonomic functions be a part of clinical evaluation of individuals with SCI. The committee recommends the recognition and assessment of orthostatic hypotension AD, neurogenic shock, cardiac dysrhythmias, temperature dysregulation, and hyperhidrosis as parameters for general autonomic function testing following SCI.[20-28]

CONCLUSION

Complications due to autonomic impairment pose day to day difficulties in life of chronic SCI patients, considerably affecting their quality of life especially patients with high cervical cord injury where dysautonomias and dysarrythmias may be life-threatening. Furthermore, this autonomic imbalance might also act as a risk factor for deterioration of neurological function and may make these patients more prone to cardiovascular comorbidities following SCI. From this study, it can be ascertained that if resting hypotension and resting bradycardia are present along with the orthostatic hypotension, then patients are more prone to the dysautonomias. These three together indicate more complete autonomic impairment compared to any of the features alone. Assessment of the autonomic functions should also be made an integral part of the routine clinical examination of the chronic spinal cord injury patients, so these problems can be adequately addressed for the better rehabilitation of these patients.

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