Bowel Dysfunction and Disturbance of Physical Condition after Evacuation in Patients with Chronic Cervical Spinal Cord Injuries

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Abstract. We investigated the disturbance of physical condition following evacuation of the bowels in patients with chronic cervical spinal cord injuries. The cases dealt with 17 patients who had incurred spinal cord injuries a year or more before. We measured patients’ blood pressure, heart rate, and fingertip plethysmography during the evacuation procedure. Also blood pressure, heart rate and fingertip plethysmography were measured before and after the tilting test. Fourteen patients out of 17 complained about their physical condition with such complaints as feelings of exhaustion, listlessness or dizziness after evacuation. We observed a rise in blood pressure and a lowering of fingertip plethysmography during evacuation. Immediately after getting on the tilt table, these patients experienced a decrease in blood pressure and an increase in heart rate; however, compared to the day before evacuation, the heart rate increase was not considered significant and the wave height for finger plethysmography was low. The strain on the sympathetic nerves due to evacuation causes autonomic dystonia which means the parasympathetic nervous system is dominant and causes impairment of circulatory function.

Key words: Autonomic dystonia, Evacuation, Chronic cervical spinal cord injuries.

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INTRODUCTION

Orthostatic hypotension1) becomes a problem in rehabilitation of cervical spinal cord injuries. Patients undergoing continuous tilting or sitting posture training do not show orthostatic hypotension. Patients with cervical spinal cord injuries undergoing the procedure for evacuation of the bowels generally develop obstinate constipation; therefore, an appropriate evacuation program2, 3) is important. Generally speaking, the frequency of evacuation is 2 or 3 times a week. During rehabilitation, such as physiotherapy and occupational therapy, that follows the evacuation procedure, there are some patients who complain of disturbance of their physical condition with feelings of listlessness, dizziness, or exhaustion. On the morning of evacuation, some patients need to lie down and some are not able to follow through with their rehabilitation activities. There are many complaints about disturbance of the physical condition following evacuation in the acute stage.
but there are also some cases that show such disturbances continue after evacuation even in the chronic stage. In this paper we investigated the symptoms related to the disturbance of the patients’ physical condition for patients with chronic cervical spinal cord injuries.

MATERIALS AND METHODS

Seventeen patients took part in this study (15 male, 2 females). All had chronic cervical spinal cord injuries and more than a year had passed since they had sustained their injuries. Their ages ranged from 22 to 55 (average age 36.4 ± 16.9 years). All the cases were complete injuries. The injury levels were: C5, 6 patients; C6, 9 patients; C7, 2 patients. The number of years following the occurrence of the injury was from 1 to 12 years (average 3.5 ± 2.9 years). The frequency of evacuation varied from daily to once a week. Most of the patients underwent the procedure twice a week. Most of the patients used laxatives and enemas. The time requirement for evacuation was 8 patients within 45 min, 7 patients within 90 min, and 2 patients over 90 min.

Only 3 patients had no complaints of any disturbance in their physical condition during or after the evacuation process. Fourteen patients complained about their physical condition. Many complaints were a feeling of exhaustion or listlessness. Besides these, there were other complaints of perspiration, horripilation, heaviness in the head, nausea, dizziness, etc. These complaints correspond to autonomic hyperreflex symptoms.

We measured blood pressure, heart rate, and fingertip plethysmography during evacuation. We also carried out the tilting test on the day before evacuation and after evacuation. This test was carried out with the patients in the supine position on the tilt table and after the blood pressure and heart rate had settled, the table was tilted 70 degrees. Blood pressure, heart rate and plethysmography were measured every minute. When the patient fainted, the patient was immediately returned to the supine position and we waited till the patient had regained consciousness and blood pressure and heart rate had returned to the values they had been before the patient had gotten on the tilt table. Then the test was carried out again.

RESULTS

(1) Blood pressure, heart rate and fingertip plethysmographic measurements during evacuation of the bowels

There was a rapid rise in blood pressure and a considerably lower wave height with fingertip plethysmographic measurements during evacuation. At this stage the patients showed symptoms such as chills, perspiration, horripilation and a feeling of heaviness in the head. There were many cases that showed a decrease in heart rate.
during evacuation; however, some cases showed an increase. There was a tendency among the group of patients who had complained about their physical condition to show a considerable drop in heart rate. However, we did not see a significant difference between the increase or decrease in heart rate and whether or not there were complaints of disturbance of the patients' physical condition.

(2) Tilting test

In the tilting test, we observed a decrease in blood pressure and a corresponding increase in heart rate, immediately upon tilting the table. When the patients' physical condition was disturbed after evacuation, the heart rates increase in proportion to the decrease in blood pressure was less than that experienced with the tilting test on the previous day.

Figure 2 shows the results of the tilting test for a 49 year old male (C6, complete paralysis). The patient had no complaints after one hour in the standing position on the day before evacuation. Immediately upon tilting the table, his blood pressure fell rapidly and an increase in the reactive heart rate appeared promptly. So there is a significant correlation between blood pressure and heart rate. The tilting test was carried out 5 hours after evacuation; however, the patient complained of indisposition and dizziness because of the tilt of the table. His blood pressure dropped rapidly to the point that it could not be measured and he fainted. There was no corresponding increase in heart rate. After we had the patient lie down in the supine position, we carried out the tilting test again but the results were the same. The correlation between blood pressure and heart rate disappeared. Also during the process, there was a significant change in blood pressure when the patient was lying on his back. Sometimes the blood pressure in the contraction period went over 200 mmHg.

We measured the wave height obtained with fingertip plethysmography taken during the tilting test. The wave height was lower when the table was tilted. But comparing the result for the day before evacuation with that for the day of evacuation, the wave height after evacuation was low regardless of the patient's position, standing or supine. Thus we could see that there was an impairment of circulatory function after evacuation. The average wave height of fingertip plethysmographic measurements on the day before evacuation for 10
patients was 3.22 ± 1.31 mV/V in the supine position, and 1.12 ± 0.53 mV/V in the vertical position. On the other hand, the wave height after evacuation was significantly lower showing 2.09 ± 0.87 mV/V in the supine position and 0.58 ± 0.23 mV/V in the standing position.

**DISCUSSION**

By changing the position from supine to a sitting or standing posture, a decrease in venous return by gravitation occurs, as does a decrease in heart rate. However, in an uninjured individual, there is not a considerable lowering of blood pressure in this case because of the influence of the reaction through pressoreception, the mechanical action of muscle movement, and the influence of humoral factors\(^4\). In patients with cervical spinal cord injuries, the adjustments mentioned above do not function and often a rapid decrease in blood pressure appears with the changing of posture. At such times, many patients show a reflexive heart rate increase through pressoreception. This is because of the restraint of the vagus nerve.

In patients with cervical spinal cord injuries, the vagus nerve, which is a parasympathetic nerve, is retained anatomically and the parasympathetic nervous system assumes dominance in autonomic nervous control. Especially in the spinal shock stage immediately following the injury, well-known bradycardia and hypotension can be seen. Rising blood pressure and lowering fingertip plethysmographic wave heights accompanying the evacuation process for patients with cervical spinal cord injuries are the same symptoms as those for autonomic hyperreflex. Patients with cervical spinal cord injuries use laxatives and enemas for evacuation. Also patients endure stress for a long period of time, and during and after the evacuation process, the condition of the sympathetic nervous system is continuously over tensed.

In the chronic stage, the body condition is more stable and the autonomic function recovers to a certain level. There are adjustments in the circulatory system by autonomic function though these are not perfect. During evacuation, the overstrained condition of the sympathetic nerves shows up and in the tilting test carried out after evacuation, there is less of a heart rate increase proportional to blood pressure decrease. Also the wave height in fingertip plethysmographic measurements is low. Excessive strain on the sympathetic nervous system due to the evacuation procedure causes autonomic dystonia and in particular, the dominance of the relative parasympathetic nervous system becomes apparent.

**CONCLUSION**

In the acute stage for patients with cervical spinal cord injuries, the dominance of the parasympathetic nervous system shows bradycardia and hypotension. In the chronic stage, a certain level of autonomic nervous function seemingly recovers; however, essentially an ataxic condition remains and even in the chronic stage, the appearance of autonomic dystonia and the predominance of the parasympathetic nervous system caused by evacuation of the bowels shows an impairment of the circulatory function.

**REFERENCES**