"Ten Second Step Test" as a New Quantifiable Parameter of Cervical Myelopathy

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FROM ABSTRACT:

Study Design. A clinical and cohort study.

Objective.
We developed 10-second step test as a quantifiable measure of severity in cervical compressive myelopathy. The purpose is to establish the standard value of 10-second step test and to verify its clinical effectiveness.

Summary of Background Data.
In determining the severity of cervical myelopathy, the effects of surgical intervention, or the factors that influence prognosis, it is essential to have an objective and reproducible means of measuring the patient's disability.

Methods.
One hundred sixty-three preoperative patients with cervical compressive myelopathy and 1,200 healthy volunteers were included.

The study population included 99 men and 64 women with a mean age of 63.3 years (range, 33-92).

The primary test evaluated was number of steps in 10 seconds, which was then compared to other standard tests for cervical myelopathy. Number of steps significantly correlated with these other standard tests.

Results.
The average number of steps in all patients was 10.7 ± 5.5 before surgery whereas the average number of steps in the control was 19.6 ± 3.5.

The number of steps was significantly lower in patients than in control and decreased with age in both groups.

One hundred twenty-three patients were retested at 12 months after surgery. In this group, the average data of the step test were 10.4 ± 5.9 before surgery, and 14.0 ± 5.4 after surgery, showing significant postoperative improvement.
Conclusion.
A 10 second step test is an easily performed, quantitative task, and useful in assessing the severity of cervical spine myelopathy. Moreover, it can be used in determining the effects of decompressive surgical treatment.

THESE AUTHORS ALSO NOTE:

“Cervical compressive myelopathy is one of the most common neurologic disorders increasing in the geriatric population. It is caused by cervical spondylosis, disc herniation, and ossification of the longitudinal ligament. Symptoms include sensory disturbances of the extremities, clumsiness of hands, gait disturbance, and urinary dysfunction.”

“Patients with myelopathy experience difficulty in taking a step while walking, due to disorders of position sense and locomotor disability in the lower extremities, which reflect long tract pathology.”

“Hence, it was assumed that the step test could be used as a scale to quantify the severity of cervical compressive myelopathy.”

The patients and controls “were instructed to take a step by lifting their thighs parallel to the floor (hip and knee joints in 90° flexion) in the same place without holding onto any object for balance. The number of steps in 10 seconds was counted. Each patient and control was requested to perform the test at maximum speed.”

RESULTS

The average number of steps in patients was 10.7 ± 5.5 before surgery.

The average numbers of steps in healthy volunteers was 19.6 ± 3.5.

“The number of steps in 10 seconds was significantly lower in patients than in controls and decreased with the age of both the patients and controls.”

“One hundred twenty-three patients were retested at 12 months after surgery. In these patients the average data of the step test were 10.4 ± 5.9 before surgery and 14.0 ± 5.4 after surgery.” The step test showed significant postoperative improvement.

DISCUSSION

“A new locomotor scale 10 second step test was investigated to determine if it could be used as a quantifiable parameter for cervical compressive myelopathy. The present study demonstrates that the step test can reflect and quantify the severity of cervical compressive myelopathy. This test can easily be performed anywhere and at any time without the requirement of a special instrument and repeated if
necessary, as it is sensitive to neurologic impairment, particularly locomotor function of the lower extremities.”

This test also has a possibility to reveal the silent patient, as a screening test, who does not recognize they may be suffering from sub-clinical myelopathy.

“The average score of the step test in 1,204 healthy volunteers was 19.6 ± 3.4. The value 12.8 in this test can be used as the border between normal and patients with a possibility of cervical compressive myelopathy.”

Myelopathy secondary to spondylosis has an insidious onset, developing over a prolonged period. Once myelopathy occurs, spontaneous remission of symptoms is unlikely.

“A test result of less than 12.8 indicates the possibility of cervical compressive myelopathy, if no other locomotor disorders are present. This value might be used as a screening test for cervical compressive myelopathy.”

Worsening of performance on the step test indicates increasing damage to the long tracts of the spinal cord.

CONCLUSION

“A 10-second step test is an easily performed, quantitative task, and is useful in assessing the severity of cervical spine compressive myelopathy.”

“This test is reproducible and comprehensively performed worldwide and is not affected by the difference in language and life style.”

Moreover, it can be used for determining the effects of treatment.
Gray’s Anatomy has a nice axial view picture of the spinal cord showing its somatotopic organization. In oversimplification, the spinal cord appears like a bull’s eye target. The outer rings of the target (spinal cord) are the motor and sensory innervation to the perineum, legs and low back; while inner rings of the target (spinal cord) are the motor and sensory innervation to the upper extremities.

Central canal spinal stenosis of the cervical spine is essentially an irritation to the spinal cord from the outside towards the center. Consequently, central canal spinal stenosis primarily adversely affects the outer rings of the target (spinal cord), thereby affecting the nerve fibers that innervate the perineum, legs and low back.

Consequently, it is known that central canal stenosis of the cervical spine adversely affects the lower extremities, and such patients often have a walking intolerance. Testing lower extremity function is an assessment of the motor and sensory integrity of the outer fibers of the cervical spinal cord.

**Cervical Stenosis / Myelopathy**

From Gray’s Anatomy, 39th edition, 2005, p. 318
KEY POINTS FROM DAN MURPHY
1) Myelopathy secondary to spondylosis has an insidious onset, developing over a prolonged period.

2) “Cervical compressive myelopathy is one of the most common neurologic disorders increasing in the geriatric population. It is caused by cervical spondylosis, disc herniation, and ossification of the longitudinal ligament. Symptoms include sensory disturbances of the extremities, clumsiness of hands, gait disturbance, and urinary dysfunction.”

3) “Patients with myelopathy experience difficulty in taking a step while walking, due to disorders of position sense and locomotor disability in the lower extremities, which reflect long tract pathology.”

4) The patients and controls “were instructed to take a step by lifting their thighs parallel to the floor (hip and knee joints in 90° flexion) in the same place without holding onto any object for balance. The number of steps in 10 seconds was counted. Each patient and control was requested to perform the test at maximum speed.”

5) Normal controls can perform about 20 steps in 10 seconds.

6) Proven pre-surgical patients with cervical compressive myelopathy can perform about 10 steps in 10 seconds.

7) Post-surgical patients can perform about 14 steps in 10 seconds, which is significant postoperative improvement.

8) “A test result of less than [13 steps in 10 seconds] indicates the possibility of cervical compressive myelopathy, if no other locomotor disorders are present. This value might be used as a screening test for cervical compressive myelopathy.”

9) A 10-second step test is an easily performed, quantitative task, and useful in assessing the severity of cervical spine myelopathy. Moreover, it can be used in determining the effects of treatment.

10) “The present study demonstrates that the step test can reflect and quantify the severity of cervical compressive myelopathy. This test can easily be performed anywhere and at any time without the requirement of a special instrument and repeated if necessary, as it is sensitive to neurologic impairment, particularly locomotor function of the lower extremities.”

11) Worsening of performance on the step test indicates increasing damage to the long tracts of the spinal cord.

12) “This test is reproducible and comprehensively performed worldwide and is not affected by the difference in language and life style.”