

## Construction Anatomical Features of the Spine in the Lumbago Patients Comparison between Surgery Patients and Healthy Subjects

Minami Y and Daikuya S\*

Department of Rehabilitation, Kishiwada Eishinkai Hospital, Japan

### Abstract

As the preliminary study for establishment of how to decide the adaptation of the invasive therapy and how to increase the efficacy of the conservative therapy, we compared the characteristics of spine alignment between surgery patients with low back pain and healthy subjects using the Spinal Mouse. In the average of various angle, we compared them. Lumbar spinal Canal Stenosis (LCS) accepted a significant difference in thoracic spinal kyphosis angle (Th angle) of upright and Th angle, lumbar spinal lordosis angle (L angle), sacrum anteversion angle (S angle) of between trunk upright to trunk flexion (UF) and L, S angle of between trunk upright to extension (UE) in comparison with healthy subjects. Lumbar Disk Herniation (LDH) accepted a significant difference in Th angle of upright in comparison with healthy. But LDH didn't accepted a significant difference in all except Th angle of upright in comparison with healthy. It was suggested that it becomes an aid of aggravation prevention of a nerve lesion to catch the form of the spine in spinal patient.

**Keywords:** Spine; Physical therapy; Spinal mouse

### Introduction

In the patient with low back pain, some cases were selected the invasive therapy, some cases were selected the conservative treatment. Because the several risks and complications associated with the invasive therapy, we want to cure with the conservative therapy as much as possible based on our own physical therapy concept.

As for the factor related the low back pain, there is the spine alignment, the spinal mobility, the strength of back muscles and abdominal muscles, and so on. Especially, in the evaluation of spine alignment and mobility, the non-invasive study was useful in the field of physical therapy.

In this study, as the preliminary study for establishment of how to decide of the adaptation of the invasive therapy and how to increase the efficacy of the conservative therapy, we compared the characteristics of spine alignment between surgery patients with low back pain and healthy subjects using the Spinal Mouse (Figure 1).

### Methods

Subjects were twenty patients, who were scheduled to surgery and thirteen healthy people. Their mean age was  $60.7 \pm 13.7$  (30-77) years and  $66.8 \pm 5.9$  (55-75) years, respectively. And more, twenty patients were consisted of the patient with LCS (n=13) and the patient with LDH (n=7).



The rigs indicated by the small arrows move toward the large arrows over spinal process.

**Figure 1.** Spinal Mouse by Index Ltd [1].

We used the Spinal Mouse (Index Ltd), which measured spine alignment with three postures - trunk upright, flexion and extension in the standing position. This medical equipment is also no contamination, it is a short time, and a deer is also easily. Those were measured based on the Spinal Mouse's measurement manual (Figure 2). Measurement is simply possible by assigning to Spinal Mouse a subject's spinous process side and making it move to the tail side from the head side (Figure 2). As an index of this research, it was chosen from the measurement result Th angle, L angle, and S angle (Figure 3). In addition, we calculated it about the angle change from date, between UF and UE. Those were analyzed results of a measurement by attached software. We compared the obtained result by Th, L, and S angle in each Upright, UF and UE.

As statistical examination, we compared Th angle and L angle with S angle of trunk upright, UF, UE about LCS, LDH, healthy by use of t-statistical test. Following descriptions of statistical significance refer to a p-value < 0.05.

### Results

The details of the result were shown in Table 1. Average value  $\pm$  Standard deviation  $\times 3$  is detected as an abnormal value, we checked that there was no abnormal value in a measurement result.

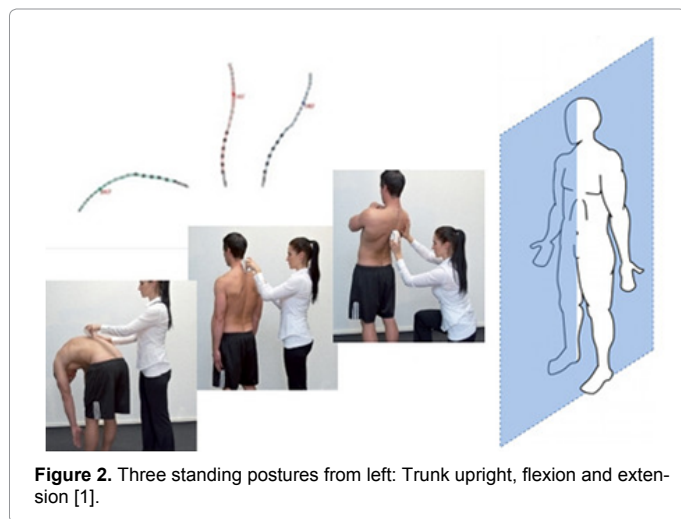
LCS accepted a significant difference in Th angle of upright and Th, L, S angle of UF and L, S angle of UE in comparison with healthy subjects (p < 0.05). LDH accepted a significant difference in Th angle of upright in comparison with healthy subjects (p < 0.05). But LDH was not accepted a significant difference in all except Th angle of upright in comparison with healthy (Figure 4).

\*Corresponding author: Daikuya S, Department of Rehabilitation, Kishiwada Eishinkai Hospital, Japan, E-mail: [yuichiro1007@mail.goo.ne.jp](mailto:yuichiro1007@mail.goo.ne.jp)

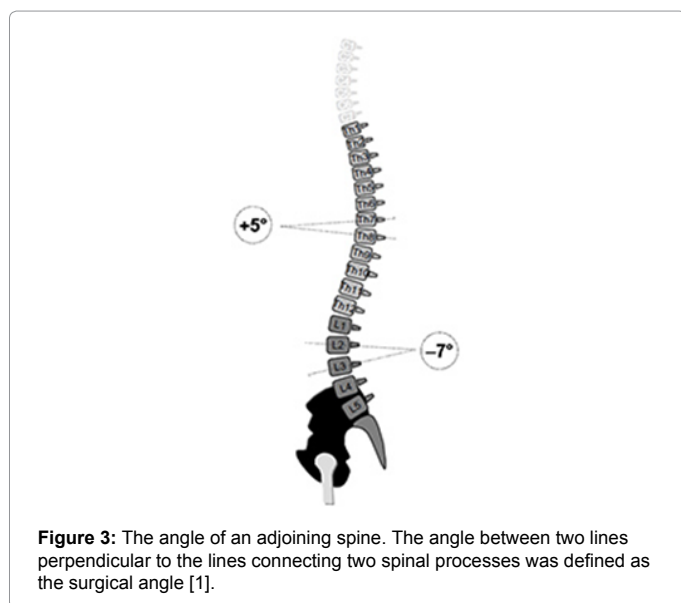
Received July 25, 2013; Accepted November 21, 2013; Published November 29, 2013

Citation: Minami Y, Daikuya S (2013) Construction Anatomical Features of the Spine in the Lumbago Patients Comparison between Surgery Patients and Healthy Subjects. Orthop Muscul Syst 2: 139. doi:10.4172/2161-0533.1000139

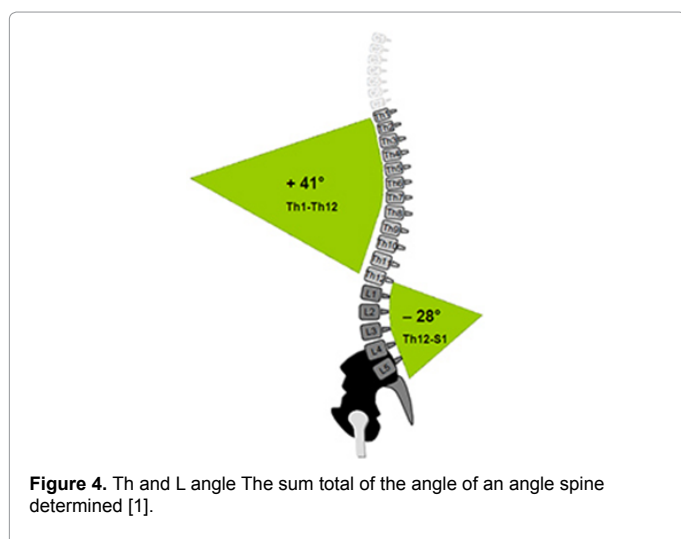
Copyright: © 2013 Minami Y, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.



**Figure 2.** Three standing postures from left: Trunk upright, flexion and extension [1].



**Figure 3:** The angle of an adjoining spine. The angle between two lines perpendicular to the lines connecting two spinal processes was defined as the surgical angle [1].



**Figure 4.** Th and L angle. The sum total of the angle of an angle spine determined [1].

	LCS	Healthy	LDH
Upright - Th angle	32.6	*40.4	*28.7
L angle	-13.9	-22.1	-14.9
S angle	7.8	10.7	13.3
UF - Th angle	21.5	*7.6	18.1
L angle	45.2	*20.3	26.1
S angle	49.0	*31.5	32.3
UE - Th angle	3.7	-4.4	-8.6
L angle	-12.4	*-4.7	-5.7
S angle	-11.2	*-5.0	-10.1

\*p-value<0.05

**Table 1.** The average of each angle (°)

## Discussion

In LCS comparison with healthy subjects, Th angle of upright and Th, L, S angle of UF and L, S angle of UE significantly showed a high score. It was cleared that the movement range of LCS is larger than healthy subjects. By various reports relevant to this factor, they are described that it is little mobility is mentioned as a factor of low back pain, differ from the result of this research [1,2]. There are various impairments due to decrease of normal curve of Th angle in patient with conservative therapy.

The range of motion of a lumbosacral spine increases by reduction in a range of motion of the thoracic spine [3]. In order to carry out compensation of the spine movement, L and S angle in UF and UE think that it moved hyper. On the other hand, patients of being before a surgical operation showed a low tendency as an overall angle. Because Th angle of upright in LCS was significantly lower than that of L angle, and S angle of upright. Accordingly, we think that it became the factor that a difference produces in width of a movement flexion and extension that is start form in upright it is flat spine. LDH was not accepted a significant difference in comparison with healthy subject because the characteristic of onset of LDH is acute compared with LCS.

By the way, although the evaluation of a posture is possible by a radiographic, there is a problem of contamination or an error of measurement. The pose estimation of the sagittal plane by Spinal Mouse is said almost equivalent to a radiographic [4]. No research refers to spine alignment in the surgery patient using the Spinal Mouse.

Spine alignment and mobility are mentioned as a factor of low back pain. There are researches which analyzed the posture of the example of patients with low back pain [2] and researches which carried out comparison with the person experienced in lumbago, and a healthy person [5]. In the patient with low back pain, that is said the lumbar kyphosis angle reinforces [6,7]. Thus, in patients with low back pain, many researchers have reported increase of the kyphosis angle of lumbar. However, from the result of this study, it was suggested that the kyphosis angle of a lumbar decreased. Although there is no significant correlation between Th angle and the age. In L angle and S angle, the significant correlation was excited [8].

On the other hand, change of a curve of thoracic spine has negative influence on alignment of a lumbosacral spine [2]. From these findings, we think that the nerve lesion of the lumbar would be worsened with the cause of some different influence from age; overuse, mal-alignment and so on.

## Conclusion

In the characteristics of spine alignment between surgery patients with low back pain and healthy subjects, Th angle in upright decreases and motion range of spinal increase LCS. It was suggested that these exacerbated the neurologic lesion of lumbar spinal.

---

## References

1. <http://www.index-j.com/spinalmouse.html>
2. Houki N, Satomi K, Nakagawa T, Kodama T (2003) Posture analysis of the lumbago patient by Spinal Mouse: The Journal of East Japanese Society of Plastic Surgery Disaster.
3. Oishi J, Aoki K, Uehara T, Kimura S, Maeno K, et al. (2011) Influence which change of a curve of a thoracic spine has on alignment of a lumbosacral spine: The Journal of Tokai Hokuriku Society of Physio Therapeutics.
4. Houki N (2010) Posture analysis of a Japanese healthy person, and the back and a lumbago patient by Spinal Mouse: *Journal of Anrin medical society* 41: 2-12.
5. Satou S, Kumazawa S, Koshiguchi S, Yamamoto T, Ishii C (2008) About the spinal column alignment in the example of a lumbago disease: The Journal of Japanese Society of Physio Therapeutics.
6. Berlemann U, Jeszenszky DJ, Bühler DW, Harms J (1999) The role of lumbar lordosis, vertebral end-plate inclination, disc height, and facet orientation in degenerative spondylolisthesis. *J Spinal Disord* 12: 68-73.
7. Jackson HC 2nd, Winkelmann RK, Bickel WH (1966) Nerve endings in the human lumbar spinal column and related structures. *J Bone Joint Surg Am* 48: 1272-1281.
8. Satou S, Kobayashi R, Tamaki H, Jigami H, Yamamoto T (2008) Examination of the spinal column alignment change by aging (The 3rd news): The Journal of Japanese Society of Physio Therapeutics.