

MEASUREMENT OF DIFFERENCE BETWEEN LEFT AND RIGHT RIB LENGTHS ON SCOLIOSIS

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INTRODUCTION

Scoliosis is a disease of spinal deformity accompanied by deformation of costal bones. Some researchers[1] suppose that the difference between left and right costal bones lengths cause the scoliosis in some case of AIS (Adolescent Idiopathic scoliosis). This paper measured the lengths of left and right ribs of 5 scoliosis subjects and 3 healthy subjects. These geometrical data are gotten by 3-D reconstruction of CT images. CAD software executed the measurement of 3-D length of the ribs.

METHODS

CT images including thoracic vertebrae and their costal bones were used. The images were reconstructed by the software, 3D-DOCTOR (Able Software corp. MA, USA). The 3-D data were converted to CAD data. For the measurement of the length of 3-D costal bone, CAD software, Rhinoceros (Robert McNeel & Associates, WA, USA) was used. Figure 1 is an extracted spinal centerline and the illustration of its curvature. Table 1 shows the Cobb angles and locations of apex vertebrae of curvature of scoliosis on each patient.

RESULTS AND DISCUSSION

The result shows that in scoliosis subjects the difference between the left and the right rib lengths was a little larger than that of healthy subjects. And the average percentage difference to the rib length was 2.2% (SD: 1.5%) in scoliosis subjects ($n=5$) whereas it was 1.1% (SD: 0.1%) in healthy subjects ($n=3$). (Figure 2) Each patient's correlation coefficient of CCS (Concave Curvature of Spine) and ΔCV (Difference between the rib length of concave side of spine and that of the convex side, that is the value subtracted rib length of the convex side of spine from that of the concave side) is shown in Figure 3. The average correlation coefficient of all patients was 0.24 (SD: 0.33) assuming the tendency that the rib of concave side is longer than that of convex side.

CONCLUSIONS

From the measurement of five scoliosis patients, it was suggested that rib of concave side of spinal curvature is longer than that of convex side or that there is no difference between both lengths of the rib.

Table 1: Cobb angle and apex vertebral location of five scoliosis subjects

Case	Cobb angle (deg.)	Location of apex vertebra of the lateral curvature
1	97	T8
2	50	T9
3	57	T7
4	65	T12
5	41	T8



Figure 1: Illustrated magnitude of curvature of the spinal centerline having the direction to the convex side of the line.

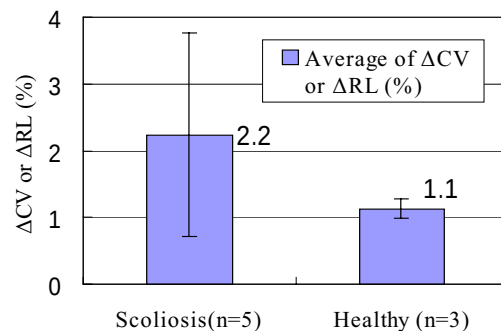


Figure 2: Comparison between ΔCV of scoliosis patients and ΔRL of healthy subjects.

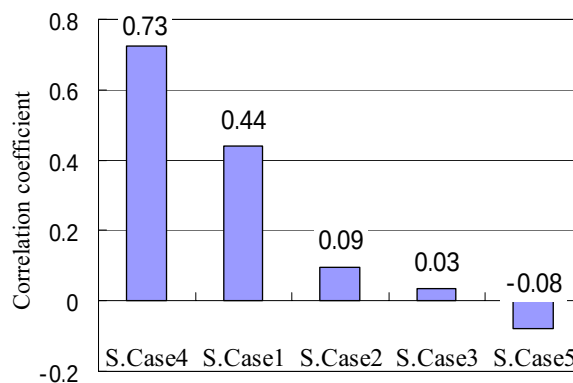


Figure 3: Correlation coefficient between CCS (Concave Curvature of spine) and ΔCV for each patient.

REFERENCES

- Sevastik JA, New approaches into the etiology, pathomechanism and treatment of idiopathic scoliosis, *International Research Society of Spinal Deformities, Symposium 2004*, Vancouver, Canada, University of British Columbia Press, 31-38, 2004.