INFLUENCE OF POSTERIO-ANTERIOR MOBILIZATION ON DIFFERENT LEVEL OF THE SPINE

[1]Bonnie YS Tsung, [2]John Evans, [3]Pin Tong, [1]Raymond YW Lee
[1]Department of Rehabilitation Sciences, The Hong Kong Polytechnic University, Hong Kong
[2] Centre for Rehabilitation Science and Engineering, Queensland University of Technology, Australia
[3] Department of Mechanical Engineering, The Hong Kong University of Science and Technology, Hong Kong
Contact: email: bonnie.t@polyu.edu.hk

INTRODUCTION

Postero-anterior mobilization involves the application of vertical forces on the human spine when the subjects lying prone. It is commonly used clinically for changing the spinal stiffness and symptoms of back pain patients. Previous research modeled posteroanterior mobilization as three-point bending of the lumbar spine, which was considered to be a beam supported at the pelvis and the thoracic cage [1]. But geometric effect of the spine on the segmental stiffness of the spine was still not be considered. The aim of this study was to measure the curvature change of the lumbar spine to PA mobilization of different lumbar spinal segments.

METHODS

Seventeen normal subjects (mean age = 30.71 ± 5.82, mean height = 1.71 ± 0.05m, mean weight = 65.53 ± 8.12 kg) agreed to participate in this study. Subject was requested to lie on the unpadded plinth with the face down. Posteroanterior mobilization force was applied to the spinous process of each level of lumbar spine by an experienced physiotherapist.

The spine was modeled as a beam support at thoracic cage and pelvic (Figure 1). Force applied to the spine was continuously monitored and captured by the use of a non-conductive force plate (4060-NC Bertec Corporation, Columbus, OH 43229, USA), which was mounted underneath the unpadded plinth. An electromagnetic tracking system (Fastrak, Polhemus Navigation, Colchester, VT) was used to measure the change in curvature of the spine. Two electromagnetic sensors were used to measure the local curvature change of the spine (e.g. Mobilizing L3, measure angle between L1 and L5 level). The bending stiffness (EI) of the spine was derived from the bending force and the local change in curvature of the spine by moment area method (Equation 1).

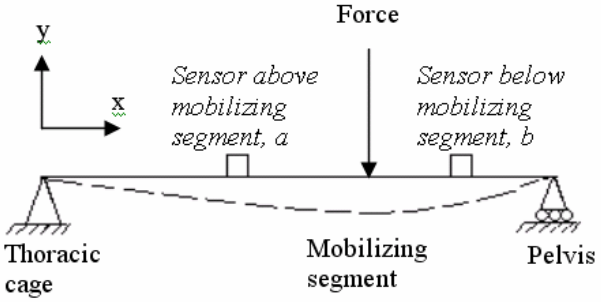

Figure 1: A beam model representing deflection of spine under posteroanterior mobilization.

$$EI = \frac{\int_b^a Mdx}{\theta_{ab}} \qquad \textit{(Equation 1)}$$

RESULTS AND DISCUSSION

Figure 2 shows the result of mobilizing different lumbar level. The mean frequency of mobilization for all five lumbar levels was 1.64 ± 0.13 Hz. Higher force was applied to the spine when mobilizing L4 & L5 level, and more resulting spinal curvature change was found on these levels than the remaining levels. However, these levels were found to be stiffer than the remaining levels.

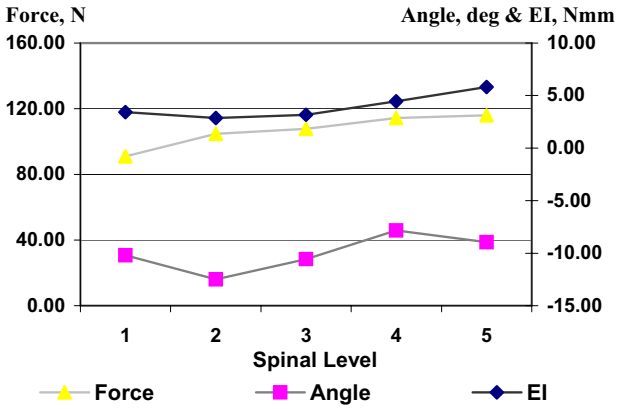

Figure 2: The average center of oscillation of the mobilizing force, change in spinal curvature (angle between L1and S2) and stiffness (EI).

CONCLUSIONS

The influence of spinal level and geometry on bending stiffness should be considered when clinical changes in spinal stiffness were evaluated.

REFERENCES

1. Lee RYW and Evans JH. Physiotherapy **80,** 68-73, 1994

ACKNOWLEDGEMENTS

The authors wish to thank the Hong Kong Research Grant Council in providing funding of this research project (Competitive Research Grant PolyU 5195/01E).