Title: Weight Bearing and Upright Simulation MRI/CT Evaluation for Degenerative Spinal Disorder

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Purpose: To demonstrate the benefit of diagnostic “weight bearing and upright position simulation” MRI/CT scanning to enhance diagnostic accuracy and precise pathology findings in degenerative spinal disorders. This system more accurately demonstrates the “real life” patho-anatomy and patho-physiology of the degenerative spine and the neural compression under “axial loading” condition. This technology enables more specific and precise diagnosis of degenerative lumbar spine, compared with the conventional supine spinal imaging study. It compresses the disc and facet joint further, simulating a patient in standing, bending and lifting weight, i.e. when sciatica and neurogenic claudication are more pronounced as a result of this “weight bearing and upright position simulation” MRI and CT imaging studies.

Materials and Methods: Since 2005, 620 consecutive weight bearing imaging studies have been performed. A lumbar spine compression device (by using DynaWell® – L-spine Compression Device, DynaWell Diagnostics, Inc., www.dynawell.biz) was utilized. Spinal axial compression was performed with gradual increasing compressive force, up to 50% of the patient’s body weight during MRI or CT scanning.

Results: Under axial lumbar spinal compression protocol, 70% of disc protrusions or herniation showed a significant increase of 2mm or more, compared with non-weight bearing MRI or CT Scanning. 14% of patients over age 55 were found to have a significant synovial cysts of 2 mm. or greater. It also demonstrates the relationship and mechanism of the neural compression by the protruded lumbar disc and the synovial cyst on the images. The patho-anatomy and mechanism of lumbar stenosis, both central and lateral, as the result of the axial compression to the lumbar discs, ligamentum flavum, and synovial cysts, causing “stenotic choking” of the lumbar nerves was clearly demonstrated. A more specific and valid diagnosis was achieved, as compared to regular non-loading MRI/CT scan imaging. A firm basis for the treatment decision for exact pathology is offered to the spine surgeon for a better treatment outcome.

Conclusion: It is obviously advantages with “weight bearing and upright position simulation” MRI/CT imaging evaluation for degenerative spinal disorder. It assists in defining the diagnosis of lateral and central spinal stenosis with encroachment of spinal canal, the disc herniation and facet joint synovial cyst, and the extent of neural compression. The spinal patient should be referred for MRI or CT imaging study with and without “weight bearing and upright position simulation” for better understanding and treatment of the degenerative spinal disorder. It should be an important part of preoperative surgical planning in minimally invasive spinal surgery.

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