TTUHSC-SOAHS Research Update and Fluid Dynamics of Neural Tissue

This session will provide an update on the Texas Tech University Health Sciences Center's School of Allied Health Sciences research conducted through the Center for Rehabilitation Research with an emphasis on the activity within the Clinical Anatomy Research Laboratory. Areas of focus will include discussions related to neural displacement and strain as well as fluid dynamics of intraneural fluid during upper and lower limb movement and neurodynamic mobilization strategies used in clinical practice.

The Effect of Lower Limb Neural Mobilization on Intraneural Fluid Dispersion of the Fourth Lumbar Nerve Root: An in-vitro Unembalmed Cadaveric Investigation

Background: Neural pathology affects a substantial portion of the population as a result of central and lateral stenosis, discogenic pathology, and peripheral entrapment . Clinicians incorporate neurodynamic mobilization to improve mobility of neural tissue post injury. Studies indicate that these strategies create less movement to the nerve roots than previously thought. Consequently, other mechanisms may be responsible for the positive clinical outcomes noted from these clinical interventions. These may include changes in blood flow, decreased intraneural edema, and improvements in axonal transport. **Methods:** A Biomimetic solution (Touludine Blue and Plasma) was injected intraneurally into the L4 nerve roots of seven unembalmed cadavers. The initial dye spread was allowed to stabilize and measured with a digital caliper. Once stabilized an intervention strategy (repetitive Straight Leg Raise (SLR)) was applied incorporating neurodynamic mobilizations (stretch/relax cycles) in a rhythmical pattern at a rate of 30 repetitions per second for a period of 5 minutes. Post intervention caliper measurements were taken of the dye spread. **Results:** The intraneural fluid dye spread increased as a result of neurodynamic mobilization. The mean experimental post-test measurement was 1.0 $\pm$ 1.0 mm greater than the initial stabilized pre-test measurement. These increases ranged from 0.0 to 2.6 mm and represented up to an 18.1% increase in longitudinal dye spread. The results of the paired samples *t-test* showed that these differences were statistically significant ($p<0.05$). ($F=9.90$; $p= 0.02$; partial eta-squared= 0.62; power= 0.75). **Conclusion:** Passive neurodynamic mobilization in the form of repetitive SLR mobilizations induced a significant increase in longitudinal fluid dispersion in the L4 nerve root of human cadaveric specimen. Lower limb neurodynamic mobilization may be beneficial in preserving nerve function by limiting or altering intraneural fluid accumulation within the nerve root, thus preventing the adverse effects of intraneural edema and resultant pressure.

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Dr. Gilbert was born and raised in Austin, Texas. He attended The University of Texas and graduated in 1993 with a Bachelor of Science Degree in Kinesiology. In 1994 he moved to Lubbock, Texas to attend Texas Tech University Health Sciences Center (TTUHSC) to pursue his Master of Physical Therapy (MPT) Degree. After receiving his MPT degree (1997) and being licensed as a physical therapist, he worked in an outpatient orthopaedic setting at University Medical Center in Lubbock, Texas. He took an Assistant Professor position in the TTUHSC, School of Allied Health Sciences (SOAHS), MPT Program in 1999. Since that time, he has completed his Certification in Orthopaedic Manual Therapy (COMT) through the International Academy of Orthopaedic Medicine-United States (IAOM-US; 2000), and completed his Doctor of Science (ScD) degree through TTUHSC/SOAHS in 2004. Dr. Gilbert has served as the MPT/DPT Program Director since 2004 and also has faculty appointments within the Transitional DPT, ScD, and PhD Programs within the Department of Rehabilitation Sciences. Dr. Gilbert coordinated the Musculoskeletal Practice Patterns track of the DPT curriculum for 10 years now coordinates the Human (Gross) Anatomy course for the Department of Rehabilitation Sciences. He also serves as the Director of the Clinical Anatomy Research Lab within the Center for Rehabilitation Research. Dr. Gilbert was awarded the "Young Investigator Award" (2007) by *SPINE* for his work in nerve root displacement and strain in unembalmed cadavers.