Dynamic Chiropractic

NCMIC Grant Allows for Research on Live Human Subjects

A $25,000 grant given to the National Institute of Chiropractic Research (NICR) by the National Chiropractic Mutual Insurance Company (NCMIC) has made it possible for our profession to investigate lumbar spinal mechanics and neurophysiology on live human subjects. Dr. Tony Keller, PhD, a professor from the department of mechanical engineering at the University of Vermont's musculoskeletal research laboratory, serves as the project's principal investigator.

Neurophysiological Investigations

Dr. Keller, currently on sabbatical from the university, is utilizing his overseas connections to perform research in a Belgian orthopedic hospital. He is working with surgeons to perform neurophysiologic investigations on live human subjects undergoing surgery. Recording electrodes monitor the nerve discharge from the lumbar facet joints before, during and after a chiropractic adjustment using the Activator adjusting instrument (AAI).

Previous research in the literature has demonstrated the innervation of the facet joint. It is theorized that spinal manipulation/adjustment may cause depolarization of various mechanoreceptor populations in the facet joint and surrounding tissues.

We are interested in what happens to mechanoreceptor response following chiropractic adjustments at different lines of drive on the transverse and spinous processes. We know from the literature that certain angles of stretching cause differences in mechanoreceptor depolarization. To our knowledge, this is the first time that this type of work has ever been performed on live human subjects.

Biomechanical Investigations

Dr. Keller and colleagues are also repeating studies on bone movement following chiropractic adjustments. The AAI is again being used because of its reproducibility. Steinmann pins are inserted into the spinous processes and equipped with accelerometers that monitor rotations and translations in six degrees of freedom. Adjustments are performed at different segmental contact points, and the corresponding bone movement and muscular responses recorded.

We also needed to do another bone movement test on cadavers, and that required another affiliation with an institution equipped with such facilities. We were very fortunate that Dr. Keller was able to call the University of Arizona and make contact with their chief anatomist. We are doing all the setup work, protocols, and bone movement measurements in vitro before we go live (in vivo) in the operating theaters in Belgium.

Over the last two years, we have also built the new equipment necessary to measure the force, acceleration and stiffness of the spine. This equipment is known as the Analyzer 2000 or the "pinger," and we will be using it in Belgium to measure the dynamic stiffness of the spine and the exact force and acceleration of the adjustments being made.

The Research Project

On February 1, 1998, Dr. Keller arrived in Phoenix, Arizona to begin his six-month sabbatical. He immediately began meeting with Dr. Arlan Fuhr and myself to begin the project. I don't know if you realize all the preplanning that is necessary to put a project like this together. First of all, we had to agree on what we were trying to accomplish. It is a tedious job explaining to a mechanical engineer what we are interested in as chiropractors.

We had several things we wanted to investigate. Primarily, we wanted to evaluate Activator Methods isolation tests and the effect they have on paraspinal musculature. We theorized that paraspinal muscle activity is in part influenced by spinal structure and function. Previous studies have demonstrated that the paraspinal musculature may be facilitated in the presence of dysfunctional spinal joints. Faciliated muscles have been shown to react in a hyperactive state, producing activity in a more prolonged and exaggerated manner than normal.

I recruited 20 subjects and gave them complete chiropractic examinations and radiographs. Subjects were then taken through the Activator Methods protocol. EMG electrodes were attached to the paraspinal musculature to monitor activity before, during and after isolation testing. Correlations were made and compared to outcome assessment instruments, as well as pressure algometry for validation purposes. Spinal stiffness was recorded to determine differences between subjects with and without back pain. All of this was preliminary work before leaving for Belgium.

Research is Time-Intensive

Our project that began the first week in February was very sacrificial on the part of everyone involved. Picture this: I started my regular practice at 8:00 am and finished with my regular patients at 6:00 pm. Then the research patients were scheduled one per hour from 6:30 pm until three patients were evaluated. (Due to the demands of the project, a five-minute adjustment took one hour!) Each evening, the project wrapped up around 9:30 or 10:00 pm. This had to be done every night for a period of one month so we could assess the change over time.

Dr. Keller began each day at 8:00 am by getting all the protocols ready, along with setting up equipment and making sure it was properly working by the time the patients arrived. After the data collection began, Dr. Keller spent the major portion of his day analyzing data and attending to the tedious process of writing manuscripts.

I am happy to report that the project is off to a great start. Drs. Keller and Fuhr, and myself have already completed one manuscript for submission for publication. We are very fortunate to have Dr. Keller here in Phoenix on sabbatical, with no other demands on his time. Also, the data collection has gone better than we had hoped for. All of this work is critical for the future of the profession, and especially for finally defining subluxation by using neurophysiological and biomechanical terms understood by the scientific community at large.

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APRIL 1998