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## Kinematic analysis of the upper cervical spine manual techniques and 3D anatomical modeling for a better reappraisal of what we do with our hands

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Segmental or regional biomechanical characteristics have been investigated for cervical spine manual techniques. 3D motion computation of the upper cervical spine (UCS) during mobilization, manipulation and motion palpation is of interest to enhance understanding of manual approaches applied at this critical spine complex. To conduct this study, motion and imaging data were collected from 5 specimens on the basis of a previous in-vitro experimental method. Kinematics of the UCS was assessed during manual procedures. Different manual techniques were selected consisting in UCS manipulation, mobilization and motion palpation (i.e. condylar glide). Bone motion data was processed using an optoelectronic system thanks to reflective clusters inserted into the bones of interest. The reliability of motion during tasks was also assessed. Additionally, integration of 3D kinematics into anatomical models was registered to provide motion representation. Our investigation supports the reduced angular displacements during UCS manual techniques, especially regarding axial rotation during thrust manipulation. Additionally, kinematics variability was low confirming intra- and inter-practitioners consistency of UCS manual achievements. Condylar glide assessment displayed specific motion patterns that may reappraise the issue of this manual clinical task. Anatomical modeling and motion representation constitute an innovative development to provide new insights for understanding motion behaviors of the UCS during manual techniques. The present data may be considered for clinical use and could be suitable for further development of manual techniques. Pedagogical application is available for better understanding of manual approaches such as passive joint mobilization or clinical testing.

### Biography

Pierre-Michel Dugaillly received his PhD in Biomedical Sciences from the Université Libre de Bruxelles. He is Head of the Department of Osteopathic Sciences and is a full-time Professor at the Faculty of Motor Sciences. He has expertise in clinical assessment and treatment of musculoskeletal disorders. His teaching interests include joint kinematics, spinal manipulation and osteopathic methods. His main research concerns in joint kinematics, anatomical motion modeling and clinical assessment of the spine.

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