Author's Accepted Manuscript

Twente Spine Model: A Complete and Coherent Dataset for Musculo-Skeletal Modeling of the Lumbar Region of the Human Spine

Riza Bayoglu, Leo Geeraedts, Karlijn H.J. Groenen, Nico Verdonschot, Bart Koopman, Jasper Homminga



PII: S0021-9290(17)30010-6 DOI: http://dx.doi.org/10.1016/j.jbiomech.2017.01.009 Reference: BM8081

To appear in: *Journal of Biomechanics* Accepted date: 5 January 2017

Cite this article as: Riza Bayoglu, Leo Geeraedts, Karlijn H.J. Groenen, Nice Verdonschot, Bart Koopman and Jasper Homminga, Twente Spine Model: A Complete and Coherent Dataset for Musculo-Skeletal Modeling of the Lumba Region of the Human Spine, *Journal of Biomechanics* http://dx.doi.org/10.1016/j.jbiomech.2017.01.009

This is a PDF file of an unedited manuscript that has been accepted fo publication. As a service to our customers we are providing this early version o the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable form Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain

ACCEPTED MANUSCRIPT

Twente Spine Model: A Complete and Coherent Dataset for Musculo-Skeletal Modeling of the Lumbar Region of the Human Spine

Riza Bayoglu^{a,*}, Leo Geeraedts^b, Karlijn H. J. Groenen^c, Nico Verdonschot^{a,c}, Bart Koopman^a, Jasper Homminga^a

^aDepartment of Biomechanical Engineering, University of Twente, Enschede, the Netherlands

^bRadboud university medical center, Department of Anatomy, Nijmegen, the Netherlands

^cRadboud university medical center, Radboud Institute for Health Sciences, Orthopaedic Research Laboratory,

Nijmegen, The Netherlands

9 Abstract

3

7

Musculo-skeletal modeling can greatly help in understanding normal and pathological func-10 tioning of the spine. For such models to produce reliable muscle and joint force estimations, an 11 adequate set of musculo-skeletal data is necessary. In this study, we present a complete and co-12 herent dataset for the lumbar spine, based on medical images and dissection measurements from 13 one embalmed human cadaver. We divided muscles into muscle-tendon elements, digitized their at-14 tachments at the bones and measured morphological parameters. In total, we measured 11 muscles 15 from one body side, using 96 elements. For every muscle element, we measured three-dimensional 16 coordinates of its attachments, fiber length, tendon length, sarcomere length, optimal fiber length, 17 pennation angle, mass, and physiological cross-sectional area together with the geometry of the 18 lumbar spine. Results were consistent with other anatomical studies and included new data for 19 the service posterior inferior muscle. The dataset presented in this paper enables a complete and 20 coherent musculo-skeletal model for the lumbar spine and will improve the current state-of-the art 21 in predicting spinal loading. 22

23 Keywords: lumbar spine, cadaver, musculo-skeletal model, muscles, sarcomere length

*Corresponding author at: Department of Biomechanical Engineering, Horstring W213, University of Twente, P.O. Box 217, 7500 AE Enschede, the Netherlands. Tel.: +31 053 4896477, Fax: +31 53 489 2287,

E-mail address: r.bayoglu@hotmail.com (Riza Bayoglu).

Preprint submitted to Journal of Biomechanics

Download English Version:

https://daneshyari.com/en/article/5032200

Download Persian Version:

https://daneshyari.com/article/5032200

Daneshyari.com