



# Analysis of surgeon biometrics during open and robotic radical cystectomy with electromyography and motion capture analysis

Adam Baumgarten <sup>1</sup>, Joon Kyung Kim <sup>1</sup>, Jeff Robison <sup>1</sup>, John Mayer <sup>2</sup>, Dustin Hardwick <sup>2</sup>, Trushar Patel <sup>1</sup>

<sup>1</sup> Department of Urology, University of South Florida, FL, United States; <sup>2</sup> Department of Physical Therapy, University of South Florida, FL, United States

## ABSTRACT

**Purpose:** To determine feasibility of measuring surgeon physical stress during both open radical cystectomy (ORC) and robotic radical cystectomy (RRC).

**Materials and Methods:** One patient underwent ORC, while the other underwent RRC by a single surgeon. The diversion was excluded from this study. Noraxon® myoMOTION™ kinematics sensors were used to quantify the amount of joint and segmental motion of the spine, shoulders, and head. myoMUSCLE™ EMG sensors were used to measure activation levels, patterns, and fatigue characteristics of key muscle groups. The Prone Static Plank Test (PSPT) and Modified Biering-Sorensen Test (MBST) were used to assess surgeon strength and endurance of core musculature.

**Results:** The surgeries were represented in five stages. During ORC, the percentage of time spent in cervical flexion was 98%, 91.8%, 87.5%, 100%, and 97.1%, respectively. During RRC, 100% of the time was spent in cervical flexion. Activation of key muscle groups was examined across all stages and expressed as a percentage of peak activation. MBST times were both 25 second pre-and post-surgery ORC and 25.1 seconds pre-surgery and 32.4 seconds post-surgery for RRC. PSPT times were 68 second pre-surgery and 48 seconds post-surgery for ORC, and 59 second pre-surgery and 51 seconds post-surgery for RRC.

**Conclusion:** We were able to identify meaningful data using kinematic and EMG analysis during ORC and RRC. We were able to identify target muscle groups that will be used to conduct a larger study with multiple surgeons to help determine if there is an ergonomic advantage to RRC over traditional ORC.

## ARTICLE INFO

 Adam Baumgarten

<https://orcid.org/0000-0001-8042-7036>

Available at: [http://www.int brazjurol.com.br/video-section/20190163\\_Baumgarten\\_et\\_al](http://www.int brazjurol.com.br/video-section/20190163_Baumgarten_et_al)  
Int Braz J Urol. 2020; 46 (Video #1): 138-138

Submitted for publication:  
March 11, 2019

Accepted after revision:  
May 01, 2019

Published as Ahead of Print:  
June 22, 2019

### Correspondence address:

Adam Baumgarten, MD  
Department of Urology  
University of South Florida, CA, USA  
2 Tampa General Circle  
Tampa, 33620-9951, Florida, CA, United States  
E-mail: [abaumgar@health.usf.edu](mailto:abaumgar@health.usf.edu)