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### Technological developments in the quantitative visualization of pelvic floor function using imaging and biomechanical devices

The muscles associated with the pelvic floor function contribute to multiple function during a lifetime. These vary from conception to birth/delivery to urinary and bowel continence and respond to voluntary and reflex stimuli. Ultrasound imaging and image analysis enables the visualization of movement of important anatomical structures such as the bladder, vagina, and urethra. The relative displacement of such organs to incontinence producing events provides an indication of their attachment within the abdomen. Such displacement can be used to analyze the superficial pelvic floor function because it is affected by the ischiocavernosus muscle, the bulbocavernosus muscle, and the perineal membrane containing muscles surrounding the vagina and the urethra. Analysis of sequences of ultrasound images generates biomechanical parameters such as relative displacement, velocity and acceleration of movement of relevant organs. However the force generated by the various pelvic floor muscles cannot be derived directly from imaging. To enable the biomechanical evaluation of muscle strength a novel vaginal probe was constructed and used to measure the force of voluntary passive, and active displacement as well reflex response at various positions within the vagina. Data were obtained from healthy volunteers as well as incontinent subjects and those with pain. Presentation illustrates the characteristic response of these subjects and integrates the data generated using the two different modalities. The visualization approach enables the direct evaluation of the differences not only between healthy and incontinent function but also aids in the evaluation of the coordinated voluntarily and involuntarily reflex contractions that responds timely to changes in intra-abdominal activity. Consequent dysfunction that may produce disorders, which such as incontinence, lower urinary tract symptoms and pain can be quantified. Furthermore, image analysis of ultrasound visualizations is advantageous in exploring relative dynamic anatomy by providing simultaneously considerable amount of dynamic data of different pelvic structures that cannot be visually assimilated in real time by the observer, particularly during fast events such as coughs.

#### Biography

Chris Constantinou has completed his Ph.D at Stanford University and continued as faculty in the department of Urology. He is now the principal investigator of an NIH project involving the evaluation of pelvic floor function at the VA Medical Center in Palo Alto at the Spinal cord injury center. He has published more than 136 papers and chapters in peer reviewed journals, is Editor in Chief of the Open Journal of Obstetrics and Gynecology and is serving on the editorial board member of many other journals.