

PRESSURE MAPPING OF VOLUNTARY AND INVOLUNTARY MUSCLE CONTRACTION FOR ASSESSMENT OF SUI CONDITIONS

Introduction

The effective management of stress urinary incontinence (SUI) requires understanding of the anatomy and function of the female pelvic floor. Tactile imaging, translating the sense of touch into a computer image, allows biomechanical assessment of pelvic floor conditions including muscle function [1, 2]. Objective of this study is to introduce new clinical evaluation tools with a vaginal tactile imaging probe, which allows high definition pressure mapping, to assess pelvic floor function by quantitative and anatomically sensitive manner during voluntary and involuntary muscle contractions.

Design

A vaginal tactile imaging probe that images the entire vagina, the pelvic floor support structures and pelvic floor muscle contractions in real time was utilized [3]. The probe has 96 tactile sensors positioned along the both sides of the probe (11 cm length), a motion tracking sensor, temperature controller, and two microchips for communicating with a computer. We implemented the software support for high definition pressure mapping during voluntary (prompted flicker and sustained contractions) and involuntary (cough) pelvic floor muscle contractions. We enrolled the first 26 subjects of 150 planned into an observational case-controlled study. The patients were studied with the vaginal tactile imaging probe in lithotomy position. They were asked to complete an assessment of comfort and pain levels for the tactile imaging (pressure mapping) procedures.

Results

All 26 patients were successfully examined and data were recorded using the Vaginal Tactile Imager [3]. The preliminary data analysis reveals the following findings:

- 1) We observed significant amplitude difference in voluntary muscle contractions for anterior vs posterior and left vs right side which may allow recognizing of muscle avulsion and further characterization of their functional conditions.
- 2) The pressure patterns during involuntary muscle contraction (cough) are substantially different from voluntary contractions as in amplitudes as well as in peak locations.
- 3) Patients with normal pelvic floor conditions demonstrate higher pressure applied amplitudes in both voluntary and involuntary muscle contractions than the patients with SUI.
- 4) The pressure patterns during involuntary muscle contraction (cough) with SUI conditions have distinctive structure from the patterns without SUI.
- 5) It seems possible to characterize functional conditions of multiple dynamic pelvic structures.

A typical examination with vaginal tactile imaging probe takes 2-3 minutes. 54% of patients classified VTI comfort level as more comfortable than manual palpation, 30% as the same, and 16% as less comfortable than manual palpation. Only 4% reported pain with the examination.

Conclusion

Our findings demonstrate that high definition pressure mapping during voluntary and involuntary muscle contractions may be used for assessment of pelvic muscle conditions/defects which contribute into SUI.

References

1. IEEE Trans. Biomed. Eng. 2010; 57(7):1736-44.
2. Int. Urogynecology J. 2012; 23(4):459-66.
3. Int. Urogynecology J. 2015; 26(4): 607-9.

Disclosures

Funding: The work was supported by NIH/NIA grant AG034714 **Clinical Trial:** Yes **Registration Number:** ClinicalTrials.gov: NCT02294383 **RCT:** No **Subjects:** HUMAN **Ethics Committee:** Princeton HealthCare System and St. Luke's University Health Network **Helsinki:** Yes **Informed Consent:** Yes