

COUGHING AND PELVIC FLOOR MUSCLE ACTIVITY: COMPARISON BETWEEN UPRIGHT SITTING AND SLUMPED SITTING POSTURES.

Hypothesis / aims of study

The muscles of the female pelvic floor (PF) consist of more than one muscle layer, but the relationship between the layers during function has received little attention. Previous work has recorded differences in EMG activity recorded with 2 sets of electrodes on a vaginal probe; one electrode close to the entrance to the vagina (superficial) and one electrode placed further internally (deep). In that study activation of the superficial muscles preceded that of the deep muscles during a voluntary contraction of the pelvic floor muscles in healthy women (1). Whether these recordings show differential activation of parts of the pelvic floor during other tasks is unclear. Notably due to differences in orientation of the muscle fibres of the multiple muscle layers, the activity of the different muscle regions may be affected differentially by changes in body posture. Thus the aim of this study was to compare the effect of the sitting position on the activity of the deep and superficial regions of the pelvic floor muscles during a voluntary cough.

Study design, materials and methods

Four parous pre-menopausal women, with an average age of 41 years, participated in this preliminary study. Three of the subjects had a history of vaginal delivery and one of elective caesarean sections. Recordings of PFM EMG were made with a custom designed electrode that allowed recording of vaginal EMG with electrodes placed to record muscle activity separately from the deep and superficial regions of the PF muscles and on each side of the vagina. EMG activity was amplified 2000 times, filtered between 30 Hz – 1 kHz and sampled at 2 Hz. Pressure at the mouth was recorded with a pressure transducer attached to a face mask. Subjects were instructed to perform a single cough of moderate intensity in both a slumped posture with the lumbar spine resting against a support and in an upright unsupported position with the back positioned away from the chair support. The feet were well supported and pressure on the probe was avoided by use of a chair with a cut-out in the seat. EMG data was high pass filtered at 50 Hz to remove any movement artefact from the cough. Root mean square EMG amplitude was calculated for 200 ms after the onset of increase in mouth pressure. A ratio of EMG amplitude was calculated between that recorded in the slumped position and that recorded in the upright position. This value was averaged for the data from the left and right pelvic floor EMG recordings. Ratio data were compared to no change in activity with t-test for single samples. Significance was set at $p < 0.05$.

Results

When the position was changed from slumped to upright sitting there was a 19 (11) % decrease in EMG recorded with the more externally placed electrodes. When this was evaluated with a t-test against no change, the reduction in EMG amplitude was significant. ($P < 0.02$). However, there was no significant change in amplitude of PF EMG recorded with the more deeply situated electrodes ($P = 0.90$).

Interpretation of results

These results indicate that although the activity of the deeper region of the PF muscles during a cough is not affected by lumbopelvic posture, the activity of the more superficial regions of the PF muscles is greater in a slumped position. These data may suggest that greater activity of the more superficial regions of the muscle (closer to the entrance of the vagina) is required to maintain continence when the pelvis is posteriorly tilted which could slacken the pelvic fascial support. Although the number of subjects was small, there results were consistent between subjects and yielded a significant change in activity.

Concluding message

These data add further support to the proposal that the superficial and deep regions of the PF muscles are differentially active, with differential effects of changes in posture.

References

1. International Continence Society conference, Paris 2004, abstract 239.

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HUMAN SUBJECTS: This study was approved by the The University of Queensland Research Ethics Committee. and followed the Declaration of Helsinki Informed consent was obtained from the patients.