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THE EFFECT OF SITTING POSTURE ON RESTING PELVIC FLOOR AND ABDOMINAL MUSCLE ACTIVITY IN WOMEN WITH AND WITHOUT STRESS URINARY INCONTINENCE.

Hypothesis / aims of study

The pelvic floor muscles (PFM) exhibit tonic electromyographic (EMG) activity at rest which increases from lying to sitting and further still in standing (1). However sitting posture can vary and it has been shown that abdominal muscle EMG activity differs with changes in sitting posture (2). It is not known whether PFM tonic activity varies with changes in sitting posture, and whether continence status affects the level of activity. The aim of the study was to investigate the resting EMG activity of the pelvic floor and abdominal muscles with changes in sitting posture (slumped sitting and upright unsupported sitting) and to compare this between women with and without incontinence. A further aim was to compare activity in an unsupported position involving thoraco-lumbar extension (extreme upright sitting) in a subset of subjects.

Study design, materials and methods

Seventeen parous females (nine asymptomatic subjects and eight subjects with untreated symptomatic stress urinary incontinence (SUI)) were recruited from volunteers and patients, all of whom had a history of one or more vaginal deliveries. EMG activity of right and left obliquus internus abdominis (ROI & LOI), right and left obliquus externus abdominis (ROE & LOE) and right rectus abdominis (RRA) was monitored with Ag/AgCl surface electrodes. PFM activity was monitored intra-vaginally with a Periform probe (Neen Healthcare, UK). All subjects were seated over a small cut-out that prevented pressure on the Periform probe.

Muscle activity was recorded in slumped supported sitting (SS)(n=17)and upright unsupported sitting (UU)(n=17) while the position was maintained for 10 seconds, and in very tall unsupported sitting position (VT)(n=13) which was assumed during the 10 second recording. A modified turning point filter was used to remove the heart beat artefact from the EMG recordings. The shape of the spinal curves from S2 to C7 was monitored using a flexible ruler in SS and UU postures in all subjects. The order of positions was randomised. Five seconds of data was analysed for SS, UU and VT sitting. Subjects gave informed consent for participation in the study which had ethics committee approval.

Analysis

EMG data were analysed as raw EMG. Although there are issues associated with comparison of raw EMG due to changes in the placement of the electrode, differences in filtering by soft tissues, there are also issues associated with comparison of EMG data that has been normalized to activity recorded during maximal efforts and standardised manouvres. For instance women with SUI are unlikely to be able to perform maximal voluntary efforts of the pelvic floor muscles and if the recruitment of the pelvic floor muscles is changed in women with SUI, the activity recorded during a standardized manouvre is likely to differ between women with and without incontinence. As we did not expect large differences in soft tissue between groups and electrodes were placed over specific landmarks, we argue that this is unlikely to systematically affect EMG amplitudes.

Primary analysis involved repeated measures ANOVA (1 repeated measure – position, 1 independent factor – group). Secondary analysis – comparison of 3 postures in the sub-set of subjects in whom the position was tested – repeated measures ANOVA.

Results

When subjects adopted the upright unsupported sitting posture the EMG activity of the PFM ($P<0.01$) and ROI ($P<0.05$) increased compared to the slump supported position. There was also a trend, although non-significant, for EMG activity of LOE ($P=0.19$), LOI ($P=0.10$), ROE ($P=0.12$) to increase. There was no change in RA activity ($P=0.28$). Women with SUI had decreased tonic activity of the pelvic floor muscles in both sitting positions ($P<0.05$) compared to the control subjects. This was associated with a trend for increased activity of RA ($P=0.059$) and LOE ($P=0.14$) in both positions. All subjects increased the lumbar lordosis and decreased the thoracic kyphosis in moving from SS to UU sitting.

The secondary analysis, which included the VT posture, indicated that PFM activity ($P<0.001$) was increased in all subjects in comparison with the slumped posture. However there were no differences between groups in this smaller subset of subjects. EMG activity in LOE, LOI, ROE, ROI ($P<0.05$) was significantly greater in VT compared to the slump supported position.

Interpretation of results

More upright sitting postures are associated with greater tonic activity of the PFM compared to slumped supported postures, irrespective of continence status, and this is accompanied by a trend to increased abdominal muscle activity. However women with SUI had lower levels of tonic PFM activity, irrespective of position, than continent women. Increased abdominal muscle activity accompanied the increased PFM activity in the VT posture.

Concluding message

Tonic PFM activity is affected by sitting. This should be taken into account during rehabilitation of these muscles and in the development of programmes for long term maintenance of muscle function.

References

1. Urology International 1975, 30:92-98.
2. Spine 2002, 27:1238-1244.

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