Intra-abdominal pressure increase in women during exercise: A preliminary study

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Background
Women with chronic cough, high BMI or who perform repeated heavy lifting are more at risk of pelvic organ prolapse (POP). The influence of intra-abdominal pressure (IAP) on POP development is poorly understood. Currently there is little quantitative measurements of IAP during exercise and movement, despite the knowledge that moderate exercise is important for general health and recovery. Previous devices used to measure IAP are limited by their shape or inability to transmit data wirelessly. Thus, clinical advice to patients on physical and work activity following prolapse surgery is often inconsistent and possibly overly restrictive.

Aim
To use a novel, wireless intra-vaginal pressure sensor (IVPS) to provide preliminary quantitative evidence of increases in IAP during exercise and movement.

Methods
• The IVPS shown to be reliable in test re-test series across a range of activities (Cronbachs alpha >0.9)
• IVPS shape conforms to the vaginal anatomy, is flat, soft and compliant, thus does not distort the surrounding tissue.
• All participants inserted and removed the device themselves.
• 14 volunteers used new IVPS to record IAP increases during eight activities.
• Activities included coughing, valsalva manoeuvre, walking on a treadmill at 2 km/hr, 4 km/hr, 6 km/hr and running at 7 km/hr, star-jumps, squatting, lifting weights (2 kgs, 5 kgs) above the head, and sit-ups.
• Baseline pressures were obtained lying down.
• Data was sampled at 2 kHz and pressure changes transmitted to an external receiver (Telemetry Research®).
• LabChart7 used to extract mean and peak pressures (Figure 1).
• The IVPS was calibrated before and after each test.

Results
• Mean age was 35.9 years (range 20-51 years), BMI 22.6 kg/m² (range 18.6-26.7 kg/m²).
• Four were nulliparous, eleven multiparous, median vaginal deliveries = 2.
• Twelve sets of data analysed; two participants could not complete the protocol due to fitness.
• All women retained IVPS and found it comfortable.
• Mean and amplitude pressures measured across activities (Figure 2).
• Coughing and star jumps – highest amplitude (n = 10).
• >40 % in amplitude from walking at 6 km/hr to running at 7 km/hr (n = 11)
• Highest mean pressure during valsalva (n = 7).
• Sit-ups were variable and technique dependant.
• Mean pressures were similar for lifting weights and sitting.

Statistical analysis:
• Descriptive analysis examined the relative increases in IAP across activities

Figure 2: Mean and amplitude pressures (n=12)

Concluding message
The IVPS reliably measured intra-vaginal pressure across a range of activities. This is the first device to measure IAP at high frequency with the freedom of a wireless system. The IVPS aims to provide information to better advise women on pre and post operative activities. Studies are planned in a gym setting and in women with a wide BMI range.

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References: