

EFFECTS OF AGE ON LEVATOR FUNCTION AND MORPHOMETRY

Hypothesis / aims of study

Epidemiological data supports the hypothesis that ageing is a risk factor for female pelvic organ prolapse. It is generally accepted that anatomical integrity and function of the levator ani muscle are likely to play an important role in pelvic organ support, and recent studies have shown a correlation between levator biometric indices and pelvic organ support (1). In this study we intended to determine the effect of age on levator function and morphometry in a series of patients presenting for urogynaecological evaluation, in order to determine whether the effect of age on pelvic organ support might be mediated by the levator ani muscle.

Study design, materials and methods

375 patients underwent a physical examination and transperineal ultrasound in a tertiary urogynaecological unit. Clinical assessment of the pelvic floor muscles (PFM) was performed by digital palpation for contractility using the Modified Oxford Scale (MOS) system. MOS grading was undertaken for both sides separately, and allowing for half-grades, resulting in a 21-point scale. For ultrasound imaging Volume cine loops were obtained by 3D transperineal pelvic floor ultrasound. A GE Kretz Voluson 730 expert system (GE Medical Ultrasound) was used with an 8- to 4- MHz RAB volume transducer with 85° acquisition angle. Imaging was performed with the patient supine and after bladder emptying. All datasets were processed offline using the software GE Kretz 4D View v 5.0 for hiatal area and diameters in rest, on PFM contraction and Valsalva (figure 1). Biomechanical properties were determined by calculating strain on Valsalva and contraction (2). Statistical analysis was performed with Minitab version 13.1 and SPSS version 14.0 for Windows. Pearson's correlation, t-test and stepwise regression were used. A p-value < 0.05 was considered statistically significant.

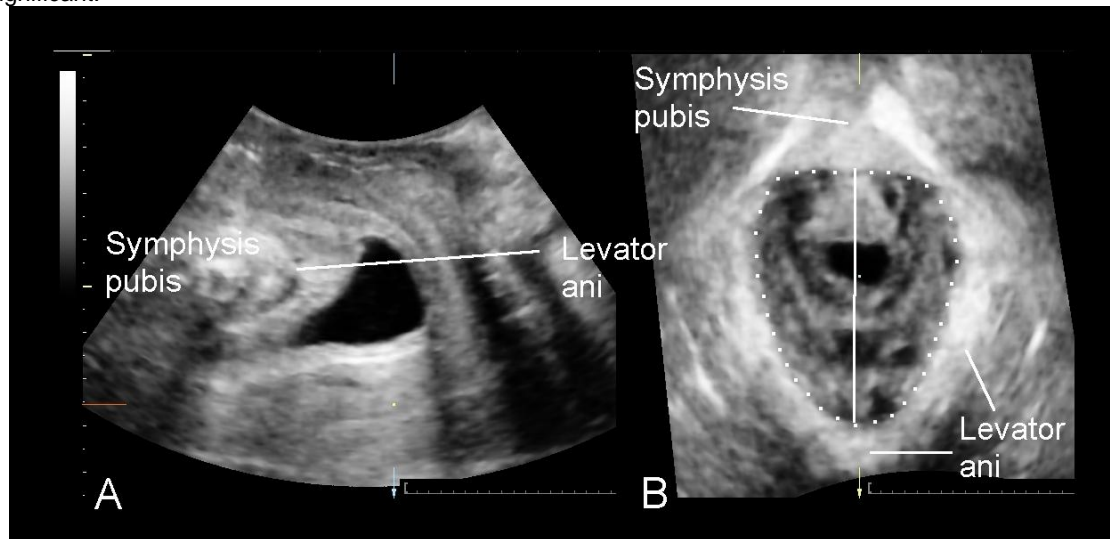


Fig 1: Determination of hiatal dimensions by translabial ultrasound. The left figure (A) shows a midsagittal view on maximal Valsalva. The white line defines the plane of minimal hiatal dimensions which is shown in the axial plane image on the right (B). The vertical white line on the right is the midsagittal hiatal diameter, the dotted line demonstrates measurement of the hiatal area on Valsalva.

Results

Mean age was 55 years (range 18- 89). Of 375 patients, 26 (7%) were nulliparous, and 48(13%) were vaginally nulliparous. In 78 women (24% of the vaginally parous) an avulsion of the levator muscle was determined. Pelvic floor muscle strength as measured by the Oxford grading system was weakly but highly significantly associated with patient age ($r = -0.254$, $p < 0.001$). Figure 2 shows a fitted line of the relationship between Oxford grading and age. On stepwise regression, there seemed to be largely independent effects of both vaginal parity and levator defects. After accounting for these confounding factors there was still an association between age and the Oxford grading system.

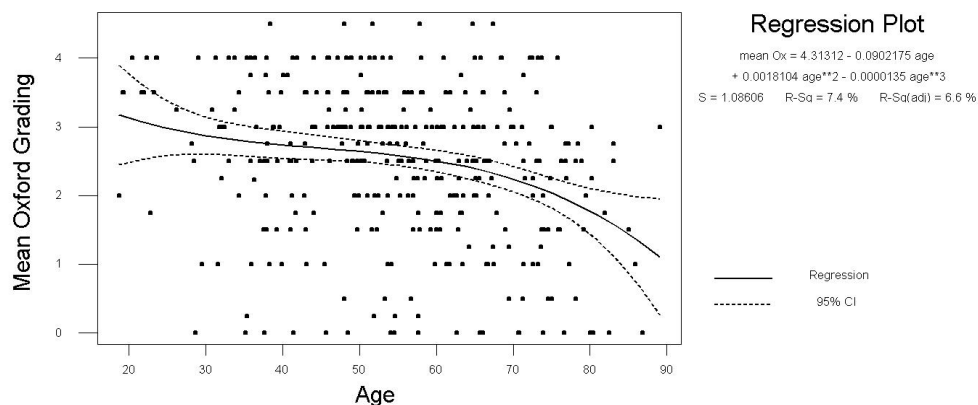


Figure 2: Fitted Line plot (cubic regression) of mean Oxford grading (21 pt scale) versus age.

Morphometry of the levator ani includes levator hiatal diameters and hiatal area in rest, on PFM contraction and on Valsalva. The coronal diameters showed no significant relationship with age. All AP-diameters and area-measurements were weakly positively correlated with age (e.g., hiatal area on Valsalva, $r = 0.136$, $P = 0.009$). On performing subgroup analysis to determine the confounding effect of parity, correlations between age and hiatal dimensions were consistently strongest in nulliparous or vaginally nulliparous women (hiatal area on valsalva, $r = 0.261$, $P = 0.07$), confirming that parity conveys a small confounding effect. There was no relationship between age and strain on Valsalva and PFM contraction.

Interpretation of results

It appears that ageing has a small but significant effect on the pelvic floor muscle, resulting in reduced contraction strength and increased hiatal diameters. This is in contradiction to a recently published study on 82 nulliparous women claiming that increasing age does not affect levator function (3). The authors hypothesized that previously observed effects of age may have been due to the confounding effect of multiparity. In our study the finding of an association between levator function and morphometry on the one hand and age on the other hand was apparent in the group with mixed parity, but did not disappear after accounting for parity and levator defects. On the contrary, the association between levator morphometry and age was strongest in nulliparous women. However, biomechanical properties as measured by strain on Valsalva and contraction were not associated with age.

Concluding message

Pelvic floor muscle strength as quantified by the Modified Oxford Grading system is weakly but significantly associated with patient age. This association remained after accounting for the confounding effects of parity and levator defects. Morphometric measurements of the levator muscle were weakly positively correlated with age. The same weak relation between biometric measures of the levator and age was apparent after controlling for parity and levator trauma.

References

1. Ultrasound Obstet Gynecol 2005; 25: 580-585
2. Ultrasound Obstet Gynecol 2008; 31: 201-205
3. Obstet Gynecol 2007;109: 715-720.

<i>Specify source of funding or grant</i>	No funding or grant
<i>Is this a clinical trial?</i>	Yes
<i>Is this study registered in a public clinical trials registry?</i>	No
<i>What were the subjects in the study?</i>	HUMAN
<i>Was this study approved by an ethics committee?</i>	Yes
<i>Specify Name of Ethics Committee</i>	The study was a sub analysis of a parent study approved by the local Human Research Ethics Committee of Sydney West Area Health Service.
<i>Was the Declaration of Helsinki followed?</i>	Yes
<i>Was informed consent obtained from the patients?</i>	Yes