

ANATOMICAL VARIABILITY OF THE PUBOPERINEAL AND PUBORECTAL MUSCLES IN NON-OBESE NULLIPAROUS WOMEN - A 3D ULTRASOUND STUDY

Hypothesis / aims of study

The puboperineal (PPM) and puborectal (PRM) muscles are parts of levator ani muscle. Both of them arise from the pubic bone. PPM, a subdivision of pubovisceral muscle, fuses then with the perineal body, whereas PRM forms a sling around and behind the rectum. PPM and PRM are the outermost boundaries of the opening within the levator ani through which the urethra, vagina and rectum pass. Contraction of levator ani muscle causes the pubovisceral muscles and puborectal muscles to compress the urethra, vagina and rectum against the pubic bone thus playing important role in pelvic organ support and continence mechanism (1). Modern ultrasound equipment with three-dimensional acquisition enables detailed examination of pelvic floor structures comparable to MRI. In this study we aimed to check the anatomical variability of PPM and PRM in non-obese nulliparous women visualised with 3D transvaginal ultrasound.

Study design, materials and methods

Subjects of the study were 16 nulliparous volunteers aged from 18.0 to 39.7 years (mean 29.8 years). Their BMI ranged from 18.4 to 24.6 (mean 21.6) and height from 154 to 176cm (mean 164cm). Examination was performed using the Profocus ultrasound scanner and a 12-16 MHz rotational 360-degree transducer (type 2050) with a built-in 3D automatic acquisition system (B-K Medical, Denmark). Patients were examined in the supine position with the urinary bladder felt comfortably full. The data acquisition started above bladder neck ending slightly below the external meatus of the urethra. Then, it was stored as a three-dimensional cube eligible to tilt in order to obtain the images of pelvic structures in their entity. The measurements included: PPM and PRM lengths (left and right parts altogether) as well as pubic arch angle. Measurements were done by two investigators (M.B. and A.S.)

Results

The length of puboperineal muscle ranged from 75.0mm to 111.4mm (mean 89.9±10.1mm). Comparison of interobserver repeatability for measurement of PPM showed good agreement (ICC=0.72, p=0.002), although a statistically significant difference in its length of mean 6.5mm was noted between two investigators (p=0.007). PRM length ranged from 101.0mm to 138.3mm (mean 138.3±10.5mm). The interobserver repeatability was good with ICC=0.6 (p=0.014) and only slight insignificant difference in mean length observed between examiners. PPM length positively correlated with BMI (r=0.61, p=0.012), but was unrelated to the age, height or pubic arch angle of the examined women. Similar findings were observed for PRM. Its length positively correlated with BMI (r=0.79, p<0.0001) but not with other variables. Lengths of both muscles were related to each other (r= 0.65, p=0.006). PRM was on average 32.2% (range from 17,1 to 60,8%) longer than PPM. The PRM/PPM length ratio did not depend on age, height, BMI or pubic arch angle of the participants.

Interpretation of results

Results of the present study showed that lengths of muscles forming the levator ani muscle may vary considerably among nulliparous women. All participants of the study have normal or slightly below normal weight. In this selected population we were able to find a relationship between puboperineal and puborectal muscle lengths and BMI, whereas age and height of the women as well as bony pelvis anatomy (judged by pubic arch angle) had no significant impact on measured parameters. 3D transvaginal ultrasonography appeared to be a reliable method for evaluation of selected pelvic floor muscles. It may be hypothesized that this examination may be useful for identification of women susceptible to pelvic muscles damage during childbirth and occurrence of pelvic organ prolapse. Use of transvaginal probe may be a potential limitation to the study, although due to small diameter (18mm) of the utilized probe it is unlikely that results of the study have been significantly biased.

Concluding message

In non-obese nulliparous women length of puboperineal and puborectal muscles evaluated by 3D transvaginal ultrasound correlates with BMI, but is unrelated to age, height or pubic arch angle.

References

1. Ashton-Miller JA, DeLancey JO. Functional anatomy of the female pelvic floor. *Ann N Y Acad Sci.* 2007;1101:266-96

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Is this a clinical trial?	No
What were the subjects in the study?	HUMAN
Was this study approved by an ethics committee?	Yes
Specify Name of Ethics Committee	Bioethical Committee of the Medical University of Lublin, Poland

Was the Declaration of Helsinki followed?

Yes

Was informed consent obtained from the patients?

Yes
