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Title: AGE-RELATED CHANGES IN PUBOCOCCYGEAL MUSCLE MASS (PCMM) AND LEVATOR HIATUS AREA (LHA) OF POSTMENOPAUSAL WOMEN

Aims of Study

It is generally accepted that skeletal muscle mass decreases with increasing age in healthy men and women. Recent study on female pelvic floor using MRI has suggested that the muscle volume of the levator ani is relatively uniform among healthy young nulliparous women. However, little is known about age-related changes in the volume of pelvic floor muscle of postmenopausal women. This study attempts to find these changes and correlate to the laxity of pelvic floor.

Methods

20 continent females with normal pelvic support (mean age 63.9 y, range 46-82, normal group) and 8 females with pelvic organ prolapse (mean age 68.3 y, range 54-79, prolapse group) were recruited from our clinic. All subjects were parous, postmenopausal and had no history of intrapelvic operation. Prolapse was evaluated by experienced urogynecologist with physical examination and scored using ICS female pelvic organ prolapse grading system. Among the 8 patients with prolapse, 6 had concomitant stress urinary incontinence. All women underwent MR imaging of the pelvis in the supine position at rest (Gyroscan NT, 1.5 Tesla, Philips). And transverse T2-weighted images with a slice thickness of 3 mm, separated by a slice gap of 0.3 mm, were obtained spanning whole pubococcygeal muscle (PCM). The images were transferred to a personal computer and analyzed with NIH Image software by one examiner blinded to pre-imaging clinical findings. The PCM from each image plane was traced by manual editing and its area was measured by counting the number of pixels. By integrating these areas of PCM, the volume of PCM (PCMM, cm³) was calculated. The area of levator hiatus (LHA, cm²) was also calculated at the level of the proximal urethra.

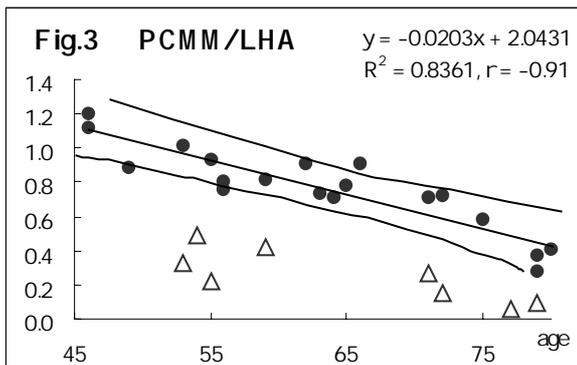
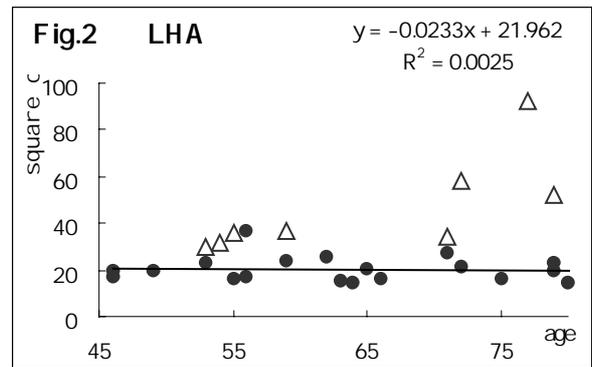
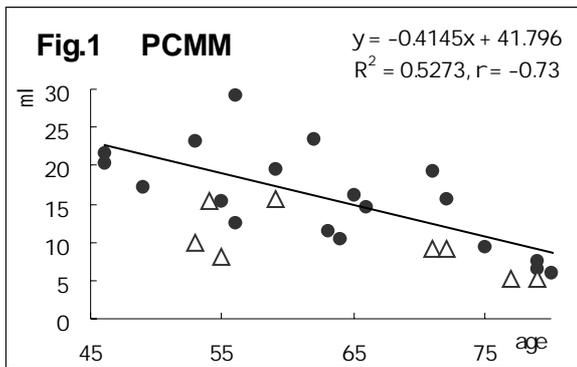
Results

PCMM decreased with increasing age (Fig.1, $r = -0.73$) but no correlation between LHA and age was found (Fig.2, $R^2=0.002$) in normal group. The women in prolapse group had a tendency to have smaller PCMM compared to normal group but it was not statistically significant (Fig.1). The values of LHA in normal group were relatively identical regardless of age whereas prolapse group showed a great variation in LHA (Fig.2). A strong correlation was observed between PCMM/LHA and age in normal group (Fig.3, $r = -0.91$). The value of PCMM/LHA in prolapse group was significantly lower than that of normal group (Fig.3). In prolapse group, four women were diagnosed as having stage II prolapse, two women stage III and other two women stage IV, respectively. The mean value of PCMM/LHA in stage III and stage IV prolapse women was significantly smaller than that in stage II prolapse women (data not shown).

Conclusions

The present study clearly shows that the volume of PCM decreases with advancing age. We speculated first that the area of levator hiatus would widen with age because of the loss of PCM mass. But LHA does not increase with age in women without prolapse (Fig.2). PCMM/LHA in normal group demonstrated a strong negative correlation with age and was expressed by a linear equation of age. Compared with normal, all women with prolapse had significantly smaller value of PCMM/LHA and the severer prolapse showed the smaller PCMM/LHA

value. Thus, PCMM/LHA may reflect the laxity of pelvic floor and this value is a function of age in healthy postmenopausal women. In the clinical situation, we experience failure in detecting prolapse because of insufficient patients straining. Our method can generate simple, uniform and quantitative information about pelvic floor laxity without any provocation or instruments.



Closed circle ; normal group, open triangle ; prolapse group, Linear regression is adjusted only for normal subjects. Two curves in Fig.3 indicate 95% confidence interval