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URETHRAL SPHINCTER VOLUME MEASURED WITH MRI.

Hypothesis / aims of study

To define the urethral sphincter volume measured with harmless magnetic resonance imaging (MRI) relevant to normal and abnormal voiding status.

Study design, materials and methods

0.3-T MR images of the pelvis were obtained on healthy volunteers (5 men and 5 women) without endoluminal coil as the control study. In men, the urethral sphincter and urethra were visible as two layered disk-like structure between the apex of prostate and the corpus spongiosum on T2-weighted images (Fig.1). On the other hands, urethral sphincter and urethra in women were recoginised as two layerd tube-like structure, as “urethral sphincter complex” on transvaginal ultrasound reported by Fowler et al.[1]. The urethral sphincter volume was measured as urethral sphincter complex with diameters and slice thickness on axial views of T2-weighted image and sumed up (Fig.2). MR images were also obtained on 10 men with prostate cancer treated by maximum androgen blockade and/or radiation therapies and 6 men after radical prostatectomy as a part of followup examinations.

Results

In male (27-35 y.o., average IPSS 1.4 points) and female (24-54 y.o., average IPSS 0 points, without any incontinences) volunteers, the average urethral sphincter volumes were 1.21 cm3 (0.92-1.87cm3) and 4.26 cm3 (2.95-5.22 cm3) respectively. Although we expected the aging atrophy in men, the average urethral sphincter volume increased to 1.74 cm3 (1.28-2.31 cm3) in 10 men with prostate cancer (72-81 y.o., average IPSS 16.1 points). But in men after radical prostatectomy (64-80 y.o., average IPSS 14.3 points, 3-82 months after surgery), the average urethral sphincter volume distinctly decreased to 1.02 cm3 (0.76-1.19 cm3). In the prostatectomy group, the average urethral sphincter volume was smaller in 3 men with stress and/or urgency incontinence (0.96 cm3) than in 3 men without any incontinences (1.11 cm3). And the relative rich average urethral sphincter volume (more than 1.00 cm3) was noticed on men in the long duration after the surgery (45.30 vs. 24.33 months). Any scarring and ischemic change of urethral sphincter could not be found on MR images.

Interpretation of results

Unexpected rich urethral sphincter volume in the elderly people might suggest the compensatory hypertrophy against the overactivity of the aging bladder. Radical prostatectomy itself decreased the volume of sphincter, but urethral sphincter might increase its volume as the time went by. But theses quantitive analyses should be needed a further investigation.

Concluding message

We reported the easy and harmless method for the evaluation of urethral sphincter with the relative low-resolution MRI without endoluminal coil. This method might be applicable for the young women and even for the children. In the future, we will apply this method for the evaluation of the diseases resulting from failure of sphincteric relaxation, such as the detrusor-sphincter dissynergia and Fowler’s syndrome.

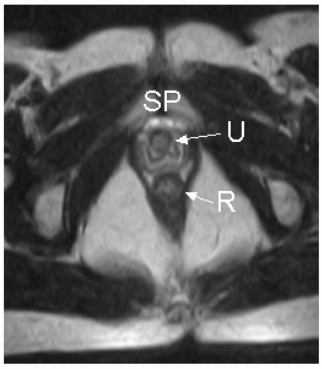

Fig.1. Axial view of urethral sphincter and urethra on T2-weughted image of healthy male volunteer.
SP, symphysis pubis; U, urethral sphincter and urethra; R, rectum.

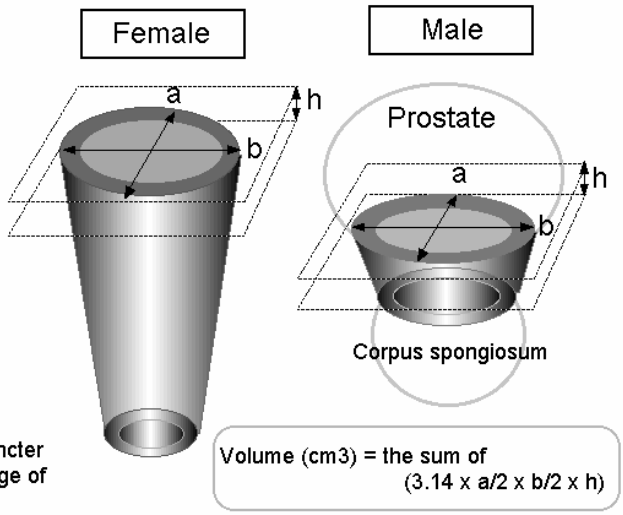

Fig.2. Urethral sphincter Complex on MRI.

References

1. Maximum urethral closure pressure and sphincter volume in women with urinary retention. J Urol 2002: 167: 1348-51.