

ELECTRON-MICROSCOPIC STUDIES OF ELASTIC FIBERS IN THE PERIURETHRAL CONNECTIVE TISSUE OF CONTINENT AND STRESS INCONTINENT WOMEN.

Aims of Study

Stress urinary incontinence is one of the most common types of urinary incontinence in women. It is defined as an involuntary loss of urine associated with a rise of the intra-abdominal pressure due to coughing, sneezing or physical exertion without contraction of the detrusor muscle.

Factors like increasing age, neurological and psychiatric disorders, physical immobility, pregnancy and delivery, obesity or previous pelvic surgery contribute to the occurrence of stress urinary incontinence in women.

There is a growing body of evidence that components and structures of pelvic connective tissue play an important role in the urinary continence mechanism. The hypothesis of Papa Petros and Ulmsten (1990 [Integral theory]) and DeLancey (1994 [hammock hypothesis]) outline the importance of connective tissue alterations affecting the urethral closure mechanism. Ultrastructural and quantitative studies of collagen fibers in the paraurethral connective tissue of stress urinary incontinent and urinary continent women showed a higher content and a larger diameter of these fibers in stress incontinent women in reproductive age (Ulmsten and Falconer 1999).

There is a lack of information about the elastic fiber system in pelvic connective tissues of continent and stress incontinent women, so far. Therefore we studied elastic, elaunin and oxytalan fibers in the periurethral connective tissue of continent and stress incontinent women using electron microscopy.

Methods

Specimen of periurethral connective tissue from 20 women were studied by electron microscopy. Thirteen of these women (median age: 50 years, range: 35-72 years) suffered from stress urinary incontinence, the other seven women (median age: 61 years, range 52-81 years) were continent and showed different grades of genital prolapse. Samples of periurethral connective tissue were obtained during different surgical methods: in stress-incontinent women during TVT (tension-free vaginal tape)-procedure, and in the continent women at reconstructive surgery of the pelvic floor.

Ultra thin sections were stained according to Kajikawa (1975) with 5% tannic acid/ 5% uranyl acetate and lead citrate. This procedure results in a selective staining of elastin-containing tissue structures, as previously described by Klein and Boeck (1983) and Boeck (1999) to demonstrate elastic and elaunin fibers in human endocardium and in the fallopian tube.

The sections were examined in a transmission electron microscope EM 900 by Carl Zeiss at 50 kV.

Results

The elastin-containing components of the elastic system (elastic and elaunin fibers) were detected selectively in remarkable amounts in the periurethral connective tissue of all women in our study.

Mostly elastic, elaunin and oxytalan fibers lie in close neighbourhood and seem to be connected with each other. They form wide elastic networks and contain areas with rich or low amounts of elastin.

The components of the elastic fiber system are in close contact with fibrocytes and smooth muscle cells.

We detected an irregular, fragmented distribution of the protein elastin in all patients with increasing age, irrespective, if they were stress incontinent or not. Moreover, the elastin-containing, homogenous and electron-dense core of elastic fibers was lost with increasing age. Fragmented elastic fibers of different sizes were found between collagen fibers, fibrocytes and smooth muscle cells.

Specific differences between the elastic fiber system of continent and stress incontinent women were not detectable.

Conclusions

Our investigations indicate age related changes of the elastic fiber system in all women. However, there is a lack of substantial difference between stress incontinent and continent females.