Title:
Urogynecological dysfunction after radical hysterectomy,
subjective and objective findings

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Abstract:
The idea for this thesis started with an interest in exploring whether patients had urogynecological problems after radical hysterectomy, an operation used to treat early stages of cervical cancer. Literature in the field describes many problems after radical hysterectomy, but when we asked our patients at the clinical follow-up, they reported only a few urogynecological dysfunctions.

Most survivors of cervical cancer are young or middle-aged women with a long life expectancy and, accordingly, will live many years with the potential sequelae of the disease and treatment. Knowledge of possible sideeffects makes it feasible to treat and prevent them by early intervention and rehabilitation.

The main purpose of the present thesis was to characterize urogynecological dysfunction after radical hysterectomy. This purpose was evaluated in several ways - by mapping subjective urogynecological dysfunction, identifying risk-groups, testing whether symptoms of urinary incontinence could be objectified by urodynamics and ultrasound, and evaluating the effect of radical hysterectomy on the pelvic floor muscles and bladder neck mobility before and after the operation with the use of magnetic resonance imaging (MRI) and ultrasound.

The results in this thesis were based on three designs:

1) Cross-sectional descriptive study
2) Case-control study
3) Prospective follow-up study

All women operated on for cervical cancer with radical hysterectomy without postoperative radiotherapy, from 1983 to 2000 at Aarhus University Hospital (N = 396), received a questionnaire. The response rate was 84%.
Based on answers to the questionnaires, 50 women with subjectively reported urinary incontinence were matched with 50 continent women. The women were examined with urodynamics, ultrasound, and given a gynecological examination.

Twenty-two women participated in the prospective part of the thesis. They were examined with ultrasound and MRI before, 3 months, and 1 year after the operation. Moreover, 14 of these women were examined with urodynamics in the same schedule.

Results from case records showed that 5% of the patients reported urogynecological problems at clinical follow-up. Results from the questionnaires showed that urinary incontinence was reported by 37% of the patients, 37% felt urinary retention, and 28% reported cystitis at least once.
Multiple logistic regression analysis identified BMI, at least one delivery, preoperative urinary incontinence, and pulmonary disease as predictors of significance for development of postoperative urinary incontinence. Significant predictive variables for urinary retention symptoms were age, cystitis and/or dysuria, previous rupture of the anal sphincter, fetal weight at delivery $\geq$ 4000 g, sensation of vaginal dryness, and preoperative urinary retention symptoms. With regard to postoperative cystitis and/or dysuria, fetal weight $\geq$ 4000 g, sensation of vaginal dryness, cystitis and/or dysuria before the operation, and physical activity were significant predictive variables.

Results from the case-control study showed no differences in urodynamic studies and mobility of the bladder neck between the incontinent and the continent group, except a difference in the urethral pressure. The urethral pressure at rest and at contraction was lower in the incontinent than in the continent women. The urethral pressure at rest was only significantly lower in the sub-group of urge incontinent women ($P = 0.02$) compared with the group of continent, and not, as expected, in the sub-group of stress incontinent women ($P = 0.08$). On contraction of the pelvic floor muscles the opposite situation was true: the urge incontinent women did not differ significantly from the continent group ($P = 0.13$), but the stress incontinent women did ($P < 0.01$).

Results from the prospective part of this thesis showed a reduction in the size of the pelvic floor muscles and in the mobility of the bladder neck 3 months after the operation. But the muscle size and the bladder neck mobility had almost reached preoperative levels 1 year postoperatively. Moreover, the puborectalis muscle more than regained its size, and the bladder neck mobility at contraction of the pelvic floor muscles overshot the preoperative level. The development of the muscle-size and mobility of the bladder neck followed the same pattern during the observation period for all the women in the study, except for the axial imaging of the levator muscle.
The women had wide variation in starting points regarding muscle-size and mobility of the bladder neck. The resting position of the bladder neck was influenced by age, and the ability to move the bladder neck during contraction was reduced in relation to the number of vaginal deliveries. Levator ani musclesizes were influenced by both age and number of deliveries. BMI did not affect results.

Only two of the 22 women in the prospective part were urinary incontinent before the operation. These two women and three more women reported incontinence 1 year after the radical hysterectomy. Urinary retention was reported by 36% and cystitis by 14% of the women. Despite 59% of the women reporting altered voiding, none asked for professional help within the first year after the operation.
The urodynamic observations in 14 of the 22 women in the prospective part did not demonstrate any remarkable development.

The main conclusion of this thesis was that substantial urogynecological problems after radical hysterectomy were inevitable, when women were surveyed in a self-administered questionnaire,

compared with experience from clinical follow-up. Sub-groups of patients at particular risk of urogynecological problems were easily identified.

The urethral pressure was the only difference between continent and incontinent women in the present cohort. This finding could contribute to the characterization of incontinence after radical hysterectomy, indicating that the urethral sphincter mechanism played a role in the pathophysiology. In this study design, the mobility of the bladder neck did not play any role. The women had wide variation in starting points regarding pelvic floor musclesize and mobility of the bladder neck before the radical hysterectomy, depending on age and number of deliveries, but 3 months after the operation the muscle sizes and the mobility of the bladder neck were reduced, and 1 year postoperatively sizes and mobility had almost returned to the starting point.