Pelvic floor symptoms after gynaecological surgery
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Summary

In chapter 1 the background of this thesis is illuminated. The aims of this thesis are:
1. To evaluate the long term effect of vaginal and abdominal hysterectomy on micturition and defecation symptoms
2. To evaluate whether adjustment of surgical technique can reduce morbidity related to hysterectomy.
3. To develop and validate a reproducible technique to objectively quantify vaginal wall sensibility
4. To evaluate the effects of hysterectomy and prolapse surgery on vaginal wall sensibility, vaginal vasocongestion and sexual function

In chapter 2 we prospectively compared the development and persistence of micturition symptoms three years after vaginal and abdominal hysterectomy. Four-hundred-thirty women were included; 112 women underwent vaginal hysterectomy and 318 women underwent abdominal hysterectomy. All women completed a validated disease specific questionnaire (Urogenital Distress Inventory (UDI)) before surgery, six months, one year and three years after surgery. Three years after surgery micturition symptoms were more common after vaginal hysterectomy than following abdominal hysterectomy (OR 2.2, 95% CI 1.3-4.0). The difference in micturition symptoms persisted after correction for differences in parity, decent of the uterus, uterine size and indication for hysterectomy (adjusted OR 3.0 95% CI 1.4-6.2). An interesting observation of this study was that the difference in prevalence of micturition symptoms between both surgical approaches seemed to increase over time. Since micturition symptoms negatively affect the quality of life, the increased risk of post-operative micturition symptoms after vaginal hysterectomy, should be mentioned during counselling and should be balanced against the lower morbidity of the vaginal approach.

In chapter 3 a prediction rule to predict the patients individual risk of developing stress urinary incontinence (SUI) three years after hysterectomy, is presented. When counselling the patient it would be helpful to counsel patients about their individual risk on SUI after hysterectomy rather than to inform them about the average risk. As both patient characteristics and surgical technique determine this risk, we aimed to define a prediction rule based on these variables. For this prediction rule the same cohort was used as in chapter 2, however only women not reporting SUI before surgery were included (n=243). Three years after surgery 183 women (78%) completed the questionnaire, of whom 40 (22%) patients had developed SUI. Using multivariable regression analysis with a stepwise forward selection procedure we identified three prognostic factors for developing SUI three years after hysterectomy: BMI (OR 1.1 per kg/m², 95% CI 1.0-1.2), younger age at time of hysterectomy (OR 0.9 per year, 95% CI 0.8-1.0) and vaginal hysterectomy (OR 2.3, 95% CI 1.0-5.2). Using these parameters we developed the following rule to predict the risk of developing SUI: 32 + BMI - age + (7.5 x route of surgery), in which women for vaginal hysterectomy receive 1 point and women for abdominal hysterectomy receive 0 points. The calibration of the model was good (Hosmer Lemeshow p=0.68) the area under the ROC curve was 0.69 (95% CI 0.59-0.79). This prediction rule will improve counselling patients undergoing
hysterectomy about their individual risk on de novo SUI following surgery.

Chapter 4 reports the results of a ten year follow-up of the same, prospectively collected, cohort of women undergoing abdominal and vaginal hysterectomy. In our three year follow-up we found that the difference in prevalence of micturition symptoms between both surgical approaches seemed to increase over time, possibly as a result of chronic progressive nerve damage. To evaluate if, ten years after hysterectomy, the difference in micturition symptoms between vaginal and abdominal hysterectomy still existed or even increased, we performed a ten year follow-up. All women received the same validated disease specific questionnaires as they received before surgery, six months, one year and three years after surgery (UDI, Defecation Distress Inventory (DDI), Incontinence Impact Questionnaire (IIQ)). The response rate was 73%. Ten years after hysterectomy no difference in the prevalence of micturition symptoms between vaginally and abdominally operated patients was found. This might be explained by the finding that after vaginal hysterectomy, significantly more women reported that they had been treated for micturition symptoms (18% vs 8% p=0.02, adjusted OR 3.8 95% CI 1.2-11.6) and were therefore no longer symptomatic. Most women were treated for stress urinary incontinence. Defecation symptoms, mainly fecal incontinence, also seemed more common after vaginal hysterectomy (58% vs 46%, p=0.08). However this difference was not statistically significant. We concluded that ten years after vaginal hysterectomy women were more likely to seek medical help for micturition symptoms.

In chapter 5 the results of a randomized controlled trial comparing electrical bipolar vessel sealing with conventional clamping in women undergoing abdominal hysterectomy, are presented. Vessel sealing techniques enable the surgeon to cut the surrounding tissue closer to the uterus. As the more lateral parts are known to be more densely innervated we hypothesized this technique might reduce autonomic nerve damage, thus resulting in improved post-operative pelvic floor function. Furthermore, since less traction is needed, post-operative pain might be reduced. Fifty-seven patients undergoing abdominal hysterectomy for benign conditions, in two Dutch teaching hospitals, were randomised. Patients were asked to complete validated disease specific questionnaires (UDI, IIQ and DDI) before surgery and six months after surgery. Furthermore, they were asked to complete a pain diary from the evening before surgery till six weeks after surgery. It was found that during the first three postoperative days, patients operated using vessel sealing, reported significantly lower pain scores (repeated measurement analysis: p < 0.01). The amount of blood loss, surgery time, complication risk and duration of hospitalisation were comparable between both groups. Patients in the vessel sealing group resumed their normal daily activities on average 8 days earlier as compared to the conventional group (log-rank test, p = 0.07). Postoperative pelvic floor function was similar in both groups. We concluded that the use of vessel sealing during abdominal hysterectomy for benign conditions appears to be associated with reduced postoperative pain and faster recovery, however it did not improve post-operative pelvic floor function.

Chapter 6 reports the results of a randomized controlled trial aiming to compare the effects of electrical bipolar vessel sealing and conventional suturing on; post-operative pain, recovery, costs and pelvic floor function in women undergoing vaginal hysterectomy. The hypothesis of
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this study was that vessel sealing techniques reduce the amount of traction needed to enable visualisation as no sutures are needed. This decrease in traction might reduce the risk on pelvic nerve damage and hereby reduce the development in post-operative pelvic floor symptoms. The trial was conducted in eight teaching hospitals in the Netherlands. One hundred patients scheduled to undergo vaginal hysterectomy for benign conditions, excluding pelvic organ prolapse, were included. The quality of life related to pelvic floor function was assessed using validated questionnaires before surgery and 6 months after surgery (UDI, DDI, IIQ). Pain scores and recovery were assessed using a diary, including daily Visual Analogue Scores (VAS), starting from the day before surgery until 6 weeks after surgery. The evening after surgery, patients in the vessel sealing group reported significantly less pain (5.7 vs 4.5 on a scale of 0-10, p=0.03), but after that pain scores where comparable. Operation duration was shorter for vessel sealing (60 vs 71 minutes p=0.05). Blood loss and hospital stay did not differ. We observed no major difference in costs between the two interventions (2903 vs 3102 euro, p=0.26). Changes in micturition and defecation symptoms were not affected by the used surgical technique. It was concluded that patients may benefit from the use of a vessel sealing technique since the post-operative pain during the first night after surgery is less and the operation duration is shorter. However, no difference in post-operative pelvic floor function was found and the shorter operation duration does not completely compensate for the costs of the vessel sealing clamp.

In chapter 7 a new method to measure vaginal wall sensibility is presented. This method was developed to enable objective measurement of the autonomic genital response mechanisms. All types of gynaecological surgery may not only affect subjective sexual function, but may also cause damage to the innervation of the vagina due to surgical incision, traction and manipulation of the vagina and visceral organs. The aim of this study was to investigate intra- and inter observer reproducibility of this new method and to define possible influences of menstrual cycle phase and oral contraceptive use. Measurements were performed in four different target areas (proximal and distal, posterior and anterior) by holding a pulse-generating electrode, which was attached to the gloved index finger of the investigator, to one of these locations. The intensity of the pulse was gradually increased until the sensation was felt by the patient. In this validation study measurements were performed in twelve healthy women. Measurements were performed by two independent researchers, target area’s were stimulated in a random order. We found that the intra-observer reproducibility of both researchers was almost perfect (pearsons-rho correlation coefficient 0.77-0.96 p < 0.001). The inter-observer reproducibility was moderate (pearsons-rho correlation coefficient 0.39-0.49). Both researchers measured increased sensibility in the proximal posterior vaginal wall relative to the proximal anterior vaginal wall, but for all measurements, researcher 2 obtained higher sensibility ratings than researcher 1. We concluded that this method is sufficiently sensitive so as to differentiate between anterior and posterior proximal vaginal wall sensibility, but the outcome differs as a function of researcher. Further evaluation of the clinical use of this method is needed, provided that measurements are performed by the same researcher.

In chapter 8 we used the newly developed method to measure vaginal wall sensibility as part of a randomized controlled trial comparing vaginal and abdominal prolapse surgery. Women with
uterine prolapse stage 2 or more were included. The aim of this study was to compare the amount of damage to vaginal wall sensibility between vaginal and abdominal prolapse surgery, with or without incontinence surgery. Measurements of vaginal wall sensibility were performed by one researcher, before surgery and six months after surgery. Sexual function was assessed at the same time points using a questionnaire. Data on vaginal wall sensibility were obtained from 65 patients. The sensibility of the distal posterior (p=0.02) and distal anterior (p=0.10) vaginal wall decreased after vaginal surgery compared to abdominal surgery. Abdominal prolapse surgery with incontinence surgery decreased the sensibility of the distal part of the anterior vaginal wall significantly more than abdominal prolapse surgery only (p=0.01). Before surgery, vaginal wall sensibility was lower in women who reported vaginal dryness or anorgasmia. The presence of genital pain was associated with higher vaginal wall sensibility. Post-operative vaginal wall sensibility was similar in women with and without sexual problems. We concluded that vaginal prolapse surgery as well as abdominal prolapse surgery with additional incontinence surgery resulted in decreased vaginal wall sensibility. This study shows no influence of the decreased vaginal wall sensibility on sexual well-being. Larger studies are needed to better understand the association between changes in vaginal wall sensibility and changes in sexual well-being.

Chapter 9 presents the results of a prospective study, including patients scheduled for vaginal prolapse surgery. The first aim of this study was to evaluate the effect of vaginal prolapse surgery on vaginal vasocongestion and vaginal wall sensibility and secondly to evaluate if sexual dysfunction was related to diminished vaginal vasocongestion and innervation. Participants underwent measurements before and 6 months after surgery, during non-erotic and erotic visual stimuli. Measurements were performed using a validated vaginal combi-probe which included vaginal photoplethysmography to assess Vaginal Pulse Amplitude (VPA) (representing vaginal vasocongestion), and four pulse-generating electrodes to measure vaginal wall sensibility (representing vaginal innervation). Sexual function was assessed using validated questionnaires (FSFI, FSDS-R, SSAQ). Pre- and postoperative vaginal vasocongestion, vaginal wall sensibility and sexual function scores were compared. Twenty-nine women were included, 24 (83%) completed the six months follow-up visit. This study showed a significant reduction in vaginal vasocongestion during sexual stimulation post-operatively (p=0.05). Vaginal wall sensibility in the proximal posterior vaginal wall was significantly reduced after surgery (pre-op 13.3mA vs post-op 17.5mA, p<0.05). Sexual function as assessed with questionnaires, was not significantly affected. An explanation for the absence of an effect of decreased genital autonomic responses on sexual function might be that the negative effect of surgery on autonomic genital responses is masked by the positive effect of surgery on subjective sexual function due to the elimination of bothersome symptoms. We concluded that future studies are needed to tease out the impact of surgery related damage to vaginal vasocongestion and vaginal wall sensibility, to post-operative sexual function.

In chapter 10 the results of a prospective study including 19 patients scheduled for hysterectomy are presented. Seventeen patients completed the six months follow up. With this study we aimed to evaluate if vaginal and/or abdominal hysterectomy negatively affected vaginal vasocongestion, vaginal wall sensibility and sexual function. Participants in this study also
underwent measurements, using the vaginal combi-probe, before and 6 months after surgery, during non-erotic and erotic visual stimuli. Sexual function was assessed using validated questionnaires (FSFI, FSDS-R, SSAQ). We concluded that vaginal vasocongestion, vaginal wall sensibility and sexual function, as assessed with questionnaires, were not significantly affected by hysterectomy. Two trends were noted in the subgroup analyses: the first towards decreased vaginal wall sensibility in the proximal posterior vaginal wall after vaginal hysterectomy \( (p=0.08) \), and the second towards better scores on the FSFI pain domain after abdominal hysterectomy \( (p=0.06) \). These two trends might warrant further research.

In chapter 11 the results of these studies are placed in a broader perspective and recommendations are given for clinical practice and future research.

The first part of this thesis focused on micturition and defecation symptoms after hysterectomy. We concluded that, when scheduling hysterectomy, one should realize that vaginal hysterectomy does increase the risk of developing micturition symptoms after surgery. As these symptoms are known to negatively affect the quality of life, we recommend that the search for a less traumatic operative technique should continue. We attempted to reduce the risk of developing micturition symptoms by using vessel sealing techniques. We could not show a decrease in micturition symptoms after using this technique.

The second part of this thesis focused on the evaluation of vaginal wall sensibility, vaginal vasocongestion and sexual function after hysterectomy and prolapse surgery. With our studies we provided support for the hypothesis that vaginal prolapse surgery and vaginal hysterectomy affect vaginal wall sensibility in the proximal posterior vaginal wall and that vaginal prolapse surgery affects vaginal vasocongestion. As both of these physiological parameters seem relevant for optimal sexual function, one could expect to find a decrease in sexual function after surgery. Future studies should therefore evaluate these findings within the multidimensional framework of female sexual dysfunction. If these studies indeed show that damage to vaginal innervation and vasocongestion are important in the development of female sexual dysfunction, the performed surgical techniques should be adjusted accordingly.