Voiding dysfunction after vaginal prolapse surgery: etiology, prevention and treatment
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Citation for published version (APA):

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This thesis reports on the etiology, prevention and management of abnormal post void residual volumes (PVR) following vaginal prolapse surgery.  

In chapter 1 the introduction, an overview is given of the possible etiology and treatment of the clinical condition of incomplete voiding. The research questions are raised which are dealt with in the thesis. 

In chapter 2 the results of a randomised controlled trial comparing preventive catheterisation after vaginal prolapse surgery for a duration of less than 1 day is compared to 5 days. The study was undertaken to determine whether patients undergoing vaginal prolapse surgery need a prolonged period of preventive catheterisation. The period of 5 days was chosen as a comparison because this was common practice at that time. A significant higher rate of abnormal PVR was found in the 1 day catheterisation group (OR 0.15, limits 0.045-0.47). 40% of patients in the 1 day group and 9% in the standard prolonged group of 5 days required repeated catheterisation due to incomplete voiding. Despite the higher number of recatheterisations in 1 day group the mean duration of catheterisation was still significantly shorter than in the 5 day group (p<0.001). In the 5 day group the occurrence of urinary infections was significantly higher (chi-square analysis, OR 15, limits 3.2-68.6) than in the 1 day group. The mean hospital stay was 1.3 day shorter in the not prolonged catheterisation group (p<0.001). 

Although a significant proportion of patients experience abnormal PVR there is a major benefit of 1 day catheterisation regarding urinary tract infection risk. A majority of 60% does not require additional catheterisation in the group where catheterisation was ceased within 1 day. It is advised to remove indwelling catheters on the morning of the first postoperative day. 

In chapter 3 the results of a dutch nationwide survey to measure practice variation concerning catheterisation is presented. The main reason for this study was that a considerable practice variation was suspected concerning diagnosis and management of abnormal postvoid-residual volume. As bladder catheterisation following vaginal prolapse surgery causes inconvenience for patients, raises the risk of urinary tract infections and potentially lengthens hospitalisation this implies suboptimal treatment for certain subgroups. A self developed questionnaire was sent to each hospital addressing the gynaecologist with a special interest in urogynaecology at that specific institution. The response rate was 93%. Postoperatively, 77% performed transurethral indwelling catheterisation, 12% suprapubic and 11% intermittent catheterisation. Catheterisation was applied 3 days (1-7 days) following anterior repair and 1 day (1-3 days) following all other procedures. The median cut-off point for abnormal post-void residual (PVR) was 150 ml (range 50-250 ml). Treatment of abnormal PVR consisted mostly of prolonging transurethral indwelling
catheterisation for 2 days (range 1-5 days) (57%), 29% by intermittent and 12% by suprapubic catheterisation. Antibiotics were administered by 21% either routinely or based on symptoms only. It was concluded that due to insufficient evidence and suboptimal implementation of available evidence concerning bladder care practice variation is high.

In chapter 4 the results are presented of a randomised study comparing indwelling catheterisation for 3 days with intermittent catheterisation for the treatment of abnormal PVR after vaginal prolapse surgery. These methods were the most frequently applied treatments for abnormal PVR but no evidence existed which one was the most preferable.

All patients were given an indwelling catheter directly after surgery which was removed on the first postoperative day. Patients with a PVR of more than 150 mL after their first void were randomised for either clean intermittent catheterisation performed by nursing staff (CIC) or for transurethral indwelling catheterisation (TIC) for three days.

A total of 87 patients were included in the study. In the CIC group (n=45) a lower risk of developing bacteriuria (14% vs 38%, P=0.02) and UTI (12% vs 33%, P=0.02) was found together with a shorter required duration of catheterisation compared to the TIC group (n=42) (18 hours CIC versus 72 hours TIC, P< 0.001). Patient satisfaction was similar. No adverse events occurred. It was concluded that clean intermittent catheterisation is preferable above indwelling catheterisation for three days in the treatment of abnormal PVR following vaginal prolapse surgery.

Chapter 5 describes patient preferences for intermittent catheterisation and indwelling catheterisation. Preferences were assessed using written treatment scenarios. In the initial scenario, treatment duration was set at 3 days and the risk for urinary tract (UTI) at 30% for both interventions. Treatment duration and UTI risk after CIC were varied until patients switched preference, with the aim to determine what role duration of catheterisation and UTI risk play in the preference of patients for either of the two treatments. Treatment duration and UTI risk related to TIC were kept constant throughout the interview. When duration of treatment and risk of UTI would be identical for both interventions 64% percent of patients would prefer CIC above TIC. When CIC would last 3 days and would result in a 15% lower UTI risk than TIC, 92% of the patients would prefer CIC. Assuming that CIC resulted in a 15% lower UTI risk, respectively 98% and 99% of the patients preferred CIC over TIC when catheterisation with CIC would last one respectively two days shorter than TIC.

Chapter 6 presents the results of a logistic regression model which was performed to identify risk factors for abnormal PVR. Identifying risk factors for abnormal PVR is important because it can improve pre-operative counselling and ultimately
the catheterisation regime can be adjusted to an individual risk for post-operative abnormal PVR. The medical records of 345 women undergoing surgical correction for symptomatic pelvic organ prolapse were analysed. Independent risk factors for the development of post-operative abnormal PVR were identified by performing univariate and multivariate logistic regression analysis. Several patient, demographic and surgical parameters were collected to determine risk factors for incomplete voiding. High grade cystocele (OR 2.5, CI 1.3 - 4.7), performing levator plication (OR 4.3, CI 2.0 – 9.3), performing Kelly plication (OR 5.1, CI 1.7 -15.5) and amount of intra-operative blood loss (OR 1.4 per 100 ml, CI 1.1-1.8) were identified as independent risk factors for the occurrence of abnormal PVR after vaginal prolapse surgery. From the finding that Kelly plication was of influence it was concluded that possibly the causes of abnormal PVR are an elevation of the bladder neck with an obstructive effect on the bladder outlet. From the finding that higher stage prolapse proved to be a risk factor, an influence of innervation damage due to extra dissection with higher stages was suspected. Further, levator plication was thought to exert its effect through pain leading to a disabled relaxation of the pelvic floor and consequently a negative effect on micturition.

In chapter 7 the results are shown of a second logistic regression model of a prospective cohort of patients having underwent vaginal prolapse surgery. A total of 342 patients were included. In the multivariable analysis with stepwise backward selection the strongest predictors were parity (OR 1.34, 95% CI 0.9-1.9), UDI pain domainscore (OR 1.11 95% CI 1.0 -1.3), situationally induced anxiety level (OR 1.39, 1.0 - 1.9) and point Ba (OR 1.25 95% CI 1.0-1.5). Of these factors situationally induced anxiety level and point Ba remained as the only two statistically significant predictors. It was concluded that incomplete voiding can be related to an obstruction of bladder outflow through a disturbed relaxation of the pelvic floor, central inhibition of the bladder and/or alpha adrenergic stimulation of the bladder outlet respectively but also to innervation damage through surgery.

In chapter 8 pre operative and postoperative urodynamic data are presented to determine the effect prolapse surgery has on bladder function and bladder outflow resistance patients undergoing vaginal prolapse surgery. The data were plotted in the Blaivas/Groutz nomogram as a reference to subclassify patients into categories varying from non-obstructed to obstructed (Blaivas). It appeared that vaginal prolapse surgery does not cause a significant obstruction as postoperative patients fell into the categories non obstructed to mildly obstructed.

In chapter 9 the discussion section the results of these studies are placed in a broader perspective and recommendations are given for clinical practice.