Voiding dysfunction after vaginal prolapse surgery: etiology, prevention and treatment

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Citation for published version (APA):
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General discussion
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This thesis reports on the etiology, prevention and management of incomplete voiding after vaginal prolapse surgery.

I Objectives of this thesis

The first objective was to determine the preferred practice and practice variation in Dutch hospitals concerning bladder care management after vaginal prolapse surgery. A survey was performed among Dutch gynaecologists with a special interest in urogynaecology.

The second objective was to optimise postoperative bladder care. Firstly, a randomised controlled trial was performed to compare a duration of standard postoperative catheterisation of 5 days (which was then the most frequently applied duration) to removal within 24 hours. Secondly, based on the results of the survey, the two most popular treatment protocols for the treatment of incomplete voiding, transurethral catheterisation for 3 days and intermittent catheterisation were compared in a multicenter randomised controlled trial (RCT) to establish what the most optimal technique of catheterisation is for management of patients with an abnormal postvoiding residual volume. In addition to the last RCT a preference study was performed to evaluate why patients choose for one or the other treatment.

The third objective was to understand the development of abnormal PVR. Risk factors for the development of abnormal PVR postoperatively were identified through logistic regression analysis on one retrospective and one prospective cohort. In the prospective study, anxiety and pain scores were included to determine their possible effect on the development of abnormal post void residual volume. An additional urodynamic study was performed to investigate the potential role of bladder outlet obstruction after prolapse surgery as an aetiological factor of incomplete voiding after vaginal prolapse surgery.

II Main conclusions

First objective: determining preferred practice and practice variation

At the time the studies in this thesis were designed it was common practice to prolong initial catheterisation for several days after vaginal prolapse surgery. Duration of this type of catheterisation frequently lasted up to 5 and sometimes 7 days. A randomised controlled trial comparing removal on the fifth day with removal within the first day showed clear benefits of removal within the first postoperative day. After this RCT a survey was performed to evaluate the effect of this RCT on the content of protocols in the Netherlands. The survey showed that initial catheterisation was mostly performed with a transurethral indwelling catheter. The duration of this initial catheterisation ranged from 1 to 7 days. Interestingly, the median duration went
down to 3 days. This might represent an adjustment to our trial results. Other findings were that there was no consensus about the minimal residual volume considered to be pathological (median 150 ml, range of 50-250 ml). Furthermore, there was a considerable practice variation regarding the use of antibiotics. These were given either standardly or based on urinary tract infection symptoms alone by 21% of responding gynaecologists. Lastly, there was a great variation in the management of abnormal PVR. The two most popular catheterisation regimens for abnormal PVR were indwelling catheters for 2 to 3 days and intermittent catheterisation. The large practice variation regarding these issues could be explained by limited evidence and inadequate implementation of available evidence on this subject.

**Second objective: optimising postoperative bladder care**

In the first RCT patients were randomised between a 5 day regime of catheterisation or a regime in which catheterisation was ceased within 24 hours postoperatively. This study revealed that a standard regimen to prevent abnormal PVR after vaginal prolapse surgery (duration of indwelling catheterisation of 5 days) could be safely reduced to a maximum of 1 day. It was observed that shorter catheterisation lowers the risk of urinary tract infections and gives a higher risk of re-catheterisation. However, the total days catheterisation lasted was still lower in the short catheterisation arm. After the removal of the initially placed catheter some patients develop an abnormal post void residual volume. It was observed, in the second RCT, that intermittent catheterisation showed a significant reduction in bacteriuria, a lower number of urinary tract infections and a quicker resumption to adequate bladder emptying when compared to transurethral indwelling catheterisation for 3 days. After disclosure of the results of this RCT 98% patients expressed a preference for intermittent catheterisation. It is likely that the finding of a higher bacteriuria and urinary tract infection rate in the indwelling group can be explained by the continuous presence and bacterial colonisation of the indwelling catheter as opposed to the in/out regime with intermittent catheterisation (IC). Although the repeated introduction of catheters during IC may also introduce bacteria, the difference in urinary tract infection rate can be explained by earlier observations by others that clearance of bacteria occurs during micturition in the absence of a (long term) catheter.

The most likely explanation of the better results of intermittent catheterisation (as opposed to the continuous drainage with transurethral catheterisation) is that the bladder intermittently fills and empties and that this trains the bladder to sensate the difference between a filled and an emptied status.
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Third objective: understanding development and etiology of abnormal PVR

From the multivariable analysis of a retrospective cohort it was observed that abnormal PVR after vaginal prolapse surgery occurs more often in women with larger cystoceles, with larger amounts of intra-operative blood loss and/or after surgery with levator plication or suburethral (Kelly) plication.\textsuperscript{8} A subsequent urodynamic study revealed that after anterior repair the risk of de novo bladder outlet obstruction was low. Therefore, abnormal postvoiding bladder residual volume after vaginal prolapse surgery apparently does not result from bladder outlet obstruction.\textsuperscript{9} Lastly, in an attempt to further identify risk factors for abnormal PVR and to establish whether the magnitude of anxiety and pain levels could be of influence for developing abnormal PVR a prospective cohort was studied. In this cohort, multivariate analysis revealed that patient anxiety level and higher degree of anterior wall prolapse were independent variables related to the development of abnormal post void residual volumes.\textsuperscript{10}

Implications and future perspectives

First objective: determining preferred practice and practice variation

From our survey it is clear that clinical practice regarding bladder care varies to a great extent. From several studies including ours it can be concluded that transurethral indwelling catheterisation is a safe technique with low morbidity, provided that the duration is shortened to a maximum of 24 hours postoperative. Further, for patients with an abnormal PVR, clean intermittent catheterisation is preferable as compared to transurethral indwelling catheterisation. The observed practice variation implies that some patients are exposed to an unnecessary higher risk to develop catheter induced urinary tract infections and longer hospitalisation. Reasons for this non-compliance with the evidence may be unawareness, underestimation and/or ignorance of the risks of catheterisation. Although we did observe effects on protocols after publication of trial results and noticed more attention for this subject nationally, not all hospital departments implemented this evidence in their protocols. In order to serve patients needs and demands, an effort for further optimisation of postoperative bladder care through clinical trials and further implementation of these trials should be aimed at. We think that continuing attention to this subject and the development of national (and international) multidisciplinary guidelines could serve this purpose.

Second objective: optimising postoperative bladder care

The duration of the initial placement of a catheter directly postoperatively should be reduced in order to reduce morbidity. Early removal of the initially placed
catheter results in a reduction of total duration of catheterisation and in a reduction of the occurrence of urinary tract infections. This outweights the higher risk of re-catheterisations. We believe that transurethral indwelling catheterisation is mandatory in the period that a vaginal gauze is left in place. However, an early removal of the vaginal gauze could be feasible and, in this way, facilitate earlier removal of the catheter.

Further studies should therefore focus at the actual need for a vaginal gauze, exploring the possibility of even earlier removal of the catheter and to investigate the potential benefits of IC over transurethral indwelling catheterisation directly postoperative.

In case of incomplete voiding, intermittent catheterisation should be the treatment of choice. More studies are needed to determine the acceptance of patients for intermittent catheterisation. In such studies special attention should focus at the willingness and ability of patients to either receiving IC by nurses or performing self catheterisation and at the time efficiency for nursing staff and costs.

such studies, incorporation in guidelines, continuing attention to the subject by oral presentations and clinical lessons are mandatory to increase awareness of gynaecologists and to improve postoperative care.

**Third objective: understanding development of abnormal PVR**

The results of the multivariate analysis in our retrospective cohort revealed that patients undergoing suburethral suturing (Kelly) have a higher risk to develop abnormal post void residual volume. We hypothesised that this could be due to more pain with an inhibiting effect on bladder emptying and also due to elevation and possible obstruction of the bladder outlet. Elevation and edema formation causing obstruction of the bladder outlet have often been related to the development of abnormal post void residual volume after anterior compartment surgery. Therefore, patients undergoing vaginal prolapse surgery were urodynamically evaluated in a prospective study. The results showed that bladder outlet obstruction is not a likely explanation for incomplete voiding after vaginal prolapse surgery. This means that our surgery technique should not be altered to prevent abnormal post void residual volume.

Lastly, our retrospective multivariate analysis revealed that the development of abnormal post void residual volume is multi-factorial. Both surgical and non-surgical factors can contribute to the development of abnormal PVR. To gain more insight in non-surgical explanations of development of abnormal post void residual volume anxiety level scores and pain scores were included in another (prospective) multivariable analysis. Again an effect was found of high stage anterior wall prolapse which could point to innervation damage as an explanation. Also, anxiety level was
found to have an influence on the development of abnormal post void residual volume, however more studies are needed to confirm this finding and to further quantify which levels of anxiety predispose for abnormal post void residual volume. Ultimately, intervention strategies to reduce anxiety in patients with higher anxiety scores should be evaluated in RCT’s as prevention and treatment of abnormal PVR.

**Concluding message**

Incomplete voiding after vaginal prolapse surgery is a common, but underevaluated, clinical condition. The large practice variation in diagnosis and treatment of voiding problems after vaginal prolapse surgery underlines the need for this thesis. The studies performed show that initial catheterisation should be shortened after vaginal prolapse surgery and in the event of an occurring abnormal PVR clean intermittent catheterisation should be initiated. From the studies several new research questions can be raised to further optimise postoperative care following vaginal prolapse surgery. To increase awareness of physicians and to implement the evidence, the existing and future evidence should be incorporated in national and international clinical guidelines.
References