Review Article

Concern issues around frequency-volume charts and bladder diaries

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Abstract

Frequency-volume charts (FVC) and Bladder diaries (BD) are widely accepted as additional tools for the evaluation of urinary tract symptoms to assist in treatment. They are simple and inexpensive as well as raising awareness and providing precise information. Despite the guidelines and experts recommending a 3-day use of FVC/BD for evaluation in both men and women with lower urinary tract symptoms, the findings may not be sufficiently detailed for some specific symptoms. To avoid poor compliance and poor reliability, the appropriate duration and instructions are mandatory and standardized in each patient. However, there are some limitations and concerns which need to be recognized before interpretation. The aim of this review is to investigate and demonstrate the appropriate duration of FVC/BD to increase completion rate, compliance and reliability as well as to decrease interpretation errors of FVC/BD

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Introduction

Frequency-volume charts (FVC) and Bladder diaries (BD) are additional tools for the evaluation of urinary tract symptoms (LUTS) to assist in treatment, being particularly useful because they are simple and inexpensive. The International Continence Society (ICS) classified three types of diaries for lower urinary tract evaluation. The first is the micturition chart (MC) which is a record of the times of micturition, day and night, for at least 24 hours. Secondly, the FVC which is used to record the time of each micturition and the voided volume for at least 24 hours. Lastly, the BD is used to add information from the FVC which includes fluid intake, pad usage, incontinence episodes and the degree of incontinence.[1]

According to ICS terminology, all measurements from the FVC included daytime frequency, nighttime frequency (nocturia), 24-hour frequency, 24-hour urine production, voided volume and maximum voided volume.[1] Both polyuria and nocturnal polyuria could be diagnosed using data from the FVC. Additional information added from the BD includes daily fluid intake, time of consumption, incontinence episodes, type

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of incontinence, pad usage, urgency and degree of urgency.[2] Not all the information is necessary in some circumstances but the completion of all aspects is usually recommended.

In order to successfully analyze the voiding pattern, the patients need to record all details completely for an appropriate length of time, however, usually the longer the duration of use of the FVC/BD the more precise the record of the pattern of voiding. However, in some cases compliance by the patient to finish the FVC/BD decreased over time due to the burden.[3] As a result, the reliability may be decreased. Not only is the increase in patient burden a limitation but also the time necessary for the physicians who assign FVC/BD to analyze the data. This retrospective study was carried out in patients primarily diagnosed with nocturia over a period of 6 years in a functional urology practice. It revealed that FVC/BD was recommended in only 50% of patients after the initial visit and only 62% of these patients complied with FVC/BD.[4] Approximately 50-60% of patients successfully completed a 3-day BD and the most difficult part was the calculation of the voided volume, particularly in women.[5,6] The lowest percentage of completion and reliability was maximum voided volume during the night.[6]

The 3-day FVC/BD as a standard recommendation may not be appropriate for all lower urinary tract conditions, particularly in cases in which high accuracy is required.[7] In many studies it was found that the completion rate of FVC/BD was between 50 and 60% of participants.[4-6] However, there have been some limitations and pitfall experienced during the recording using the FVC/BD. In order to address these concerns, this review aims to discover the appropriate duration of FVC/BD to increase completion rate, compliance and reliability as well as to decrease interpretation errors of FVC/BD.

Limitation of FVC/BD

Before a physician directs a patient to record FVC/BD, any limitations need to be recognized before in order to maximize recording, analysis and interpretation. Although FVC/BD is more accurate than patient recall[7], it needs to be recognized it does not replace history taking.

The most important limitations are the level of education and cooperation of the patient. In well-educated patients, health care providers can simply teach them how to fill in and complete the FVC/BD before the first visit without compromising the accuracy of the information.[8]

In addition, the habits of the individual patients can affect recording such as convenience void and self-learning. Convenience voids were described in 2005 and defined as voiding episodes when the bladder was emptied for social reasons, before going out on a long journey and before retiring to bed at night.[9] This issue affected the analysis of the data collected from the FVC, particularly with regard to mean voided volume and mean interval between voids. A previous study demonstrated that 72% of healthy volunteers recorded at least 1 convenience void in a 7-day FVC.[9] In the case of self-learning, the longer duration of BD may influence a patient with UUI by effects of self-monitoring so that episodes of urinary incontinence (UI) would be decreased over time.[10]

FVC duration VS Reliability and Compliance

Appropriate duration of recording FVC has been debated. To increase reliability a longer duration is required but then the compliance will decrease.[11] In addition, the day-to-day variation was found to decrease over a longer duration. With regard to reliability, various studies reported on duration of recording of FVC between 1 and 14 days, all in different population and with different lower urinary tract problems.

The latest AUA/SUFU guidelines for diagnosis and treatment of a non-neurogenic overactive bladder in adults stated that information from BD may be obtained and useful to monitor efficacy and guide treatment.[12] The EAU guidelines for non-neurogenic male and female LUTS recommended using BD to assess the symptoms, especially in the case of prominent storage symptoms. The duration of BD completion was at least 3 days.[13,14]

One study proposed the terms "diary fatigue" and "diary despair" from longer duration of completion of a BD.[15] To avoid both conditions, physicians need to optimize the duration according to symptoms. Before discussing the reliability, most studies used intraclass or interclass correlation coefficients (ICC) as a tool to define reliability in each quantitative parameter. If ICC was equal to or more than 0.75, the parameter indicated good reliability. In contrast, if ICC was less than 0.5, the parameter had poor reliability.[16]

Non-specific lower urinary tract symptoms (LUTS)

Despite the greater burden from a longer duration FVC, the study comparing 2-, 3- and 7-day FVC revealed that both male and female participants significantly preferred the 7-day rather than a 2- or 3-day FVC.[3] Many studies compared less than 7-day and 7-day FVCs and found that the completion rate of a 3-day and 7-day FVC was 90% and 50%, respectively. This suggested that the 3-day FVC was superior to the 7-day in terms of data completeness.[15] Another study in women with LUTS concluded that completion of a 4-day was as adequate as a 7-day FVC with nearly a 50% reduction in burden.[17] In the case of a 1-day FVC, a study demonstrated that it might be sufficient to differentiate between high and low symptoms scores, but it could not be used to diagnose lower urinary tract dysfunction or monitor after treatment.[18] A systematic review study of the optimum duration of FVC for the assessment and monitoring of patients with LUTS revealed that 3- and 7-day FVC had higher ICC (reliability) but no statistically strong conclusions could be made due to the variety of methodologies used, the quality of the studies, sample sizes and selection bias.[19]

Urinary incontinence (UI)

Information regarding UI has been found to be accurately gained from FVC/BD. In the case of a 1-day FVC positive outcomes were that less time was needed and there was sufficient information to gain insight in women with objective urgency urinary incontinence (UUI) but the negative outcome was there was not enough detail pertinent to various activity conditions such as a leisure day and a working day.[20]

In the case of the 3-day FVC, the total number of incontinent and total number of voiding episodes were reliable following the 3 days[21] but the data was not enough in cases with a small number of UI episodes. A 7-day FVC showed enough of a pattern for an evaluation of the frequency of UI episodes10 particularly in a patient who had 3 or more UI episodes per day.[7] Longer than 7 days such as 14-day FVC may be effective in women with UUI due to self-monitoring and life-style modification.[10] Therefore, duration of FVC/BD should be considered on type and severity of UI.

Nocturia

The primary aim of using FVC in cases of nocturia is to define the etiology including global polyuria, nocturnal polyuria and/or low voided volume.[22] Generally, the FVC is considered a standard tool in the diagnosis of nocturnal polyuria and the monitoring of a treatment outcome.[23] If a reliability of more than 80% is needed, a 3-day FVC or longer is enough for nocturia and nocturnal urine production but compliance significantly decreased after day 4 therefore would not be advisable.[11] In addition to FVC, another promising method for the diagnosis of nocturnal polyuria is analysis of a single urine sample produced at the time of first nocturnal awakening.[24]

FVC and Questionnaires

There was a weak correlation and lack of agreement between a 3-day FVC and the International Prostate Symptom Score (IPSS)[25,26] indicating that the FVC could not replace the questionnaire. Moreover, the questionnaire may under- or overestimate the number of nighttime voids so therefore the FVC should be included as part of the evaluation of nocturia.[26,27] As a consequence of the lack of a standard BD, the International Consultation on Incontinence Questionnaire (ICIQ) Bladder Diary for evaluation of LUTS was developed in 2012. On phase 1a of the testing of this diary, [27] patients and 30 clinicians were enrolled onto the study. The results showed that the patients preferred a diary duration of 7 days or less without a specific format and the clinicians preferred a 3-day duration in a single format.[28] Phase 1b – content validation was carried out and then the ICIQ-BD was validated and compared with the outcomes of the questionnaire or urodynamics. Only nocturia revealed strong agreement between ICIQ-male/female LUTS questionnaires and ICIQ-BD whereas urgency had weak correlation between the questionnaires and urodynamics.[29]

FVC and Urodynamics

FVC and urodynamics need to be used for different aims. Many studies tried to use FVC as a tool to diagnose lower urinary tract dysfunction instead of urodynamics. In 1994, the Larsson FVC was proposed as a differential diagnostic tool using frequency and mean voided volumes between UUI with detrusor overactivity (DO)

and genuine stress urinary incontinence (SUI) in women instead of urodynamics.[30] At the end of the study this tool was not popularly used because the sensitivity and specificity for DO were 52% and 70%, and the sensitivity and specificity for SUI were 66% and 65%, respectively.[31] Another study in women with DO showed a low correlation between FVC and urodynamic parameters as well as concluding that FVC could not be used for diagnostic purposes.[32]

A study in 15 healthy nulliparous women, who scored a grade of fullness on FVC as a tool to measure bladder sensation during normal daily life and later were examined by urodynamics, showed that 65% of all voids was made without any desire to void. When comparing bladder sensation between FVC and urodynamics, there was no statistically significant difference in FVC with the exception of the volume at urgent desire to void after voluntarily postponing to void.[33] Therefore, bladder sensation on FVC can provide information regarding bladder sensation before a urodynamics study is performed.

Conclusion

FVC/BD is a simple, basic and useful tool to help physicians understand lower urinary tract symptoms. The greater the length of time the FVC/BD is completed by the patient, the greater the reliability of the data collected but the higher the patient burden. Lack of some information in the FVC/BD does not mean the data are useless as it depends on the focus of the physician at that time. In some cases, in which the diagnosis is doubtful, completion of the FVC/BD is encouraged not only for the monitoring a treatment outcome but also for research purposes. The FVC/BD cannot replace history taking, questionnaires and urodynamics and all are essential to support each other to help physicians to give a precise diagnosis.

Conflict of Interest

The author declares no conflict of interest.

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