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Review Article

Leakpoint Pressures in Female Stress Urinary Incontinence

J. M. Cummings

Division of Urology, University of South Alabama, Mobile, Alabama, USA

Abstract: Patient selection is critical to achieving good results in the surgical management of stress urinary incontinence. The evaluation of urethral function in these women is of great importance, since the choice of operative technique often depends on the ability of the urethra to generate adequate resistance to the expulsive forces of increased abdominal pressure. The Valsalva leakpoint pressure (VLPP) has been described as an easily performed, reproducible and accurate urodynamic test to assess the patient for the presence of intrinsic sphincter deficiency (ISD). Critical review of the VLPP demonstrates its reproducibility and correlation with other measures of ISD. However, more work needs to be done to identify the truly critical values of VLPP that would help in selecting the most appropriate procedure in surgery for stress incontinence.

Keywords: Leakpoint pressures; Stress incontinence

Introduction

There are over 100 procedures described in the literature for the surgical correction of stress urinary incontinence (SUI) in women [1]. The most important decision is which procedure is best for a particular patient. Clearly, even a well performed operation is destined to fail if it does not adequately address the underlying pathophysiology of a disorder. Patient differences are such that not all operations for SUI are suitable for each and every woman with this problem.

Paramount among the pathophysiologic differences in women with SUI is the presence or absence of intrinsic sphincter deficiency (ISD). Incontinence surgeons have typically used classification systems such as those proposed by Blaivas [2,3] and McGuire [4], distinguishing between SUI caused by urethral hypermobility and that due to ISD, commonly referred to as type III stress incontinence. The distinctions delineated by these classifications are critical, as the failure rate for standard bladder neck suspension operations in stress incontinent women with ISD is reported to be as high as 35% in the short term [5], and may be higher still in the longer term.

The diagnosis of ISD can be complex and is based on a number of factors, including patient history, physical examination, cystography and complex urodynamic studies [6]. The valsalva leakpoint pressure (VLPP) was introduced as a urodynamic test that might be a useful adjunct in the diagnosis of ISD [7]. This procedure is easily performed as a part of the urodynamic evaluation of the woman with SUI, but critical appraisal of its place in the determination of ISD is necessary.

Definition

A leakpoint pressure can be defined as pressure transmitted to the urine in the bladder to cause leakage across the urethral sphincter. There are currently two leakpoint pressures utilized in clinical practice to assess urethral function. The detrusor leakpoint pressure is used in the assessment of children with myelodysplasia and potentially other neurogenic conditions [8,9]. The evaluation of the patient with SUI is most concerned with the abdominal or Valsalva leakpoint pressure, which can be defined as the minimal abdominal pressure required to drive urine across the urethral sphincter [7]. This is truly a measure of urethral resistance to increases

Correspondence and offprint requests to: Dr James M. Cummings, Chief, Division of Urology, Department of Surgery, 2451 Fillingim Street, 10th Floor, Suite F, Mobile, AL 36617-2293, USA.

in abdominal pressure only, since during Valsalva maneuvers the detrusor pressure curve should remain flat [10].

Technique

A urodynamic catheter is placed in the bladder, which is filled at 50–75 ml/min. Filling is continued to a volume of 200 ml or one-half the functional bladder capacity. The patient is placed in the upright position with the transducer adjusted to the level of the pubic symphysis, and asked to perform a slow progressive Valsalva maneuver until leakage occurs. The total bladder pressure at which leakage occurs is the VLPP. If no leakage occurs at pressures greater than 120–130 cmH_2O, then vigorous coughing may be used to induce urine leakage. Leakage can be observed either fluoroscopically or directly. Performance of the test at the same time as cystometry allows one to exclude simultaneous detrusor instability as a cause of incontinence [11].

There are certain pitfalls in the measurement of the VLPP that must be considered when examining the test results. The presence of a large cystocele leads to an artificially high VLPP, since the prolapsed bladder acts to dissipate energy from the increased abdominal pressure [12]. This effect can be ameliorated by reducing the cystocele with packing and repeating the VLPP measurement [13]. VLPP may also vary with the volume of fluid within the bladder when measured. Theofrastous [14] and Miklos [15] demonstrated an inverse relationship between VLPP and bladder volume and suggested that studies utilizing VLPP should carefully define the circumstances of its determination. Catheter size also has an effect on this test, with VLPP usually found to be higher in patients tested with a larger catheter [15,16].

Utility

For any test to have true utility it must meet several conditions: it should be easily performed and reproducible; correlation with other known markers of the process being examined should be sought; and outcomes of treatment should be favorably affected by the data obtained.

Several studies have examined the reproducibility of VLPP. Bump et al. [16] looked at test–retest variability and found statistically significant correlation coefficients between tests as long as catheter size was held constant. Similar findings were also noted by Heritz [17]. VLPP has also been shown to have excellent interobserver reproducibility. Heritz [17] showed good correlation between the VLPP measurements made by two observers, and Song [18] found reproducible results across four examiners over two different visits. Clearly, one strength of VLPP lies in its reproducibility.

The true usefulness of VLPP lies in its ability to detect ISD. The measurement has been found to correlate with other indicators of urethral dysfunction. In McGuire's early description of VLPP, 76% of the women with type III SUI on videourodynamics had a VLPP less than 60 cmH_2O, and all had VLPPs less than 90 cmH_2O [7]. Nitti [19] examined the relationship between subjective grade of SUI and VLPP, and found a high likelihood of a VLPP less than 90 cmH_2O in women with grade 3 symptomatology. Others found a correlation between VLPP and the parameters of pad usage and quantitative measures of fluid lost, but interestingly not with quality of life measures [20]. In another study, Cummings found a VLPP less than 65 cmH_2O in 83% of women with SUI who complained of severe leakage and also had a history of prior bladder neck or urethral surgery [21]. Comparisons have also been made to urethral closure pressures. Sultana showed good correlation between VLPP and maximum urethral closure pressure [22]. Swift and Ostergard [23] also showed a weak correlation between VLPP and maximum urethral closure pressure, but found that VLPP should be less than 45 cmH_2O to be predictive of a low-pressure urethra. McGuire did not show a correlation between maximum urethral pressure and VLPP [7]. Furthermore, Bump showed a poor positive predictive value for the prediction of a maximum urethral closure pressure of less than 20 cmH_2O by a VLPP less than 60 cmH_2O [16].

Relationship to Treatment Outcome

The purpose of classifying SUI is to allow the surgeon to select an appropriate operative procedure to correct the problem with best chance of a good long-term result. Women with ISD, as determined by various parameters, most commonly including videourodynamics, are thought to do poorly with standard urethropexy procedures [5,24] and should be treated by injection, slings or artificial sphincters [6]. Although the correlation between the presence of ISD and a low VLPP is good, there are few data in the literature showing a relationship between any particular level of VLPP and results of the treatments for ISD. There is some evidence that injection therapy works best in women with a low VLPP and no hypermobility of the bladder neck [25–27]. However, there are no reports showing a definite VLPP above which it is safe to perform one of the standard urethropexies rather than a sling or injection procedure, although certainly a VLPP less than 60 cmH_2O indicates poor urethral function, whereas VLPP measurements greater than 90–120 cmH_2O indicate a lesser likelihood of ISD.

Conclusion

Selection of the proper procedures for the operative treatment of female stress urinary incontinence is critical to the achievement of good, long-lasting results. Proper classification by urethral function aids in that selection process. The Valsalva leakpoint pressure is an easily

performed, reproducible urodynamic test that appears to add information to the standard evaluation of the woman with stress incontinence. Low Valsalva leakpoint pressures indicate a high likelihood of intrinsic sphincter deficiency and should be taken into consideration when choosing which operative therapy is to be used. The test should, however, be performed in a standardized fashion in order to compare results to those currently reported.

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