Effect of Intravesical Prostatic Protrusion (IVPP) on Lower Urinary Tract Function And Management

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DECLARATION

I solemnly declare that this dissertation **"Effect of Intravesical Prostatic Protrusion(IVPP) on Lower Urinary Tract Function And Management"** was prepared by me in the Department of Urology, Government Stanley Medical College and Hospital, Chennai under the guidance and supervision of DR.R.RADHAKRISHNAN MCh Uro, Professor &HOD and DR.P.GOVINDARAJAN Mch Uro, Professor, Dept. of Urology, Government Stanley Medical College, Chennai between 2006 and 2009.

This dissertation is submitted to the TamilNadu Dr. MGR Medical University, Chennai in partial fulfillment of the University requirements for the award of degree of MCh Genitourinary surgery.

Place : Chennai

Date :

CERTIFICATE

This is to Certify that this dissertation entitled **"Effect of Intravesical Prostatic Protrusion(IVPP) on Lower Urinary Tract Function And Management"** is a bonafide record of the research work done by Dr.M.G.Shekar. for the award of MCh Genitourinary surgery under the guidance and supervision of DR.R.RADHAKRISHNAN MCh Uro, Professor &HOD and DR.P.GOVINDARAJAN Mch Uro, Professor, Dept. of Urology, Government Stanley Medical College, Chennai between 2006 and 2009.

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INTRODUCTION

Intravesical prostatic protrusion (IVPP) is represented as a severe parameter of the Bladder outlet obstruction (BOO) due to Benign prostatic hypertrophy (BPH) traditionally and it is considered based on the experience that it can be cured only by surgical management.But till date it is not made standard in various association guidelines and in standard textbooks except for a few publications in literature. In symptomatic Benign prostatic hypertrophy patients, there is no consensus or clear practical guidelines to define the presence and severity of obstruction, other than the pressure-flow study .The latter has been traditionally regarded as the 'reference' gold standard but the technique is invasive, uncomfortable for the patient, time-consuming and expensive and not available, especially in most developing countries(Ref.Biblio.2). The various standard non invasive measures used for finding the severity of Bladder outlet obstruction due to Benign prostatic hypertrophy are IPSS score(International prostatic symptoms score),Uroflowmetry and Postvoid residual urine estimation(PVR).Eventhough these are not considered significant to asses the severity of Bladder outlet obstruction on individual basis they are at present used in combination to asses the severity.Each one has their own pitfalls to be a single standard non invasive mode for assessing the severity of Bladder outlet obstruction due to Benign prostatic hypertrophy.Cystoscopy and Pressure flow study are reliable in assessing the severity of Bladder outlet obstruction due to Benign prostatic hypertrophy but both are invasive.

New studies are undertaken throughout the world to find out reliable single non invasive mode to measure the severity of Bladder outlet obstruction due to Benign prostatic hypertrophy such as Bladder wall thickness, Obstructive symptoms score(OSS), Tranzition zone volume(TZV) etc.(Ref.Biblio.1). The Intravesical prostatic protrusion may not be present in all cases of Benign prostatic hypertrophy and hence cannont be accomplished as a single non invasive measure for assessing the severity of Bladder outlet obstruction due to Benign prostatic hypertrophy.But whomsoever having Intravesical prostatic protrusion may be considered to be suffering from severe Bladder outlet obstruction and may be taken up for surgical intervention rather than observing with medical management.

The IVPP is caused by mainly median lobe and also enlarging lateral lobes.The natural history of the formation of the Intravesical prostatic protrusion includes the Transition zone hyperplasia in its proximal end and hyperplasia of the central zone which may occur rarely.Also the enlarging lateral lobes,because of the associated bladder contraction for the forceful micturition and severe contraction of the bladder neck to coapt forcefully, protrudes inside the bladder and forms the Intravesical prostatic protrusion.So Intravesical prostatic protrusion may be considered as a severe enlarged lateral lobe in its course of enlargement esp when the protrusion is manily formed by the lateral lobe. The anatomical configuration of the prostate, in particular the extent of intravesical protrusion of the prostate (IVPP), could affect voiding. Intravesical protrusion of the prostate causes a 'ball-valve' type of obstruction which is the main

mechanism depicted for its severity in Bladder outlet obstruction. Intravesical protrusion of the prostate disrupts the funnelling effect of the bladder neck and causes dyskinetic movement of the bladder during voiding.The strong bladder contraction could force open a channel between the lobes but tend to aggravate the ball-valve effect in intravesical protrusion of the prostate (IVPP)This mechanism differentiates the Intraurethral prostatic protrusion(IUPP) to be a less severe parameter in Bladder outlet obstruction.(Ref.Biblio.1&16).

The Intraurethral prostatic protrusion gives way because of the forceful bladder contraction and considered to be an early level of progressing lateral lobe enlargement. The Intraurethral prostatic protrusion cannot be assessed by radiological investigation and even cystoscopy can only delineate the length of the Intraurethral prostatic protrusion and cannot asses the depth and height of protrusion.Bladder wall thickness is accounted recently by many people as a non invasive measure for assessing the severity but the vary of thickness with bladder volume and subjective and objective errors in measurement of the wall thickness makes this parameter yet to be standardized.

In our study the grades of Intravesical prostatic protrusion detected by TAUS(Transabdominal Ultrasound) correlated with the severity of Bladder outlet obstruction (BOO) as assesed by Uroflowmetry,Postvoid residual urine measurement,IPSS scoring and Pressure flow study(PFS).Also the effects of medical and surgical treatment in patients with IVPP are compared. Intravesical prostatic protrusion(IVPP) is correlated with International prostate symptoms score

Tuberculoid Leprosy (TT):

(IPSS),Quality of life index (QOL),Uroflowmetry,Postvoid urine (PVR) and Pressure Flow study (PFS) and to asses whether the presence and increasing grades of Intravesical prostatic protrusion are directly correlated with the severity of Bladder outlet obstruction due to Benign prostatic hypertrophy. Response of patients with Intravesical prostatic protrusion of same grade to surgical therapy and drug therapy are compared to decide which modality of management is best.The abstract stating the aim and methods and the powerpoint presentation of the this study is presented to the Ethical committee and got approved for the completion of the study

REVIEW OF LITERATURE

Bladder outlet obstruction (BOO) is characterized by increased detrusor pressure and reduced urinary flow rate. Pressure-flow studies are the gold standard for BOO determination. However, this method is an invasive and expensive procedure with limited availability. Therefore, attempts have been made to diagnose BOO through noninvasive methods that can be divided into 2 categories: non-urodynamically based measurements and noninvasive urodynamics.

Non-urodynamically based measurements include symptoms, post-void residual urine (PVR), Prostate Specific Antigen (PSA) and ultrasound derived measurements, such as

prostate volume, bladder wall thickness, bladder weight and intravesical prostatic protrusion (IVPP). Noninvasive urodynamics include uroflowmetry, use of a penile cuff, the condom-method and Doppler urodynamics .All the non invasive modalities are discussed in this literature review and IVPP is compared with the other parameters and assesesed for its accuracy and stance in detecting the severity of BOO due to BPH.

It is well known that the prostate's anatomic conformation together with intravesical prostatic protrusion (IVPP) may affect normal voiding. Earlier studies have previously demonstrated that the ultrasonographic measurement of IVPP could identify BOO. A total of 200 patients were assessed with invasive urodynamics and transabdominal ultrasound. The relationship of IVPP to BOO showed that as IVPP grade increased in severity, BOO grade also increased. The sensitivity and specificity of diagnosing BOO were 76% and 92% for over 10 mm IPP, 17% and 53% for between 5 and 10 mm IPP and 7% and 56% for under 5 mm IPP, respectively. PVR more than 100 mL showed 75% sensitivity and 91% specificity for predicting BOO in the population studied.

LUTS are one of the most common complaints in the elderly men and benign prostate obstruction is one of the most frequent causes. Pressure flow study has been recommended before surgical treatment of prostate enlargement by many authors. Searching for new accurate methods that could substitute the gold standard pressure-flow study demonstrates the need for lowering costs, expanding accessibility and

relieving patient discomfort .

Since transrectal methods can produce great discomfort to the patient, abdominal ultrasound was demonstrated to be equivalent to rectal ultrasound for measuring the prostate when bladder volume is over 100 ml. Clinical data such as IPSS, post voiding residue and flowmetry have been previously demonstrated to correlate mostly to lower urinary tract functional status rather than mechanical obstruction itself. Therefore, noninvasive measurements of the prostate intend to delineate a morpho-functional correlation in order to orient conduct towards LUTS secondary to benign prostate obstruction.

Chia et al. demonstrated the possibility of using the IVPP measurements for diagnosing BOO, which was also a predictor of the capacity for spontaneous voiding after acute urinary retention in Tan et al. study .Other authors have suggested determining bladder weight, bladder wall width or prostate conformation through abdominal or rectal ultrasound.Kojima et al. demonstrated, studying 104 patients, that the bladder weight more than 35 g performed thought transabdominal ultrasound is strongly associated with bladder outlet obstruction on pressure-flow studies.

A bladder wall thickness of 5 mm appeared to be the best cutoff point to diagnose bladder outlet obstruction, since 63.3% of patients with bladder wall thickness less than

5 mm were unobstructed while 87.5% of those with a bladder wall thickness 5 mm or greater were obstructed in a study including 174 patients of Manieri et al. at 150 mL bladder filling.

Hakenberg et al. found that mean bladder wall thickness was 3.33 mm in healthy men and 3.67 mm in men with LUTS and BPE, measuring all patients at different bladder fillings. BOO was found in 95.5% of men with a detrusor wall thickness greater than or equal to 2 mm in Oelke et al. study, at 250 mL or more bladder filling.Recently, Blatt et al. who performed urodynamics evaluation and abdominal ultrasound among patients with different types bladder dysfunction, found that mean bladder wall thickness in patients with normal urodynamics, bladder outlet obstruction, detrusor overactivity and increased bladder sensation was 2.0, 2.1, 1.9 and 1.8 mm, respectively. No significant difference was found between the groups. In particular, there was no difference in bladder wall thickness between patients with normal urodynamics, and those with bladder outlet obstruction ($p = 0.31$) or detrusor overactivity ($p = 0.31$).The inconsistency as regards the results obtained and the lack of technique standardization have limited their clinical use until now.

Single Nonurodynamic Measures:

SYMPTOMS*:* The association between LUTS and BOO has been investigated in many studies. A large multicenter,multinational trial such as the International Continence Society-“BPH” study in 1,271 men between 45 and 88 years old showed the relationship

to be poor. This study evaluated a subpopulation of 933 patients with suitable pressure flow data and used the validated International Continence Society male questionnaire to evaluate storage and voiding symptoms. This was regardless of whether one examined voiding and storage symptoms separately. Some studies show a weak correlation between voiding symptoms and BOO.Reynard and Abrams found that the symptoms of hesitance and decreased flow were statistically significantly related to BOO (chi-square test p _ 0.04 and 0.002, respectively). However, the symptoms of straining to void, intermittence and terminal dribble were not observed to be associated with BOO by the same group. Despite statistical significance due to large patient numbers these symptoms have limited clinical significance.

Further quantification of symptom severity by scoring using a validated self-administered questionnaire, such as the AUA symptom score, has shown a poor relationship with BOO and the ability of the AUA symptom score to diagnose BOO is also poor. The fact that older women have a

high AUA score suggests that the questionnaire is not disease specific. The International Prostate Symptom Score is derived from the AUA symptom questionnaire with an additional quality of life question. Not surprisingly this instrument also shows weak correlation with objective measures of BOO (r _ 0.18). Symptoms are important for managing BOO because they are what bothers the patient but they are insufficient alone to diagnose BOO. However, a substantial number of clinicians base their prostate surgery decisions on symptom severity alone.

Biochemical Parameters:

PSA: In a study of more than 300 patients the relationship between PSA and urodynamic BOO was examined and stratified using logistic regression analysis. If PSA was 4 to 6 ng/ml, definite BOO was likely in 65% of cases, whereas if PSA was in the range of 6 to 10 ng/ml, the likelihood of obstruction increased to 81%. The approach is limited since only 23% of the population studied could be stratified in this fashion and had PSA more than 4 ng/ml. Furthermore, PSA is also a marker of prostate cancer, which may need to be excluded, especially at PSA greater than 4 ng/ml. Therefore, if it is used, clinical assessment becomes more complex.

Single Ultrasound Measurements:

PVR: PVR is a useful parameter for assessing patients presenting with LUTS. The pathophysiology of increasing PVR is not generally well understood, and interactions with BOO and detrusor contractility are complex. It is known that increased PVR occurs in patients with BOO. However, a large PVR may reflect detrusor underactivity rather than BOO. A third of patients with BOO do not have significant PVR. Nevertheless, PVR has been shown to decrease in patients with BOO after surgery.

The interaction of detrusor contractility, PVR and BOO was recently investigated in 131 patients. This showed that there was a weak correlation between PVR and BOO, and PVR alone could not predict BOO. This demonstrates that PVR depends on BOO and

detrusor contractility, and conversely PVR cannot predict BOO alone. Briefly, PVR alone cannot be used to diagnose BOO with good sensitivity but is useful in conjunction with other parameters, such as uroflowmetry.

PROSTATE SIZE: Prostate size is usually assessed by DRE, TRUS or magnetic resonance imaging. The accuracy of DRE for assessing prostate size is poor. TRUS is the imaging modality used most frequently to assess prostate volume and it is more accurate than DRE. The relationship between total prostate volume and BOO has been investigated in several studies. A retrospective study in 521 patients showed a relatively weak but statistically significant correlation of prostate size and BOO (r _ 0.32, p _0.001).24 of patients with a prostate volume of more than 40 ml 70% would have been diagnosed with BOO. This group represented 45% of the population group and, therefore, it is not sufficient alone to diagnose BOO in the majority of patients. In the data presented the sensitivity and specificity of a prostate volume of greater than 40 ml was 49% and 32%,respectively. In 525 patients Eckhardt et al also noted a statistically significant correlation between prostate volume and BOO (r _ 0.28, p _0.001). However, unexpectedlyprostate volume decreased slightly as the Schafer grade of obstruction reached 5 and 6.

With the failure of total prostate volume alone to diagnose BOO attempts have been made to diagnose BOO using prostate shape and the relative proportions of the different prostate zones. The zonal anatomy of the prostate consists of 3 zones, that is a central

zone, a TZ and peripheral zone. The TZ is the major site of benign prostatic hyperplasia. The TZ index, that is the ratio of TZ volume to total prostate volume, was reported by Kaplanet al in 61 patients to have a stronger statistically significant correlation with symptoms (r _ 0.75, p _ 0.001) and maximum urine flow (r _ _0.71, p _ 0.001) than with prostate volume alone. However, TZ had only a moderate correlation with detrusor pressure at maximum flow(r _ 0.43). Witjes et al investigated 150 patients using prostatic volume, TZ index and pressure flow studies, and failed to note any significant relationships. They believed that none of these parameters used singly was sufficient to diagnose BOO. Lepor et al also reported that total prostate volume and TZ dimensions correlate poorly with symptoms and have inadequate correlations with BOO for clinical usefulness. The TZ index is insufficient alone to provide the diagnosis of BOO. Prostatic configuration has been investigated using prostate PCAR (Presumed circle-to-area ratio), as observed on TRUS. PCAR measures the degree to which the transverse ultrasound image of the prostate approaches a circular shape. The ratio tends toward 1 as the prostate becomes more circular. In 85 patients PCAR showed a stronger correlation than the TZ index (r _ 0.487, p _0.0001 vs r _ 0.331, p _0.005). In addition, PCAR sensitivity was 77% for diagnosing obstruction when PCAR was greater than 0.8 with 75% specificity. It seems clear that the more circular the prostate, the more likely there is to be BOO. This has notbeen repeated in further, larger studies.

BLADDER WALL THICKNESS AND BLADDER WEIGHT:

BWT is a variable that has been used to assess BOO noninvasively. The rationale of BWT as a parameter for diagnosing BOO is that increasing prostatic obstruction is associated with detrusor hypertrophy, leading to increased BWT. This has been shown to occur in some morphological studies. However, an increase in BWT may result not only from

smooth muscle hypertrophy, but also from the increased fibrous tissue and collagen that occurs with age and obstruction.

Experimental animal models of obstruction have shown increased detrusor hypertrophy, which decreases after obstruction is released. However, an increase in BWT may not necessarily be related only to BOO alone. It could be due to age or detrusor overactivity.

BWT measurement is significantly influenced by bladder volume. The bladder wall stretches as bladder volume increases therefore, decreasing the BWT measured. Several methods have been suggested to overcome this factor. Kaefer et al noted in a small group of children, including 15 with posterior urethral valves and 10 who were normal, that there is an inverse relationship between bladder radius and BWT. To overcome this the bladder thickness index was developed. The bladder thickness index was calculated from 4 BWT measurements (dome, floor and 2 lateral walls) divided by the average of 2 internal bladder measurements (to represent bladder volume). This bladder thickness index standardizes BWT with regard to bladder volume, although the calculation assumes a spherical bladder. This index was found to have 80% sensitivity and 90% specificity for predicting BOO.

Manieri et al circumvented the problem of bladder volume by measuring BWT at a constant volume of 150 ml during urodynamic procedures in adults. A total of 174 male patients with LUTS were examined with 3 measurements of BWT at 3 sites (anterior and lateral walls). Average

BWT correlated with urodynamic parameters of obstruction, as measured by the Abrams-Griffiths number (r _ 0.6724, p _0.0001). Of 58 patients with a BWT of greater than 5 mm 88% had obstruction on pressure flow studies. The specificity of BWT more than 5 mm for diagnosing BOO was 92%,although sensitivity was 54%. Furthermore, the need for measurement at a standard volume may make it difficult to use this in clinical practice. In 70 patients others determined a cutoff of BWT more than 2 mm for diagnosing BOO with 63.6% sensitivity and 97.3% specificity. Normative data on 172 asymptomatic male patients showed that BWT increases with age (r _ 0.12, p _0.014) and normal mean BWT _ SD is 3.3 _ 0.08.41 In addition, a comparison of normal, age matched, asymptomatic men, and male patients with LUTS and BPE showed no significant difference in mean BWT. A statistically significant negative correlation was also found between bladder volume and BWT, supporting the use of a fixed volume, as suggested by Manieri et al (r _ _0.12, p _0.003).39 Some groups suggested that BWT remains stable at greater than 60% to 100% of bladder capacity but it varies across the initial 50% of bladder capacity. Kojima et al suggested calculating bladder weight as a measure of detrusor hypertrophy, which allows measurement at different bladder volumes.

UEBW(Ultrasound estimated bladder weight) is calculated as follows. The total bladder volume, including BWT, is measured, assuming that the bladder is a sphere. An average of 3 points at the anterior bladder wall 1 cm apart is used to calculate BWT. Total volume is subtracted from intravesical volume, as determined on ultrasound, and multiplied by the specific gravity, which is approximated as 1. In the initial study this was repeated using a simple ellipsoid model. In an autopsy study bladder weight was calculated using 10 cadaver human bladders after filling. The sphere and ellipsoid models showed similar results and correlated with actual bladder weight. Because the spherical model was simpler to calculate, this method was adopted in subsequent studies. The reliability of UEBW calculations at different bladder volumes was studied in only 16 patients using 100 to 300 ml volumes. This appeared to show an average mean variation of 5 gm or 12% but sample size was insufficient to make further statements about the reproducibility of UEBW measurement. In the same study UEBW was shown to have different distributions in normal asymptomatic, nonobstructed and obstructed populations. Intra-investigator and interinvestigator variations in UEBW in 36 patients were studied and showed no statistical difference. Mean initial and second measurements were 42.8 _ 22.6 and 42.9 _ 22.6 gm, respectively.

A comparison of UEBW with pressure flow studies in 65 patients demonstrated a significant correlation with urodynamic parameters of obstruction, such as the Abrams-Griffiths number and Schafer grade of obstruction (r _ 0.478, p _0.0001 and r _ 0.543, p _0.0001, respectively).

Using an UEBW cutoff of greater than 35 gm test sensitivity was 85% with 87% specificity. Nevertheless, there were patients with a substantially increased UEBW who did not have obstruction. UEBW defines detrusor hypertrophy but not the cause, which may not necessarily be prostatic obstruction. The effect of detrusor overactivity on UEBW was not considered, although it seems likely that bladder weight may be increased in cases of detrusor overactivity without obstruction.

In a subsequent study a group investigated the change in UEBW parameters before and after prostate surgery. A total of 33 patients were treated with retropubic subscapular or transurethral prostatectomy. The criteria for surgery were determined from TRUS findings and clinical findings of increased PVR. In the majority of these select patients UEBW changed from a mean of 53 to less than 35 gm 12 weeks after surgery. Interestingly in 3 patients with UEBW greater than 80 gm UEBW remained greater than 35 gm after surgery. A pilot study of the change in UEBW parameters after tamsulosin treatment in 32 patients demonstrated a decrease in UEBW at 30 days that was maintained at 6 months. However, this was not a double-blind study, raising the possibility of observer bias.In conclusion, the limitations of the method include variability in the number of different sites on the anterior bladder wall used to derive BWT and UEBW. Variation in BWT with bladder volume is an issue. Repeatability of the methodology, and further assessment of interinvestigator and intra-investigator variability in the measurement of ultrasound parameters are also required. In cases of UEBW cumbersome calculations are required and they depend on the accurate

measurement of bladder volume as well as BWT.

IVPP ON TRANSABDOMINAL ULTRASOUND*:* The rationale for this approach is based on the fact that, as the prostate enlarges, it protrudes into the bladder, producing a ball valve effect and leading to BOO.IVPP is measured in mm from the bladder base in the mid sagittal line using transabdominal ultrasound. IVPP is graded according to severity as grade I—less than 5 mm, grade II—5 to 10 mm and grade III—more than 10 mm. In 22 anesthetized patients before TURP the effect of bladder volume on IVPP was investigated. The effect of bladder volume on protrusion was significant with an 80% increase (mean 4 mm) in the mean measurement as bladder volume decreased from 400 to 100 ml. The investigators suggested that IVPP should be measured between bladder volumes of 100 and 200 ml.

The same approach was used to assess the role of IVPP for determining the outcome of TWOC(Trial without catheter) after acute retention in 100 patients. As predicted by IVPP, the failure rate of TWOC for grades I to III was 36%, 58% and 67%, respectively (grade 1 vs 3 chi-square test p _ 0.008). The greater the grade of IVPP, the more the chance of TWOC failure. A total of 200 patients were assessed with invasive urodynamics and transabdominal ultrasound. The relationship of IVPP to BOO is such that, as IVPP grade increases in severity, the severity of BOO increases. The sensitivity and specificity of diagnosing BOO were 76% and 92% for grade III, 17% and 53% for grade II and 7% and 56% for grade I, respectively. PVR more than 100 ml showed 75%

sensitivity and 91% specificity for predicting BOO in the population studied.

There is variability in ultrasound measurement which should be handled by a single person on a same ultrasound machine and a test/retest of this echnique has not been published. The large effect of bladder volume on IVPP measurements should be tackled by measuring the IVPP in a constant volume say 100-200 ml. This measure requires further replication at other centers and its significant clinical application for diagnosing BOO yet to reproduced in various centres.

Doppler RI:

Some animal models suggest that detrusor blood flow is decreased in obstructed vs nonobstructed animals. This is because the detrusor undergoes compensatory hypertrophy with no increase in blood supply and, therefore, a relative decrease in blood flow. A pilot study investigated detrusor blood flow, as determined by color Doppler ultrasound in 29 patients who also underwent pressure flow studies. Average arterial blood flow at 3 bladder sites was measured as well as the RI, which is an index of change in blood flow calculated by the formula, RI _ Vmax _ Vmin/Vmax, where Vmax represents maximum velocity and Vmin represents minimum velocity. A statistically significant difference was noted between detrusor RI values in obstructed and nonobstructed cases. A logistic regression model was developed to predict BOO. This showed an overall accuracy of 86% but a

low negative predictive value of 57%. A larger study is re-quired to investigate this

further. However, it must also be recognized that other factors affect the change in blood flow, including atherosclerosis, age and detrusor overactivity.

RI has been evaluated in patients with LUTS using a transrectal approach. Of 140 patients RI was measured in 57 patients undergoing pressure flow studies. There was a correlation of RI with prostatic parameters, such as PCAR, the TZ index and patient age (r _ 0.456, p _0.0001, r _ 0.276, p _0.01 and r _ 0.337, p _0.005, respectively). Furthermore, there appeared to be some correlation between the RI and the Abrams-Griffiths number (r _ 0.330, p _0.05). When the RI was greater than0.7, sensitivity and specificity for diagnosing BOO were85% and 46%, respectively. However, the mechanism responsible for the increased RI in benign prostatic hyperplasia is not understood.

Numerous nonurodynamic approaches have been investigated as alternatives to pressure flow studies in men. It is important that studies suggesting a new diagnostic test should follow good methodological standards to allow accurate evaluation of the findings. Unfortunately there is poor compliance in such studies with the good methodological standards required for defining new diagnostic tests. Further vigilance is required on the part of journals to ensure that suchstandards are upheld.

Reviewing the diagnostic accuracy of the different methods of diagnosing BOO shows that there appears to be large variation in the sensitivity and specificity of the measures considered. For example, symptoms appear to offer excellent sensitivity but poor specificity for diagnosing BOO compared to bladder weight and IVPP, which offers

good sensitivity and specificity. However, sensitivity and specificity relate more to the yes/no accuracy of the test rather than to its usefulness in a clinical context. Positive predictive values are important in clinical evaluation but they vary according to the prevalence of BOO in the population studied. Therefore, it is important to know the pretest probability of BOO in each study, which varies from 47% to 75%. It follows that LRs are important because they determine the level of change from pretest to posttest probability for diagnosing BOO. Most measures show modest increases from pretest to posttest probability for diagnosing BOO except IVPP, BWT and UEBW. IVPP requires further replication in Western populations. BWT and UEBW are promising emerging tests with a good evidence base to support their use in entering clinical practice after further development. However, there is a need to standardize the measurements used to assess BWT and determine UEBW in Western populations.

Uroflowmetry:

Uroflowmetry provides an objective indication of voiding dysfunction. The limitation of urinary flow rates are that they do not distinguish a low flow rate due to prostatic obstruction from low flow due to poor detrusor contractility. Furthermore, patients with obstruction who have high detrusor pressure can maintain a normal flow rate. Uroflowmetry results show considerable variation in Qmax measured on the same or on different days.

The specificity of Qmax for BOO depends on a number of factors, for example the

volume voided and the value of Qmax used, ie less than 10 ml per second. The specificity and positive predictive value of Qmax less than 10 ml per second were reported in the ICS-“BPH” study as 70% but with 47% sensitivity. However, 60% of the population in the ICS- “BPH” study had obstruction. Therefore, it can be argued that the value of Qmax less than 10 ml per second only improves the PPV by 10% and really does not add much additional information. Single center studies, albeit with smaller patient numbers, suggest a higher specificity of 90%, in particular when multiple flows were done. The limitation of this approach remains the poor sensitivity of Qmax less than 10 ml per second unless flow studies are performed in a structural manner.

Non Invasive Urodynamics:

The underlying principle of noninvasive urodynamic techniques is the measurement of isovolumetric bladder pressure. In combination with the free flow rate it would allow a slow flow rate due to obstruction to be distinguished from a low flow due to detrusor underactivity. The penile cuff and modified condom method are the 2 principle methods used to

measure isovolumetric bladder pressure. These 2 methods rely on the assumption that there is a continuous column of fluid between the bladder and urethra when flow is interrupted, so that pressure at the point of measurement is the same as pressure in the bladder.

The external condom method was first suggested by Schafer.The patient voids

repeatedly through a condom catheter. At maximum flow the catheter is blocked and isovolumetric pressure is measured. In the first reported study all patients underwent pressure flow studies and the condom method. There was a 25% failure rate, leaving 56 patients with interpretable results. Several strategies for analyzing the data were used. The best method of diagnosing BOO using the condom method (penile external pressure) and Qmax showed 64% sensitivity with 79% specificity, as calculated from data presented in the article. However, this involved combining the data on the unobstructed and equivocal groups. Several significant problems have been noted when using this technique. Sometimes in some patients isovolumetric pressure was not attained. There was a decrease in the correlation of pressure in patients with obstruction. Also, the method could not be used to diagnose BOO at lower flow rates (less than 5.4 ml per second). To overcome these problems the use of a variable resistance catheter as well as preloading the condom with water was suggested. Subsequently a large longitudinal study was performed, which showed improved applicability and reproducibility. Two methods have been suggested for the penile cuff technique, that is the deflation and interruption techniques. As suggested by Gleason et al, the original penile cuff technique was the deflation technique. The penile cuff was used to occlude the urethra on penile shaft before voiding. The patient was instructed to void and the cuff was deflated slowly by the patient using a button when urine was felt in the urethra. After a flow rate of greater than 1 ml per second was detected by the flowmeter the cuff was rapidly deflated.

The penile interruption technique was proposed by the Newcastle group. The penile cuff is automatically inflated after voiding commences at a stepwise increment of 10 cm H2O per second to a maximum of 200 H2O. After voiding ceases the cuff is rapidly deflated, resulting in a surge of urine (Qsurge), followed by a steady state of urine flow (Qss). This cycle is repeated through the course of the void. Using simultaneous invasive urodynamics and the penile cuff isovolumetric detrusor pressure was reliably estimated by the cuff. However, mean cuff pressure _ SD overestimated bladder pressure by 14.5 _ 14 cm H2O. This difference is partly explained by the height difference between the symphysis pubis and the middle of the cuff. A further, larger study in 151 patients showed that overestimation of mean cuff pressure was 16.4 _ 27.5 cm H2O. Test/retest variability was 0 _ 20.3 in patients with a VV of at least 150 ml. Interobserver agreement in the analysis of the results was good. Of the patients 80% preferred the cuff to invasive urodynamics.

To diagnose BOO a modification of the ICS nomogram has been suggested for the penile interruption cuff technique. This nomogram considers that abdominal pressure is not measured and it makes a conversion of detrusor pressure at Qmax used in the ICS nomogram to isovolumetric pressure. Combinations of noninvasive urodynamic parameters were investigated by Harding et al in 116 patients from 2 centers. Using linear discriminant analysis patients were plotted on a 3-dimensional nomogram of flow rate, cuff pressure and the PCR index. The combination of these 3 parameters provided 86% and 87% sensitivity, respectively, for diagnosing BOO. Furthermore, they defined

the diagnostic parameter N, corresponding to the Abrams-Griffiths number, as N _ internal cuff pressure – 6.4 Qmax _ 0.35 PCR, where N greater than 100 indicates obstruction. A further study is in progress to assess the outcome of transurethral prostate resection using the modified ICS nomogram.Preliminary results show that preoperative assessment using the modified ICS nomogram improves the outcome of transurethral prostate resection.

The pinch test exploits the same principles as the cuff test. Urine flow waveforms after penile compression and release have been investigated as a possible method of diagnosing BOO. Sullivan and Yalla investigated manual pinching of the penis in 110 patients. The PCR (Penile compression release) index was formulated by the equation, (Qsurge – Qss)/Qss *100.The PCR index was found to be different in obstructed, nonobstructed, detrusor underactivity and detrusor overactivity groups. In fact, a PCR index of greater than 100% had the ability to diagnose BOO in the population studied with 91% sensitivity and 70% specificity. When the cuff test was used to calculate PCR, a PCR index of 160% provided 78% sensitivity and 84% specificity for predicting BOO. Furthermore, it showed a positive correlation of isovolumetric pressure with the PCR index (r _ 0.44, p _0.01). In conclusion, noninvasive urodynamics may have the possibility of providing a noninvasive diagnosis of BOO, although one must note that abdominal straining may affect the result. The techniques and pitfalls have been well covered previously. The combination of the noninvasive urodynamics parameters isovolumetric detrusor pressure, PCR index and Qmax form a potentially accurate

method of diagnosing BOO.

Doppler Ultrasound Urodynamics:

Doppler ultrasound is usually used to measure blood flow velocity. Initially the application of Doppler ultrasound was thought unlikely to be useful for measuring urinary flow since there are no cells in urine to reflect ultrasound waves and, hence, a Doppler effect would not occur. However, in an experimental model urine but not degassed water was continuously detected when the flow rate was greater than 1.5 ml per second. Therefore, it was surmised that Doppler works because microbubbles are created by the urinary flow. However, flow must be greater than 1 to 3 ml per second to be measured by Doppler ultrasound. The technique of Doppler flow measurement has been applied to measure urine flow in the prostatic urethra, which is the site of the flow controlling zone. Clinical application requires the patient to be seated with the probe positioned perineally by a robotic arm. The technique was initially evaluated in 6 patients with and 6 without BOO. This demonstrated that the functional cross-sectional area calculated by dividing Qmax by maximum flow velocity, as determined by Doppler ultrasound, was lower in the BOO than in the control group (mean 0.31 _ 0.16 vs 0.78 _ 0.23 cm2, p _ 0.006). Further clinical evaluation was performed in 22 patients with pressure flow studies as well as Doppler ultrasound investigation. Further parameters evaluated were flow velocity

in the distal prostatic (V1) and membranous (V2) urethra, and the velocity ratio (VR _

V1/V2). The velocity ratio represents the change in flow across the flow controlling zone. In patients with obstruction a greater decrease in urine velocity between the prostatic urethra and membranous urethra would be expected, resulting in a greater VR. Indeed, VR greater than 1.6 showed 60% sensitivity and 100% specificity for diagnosing urodynamic obstruction, as shown by pressure flow studies. In a further study of 22 patients a decrease in VR was observed after _-blocker therapy. V2 had the best correlation with the I-PSS change after treatment (r _ 0.584). In conclusion, several problems exist with this technique. Although the reliability of the Doppler urodynamic test was shown to be reasonable, no test-retest reliability was determined and there was large interrater variability in the VR calculation. Some of the difficulty was in where exactly V1 and V2 are measured. Furthermore, it requires expensive and specialized equipment to perform. The technique requires the patient to be cooperative and sit still. To date it has only been evaluated in a small number of patients. Also, it is a fact that most men void while standing, whereas this technique requires a sitting position.

Combination of single measures:

As discussed, the shortcomings of individual parameters for diagnosing BOO noninvasively have led investigators to examine the diagnostic potential of combining

different measures. They have used various measurements, including Qmax, PV, PVR, VV, AUA score and median lobe enlargement. Qmax and total PV were used by Ockrim et al to estimate the BOO index using data on 384 men to construct a formula by logistic regression. The equation, which is rather complicated and requires a calculator, is antilog10 (2.21 _ 0.5 log maximum urine flow _ 0.18 log total prostate volume). A reference table was also constructed. In 42% of the population a predicted BOO index of greater than 40 showed 86% sensitivity for obstruction and 92% sensitivity for obstruction or equivocal obstruction. However, only 17% of the study population had BOO. As determined in 134 patients, the AUA symptom score and Qmax combination has provided the highest specificity for BOO of all single measures or combinations. Qmax lessthan 10 ml per second and AUA score greater than 20 diagnosed BOO with 98% specificity and 38% sensitivity, while conversely Qmax greater than 15 ml per second and AUA score less than 10 diagnosed nonobstruction with 98% specificity but a sensitivity of only 22%. Only 20% of the population studied were categorized as obstructed or unobstructed using this method, limiting the efficacy of this approach. Steele et al added prostate volume greater than 40 gm to the algorithm, which increased specificity to 100% but had only 26% sensitivity, while the population diagnosed remained low at 20%. Qmax, PV and relative PVR provided a statistically significant correlation with BOO in 196 patients. Relative PVR was defined as PVR divided by cystometric capacity, multiplied by 100. An equation was constructed from these measurements, that is prostate volume on transrectal ultrasound in cm^3 – 3x Qmax +

(0.25 times relative PVR) to obtain the BOO number. In this population 50% of men with BOO were diagnosed with 90% sensitivity when the BOO number was greater than _2. BOO was defined as a Schafer grade of 2 or more using the linear passive urethral resistance relation. Grade 2 is defined as mild obstruction. However, when the data for Schafer grade 3 or above (equivalent to obstruction on the ICS nomogram) were reanalyzed, the discrimination between obstruction and nonobstruction disappeared. Furthermore, 80% of the population studied had obstruction on urodynamics, which may not represent a general population presenting with LUTS and, therefore, may show falsely high test reliability. van Venrooij et al further refined their equation to use VV instead of relative

PVR and further quantified the probability of obstruction on an individual level. Qmax, PV and PVR have shown significant correlations with BOO, which has led to the construction of a nomogram to determine the probability of obstruction using logistic regression of these measurements. The simple nomogram is categorical in nature with 3 broad categories of less than 50, 51 to 100 and greater than 100 for PVR and PV, and less than 10 and 10 to 15 ml per second for Qmax. Due to the few patients used in logistic regression in certain categories its value is probably limited. Furthermore, this method has not been validated in an independent set of patients. Qmax, PV, PVR and VV were used by Rosier et al with retrospective conventional urodynamic data in 871 elderly patients to obtain a clinical score to help diagnose BOO.The weighting of each component was determined from logistic regression analysis with Qmax most strongly

weighted. A low Qmax scored up to a maximum of 15 of a total of 27 points. A score of greater than 11 showed 80% sensitivity but only 53% specificity for diagnosing BOO. The 7 parameters of Qmax, flow pattern, PVR, PV, VV, the transitional zone index and median lobe enlargement were used by Kuo in 324 Taiwanese men to construct a clinical prostate score for diagnosing BOO. A clinical prostate score of 3 or greater using the Kuo scoring system had 87% sensitivity with 61% specificity. However, 54% of the population studied would still have required urodynamics to determine BOO despite the large number of measures included in his prostate score. The generalizability of results from an Asian to a Western population is uncertain. The method of construction of combination algorithms uses traditional logistic regression models. The limitation of traditional regression models is their inability to determine the complex nonlinear relationships that occur in clinical medicine. Artificial neural networks may allow the detection of complex nonlinear relationships and improve prediction. The disadvantages are the requirement of complicated computation and the risk of over fitting data to 1 set of variables. Wadie et al found that traditional logistic regression analysis revealed no relationship between I-PSS and objective measures of BOO in 460 patients. This relationship was reexamined by the same investigators using artificial neural networks and then I-PSS was found to predict BOO with 87% sensitivity and 44% specificity using the same artificial neural networks with the parameters of Qmax, I-PSS, PSA, VV and PVR failed to show an advantage over traditional regression models for predicting BOO. Further advances in artificial neural networks may help

develop methods used to predict BOO.

There are outstanding issues in regard to the combination approach ie various population groups have been used to construct the algorithms, which may limit their application to a general population presenting with LUTS. Mostimportantly there remains a majority of patients presenting with LUTS who are not assigned to a diagnostic group with any certainty, such as patients with a mid range flow rate and moderate size prostate with moderate symptoms. The extremes of the population are generally easy to categorize, for example obstruction in patients with a large prostate, low Qmax and severe symptoms. Therefore, the algorithms may not tell us anything that we do not know from clinical experience. To date there is little evidence that these methods decrease the number of men who require pressure flow studies.

Overall there has been poor compliance with the methodological standards for evaluating diagnostic tests. There was insufficient information in published articles to assess the validity of some proposed measures. Nevertheless, several approaches appear to be rather limited in their reliability and clinical use, including the combination of office measures such as AUA symptom score and PV. There appear to be modest LRs for single noninvasive urodynamic parameters. Indeed, the largest LR for a single noninvasive urodynamic parameter was that for Doppler urodynamics. However, the study in question had a small number of patients with poor compliance with preset criteria and, therefore, caution is required when interpreting this result. Thereafter the PCR index, and the combination of noninvasive urodynamic parameters of the cuff,

PCR index and Qmax show the best LRs and changes from pretest to posttest probability for diagnosing BOO noninvasively However, compared to ultrasound parameters the results are not as impressive This may be partly due to greater variability in measuring the dynamic physiological measurements used in noninvasive urodynamics. Furthermore, the populations studied with the different methods may not be comparable. Ideally a trial comparing ultrasound derivatives and noninvasive urodynamics such as the cuff in the same patient population would allow better comparison.

Intravesical protrusion seems to corroborate with urinary obstruction through a "valve ball" mechanism, in which the prostate's lateral and medium lobes interfere on the complete opening of the vesical neck while the patient urinates. According to this mechanism and based on the present study, it was demonstrated that the intravesical protrusion of the prostate relates not only to the urinary obstruction itself, but it also provides information concerning the severity of obstruction. It has been demonstrated that the greater the IVPP, the higher BOOI. Still significant, but to a lesser extent, results of prostatic volume obtained through ultrasound and PSA also related to the degree of obstruction.

Utilizing receiver-operator characteristic curves, the area under the curve for IVPP were 0.772, and 0.858 for Lim et al. and Keqin et al. respectively. The latter authors found 8.5 mm as the best cutoff value for IVPP with 75.5 % of sensitivity and 82.6 of specificity. (Ref.Biblio.3,4 &26).Thus the comparison of IVPP with other non invasive parameters

in detecting the severity of Bladder outlet obstruction due to BPH and modality of the best treatment for IVPP whether medical or surgical discussed in various literature are debated and presented here.

IVPP shows good accuracy and predictive value in finding out the severity of BOO in all studies and higher grades are opted for surgical intervention.

Tuberculoid Leprosy (TT):

AIM

A. To correlate Intravesical prostatic protrusion(IVPP) with International prostate symptoms score (IPSS),Quality of life index(QOL), Uroflowmetry,Postvoid urine (PVR) and Pressure Flow study (PFS) and to asses whether the presence and increasing grades of Intravesical prostatic protrusion are directly correlated with the severity of Bladder outlet obstruction due to Benign prostatic hypertrophy.

B. Response of patients with Intravesical prostatic protrusion of same grade to surgical therapy and drug therapy are compared to decide which modality of management is best.

MATERIALS AND METHODS

1.Prospective study

2.Period of study is from June 2006 to June 2009.

3.Age Range- 50 to 80 years.

4.The sample size is 100.

5.The patients with co morbid illness such as Diabetes Mellitus(DM),Hypertension(HTN),Tuberculosis(TB) etc and associated neurological conditions are excluded from the study. Patients with a known history of previous lower urinary tract surgery, prostate or bladder carcinoma,bladder calculi, or neurological deficit are also excluded from the study.

Intravesical prostatic protrusion(IVPP) is correlated with

1.International prostate symptoms score (IPSS)

2.Quality of life index (QOL)

3.Uroflowmetry

4.Pressure Flow study(PFS)

4.Effects of surgical therapy

5.Response to drug therapy

The initial evaluation consisted of the International prostate symptoms score (IPSS) and quality-of-life (QoL) score, a physical examination including a DRE, to exclude tumour, and a neurological examination to exclude any neurological deficit and neurologically related bladder dysfunction.

The bladder is next assessed by transabdominal ultrasonography (TAUS). The bladder had to have a capacity of 150–250 mL before the extent of IPP is measured, by moving the sagittal scan of the ultrasound probe both horizontally and longitudinally,and assessing the bladder neck for protrusion of the prostate into the bladder. A grading system is used, with three grades depending on the degree of IPP, by measuring the vertical distance from the tip of the protrusion to the circumference of the bladder at the base of the prostate gland.

Intravesical prostatic protrusion(IVPP) is graded into three with Transabdominal ultrasound(TAUS) with the bladder volume of 150-200 ml

Grade I < 5mm,

Grade II -5 to 10 mm

Grade III >10mm.

This grade is standardly used in various literature and proved to be nominal.Hence taken in this study also and all the severity of Bladder outlet obstruction parameters are compared with the grades of Intravesical prostatic protrusion. TAUS is used in our study, being noninvasive and easy to learn and evaluate. Using the same probe, the upper urinary tracts can be easily assessed at the same time.

After the Transabdominal ultrasound(TAUS) assessment, the peak urinary flow rate (Q max) and voided volume are measured using Uroflowmetry and the postvoid residual urine volume (PVR) is measured by diagnostic ultrasonography of the bladder either using the double mode in ultrasound or using the formula L*B*H*0.0523 considering the spherical shape. Prostate volume is measured by diagnostic ultrasonography of the bladder either using the double mode in ultrasound or using the formula L*B*H*0.0523 considering the spherical shape.

Urine analysis and culture are done. Patients with positive cultures are treated with appropriate antibiotics and rendered culture free before proceeding with the protocol. Renal Function test is done and patients with renal insufficiency are excluded. Serum PSA was also measured and those who had higher values are excluded from the study. Cystoscooy is done routinely in all patients eventhogh not indicated in all patients according to the standard guidelines after getting the consent.

Delphis TM Laborie urodynamic machine is available in our department only from mid

2007. The cases enrolled in the study after this period underwent routinely the Pressure Flow study using the Delphis TM Laborie urodynamic machine. The pressure flow study was conducted on another occasion after cystoscopy, using a double-lumen catheter (7–8 F) vesical and rectal catheters; the procedure followed international guidelines .BOO was defined by the BOO index (detrusor pressure at Qmax– (2 * Qmax)) and then correlated with the clinical variables, including age, IPSS, QoL, Qmax, PVR, prostatic volume and IPP grade; the sensitivities and specificities of these variables were then calculated. Logistic regression and Pearson correlation were used for the statistical analysis and correlation coefficient is calculated for the significance.

The Patient is evaluated for

1.Presenting complaints

2.Past H/o

3.Physical Examination

4.Digital Rectal Examination

5.IPSS Score ___

Mild (0-7)	
Modrate(8-18)	
Severe (19-35)	

6.QOL Index

7.Urine Routine

8.Urine C&S

9.Blood Urea

Creatinine

Sugar

10.Xray KUB

11.Uroflowmetry:

12.USG KUB

Kidneys

Ureters

Bladder

Prostatic volume

PVR

13.IVPP Grade

Grade(mm)	
I (1-5)	
II (6-10)	
III(11-15)	

14.Cystoscopy

15.Pressure Flow Study (pts who enrolled from mid 2007 onwards underwent PFS)

Patients who had acute urinary retention are evaluated with IPSS score based on

symptoms before catheterization and categorized under obstructive pattern uroflowmetry(Peak Flow<10ml/sec).Their peak flow is considered 0 ml/sec and PVR > 300 ml when taken into account for calculating the mean.The Intravesical prostatic protrusion is correlated with the severity of Bladder outlet obstruction due to BPH as assessed by symptoms score , QOL index,uroflowmetry,cystoscopy and confirmed with Pressure Flow study.

Those patients who are fit and willing for surgery and those patients indicated for surgery are proceeded with conventional TURP. The general indications for prostatectomy, by either open approach or transurethral resection, include (1) acute urinary retention; (2) recurrent or persistent urinary tract infections; (3) significant symptoms from bladder outlet obstruction not responsive to medical therapy; (4) recurrent gross hematuria of prostatic origin; (5) pathophysiologic changes of the kidneys, ureters, or bladder secondary to prostatic obstruction; and (6) bladder calculi secondary to obstruction.But in this study patients with Bladder calculi, Renal insufficiency and recurrent gross hematuria are not included.Transurethral resection is done completely and resection of complete adenoma is done in all cases monitored under supervision.

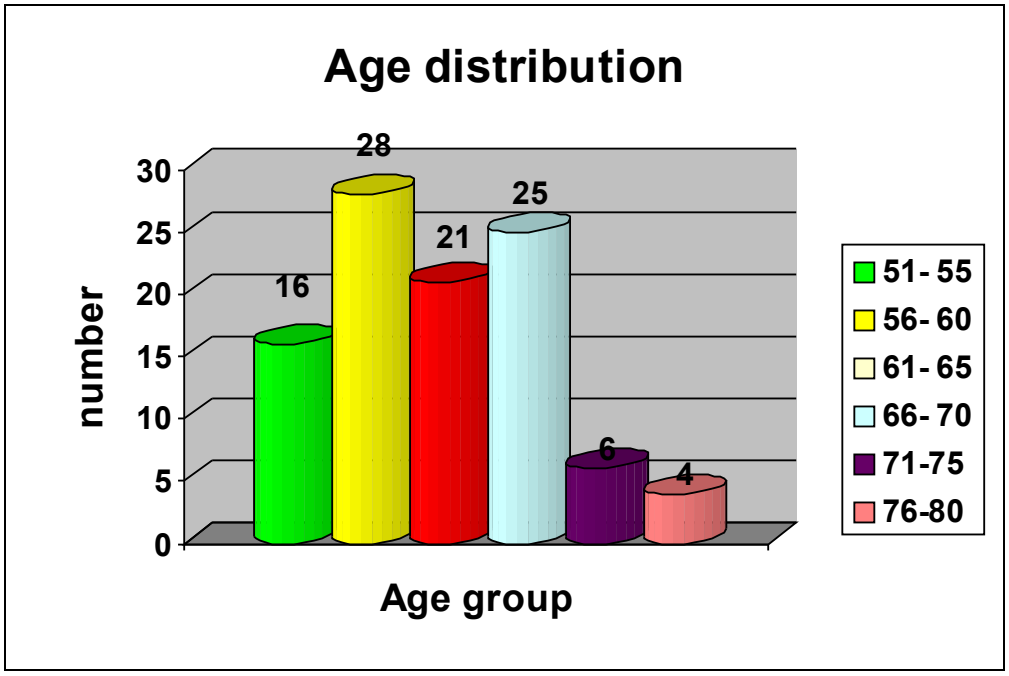
Other patients are put under drug treatment- a combination of Tamsulozin and Dutasteride for a period of 3 months.Many studies has proved that 3 months period of drug treatment is adequate for a appreciable and complete initial response for Benign prostatic hyperplasia.The drugs are available in the hospital and also the sample drugs

are used.The medical and surgical treatment on corresponding grades of Intravesical prostatic protrusion are compared after a period of three months for the efficacy as assessed by International prostatic symptoms score,successful voiding in those presented with retention, uroflowmetry and Quality of life index.The pts who failed medical treatment are planned to undergo surgery after a period of 2 weeks and are observed whether they succeed in voiding or not.This is a non randomized prospective cohort study compared on the respective grades and the treatment is said to be effective and complete when uroflowmetry Peak flow > 15 ml/sec, IPSS mild or no symptoms, QOL improvement by >- 2 grades and IVPP absent or grade I.This comparison comes under Grade B Recommendation of evidence, as this is level II evidence. Statistical and graphical analysis was performed using computer software packages SPSS (Statistical Package for Social Sciences) 12.0 for Windows and Microsoft Excel 1997-2003. Those who fails medical treatment are planned to undergo Transurethral resection.Post surgically patients are not undertaken for Urodynamic evaluation as a measure to reduce the invasiveness and also not to interfere with the raw surface of the post resected prostatic bed.The patients presented with Acute urinary retention due to BPH with IVPP are categorized into respective grades and put into medical or surgical treatment based on the above protocol and analysed for the successful trial voiding.(Ref.Biblio.16).

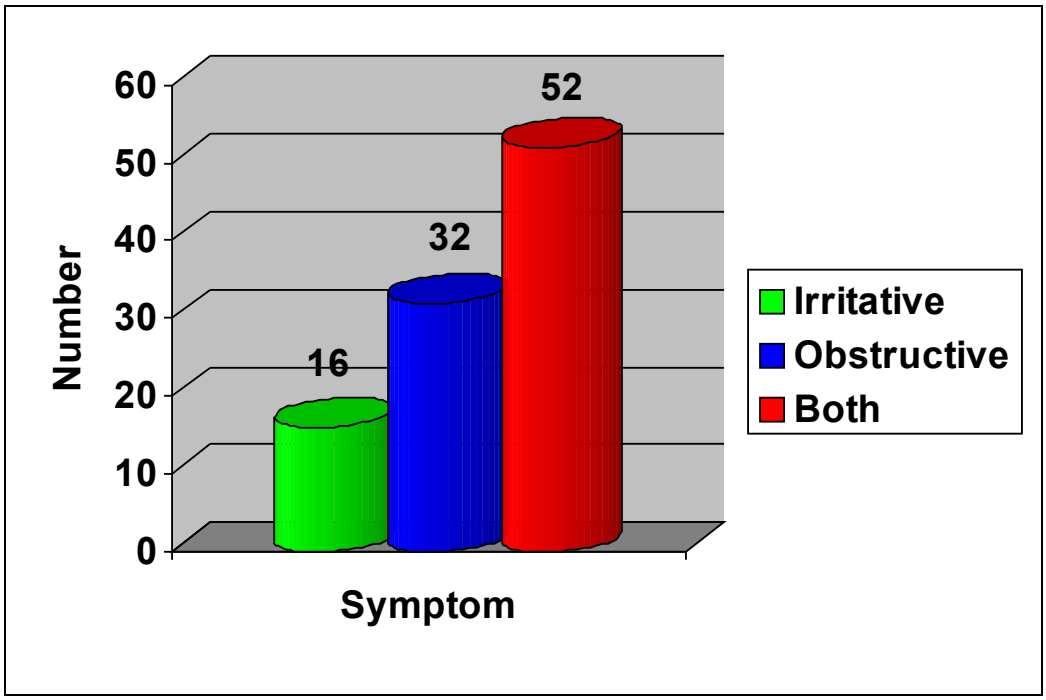
RESULTS

1.The Incidence of Intravesical prostatic protrusion presented to our department in those who presented with Lower urinary tract symptoms due to Benign prostatic hyperplasia is around 1 : 5.(100:516)

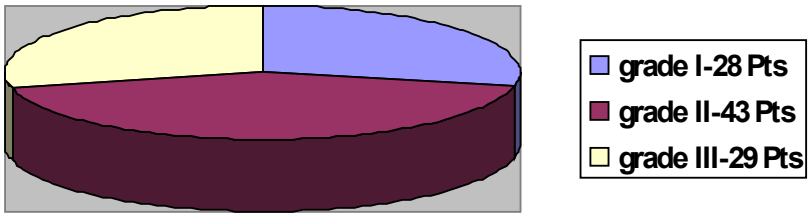
2.Mean Age-64 (100 men)



3.Total Symptoms distribution

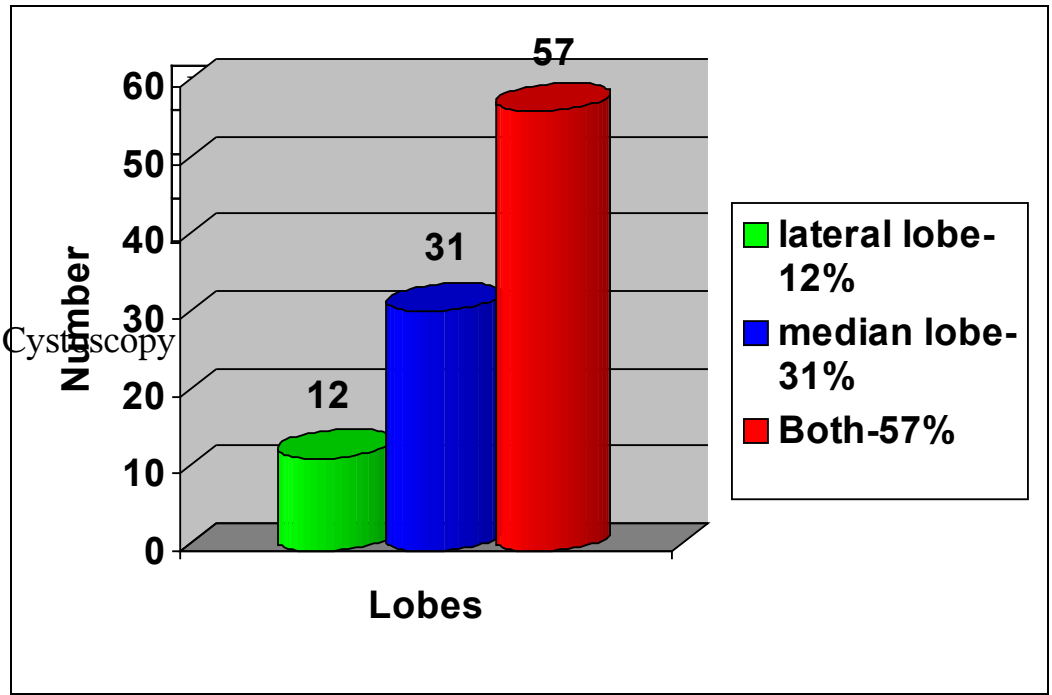


4. Intravesical prostatic protrusion Grade and No of Patients



5.IVPP and Correlation(all 100 patients)

6. AUR and IVPP: 34 patients had acute urinary retention with Intravesical prostatic protrusion due to Benign prostatic hypertrophy.(34%).85% of AUR pts had IVPP >5 mm.



7. Cystoscopy

8.Around 61 patients out of 100 underwent urodynamic evaluation(61%).

Total 61 Patients:

9.Analysis of parameters:

10.Treatment

IVPP	Medical Rx	TURP
Grade I	12	16
Grade II	11	32
Grade III	5	24

11.Comparing the medical and surgical treatment(12 cases of grade I put under medical Rx compared with 12 cases of grade I underwent TURP.Similarly 11 cases of grade II and 5 cases of grade III are compared)

Grade I:

Parameters	Medical Rx	TURP
IPSS Mean decrease by	2	5
PF Mean increase	1	3
IVPP Mean decrease	0	--
QOL Mean decrease	0	0
Coefficient	_0.121	0.351
P value	<0.231	<0.034

Grade II:

Parameters	Medical Rx	TURP
IPSS Mean decrease by	2	7
PF Mean increase	1	4
IVPP Mean decrease	0	--
QOL Mean decrease	0	1
Coefficient	_0.211	0.381
P value	<0.311	<0.022

Grade III:

Parameters	Medical Rx	TURP
IPSS Mean decrease by	2	9
PF Mean increase	1	5
IVPP Mean decrease	0	--
QOL Mean decrease	0	1
Coefficient	_0.241	0.421
P value	<0.351	<0.014

12.AUR and IVPP

IVPP	AUR Pts No	Medical Rx	TURP
Grade I	5	2	3
Grade II	11	1	10
Grade III	18	1	17

One pt of Grade I IVPP voided well with medical treatment with follow up period of 9 months. Other patients of AUR (of all grades IVPP) put under medical treatment failed trial voiding and later proceeded with TURP and succeded trial voiding. All these patients had PFS and detrussor instability is ruled out in all cases.

DISCUSSION

Totally around 516 patients presented with Lower urinary tract symptoms due to clinically diagnosed Benign prostatic hypertrophy are screened with Transabdominal ultrasound to pick up 100 cases of Intravesical postatic protrusion. Thus the Incidence of Intravesical prostatic protrusion presented to our department in those who presented with Lower urinary tract symptoms due to Benign prostatic hyperplasia is around 1 : 5. (100:516).The mean age is 64(100 men).Majority of the patients are in the age group between 55 and 70 years.52% of the patients presented with both obstructive and storage symptoms and the percentage of patients who presented only with obstructive symptoms is 32%

Majority of the patients are in Grade II IVPP (43%) whereas the incidence of Grade I and Grade II patients is almost the same. Moreover the values of all parameters in each grade are more or less similar accepting the reasonability for taking 5 mm criteria for the grade classification as shown in various literature. All the Grades of IVPP are correlated with IPPS score,QOL index,Q max,PVR and Prostatic volume and the significance is calculated using linear regression analysis and Pearson correlation coefficient.The increasing grades of IVPP are significantly directly correlated with IPSS score(r 0.163, p <0.037),Q max (r 0.231 p<0.027) and Postvoid residual (r 0.331 p<0.031).Among the

three Qmax is the best correlated one.The Prostatic volume ($p<0.131$) and QOL index($p<0.053$) do not correlate well with IVPP.

The percentage of the patients who presented with acute urinary retention is 34%. Only 15% of the grade I IVPP patients presented with AUR and rest of the others (85%) had grade II & III IVPP. Eventhough many patients had postvoid residual more than 150 ml only those accepted for catheterisation and had partial distension even after voiding are catheterized. Cystoscopy is done in all patients and majority of them had enlargement of both lateral and median lobes (57%).Median lobe alone is presented as IVPP in 31% and lateral lobe alone is in 12%.Majority of the grade II & III IVPP in TAUS showed trilobar prostatic enlargement in cystoscopy.

Urodynamics are done according to the "good urodynamic practices" recommended by the International Continence Society. Bladder outlet obstruction index (BOOI), defined as the detrusor's pressure at the maximum urinary flow (pdet_qmax) minus two times the maximum flow (qmax): BOOI = pdet_qmax - 2 x qmax. Values below 20 were considered non-obstructed, between 20 and 40 inconclusive and higher than 40, obstructed.But we have classified the values into two in this study whether obstructed or not obstructed ie above 40 is obstructed and below 40 is not obstructed. Pressure flow study is done only in 61 patients(out of 100) as the Urodynamic machine (Delphis TM Laborie) is available only from mid 2007 in our department. 71% of grade I, 78% of grade II and 88% of grade III IVPP had significant obstruction (BOOI >40) demonstrated with pressure flow study($p<0.011$).The equivocal criteria in PF

study(BOOI 20-40) is not considered in this study and BOOI >40 are considered as obstructed whereas BOOI <40 are considered as non obstructed. IPPS score(with the criteria >21 as significant),Qmax(with the criteria >10ml/sec as significant) and PVR(with the criteria >50ml as significant) are significantly and directly correlated with the obstruction as demonstrated by the Pressure flow study.($p<0.041$,$p<0.031$ and $p<0.041$respectively) whereas the Prostatic volume and QOL index comparatively have lesser significance in assessing the obstruction.($p<0.142$ and $p<0.167$ respectively). Those patients presented with AUR after the period of mid 2007, made their catheter removed and proceeded with pressure flow study.With the urodynamic catheter in situ they are proceeded with voiding study and they voided minimally eventhough they didn't void in the previously conducted uroflowmetry machine.

Based on their significant criteria for obstruction as mentioned above and 2*2 table mode statistical analysis, Qmax,PVR and IPSS have good positive predictive values(PPV 72,68 and 58 respectively) for assessing the severity of obstruction as confirmed by Pressure flow study. Among the three Qmax alone have a good negative predictive value(NPV 69) whereas others have similar NPV(around 44).IVPP along with Qmax and PVR is correlated for obstruction as demonstrated by PFS and analysed statistically using computer software packages SPSS (Statistical Package for Social Sciences) and Positive predictive value calculator 9.0.IVPP have a very good positive and negative predictive value(78,73) and also a good accuracy rate(78) in comparison with all other parameters in predicting the BOO.This is especially very significant in

increasing grades of protrusion. In conclusion, from this prospective analysis, the IVPP correlates significantly with BOO; it should be used as one of the variables initially assessed in men with LUTS, being a less invasive (than pressure-flow studies in every patient) and a more cost-effective way to stratify patients with LUTS for further management.

On the treatment aspect,those patients who are fit and willing for surgery and those patients indicated for surgery are proceeded with conventional TURP.others are put under medical treatment.This comparison comes under Grade B Recommendation of evidence,as this is level II evidence. Statistical and graphical analysis was performed using computer software packages SPSS (Statistical Package for Social Sciences) 12.0 for Windows and Microsoft Excel 1997-2003.No patients underwent open prostatectomy as no one had prostatic volume greater than 75 cc.

Comparing the medical and surgical treatment(12 cases of grade I put under medical Rx compared with 12 cases of grade I underwent TURP.Similarly 11 cases of grade II and 5 cases of grade III are compared) TURP showed a very good and significant mean decrease of IPSS and Qmax($p<0.014$ to 0.034;r 0.351 to 0.421) whereas those had medical treatment showed only a mean decrease of 2 in IPSS score and 1 in Qmax ($p<0.231$ to 0.351;r _0.241 to _0.121) in all grades irrespectively. The patients who showed improvement in IPSS score with medical treatment had storage symptoms especially before the treatment.There is no decrease in the measurement of IVPP in those patients with medical treatment whereas TURP patients showed no demonstrable

protrusion.The QOL index decreased by mean 1 in those underwent TURP whereas the mean decrease is zero in those who had medical treatment.One pt of Grade I IVPP voided well with medical treatment with follow up period of 9 months. Other patients of AUR (of all grades IVPP) put under medical treatment failed trial voiding and later proceeded with TURP and succeded trial voiding. All these patients had PFS and detrussor instability is ruled out in all cases. So surgical intervention statistically proved to be superior to medical treatment in IVPP patients, especially most significant in Grade II & III IVPP patients.

CONCLUSION

1. The increasing grades of IVPP are significantly directly correlated with IPSS score,Q max and Postvoid residual. Among the three Qmax is the best correlated one.The Prostatic volume and QOL index do not correlate well with IVPP.
2. IVPP have a very good positive and negative predictive value and also a good accuracy rate in comparison with all other parameters in predicting the BOO.This is especially very significant in increasing grades of protrusion.Thus the IVPP correlates significantly with BOO; it should be used as one of the variables initially assessed in men with LUTS, being a less invasive (than pressure-flow studies in every patient) and a more cost-effective way to stratify patients with LUTS for further management.
3. The surgical intervention statistically proved to be superior to medical treatment in IVPP patients, especially most significant in Grade II & III IVPP patients.
4. In patients presented with AUR along with IVPP surgery proved the efficacy for succeful trial voiding.The patients failed medical treatment voided succefully after TURP.

Case Proforma
Intravesical Prostatic Protrusion(IVPP)

Sl.No

Name **Age**

Address **Ph.no**

Presenting complaints

Past H/o

G/E

P/A

P/R

IPSS Score ___

Mild (0-7)	
Modrate(8-18)	
Severe (19-35)	

QOL Index ___

Urine Routine

Urine C&S

Blood Urea
Creatinine
Sugar

Xray KUB

Uroflowmetry:

Graph

Peak Flow	
Mean Flow	

Voiding Time	
Voiding Volume	

USG KUB

Kidneys
Ureters
Bladder
Prostatic volume
PVR
IVPP_____

Grade(mm)	
I (1-5)	
II (6-10)	
III(11-15)	

CYSTOSCOPY

PRESSURE FLOW STUDY

BOOI:

MEDICAL TREATMENT

Drugs
Dosage
Duration

SURGERY

Tissue resected

POSTOP/ AFTER MEDICAL Rx:

IPSS

QOL Index

UROFLOWMETRY **Graph:**

Follow up	PF	MF	VT	VV

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5.Prostate volume, IVPP and PSA showed parallel correlation. Although all three indices had good correlation with BOO index, IVPP was the best. -*Department of Clinical Research, Singapore General Hospital, Singapore* BJU Int 2004 Supplement 84

6.Transrectal power doppler ultrasonography (resistive index) in combination with uroflowmetry, median lobe projection in bladder and post void residue measurement can predict BOO with a high specificity and sensitivity- *Department of Urology, Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow*

7.IVPP assesed by transabdominal ultrasonography is a better and more reliable predictor of BOO than the other variables assesed by corelating with the results of pressure flow study-*section of urology,tan tock seng hospital,singapore* BJU Int 2004 Supplement 84.

8.The degree of prostatic protrusion measured by abdominal ultrasounds if corelated with obstructed Qmax –used in evaluation of BPH and their grades of obstruction-*arch ital urol andrl 2005 77(1):50-3*

9.IVPP is a useful predictor for evaluating the success of a voiding trial following ARU. Patients with a grade 1 prostate may benefit from a trial without a catheter. However, patients with a grade 3 prostate are less likely to do so and would require a more definitive surgical procedure.- *singapore general hospital, urology department* BJU Int 2004 Supplement 84

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