ORIGINAL ARTICLE

DIGITAL RECTAL EXAMINATION, TRANSRECTAL ULTRASOUND AND PROSTATE SPECIFIC ANTIGEN AS A TRIPPLE ASSESMENT DIAGNOSTIC TOOL FOR BENIGN ENLARGEMENT OF PROSTATE

Miteshkumar R Trivedi[1] , Bhooraram A Choudhary[2]

Author's Affiliations: [1]Assistant professor, Department Of surgery, Surat municipal institute of medical education and research, Surat, Gujarat, India.
Correspondence: Dr. Miteshkumar R. Trivedi Email: drmrtrivedi@gmail.com

ABSTRACT

Introduction: Benign prostatic hyperplasia is the most common benign tumor in men and its incidence is age related. The condition is prevalent in approximately 20% in men aged 41-50, 50% in men aged 51-60 and >80% in men aged over 80.

Objectives: In this study efforts are made to prepare a diagnostic tool that helps to diagnose benign prostatic hyperplasia more accurately and rules out prostatic malignancy.

Methods: Findings of Digital rectal examination, Transrectal ultrasound for prostate and serum prostate specific antigen, were recorded in patients included in the study.

Results: Mild to moderate enlargement of prostate on digital rectal examination, prostatic volume of less than 75 cc in transrectal ultrasound and PSA level of less than 4 ng/ml are consistent with diagnosis of benign enlargement of prostate.

Conclusion: This study concludes that instead of using a single parameter, use of all three parameters simultaneously provide relatively accurate diagnosis of benign enlargement of prostate.

Key words: Benign, digital rectal examination, hyperplasia, prostate, prostate specific antigen, transrectal ultrasound.

INTRODUCTION

Benign prostatic hyperplasia (BPH) also known as benign enlargement of the prostate (BEP) or senile enlargement of prostate, and adenofibromyomatous hyperplasia, refers to the increase in size of the prostate and occurs in older men.[1] The prostate often enlarges to the point where urination becomes difficult. Symptoms include needing to urinate often (frequency) or taking a while to get started (hesitancy). If the prostate grows too large, it may constrict the urethra and impede the flow of urine, making urination difficult and painful and, in extreme cases, completely impossible.

Digital Rectal Examination (DRE) is a relatively simple, inexpensive, non invasive procedure that is not associated with any subsequent adverse effects and been used for many years for problems with organs or other structures in the pelvis.[2] DRE establishes the approximate size of the prostate gland and its consistency. DRE provides a sufficiently accurate measurement in most cases.

Transrectal ultrasound (TRUS) uses sound waves to make an image of the prostate on a video screen. For this test, a small probe that gives off sound waves is placed into the rectum. The sound waves enter the prostate and create echoes that are picked up by the

probe. A computer turns the pattern of echoes into a black and white image of the prostate. The diagnostic accuracy of the technique is considered more than 80 per cent, along with precise measurement of prostatic size. TRUS of the prostate, first described by Watanabe et al, [3] expanded to routine clinical use with improvements in ultrasound technology.

Prostate specific antigen (PSA) is present in small quantities in the serum of men with healthy prostates, but is often elevated in the presence of prostate cancer, benign enlargement and in other prostate disorders.[4] A blood test to measure serum PSA is considered the most effective test currently available for the early detection of prostate cancer.[5] Serum PSA is a useful surrogate marker for prostate size and can also be used to predict future prostate growth, as well as the risk for urinary retention or surgery.[6,7] PSA was first measured quantitatively in the blood by Papsidero, and Stamey carried out the initial work on the clinical use of PSA as a marker of prostate cancer.[8]

Objectives: This study was conducted with an objective to prepare and evaluate a diagnostic tool that helps to diagnose benign prostatic hyperplasia more accurately and rules out prostatic malignancy.

METHODOLOGY

The study consisted of 100 cases of benign enlargement of prostate admitted or presented in OPD, at the Department of Surgery, in a tertiary care hospital. They were classified, investigated and managed to assess the value of the Triple assessment criteria. Patients of age group between 50-80 yrs, having urinary complaints were included in the study after taking their written, informed consent. Approval from the local ethical committee was obtained regarding the study.

After taking history as per the case pro forma, each patient was carefully examined. Severity of the symptoms experienced by the patients was evaluated according to the American Urologists Association Urinary Symptom Scoring system.[9] Digital Rectal Examination was done at outpatient level as well as after admission. Transrectal ultrasonography was done for each patient with their consent and with the help of the radiology department of the hospital. Serum Prostate specific Antigen levels were tested by the Enzyme immunoassay method. Blood samples were collected either before DRE and TRUS or 48 hours following the procedure to avoid false positive results. Biopsy was indicated in patients with altered PSA > 10ng/ml, DRE having nodularity or TRUS showing Capsular architecture distortion.

RESULTS

Being the most common benign tumor in men, its incidence is age related. Approximately 20% in men aged 41-50, 50% in men aged 51-60 and >80% in men aged over 80 are affected by the condition. The youngest patient evaluated was of 50 years as this was considered to be the lower age limit of senile group. The oldest was taken to be of 80 years to minimize geriatric illnesses and complication that may make the group unfit to be included in the study. The Highest incidence group according to this study was seen in the age group between 61-70 yrs. Though, one would expect it to be in the higher age group of 71-80 years, this might be probably due to the fact that incidence of malignancy also increases with age.

Table 1: Age distribution, mode of management and duration of complains. (N=100)

Variables	No.
Age in years	
50-60 yrs	28
61-70 yrs	41
71-80 yrs	31
Level managed at	
OPD	29
Indoor	71
Duration in months	
<3 month	31
3-6 months	24
7-12 months	36
>12 months	9

Out of the total 100 cases, 29 were evaluated and managed on outdoor basis, whereas the rest 71 were admitted, evaluated and managed accordingly. As this study is primarily intended to evaluate the importance of Triple assessment, it was possible to include outdoor cases too which needed only minimal or conservative management. Maximum numbers of cases fall in the ≤6 months category with 55 percent, whereas only 9 cases presented with a duration of more than 12 months.

Table 2: American Urologists Association (AUA) Scoring. (N=100)

Severity	Number of Cases
Mild(≤7)	10
Moderate (8-19)	44
Severe (20-35)	46

Table 3: Digital Rectal Examination of study cases (N=100)

Grade	Number of Cases
Mild	41
Moderate	40
Gross	14
Tender	3
Nodularity	2

Table 4: Serum PSA levels. (N=100)

Serum PSA level	Number of Cases
0-4 ng/ml	60
4-10 ng/ml	36
>10 ng/ml	4

Table 5: TRUS (Transrectal Ultrasonography). (N=100)

Prostate volume	No.
21-40cc	33
41-60cc	31
61-80cc	24
81-100cc	6
>100cc	6

Table 6: Comparison of DRE with PSA

DRE Grade	PSA-0-4 ng/ml	PSA- 4-10 ng/ml	PSA- > 10 ng/ml
Mild	36	5	0
Moderate	19	20	1
Gross	4	8	2
Tender	1	1	1
Nodular	0	2	0
Total	60	36	4

Table 7: Comparison of DRE with TRUS

DRE Grade	Vol. <75cc	Vol. >75 cc	Altered echo pattern	Capsular Distortion
Mild	40	0	2	0
Moderate	32	1	5	0
Gross	1	11	1	1
Tender	2	1	0	0
Nodular	2	0	1	0
Total	77	13	9	1

All the 100 cases were evaluated symptomatically according to the American Urologists Association urinary symptom score. Out of which 54% were in the mild to moderate category and 46% were in the severe category and were dissatisfied with life due to the severity of their symptoms.

In this study, 81 patients had mild to moderate enlargement of prostate, and only 14 were grossly enlarged. Of the 100 cases, 3 had tender prostatic enlargement mainly due to urinary tract infections rather than malignancy or abscess. The examination also revealed 2 nodular prostate with freely movable rectal mucosa and firm consistency and clinically suggested BPH.

60 out of the total 100 cases had a PSA level between 0-4ng/ml while 4 had a high PSA level above 10ng/ml and the rest in the intermediate range of 4-10ng/ml. A significant increase in PSA level would suggest malignancy and would rule out BPH. Hence, PSA helps to rule out malignancy rather than diagnose BPH. Thus 96% of the cases were favorable towards the diagnosis of BPH, while 4 % had higher than expected range for the same diagnosis.

33% of the patients had a mild increase in prostate volume, 55% had a moderate increase in prostate volume and only 12% with greatly increased prostatic volume. All of the cases had a normal and intact capsule and a hypoechoic or slightly altered echo patterns that were concurrent with a diagnosis of BPH.

A comparison between the DRE and PSA was done and the findings were recorded. Mild increase in the prostate on DRE finding usually gave a PSA Value in the normal range, with only 5 of the patients having raised PSA level. Moderate increase in Prostate on DRE yielded more cases with higher PSA levels(4-10ng/ml), a total of 20 patients, and only 1 with a PSA range >10 ng/ml. Gross increase in prostate on DRE, however showed an increase in the PSA levels too, with 71.42% of the cases. Hence, we could conclude from this comparison that, as the volume of the prostate increased, PSA levels also increase till it reaches a level after which there is not much of a variation that depends on the size.

DRE findings with mild to moderate enlargement also gave a TRUS finding <75 cc, with only one case having >75 cc. Most of the findings on DRE were consistent with the TRUS findings, with one exceptional case having nodularity on DRE but not de-

tected on TRUS, and one other case having capsular distortion.

Table 8: Comparison of PSA with TRUS

Prostate Vol.	PSA= 0-4 ng/ml	PSA= 4-10 ng/ml	PSA > 10 ng/ml
<75 cc	50	24	2
>75 cc	5	7	2
Altered Echo pattern	5	4	0
Capsular Distortion	0	1	0
Total	60	36	4

Most cases having <75cc prostate volume had a low PSA level. As the Prostate volume goes beyond 75 cc PSA levels also increased significantly till it reaches a level after which it did not increase.

Table 9: Needle Biopsy (Trucut/Spring-loaded)

Result of biopsy	No. (%)
Biopsy s/o BPH	4 (66.67)
Biopsy s/o malignancy	2 (33.33)
Total	6 (100)

Biopsy was indicated in patients with altered PSA > 10ng/ml, DRE having nodularity and TRUS showing Capsular architecture distortion. Findings of 2 patients suggested malignancy, with one having PSA 9.8ng/ml and TRUS showing capsular distortion, another one having PSA 5.4ng/ml and nodules on DRE. One of the cases in the study with PSA level 14.6ng/ml and mild tenderness on DRE, on biopsy showed changes of BPH with chronic prostatitis. Thus prostatitis may also have altered the levels of PSA. Thus a combination of all the three tests is more accurate than a diagnosis on the basis of any one test.

Table 10: Post operative HPE Reports

Result Of HPE	No. (%)
HPE s/o BPH	34 (97.14)
HPE s/o malignancy	1 (2.86)
Total	35 (100)

Out of the total 100 cases studied, 35 patients were operated and samples were obtained for Histopathology examination. Out of these 34 were concurrent with the clinical findings of BPH, while 1 of the sample suggested malignancy though clinical findings and other investigations were in favor of BPH.

DISCUSSION

The Highest incidence of Benign prostatic Hyperplasia was seen in the age group >60 yrs, and was found to be proportional to the increase in age. All patients had urinary symptoms of varying degree and most presented within 6 months of the onset of symptoms. Urinary retention was found to be a symptom of great concern among patients of BPH leading to admission on an emergency basis. Most patients of BPH had DRE findings of mild to moderately enlarged prostate, firm in consistency, smooth surface, non tender and movable rectal mucosa.[10] Thus DRE is a useful in assessing patients with suspected prostate diseases who need prostate biopsy.[11] DRE is a reliable tool for dichotomous assessment of prostatic volumes above 30 mL and 50 mL.[12] There are studies done, to standardize DRE and its advantage is that, it is feasibly sufficient to classify patients and guide therapeutic options even in inexperienced hands.[13] Total 96 percent of the cases in the study had normal ranges of PSA levels. PSA levels not only have a strong correlation with prostatic volume, but they are also a strong predictor of prostatic volume.[14,15] It is well accepted that the outcome of pharmacotherapy for BPH depends on baseline prostatic volume, and PSA can estimate prostate enlargement sufficiently accurately to be useful for therapeutic, especially medical, management.[16] Thus PSA levels are helpful in ruling out malignancy as well as making a diagnosis of BPH.[17]

TRUS was found to demonstrate the gross anatomy and natural history of BPH and its role is additive, along with DRE and PSA in assessment and management of BPH based on the volume of prostate.[18] Compare to transabdominal ultrasound, TRUS is more sensitive for diagnosis of BPH.[19,20] TRUS is cheap and as accurate as MR, for determination of prostatic volume.[21] The results of all the three tools, when compared to each other, were found correlating with the diagnosis. The triple assessment method was found to have 97% favourable result in the diagnosis of BPH, confirmed by histopathological examination, which is again indicated on the basis of results of triple assessment. The same diagnostic triad is useful to differentiate BPH from prostatic malignancy.[22]

CONCLUSION

Any single test alone is not helpful in arriving at a diagnosis, but all the three tests together give very confirmatory result, specifically to differentiate benign from malignant condition of prostate. Based on AUA score, severity of symptoms and the triple assessment, patients can be managed properly on the lines of conservative or surgical management for benign enlargement of prostate.

REFERENCES

1. Bostwick, D. G. "The Pathology of Benign Prostatic Hyperplasia". In Kirby, Peter; McConnell, John D.; Fitzpatrick, John M. et al.. Textbook of Benign Prostatic Hyperplasia. London: Isis Medical Media. ISBN978-1-901865-55-4.
2. Muris JW, Starmans R, Wolfs GG, Pop P, Knottnerus JA. The diagnostic value of rectal examination. Fam Pract. 1993;10:34–37.
3. Watanabe H, Igari D,Tanahasi Y, et al. Development and application of new equipment for transrectal ultrasonography. *J Clin Ultrasound.* 1974;2:91-98.
4. Carter et al., 1992b. Carter HB, Pearson JD, Metter EJ, et al: Longitudinal evaluation of prostate-specific antigen levels in men with and without prostate disease. JAMA 1992; 267:2215-2220.
5. Oesterling, 1993. Oesterling JE: PSA leads the way for detecting and following prostate cancer. Contemp Urol 1993; 5:60-81.
6. Roehrborn CG, Boyle P, Bergner D, et al. Serum prostate-specific antigen and prostate volume predict long-term outcome in symptoms and flow rate: results of a 4-year, randomized trial comparing finasteride vs placebo. PLESS Study Group. Urology. 1999;54:662–669.
7. Roehrborn CG, McConnell J, Lieber M, et al. Serum prostate-specific antigen concentration is a powerful predictor of acute urinary retention and need for surgery in men with clinical benign prostatic hyperplasia. Urology. 1999;53:473–480.
8. Stamey TA, Yang N, Hay AR, McNeal JE, Freiha FS, Redwine E. Prostate-specific antigen as a serum marker for adenocarcinoma of the prostate. N Engl J Med 1987;317(15):909-16
9. AUA Practice Guidelines Committee : AUA guideline on the management of benign prostatic hyperplasia: Diagnosis and treatment recommendations. J Urol 2003; 170:530-547.
10. Nicholas H. Fiebach, Lee Randol Barker, John Russell Burton. Principles of Ambulatory Medicine. 2007; 53:799.
11. Ojewola RW, Jeje EA, Tijani KH, Ogunjimi MA, Anunobi CC. Clinico-pathological Correlation of Digital Rectal Examination Findings Amongst Nigerian Men with Prostatic Diseases: A Prospective Study of 236 Cases. *Nigerian Journal of Surgery : Official Publication of the Nigerian Surgical Research Society*. 2013;19(1):26-31.
12. Su MZ, Lenaghan D, Woo HH. Dichotomous Estimation of Prostate Volume: A Diagnostic Study of the Accuracy of the Digital Rectal Examination. *The World Journal of Men's Health*. 2013;31(3):220-225.
13. Reis LO, Simão AFL, Baracat J, Denardi F, Gugliotta A. Digital Rectal Examination Standardization for Inexperienced Hands: Teaching Medical Students. *Advances in Urology*. 2013;2013:797096.
14. Soo Park D, Jin Oh J, Yup Hong J, et al. Serum prostate-specific antigen as a predictor of prostate volume and lower urinary tract symptoms in a community-based cohort: a large-scale Korean screening study. *Asian Journal of Andrology*. 2013;15(2):249-253.
15. Lieber MM, Jacobsen SJ, Roberts RO, Rhodes T, Girman CJ. Prostate volume and prostate-specific antigen in the absence of prostate cancer: a review of the relationship and prediction of long-term outcomes. Prostate. 2001;49:208–12.
16. Mochtar CA, Kiemeney LA, van Riemsdijk MM, Barnett GS, Laguna MP, et al. Prostate-specific antigen as an estimator of prostate volume in the management of patients with symptomatic benign prostatic hyperplasia. Eur Urol. 2003;44:695–700.
17. Holmström B, Johansson M, Bergh A, Stenman U-H, Hallmans G, Stattin P. Prostate specific antigen for early detection of prostate cancer: longitudinal study. *BMJ : British Medical Journal*. 2009;339:b3537.
18. Wasserman, Neil F. "Benign Prostatic Hyperplasia: A Review and Ultrasound Classification". *Radiologic Clinics of North America 2006;* 44 (5): 689–710.
19. Ajayi I, Aremu A, Olajide A, Bello T, Olajide F, Adetiloye V. Correlation of transrectal and transabodominal ultrasound measurement of transition zone volume with post-operative enucleated adenoma volume in benign prostatic hypertrophy. *The Pan African Medical Journal*. 2013;16:149.
20. Stravodimos KG, Petrolekas A, Kapetanakis T, Vourekas S, et al. TRUS versus Transabdominal ultrasound as a predictor of enucleated adenoma weight in patient with BPH: A tool for standard pre-operative work-up? Int Urol Nephrol. 2009 Dec;41(4):767–71.
21. Tewari A, Indudhara R, Shinohara K, Schalow E, Woods M, Lee R, et al. Comparison of transrectal ultrasound prostatic volume estimation with magnetic resonance imaging volume estimation and surgical specimen weight in patients with benign prostatic hyperplasia. J Clin Ultrasound. 1996;24:169–174.
22. Song JM, Kim C-B, Chung HC, Kane RL. Prostate-Specific Antigen, Digital Rectal Examination and Transrectal Ultrasonography: A Meta-Analysis for This Diagnostic Triad of Prostate Cancer in Symptomatic Korean Men. *Yonsei Medical Journal*. 2005;46(3):414-424.