

Comparative Study of Estimation of Weight of Prostate by Preoperative Ultrasound with Weight of Resected Prostate in Turp

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I. Introduction

The prostate is the major accessory sex gland of the male and has an exocrine but no established endocrine secretory function. Its secretion provides fluid that constitutes approximately 15% of the ejaculate. Clinically important aspects of the natural history of BPH center on the age-related development and course of anatomic changes in the prostate, BPH-induced dysfunctional voiding symptoms, and pathophysiologic functional changes in the bladder or upper urinary tract. As ultrasound is the most commonly used imaging modality to estimate the weight of prostate, its accuracy to the actual resected prostate needs to be studied.

Aims and Objectives

1. To find percent of resected prostate weight by TURP as to estimated weight of prostate on transabdominal ultrasound.
2. To study transabdominal ultrasound accuracy in estimation of weight of prostate to calculated specimen after transurethral resection of prostate (TURP) for BPH.

II. Materials And Methods

This is a hospital based comparative study of 100 patients with Benign Prostatic Hypertrophy who underwent Transabdominal Ultrasound (TAUS), the estimated weight of the prostate was recorded along with the rest of the urinary system. Following which the patients underwent Transurethral Resection of Prostate (TURP), the weight of the resected surgical specimen was measured with estimation of volume of Prostate 1cc of volume = 1gram of Weight. Patients with previous history of prostatic surgery, prostate cancer and patients with history of medical treatment of BPH were excluded from the study.

Observations And Results

A Total of 100 patients with benign prostatic hyperplasia (BPH) in the age group of 45 to 90 were selected and subjected to transabdominal ultrasound and Transurethral resection of prostate. All the selected candidates underwent a structured questionnaire. The weight of the prostate on TAUS was measured preoperatively and weight of resected specimen of prostate after TURP. Post-TURP weight of residual prostate was measured after 5 days.

III. Conclusion

1. According to our study less than 50% of prostate is resected in TURP
2. The calculated weight of Prostate is only 88% of the weight of prostate on preoperative ultrasound.
3. TAUS is easy, fast, noninvasive and reasonably accurate.
4. Improvement in Quality of life in this institution is at par with current trends.

The prostate is the major accessory sex gland of the male and has an exocrine but no established endocrine secretory function. Its secretion provides fluid that constitutes approximately 15% of the ejaculate¹. Aside from producing a volume-expanding vehicle for sperm, no definitive clinical function in reproduction has been identified for the prostate. However, the major clinical interest in the growth and function of the prostate has resulted from the frequency with which it is the site of benign and malignant neoplasms and infection^{2,3}. The intimate anatomic relationship of the gland with the bladder neck and urethra increases the importance of these pathologic changes⁴. Clinically important aspects of the natural history of BPH center on the age-related development and course of anatomic changes in the prostate, BPH-induced dysfunctional voiding symptoms, and pathophysiologic functional changes in the bladder or upper urinary tract^{5,6}. Some additional tests may aid in formulating the final clinical impression and treatment plan. These include blood and urine analyses, urodynamic evaluation, selected radiologic and ultrasound imaging studies, and cystourethroscopy⁷.

A transabdominal ultrasound of the prostate gland is performed to⁷:

- Detect disorders within the prostate.
- Determine whether the prostate is enlarged, with measurements acquired as needed for any treatment planning.
- Detect an abnormal growth within the prostate.
- Help diagnose the cause of a man's infertility.

As ultrasound is the most commonly used imaging modality to estimate the weight of prostate, its accuracy to the actual resected prostate needs to be studied. This can help select right approach for removal of Prostate. Transurethral resection of the prostate (also known as TURP and as a transurethral prostatic resection, TUPR) is a urological operation. It is commonly used to treat benign prostatic hyperplasia (BPH). As the name indicates, it is performed by visualising the prostate through the urethra and removing tissue by electrocautery or sharp dissection. This is considered the most effective treatment for BPH.

IV. Aims And Objectives

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V. Materials And Methods

Source of Data

The study was conducted in the Department of Urology of S.S Institute of Medical Sciences, Davangere, Karnataka. The duration of the study was 12 months, from JANUARY 2015 to JANUARY 2016. There were 100 Patients aged between 46 to 90 years who were included in the present study.

Type of The Study

Hospital based comparative study.

Method Of Collection Of Data

Number of Cases Studied: 100

1. 1. Details of all the patient were recorded according the structured clinical questionnaire.
2. 2. All the patients underwent Transabdominal Ultrasound (TAUS), the estimated weight of the prostate was recorded along with the rest of the urinary system.
3. 3. All the patients underwent Transurethral Resection of Prostate (TURP), the weight of the resected surgical specimen was measured.
4. In calculation of volume of Prostate 1cc of volume = 1gram of Weight

Ethical Clearance

The study involved the non-invasive method of ultrasound examination to calculate the prostate volume and Transurethral Resection of Prostate. Ethical clearance had been taken from the Ethical Committee of S.S institute of Medical Sciences, Davangere.

Inclusion Criteria

Patients clinically diagnosed with Benign Prostatic Hypertrophy (BPH) and who undergo Transurethral Resection of Prostate (TURP)

Exclusion Criteria

1. Previous history of prostatic Surgery
2. Prostate Cancer
3. Patients with history of medical treatment of BPH
4. Withdrawal of consent

Routine Investigations

1. Hemoglobin, total count, differential count.
2. Random blood sugar for diagnosis of occult diabetes.
3. Serum urea, serum creatinine.
4. Urine examination for sugar, albumin and microscopy.

Ultrasound Evaluation

The Ultrasound was done by the same sonologist in all the Cases. Ultrasound examination of the abdomen and pelvis was done with emphasis on the prostate gland, kidneys and urinary bladder. The prostate gland was evaluated with distended bladder for the echotexture, Morphology, focal lesions and prostate volume. The prostate volume was calculated by using Prolateellipsoid formula Anteroposterior x Transverse x Craniocaudal x 0.52.

The grading of the prostate gland enlargement was done as follows

Grade – I - 21 - 30 cc.
Grade – II - 31 - 50 cc
Grade – III - 51 - 80 cc

The median lobe enlargement was measured separately by obtaining both in longitudinal and transverse planes. The median lobe volume was added to the total prostatic gland volume. The urinary bladder was scanned for assessment of prevoid urine volume, wall thickness, mucosal regularity, calculi, diverticuli and post void assessment for the residual urine. The kidneys were scanned for the assessment of the obstructive uropathy features like hydronephrosis, scarring, parenchymal thinning, loss of cortico-medullary differentiation and increased cortical echogenicity. The ureters when dilated and were also assessed.

Operative Details

TURP was done in all the patients using standard 23 French resectoscope (Storz, Germany) with either intermittent or continued flow according to the technique of resection of prostate, down to the surgical capsule. Spinal anaesthesia was used in all the patients. The resection was done by the same surgeon in all the patients in the study. The resected tissue was weighed in the operative theatre immediately after the resection was complete, using a sensitive weighing machine

Method Of Statistical Analysis

The following methods of statistical analysis have been used in this study. The results for each parameter (numbers and percentages) for discrete data and averaged (mean + standard deviation) for continuous data .

One way analyses of variance were used to test the difference between groups. Analysis of Variance is a technique by which the total variation is split into two parts one between groups and the other within the groups. If 'F' value is significant there is a significant, difference between group means.

The formula used as follows :

a) Comparison of Two variance S_{a2} and S_{b2} , estimated for two group N_a and N_b subjects respectively. Uses F test with N_a-1 and N_b-1 degrees of freedom.

In the above test the "p" value of less than 0.05 was accepted as indicating statistical significance. Data analysis was carried out using Statistical Package for Social Science (SPSS, V 10.5) package

Observations And Results

The minimum calculated prostate volume after TURP among the study group was 23gms and maximum was 64gm, mean being 41 .28gms \pm 10 .42gms. The minimum difference of weight of prostate in this study was 3gms and maximum was 13gms with a mean of 5.55gms \pm 1.82gms Among 100 patients in the study the lowest estimation of prostate was 83.11% and maximum was 92%, mean being 88.02% \pm 2.03%.

Decade of Age →	40-49	50-59	60-69	70-79	80-89	Above 90
Variables						
N	1	11	32	41	14	1
Mean Prostate volume(In grams)SD	30	34.90(4.33)	43.93(9.03)	47.53(10.95)	61(8.75)	64
Mean Resected Prostate Volume(In Grams)	11	14.54(3.11)	21.15(5.83)	23.58(7.54)	32.57(5.23)	35
% of Prostate Resected	36.66%	41.26(3.89)	47.60(3.92)	48.61(5.30)	53.34(2.19)	52.23
Calculated Weight of Prostate(In Grams)	27	30.63(4.35)	38.75(8.05)	41.97(9.73)	53.35(6.79)	56
Residual Weight of Prostate(In grams)	16	16.09(1.50)	17.59(2.53)	18.39(2.50)	20.78(1.85)	21
Weight of Calculated Prostate in %	90	87.28(2.50)	88.04(1.81)	88.30(1.98)	87.66(2.03)	87.50

Comparison of variable according to Age in decades

In our study it was found that the mean prostate volume increased with age it was it was 47.53(SD-10.95) among patients in 7th decade which was the largest group . It was also found that mean resected weight, % of resected prostate, mean calculated prostate weight and Calculated weight in % increase with increase in weight.

Grade of Prostate->			
Variable	Grade I	Grade II	Grade III
	21-30gms	31-50gms	50-80gms
n	5	62	33
Mean Prostate volume with SD(gms)	28.8(1.16)	40.62(5.05)	61.33(6.76)
Mean resected prostate volume with SD(gms)	11.2(0.97)	18.91(4.01)	32.63(4.24)
% of Prostate Resected	39.28(4.45)	46.11(4.56)	53.03(1.87)
Residual Prostate after TURP(gms)	13.6(1.62)	17(1.51)	21.21(1.29)
Calculated weight of Prostate(gm)	24.8(1.32)	35.91(4.92)	53.84(5.17)
Calculated weight of Prostate in %	86.08(2.18)	88.24(2.05)	87.92(1.75)

Comparison of variable according to Grade of Prostate

In this study we found that the mean and % of resected increases with grade of prostate. However the calculated weight of prostate in % was maximum in Grade II prostate which was 88.24%+₋2.05% followed by Grade III at 87.92%+₋1.25% and minimum for Grade I at 86.08%+₋2.18%.

VI. Discussion

Benign Hypertrophy of Prostate is as much a problem in our country as it is in any other part of the world. I have studied 100 cases from JANUARY 2015 to JANUARY 2016. In my study majority of the patients belonged to 7th decade. This is in conformity with other authors as mentioned below.

Peak incidence of age in other authors

Authors	Decades
Marion	5 th decade
Randall	8 th decade
Seth & Upadhyaya	7 th decade
John & Morninga	6 th decade
Arvind P. Ganpule et al	6 th decade
My series	7 th decade

Age: It varied from 46-90 years. This is in conformity with other authors as follows.

Study Conducted	Youngest	Oldest	Average
This study	46 Years	90 Years	71 Years
A. David Beck & Howard	50 Years	95 Years	72 Years
J. Grandin Series			
Daimantas Milanos et al	45 Years	87 Years	68.5 Years
Arvind P. Ganpule et al	40 Years	82 Years	62 Years

Though it is difficult to find out the true incidence of BPH among the patients admitted to the hospital, since operative procedure was limited to selective group of patients.

The Hospital statistics are not a true representative picture of the disease in the country.

Since the main population of our country is in village.

Resected Prostate Volume: In our series it varied from 10-42 grams with mean being 23.06gms. It is in conformity with other studies as follows:

Study Conducted	Mean Resected Prostate Volume
Green et al	25.6gms
Borth et al	16.5gms
Vela-Navarrete et al	24.3gms
Alberto A. Antunes et al	22.3gms
This Study	23.06gms

In Alberto et al⁸, study comprised of 88 subject with a mean resected volume of 22.3gms+₋10.2gms while in Green et al series the study comprised of 432 patients with a mean

resected volume of 25.6gms; in Broth et al the resected volume was 16.5gms while in Vela-Navarrette et al study it was found that the mean prostate volume resected was 35.7gms in 1992 but reduced to 24.3gms in 2002. In our study it was found that the mean resected prostate was 23.06gms+₋8.03gms.

Weight of Prostate on TAUS and calculated weight of prostate after TURP: In our study the mean weight of prostate was calculated for each decade after 4th decade, the weight of prostate increased with increase in age. Similarly, the weight of calculated prostate also increased with increase in age. In H.J. Smith and H. Haveland⁹ study, 50 patients were examined preoperatively TAUS both before and after surgery. Of these, 31 patients underwent TURP. In their study it was found that volume estimation of prostate preoperatively by TAUS had good correlation with surgical specimen. In Ishida N et al¹⁰ study in 1982 in Japan, 107 patients were evaluated preoperatively by TAUS and underwent TURP. In their study it was found that weight of prostate on TAUS correlated with surgical specimen. Our results support above studies. During prostate volume estimation sonographically there are some limitations. First, since ultrasound is a dynamic modality, it is operator dependent factors may contribute to the differences observed.

Second, after surgical removal of prostate varying amount of residual prostate remains depending upon surgeon and surgical technique, therefore a comparison of the volume of surgically removed specimen with sonographically estimated volume may be inaccurate. In our study these errors were reduced by employing only one sonologist and one surgeon thus ensuring more accuracy. According to Finn Rasmussen study in 1975, during electroresection the weight loss of prostatic tissue varied between 15 and 42%. In our study it varied from 3 to 13gms. Transabdominal Ultrasound is thus easy, fast, noninvasive and reasonably accurate imaging modality. Our study is thus in conformity of other studies.

VII. Conclusion And Summary

1. According to our study less than 50% of prostate is resected in TURP
2. The calculated weight of Prostate is only 88% of the weight of prostate on preoperative ultrasound.
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4. Improvement in Quality of life in this institution is at par with current trends

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