

Outcome of Surgery for Benign Prostatic Hyperplasia-Is It Predictable?

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ABSTRACT

Aim: The study was done to evaluate the pre-operative and intra operative factors which influence the post-operative outcome in patients undergoing surgery for Benign Prostatic Hyperplasia (BPH).

Setting and Design: It was carried out prospectively at a university college hospital in northern India.

Material & Methods: The study was carried out prospectively in 31 patients who underwent surgery for BPH (TURP – 50, Open Prostatectomy – 10).

Various pre-operative and intra-operative parameters were studied by means of a detailed history and examination, IPS score, urodynamic evaluation & cystoscopic examination. Their effect on post-operative outcome was evaluated by measuring changes in IPSS, maximum and average flow rates, and fall in PSA values.

Statistical Analysis: Repeated measure ANNOVA was applied to calculate the significance of preoperative factors on post operative outcome (IPSS, Q max and Q av).

Results: All parameters studied in the patients improved significantly following surgery.

Patients who had pre-operative urinary retention and catheter at the time of surgery had significant improvement in both subjective (IPSS , $p=.004$) and objective (maximum & average flow rates $p=.04$) parameters studied. Patients with larger prostate had a significantly better maximum flow rate ($p=.03$) and IPSS at 3 months post-operatively. Similarly, patients with larger bladder capacity (more than 150 ml), better compliance (more than 6 ml per cm of water) and lower post-voidal residue (less than 60ml) had better post-operative outcome.

Conclusion: Patients with pre-operative urinary retention, shorter duration of bladder catheterization, lower post voidal residue, high IPSS score, larger prostate, larger bladder capacity and compliance had a significantly better outcome following surgery for BPH as assessed by various parameters studied.

Keywords: International prostate symptom score, Benign Prostatic Hyperplasia, Transurethral resection of prostate

INTRODUCTION

Benign Prostatic Hyperplasia (BPH) is one of the most common ailment affecting the elderly men. The Lower Urinary Tract Symptoms (LUTS) caused by it are distressing and cause significant morbidity. The treatment options for BPH have undergone a long development in the past two decades. Surgical treatment modalities have undergone a revolutionary change with minimally invasive techniques such as TURP becoming mainstay of operative management and open surgery being reserved for larger glands or associated urethral stricture. However, the outcome following prostatectomy is not always favourable, around 25-30% of the patients are dissatisfied with the outcome of surgery [1]. The present study was, therefore, undertaken to assess a variety of pre-operative and intra-operative parameters which would influence the post-operative outcome in patients undergoing prostatectomy for BPH.

MATERIAL AND METHODS

The study was prospectively carried out from December 2006 to April 2008, at a tertiary care centre in Northern India. Sixty patients with BPH having one or more absolute indication for surgery (that is refractory urinary retention, recurrent hematuria, recurrent urinary tract infection, inadequate response to medical therapy, renal compromise, secondary vesical calculus) were included in the study. Patients with carcinoma prostate, urothelial malignancy, or associated neurological disorders were excluded from the study. An ethical clearance was obtained from the Institutional ethical committee prior to starting the study.

All patients were evaluated with a detailed history, including evaluation using the IPSS score, physical examination including DRE (to see prostate size, echotexture or findings suspicious

of malignancy), USG KUB (for prostate size, PVR and any back pressure changes in the upper urinary tract), uroflowmetry, urodynamic study (to measure bladder capacity, compliance, Maximum detrusor pressure and Detrusor opening pressure). Serum PSA was measured in all patients as a marker for carcinoma prostate. Renal function assessment was done using serum creatinine as a surrogate marker. Urinalysis was done in all the patients to rule out microscopic hematuria and infection. All patients also underwent urethrocystoscopy to help plan the appropriate surgical procedure.

All patients subsequently underwent prostatectomy. Indications for open prostatectomy included prostate size more than 70 grams, associated large vesical calculus, presence of urethral stricture or associated ankylosis of hip preventing proper patient positioning in the lithotomy position. The type and duration of surgery, amount of intra operative blood loss {calculated by using the formula blood loss = Hb (irrigant)/g/l x Volume (irrigant) ml/Hb (patient)/g/l} [2], period of post-operative bladder catheterization were noted. Post-operatively patients were reassessed at one week and three months. Symptom's improvement using IPSS questionnaire was done. Patients underwent uroflowmetry to calculate the average and maximum flow rates.

The outcome following surgery was assessed by studying the following parameters:

1. Absolute and relative changes in IPSS score
2. Changes in uroflowmetry parameters i.e. maximum flow rates, average urinary flow rate.

Repeated measure ANNOVA was applied to calculate the significance of pre-operative factors on post-operative outcome (IPSS, Q max and Q av).

OBSERVATIONS AND RESULTS

The patients characteristics are shown in [Table/Fig-1].

Pre-operatively 54 patients (90%) had recurrent urinary tract infections and were treated with an appropriate antimicrobial course for seven days. Urinary retention with failed attempt at catheter removal occurred in 46 (76.67%) patients. The effect of pre-operative UTI, bladder catheterization and its duration, prostate size and post void urine residue on outcome of surgery is shown in [Table/Fig-2].

As depicted in the [Table/Fig-2], all patients improved significantly after surgery. However, the outcome was significantly better in those patients with absence of UTI and bladder catheterisation, shorter duration of catheterisation, larger prostate and smaller PVR pre-operatively.

	Mean	Range
Age (years)	65	55-75
IPSS	29	25-35
Uroflowmetry		
Qmax (ml/sec)	7.12	4-9.6
Qav (ml/sec)	2.86	2-3.6
Voided volume (ml)	118.83	56-180
Prostate size (USG-gms)	52	25-80
Type of surgery		
TURP	50	
Open prostatectomy	10	
Duration of surgery (min)		
TURP	54.67	35-70
Open	75	60-110
Average blood loss(ml)	381.67	250-700

[Table/Fig-1]: Patient characteristics (Qav- average flow rate, Qmax – maximum flow rate, USG- ultrasonogram, TURP- transurethral prostatectomy)

All patients underwent multichannel cystometry to measure bladder compliance, capacity, maximum detrusor pressure and opening detrusor pressure. The effect of pre-operative bladder capacity, compliance, MDP and DOP on outcome parameters studied is shown in [Table/Fig-3].

All the patients with larger bladder capacity, compliance and mean detrusor pressure showed statistically significant improvement in both subjective (IPSS) and objective parameters. However, improvement in outcome parameters was independent of detrusor opening pressure.

The effect of type of surgery, duration of surgery, amount of intra operative blood loss and duration of post-operative urinary catheterization on outcome variables is shown in [Table/Fig-4].

DISCUSSION

With the advent of medical therapy the incidence of prostatectomy has declined by 55% [3]. However, a significant proportion of patients still undergo surgery for BPH to alleviate their symptoms. The outcome of surgery is unpredictable and approximately 25-33% of the patients are dissatisfied post-operatively [1]. A successful treatment outcome has been previously defined as, greater than 50% improvement in IPSS index or a score less than 7, greater than 50% and / or more than 15 ml/sec improvement in Q max, greater than 50% and less than 60 ml decrease in PVR. Treatment failure has been defined as an inability to void post-operatively [4]. Various parameters, including impact of age, urinary retention, uroflowmetry and urodynamic variables, post void residual urine, symptom scores have been studied previously to predict prostatectomy failure pre-operatively [5-7].

Benjamin et al., (1995) stated that the urological variables reflecting recurrent UTI and markers of obstructive uropathy (calculi, diverticula etc.) may be associated with a worse outcome following prostatectomy due to non-reversible changes in the detrusor in this subset of patients [8]. In our study also patients with recurrent UTI had worse outcome as compared to those without infection.

		Factor studied	UTI		Bladder catheterization		Duration of catheterization		Prostate size(gm)		PVR(ml)	
		Outcome parameter	Yes (n=54)	No (n=6)	Yes (n=46)	No (n=14)	<4mth (n=20)	>4 (n=40)	<45 (n=20)	>45gm (n=40)	<60 (n=20)	>60 (n=40)
A	Pre-operative	IPSS	29.63	30	30	29.57	29.04	33.75	28.5	30.25	30	29.6
		Qmax	7.12	6.9	6.72	8.42	6.96	6.15	7.4	6.95	7.3	6.9
		Qav	2.84	3	2.79	3	2.88	2.7	3.12	2.73	2.9	2.85
B	Post-operative	IPSS	10.93	10	11.09	10	10.58	12.05	11.5	10.5	10	12
		Qmax	14.75	15	13.63	15.26	13.05	11	12.2	14.5	14.8	12.7
		Qav	4.89	6.5	4.21	5.92	5.15	5.1	5.45	4.98	5.66	4.83
p-value			p=0.167		p=0.003		p=0.021		p=0.03		p=0.001	
			p=0.55		p=0.002		p=0.005		p=0.02		p=0.01	
			p<0.001		p=0.146		p=0.402		p=0.04		p=0.04	

[Table/Fig-2]: Effect of pre-operative uti, bladder catheterization and its duration, prostate size and post void residue on outcome variables. (UTI-urinary tract infection, PVR- post void residue, IPSS- international prostate symptom score, Qmax- maximum urinary flow rate, Qav- average urinary flow rate)

		Factor studied	Bladder capacity(ml)		Bladder Compliance (cm water)		MDP (cm H2O)		DOP (cm H2O)	
		Outcome parameter	<200 (n=26)	>200 (n=34)	<10 (n=)	>10 (n=)	>10 (n=48)	<10 (n=12)	>10 (n=54)	<10 (n=06)
A	Pre-operative	IPSS	29.5	30	30.4	29.17	25	30.8	29.4	31.6
		Qmax	6.8	7.8	6.8	7.28	6.8	7.2	7.2	6.1
		Qav	2.8	2.8	2.9	2.83	2.8	2.8	2.8	2.9
B	Post-operative	IPSS	11.1	10	12.56	10.65	10	11.04	10.9	10
		Qmax	11.9	14.38	14.8	13.4	17.2	14.1	14.7	15
		Qav	5.08	7.5	4.94	4.29	5.2	4.1	5.1	4.8
p-value			*p=0.34		p= 0.010		*p=0.001		*p=0.51	
			#p=0.001		p=0.001		#p=0.001		#p=0.26	
			†p=0.04		p= 0.050		†p=0.04		†p=0.48	

[Table/Fig-3]: Effect of pre-operative bladder capacity, compliance, maximum detrusor pressure (mdp) and detrusor opening pressure (dop) on outcome variables. (IPSS- international prostate symptom score, Qmax- maximum urinary flow rate, Qav- average urinary flow rate)

		Factor studied	Type of surgery TURP Open		Duration of surgery (min)		Intra operative blood loss (ml)		Post-operative bladder catheterization	
		Outcome parameter	n=50	n=10	<50 (n=24)	>50 (n=36)	<400 (n=24)	>400 (n=36)	<3 days (n=36)	>3 (n=24)
A	Pre-operative	IPSS	29.8	28.75	30.4	29.17	27.5	31.1	29.4	30
		Qmax	7.62	6.2	6.88	7.28	6.7	7.3	6.9	7.33
		Qav	2.8	2.7	2.9	2.83	2.8	2.8	2.8	2.9
B	Post-operative	IPSS	10.96	10.00	10.25	10.56	11.25	12.56	11.1	10.4
		Qmax	9.08	14.7	14.8	13.4	15.3	14.3	14.71	14.8
		Qav	5.6	5.6	4.94	4.26	5.2	5.03	5.13	5.15
p-value			p=0.734		p=0.610		p=0.16		p=0.79	
			p=0.026		p=0.06		p=0.27		p=0.39	
			p=0.434		p=0.12		p=0.98		p=0.23	

[Table/Fig-4]: Effect of type and duration of surgery, intra operative blood loss and duration of post-operative bladder catheterization on outcome variables. (IPSS- international prostate symptom score, Qmax- maximum urinary flow rate, Qav- average urinary flow rate)

Most of the previously done randomized control trials have generally excluded men with urinary retention & bladder catheterization from analysis, because it was expected that they are more likely to have a poor outcome due to constant bladder stretching, hypotonia, and poor bladder contractility. Abrams et al., reported a good surgical outcome in only 59% of the patients with chronic urinary retention who underwent prostatectomy, while the remainder patients had persistent symptoms & poor bladder emptying [5]. Similar results were reported by George et al., who concluded that barely 53% of such men, with prolonged urinary retention with longer duration of catheterization had good outcome following surgery [Table/Fig-5] [6].

Study Name	Year of study	Percentage Improvement	Number of patients studied
Abrams et al	1978	59	55
George et al	1986	53	25
Present study	2008	100	60

[Table/Fig-5]: Comparison of surgical outcome in patients with chronic urinary retention undergoing prostatectomy

The post-operative outcome in our study was significantly better in patients who did not have any pre-operative bladder catheterization. Our results of comparatively, poor surgical outcome in patients with urinary retention and longer duration of bladder catheterization are, therefore, similar to those of previous studies with patients of retention and pre-operative bladder catheterization of longer duration (more than 4 months) having poor surgical outcome, presumably, due to bladder hypotonia, poor contractility, and poor bladder sensation. However, we also observed that all are patients with urinary retention and previous bladder catheterization had significant improvement following surgery, which was much higher than previously stated results, as shown above. This finding can be attributed to the fact that in our study the patients did not have any prior detrusor abnormality as seen on pre-operative urodynamic evaluation.

PVR of more than 60ml has been commonly considered as an additional indication for surgical intervention Javle P, et al., [4]. Jensen et al., found PVR to be the second best predictor of surgical management after pressure flow studies. Larger PVR leads to chronic bladder distension, poor bladder compliance and hypotonia leading to poor detrusor function and unsatisfactory post-operative recovery following surgery [9]. In our study, we found that men with PVR of less than 60 ml undergoing surgery had better post-operative outcome as measured objectively, by maximum (7.3 to 14.8 ml/sec, $p = 0.01$) & average flow rates (2.9 to 5.6 ml/sec, $p = 0.04$) and subjectively, by the IPSS score (IPSS improved from 30 to 10, $p = 0.001$).

OW Hakenberg found that patients with larger prostate benefit from TURP, in terms of symptom improvement as compared to those

with smaller prostate [10]. Similar results were obtained from Arai et al., (2000) who concluded that small prostate volume was one of the base line parameters predicting an unfavourable outcome of surgery [11]. In our study, patients with prostate size of more than 45 grams on abdominal ultrasound showed statistically significant improvement in their outcome parameters, as compared to those with smaller size prostate. The IPSS improved from 30.25 to 10.50 ($p=0.03$) and Qmax from 6.95 to 14.50 ml/sec ($p=0.02$).

Djavan et al., performed urodynamic investigations pre-operatively & post-operatively in 81 men with mean age of 72 years having acute urinary retention and undergoing prostatectomy. They observed that patients with treatment failure had lower values of maximum detrusor pressure & detrusor pressure at maximum flow. These results could be attributable to the presence of an overstretched and weakened bladder [12]. Similar results were found in the present study.

Randomski et al., categorised patients into being uroynamically obstructed (opening detrusor pressure more than 50 cm of water) and non-obstructed (opening detrusor pressure less than 50 cm of water) [13]. They, however, concluded that there was no statistically significant difference between these two groups of patients in terms of their eventual ability to void. ($p=0.64$), although voiding was more common in immediate period in obstructed men as shown below [Table/Fig-6]:

Urodynamic Parameter	Immediate Voiding	Delayed Voiding
Obstructed	16	3
Unobstructed	6	2

[Table/Fig-6]: Voiding ability after prostatectomy according to various urodynamic parameters

In our study however, none of the patients had opening detrusor pressure more than 50 cm water, as shown below [Table/Fig-7]:

Urodynamic Parameter	Immediate Voiding	Delayed Voiding
Obstructed	--	--
Unobstructed	60	none

[Table/Fig-7]: Voiding ability after prostatectomy according to various urodynamic parameters

Hence, according to this definition, all our patients were uroynamically unobstructed. However, all our patients were able to void post-operatively in the immediate period, probably as all of them had good detrusor function in their pre-operative urodynamic study, i.e. they were able to generate voluntary detrusor contraction. Rollemas & Van Mastricht has suggested that improvement after TURP in some patients with no pre-operative urodynamic obstruction, may be due to improvement in detrusor contractility as a result of TURP [14].

Ten patients (16.7%) included in this study, underwent open prostatectomy due to associated large vesical calculus or prostate

size of more than 70 gms. The maximum urinary flow rate improved significantly in patients who underwent open prostatectomy as compared to TURP (6.2 to 15.25 ml/sec, $p=0.026$). However, no statistically significant improvement was noted in the IPSS score. Benjamin et al., studied the relative impact of open vs. closed prostatectomy on impact of life and stated that there is no justification for preference between any group [8]. However, the significant difference in max flow rate in our study, could be attributed to the presence of larger sized glands in patients undergoing open surgery.

Also, in the present study, no significant difference was noted in the outcome parameters among patients, who underwent surgery for shorter duration, had greater blood loss or longer duration of post-operative catheterisation. To the best of our knowledge, there were no previous studies found to support or refute these findings.

CONCLUSION

In patients undergoing prostatectomy for benign prostatic hyperplasia, a detailed pre-operative & intra-operative evaluation can help predict the surgical outcome and identify patients at risk of surgical failure. The patients at risk for surgical failure are those with recurrent urinary tract infection, urinary retention & bladder catheterization, larger post void residue, smaller prostate, lower bladder capacity and compliance.

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