

Original Research Article

Factors influencing development of trans urethral resection of prostate (TURP) syndrome in benign prostatic hyperplasia patients with various co morbid medical illness: a prospective study

Narayanan K. J.^{1*}, Kannan V. P.²

¹Department of Urology, Thanjavur Medical College Hospital, Thanjavur, Tamil Nadu, India

²Department of Medicine, Thanjavur Medical College Hospital, Thanjavur, Tamil Nadu, India

Received: 10 June 2017

Accepted: 27 June 2017

*Correspondence:

Dr. Narayanan K. J.,

E-mail: urologistjp@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: The aim of this prospective study is to analyse the factors influencing development of trans urethral resection of prostate (TURP) syndrome in benign Prostatic hyperplasia patients with various co morbid medical illness in Thanjavur Medical College Hospital, from February 2015 to January 2017.

Methods: This prospective study was done among 38 benign hyperplasia prostate patients with various co morbid medical illness underwent TURP. Pre-operative and post-operative serum sodium levels correlated with signs and symptoms developed in various prostate gland sizes, resection times and volume of irrigation fluids.

Results: Sodium level has gone down to 14 meq/L, gone up to 2 meq/L post-operatively. Major fluctuations in serum sodium was seen in prostate size more than 50 grams, resection time more than 40 mins, irrigant volume more than 24 litres. Mean sodium decrease was increased when gland size was increased, resection time was increased, irrigant volume was increased.

Conclusions: In renal insufficiency patients, it is safe to complete the procedure within 40 minutes and restrict irrigant volume 15 litres, in coronary artery disease patients it is safe to restrict irrigant fluid volume less than 20 litres. In Diabetes Mellitus patients, it is safe to restrict irrigant fluid volume less than 24 litres. In hypertensive patients, it is safe to restrict the resection time less than 45 minutes. In patients with Diabetes and hypertension, it is safe to restrict the resection time less than 40 minutes and irrigant fluid less than 20 litres.

Keywords: BPH, Dilutional hyponatremia, TURP Syndrome

INTRODUCTION

The aim of this prospective study is to analyse the factors influencing development of trans urethral resection of prostate (TURP) syndrome in benign prostatic hyperplasia patients with various co morbid medical illness who underwent transurethral resection of prostate in Thanjavur Medical College hospital, from February 2015 to January 2017.

Trans urethral resection syndrome

Irrigating fluid is most frequently absorbed directly into the severed vascular system. On average during a TURP, approximately 20 mL of fluid per minute is absorbed, or approximately 1000-1200 mL in the first hour of resecting time. This may lead to dilutional hyponatremia. The most common signs and symptoms are nausea and arterial hypertension followed by vomiting and low urinary output, bradycardia and a marked increase in

systolic arterial pressure 50-70 mm Hg. Pulmonary oedema, depressed consciousness and coma might also develop late, indicating that serum sodium is <100 Meq/litre.¹⁻⁴

Hyponatremia

Hyponatremia is defined as a decreased plasma sodium concentration <136 meq/L, manifests itself clinically as generalized weakness and mental confusion at values <120 meq/L, bulbar or pseudobulbar palsy at <110 Meq/L and severe mental impairment between 90 and 105 Meq/L.^{5,6}

METHODS

The study was conducted among In-patients of Urology Department, Thanjavur Medical College hospital, Thanjavur, Tamil Nadu in between period from February 2015 to January 2017. A total of 38 benign prostatic hyperplasia patients with various co morbid medical illnesses who underwent transurethral resection of prostate were selected.

Inclusion criteria

Benign Prostatic Hyperplasia with bothersome symptomatic / acute urinary retention patients, with co-morbid medical illness.

Exclusion criteria

Bladder neck hypertrophy, carcinoma of bladder, carcinoma of prostate, benign hyperplasia of prostate with bladder stones, benign hyperplasia of prostate with carcinoma bladder, recurrent benign hyperplasia of prostate, residual benign hyperplasia of prostate, benign prostatic hyperplasia patients who underwent tur of prostate and died of other than tur syndrome, patients with benign hyperplasia of prostate without any co morbid medical illnesses

A total of 38 bothersome symptomatic benign prostatic hyperplasia patients with various co morbid medical illnesses, those who underwent TURP were studied during this period, between the age groups of 48-95 yrs, the average age being 71.5 years.

All the above patients were evaluated for Benign prostatic hyperplasia. The following evaluations were done on these patients preoperatively: Symptoms assessment (IPSS- Score), urine culture and sensitivity, hemogram, blood urea, sugar, creatinine and electrolytes, ultrasonogram of kidney, ureter, bladder and prostate with post void residual urine volume, uroflowmetry, office urethrocytscopy., cardiac evaluation, pulmonary evaluation if needed.

Constants in study

Spinal anesthesia, sterile water as irrigant, placing the irrigating fluid drum at 60 cm above the operating table, 22 fr irrigant rubber tube, 24 fr non-continuous irrigation resectoscope sheath, resection without spc, done by equally skilled surgeons

Variables observed in Study

Patient age, gland size, immediate preoperative serum sodium value, immediate preoperative pulse rate, immediate preoperative blood pressure, resection time, irrigant volume, blood pressure immediately completing the procedure, pulse rate immediately completing the procedure, immediate post-operative serum sodium value, symptoms and signs in perioperative periods.

Gland size measurement

Gland size is measured by conventional ultrasound. the volume in cubic centimeters of prostate is comparable to weight in grams due to its specific gravity, which is 1.050.⁷

Serum sodium measurement

Blood samples 5cc in amount collected immediate pre- and post-operative periods. Serum sodium is measured in our hospital laboratory by Flame Emission Spectrophotometry.

Resection time

Resection time is the period in minutes between time of initiation of resection to the time at which last activation diathermy is done.

Irrigant volume

Irrigation volume is volume of Sterile Water in liters which is irrigated during the period of Resection time.

Symptoms and signs in perioperative period

Clinical Signs and symptoms observed in perioperative period were categorized as mild, moderate and severe.⁸⁻¹¹

RESULTS

This study was conducted at Thanjavur Medical College hospital on 38 benign prostatic hyperplasia patients with various co morbid illness from February 2015 to January 2017. All the patients underwent transurethral resection of prostate.

Following observations are made in this study:

Among 38 patients suffered from co morbid medical illness. 16 patients were suffered from hypertension. 13 patients suffered from Diabetes Mellitus, 9 patients suffered from chronic kidney disease. Patients suffered from coronary arterial disease, and 4 patients suffered from chronic obstructive or restrictive pulmonary diseases. 3 patients suffered from both Diabetes and Hypertension.

Degree of sodium change among this various age group of patients analyzed statistically by ANOVA followed by Turkey HSD test.

Degree of Sodium changes in patients with co morbid medical illness compared with normal patients. Sodium

value gone down to 14 Meq/L and gone up to 1 Meq/L, which is compared with normal patients. Sodium change was higher in patient with co morbid medical illness than the normal patients. The P value is 0.0209, which is statistically significant.

Table 1: Co-morbid conditions.

Co morbid conditions	No. of patients
Diabetes mellitus (DM)	10
Hypertension (HT)	13
Coronary artery disease (CAD)	6
Chronic pulmonary disease (CPD)	4
Chronic kidney disease (CKD)	8

Table 2: Descriptive sodium difference in relation with co morbid conditions.

	N	Mean	Std. Deviation	Std. Error	95% Confidence interval for Mean		Minimum*	Maximum*
					Lower Bound	Upper Bound		
Normal	62	4.42 ^a	2.889	0.367	3.69	5.15	-2	11
CAD	6	4.50 ^{ab}	1.378	0.563	3.05	5.95	2	6
CPD	4	4.25 ^{bc}	0.957	0.479	2.73	5.77	3	5
CKD	8	7.63 ^c	3.420	1.209	4.77	10.48	4	14
DM	7	2.43 ^d	1.902	0.719	0.67	4.19	-1	4
DM/HT	3	3.33 ^{de}	1.155	0.667	0.46	6.20	2	4
HT	10	4.30 ^e	2.058	0.651	2.83	5.77	2	8
Total	100	4.49	2.805	0.281	3.93	5.05	-2	14

Different alphabet between age groups denotes significant risk at 5% level. *Values with negative symbol (-) denoted, sodium value more in post-operative than pre-operative sample. *Values with Positive side denoted, sodium value less in postoperative than pre-operative sample.

Table 3: ANOVA. Significance of sodium difference.

	Sum of Squares	df	Mean Square	F	P Value
Between groups	113.2873	6	18.8812	2.6377	0.0209*
Within groups	665.7027	93	7.1581		
Total	778.9900	99			

This P value denotes significant at 5% level

Table 4: Chronic kidney disease (CKD).

	Correlation coefficients	P value	Significance
Gland Size	0.6729	0.012	Yes
Irrigant volume	0.8541	0.007	Yes
Resection time	0.8844	0.004	Yes

Patients with co morbid medical illness, sodium difference was compared with gland size, irrigant volume

and resection time by finding correlation coefficients with P value.

This much of hyponatremia was not seen in other groups. minimal sodium decrease was 4 meq/l. All patients with CKD showed hyponatremia of 4 meq/l at least.

Table 5: Coronary artery disease (CAD).

	Correlation Coefficients	P value	Significance
Gland size	0.7644	0.077	Not
Irrigant volume	0.8226	0.044	Yes
Resection time	0.7736	0.071	Not

Table 4, compares sodium difference in CRF patients with gland size, resection time and irrigant volume. Which shows that all the three factors are statistically significant. So, in CRF patients with larger gland, prolonged resection time, and large irrigant volume showed high degree of hyponatremia. Patients with CKD

underwent resection in less than 40 minutes did not develop TUR syndrome, in less than 15 liters of irrigant volumes did not develop TUR syndrome, and less than 40 grams did not develop TUR syndrome.

Patients with CAD, sodium value gone down to 6 meq/l. All patients with cad showed hyponatremia of 2 meq/l at least (Table 5), compares sodium difference in CAD patients with gland size, resection time and irrigant volume. Which shows irrigant volume was statistically significant. So, in CAD patients with large irrigant volume showed high degree of hyponatremia. In less than 20 litres of irrigant volumes did not develop TUR syndrome.

Table 6: Chronic pulmonary disease (CPD).

	Correlation coefficients	P value	Significance
Gland size	0.4264	0.574	Not
Irrigant volume	- 0.1974	0.803	Not
Resection time	- 0.2818	0.718	Not

Patients with CPD, sodium value gone down in the range of 3 to 5 meq/l (Table 6), compares sodium difference in CPD patients with gland size, resection time and irrigant volume, which shows all the three factors are statistically Insignificant.

Table 7: Diabetes mellitus (DM).

	Correlation coefficients	P value	Significance
Gland size	0.7422	0.056	Not
Irrigant volume	0.4424	0.320	Yes
Resection time	0.7085	0.075	Not

Patients with DM, sodium value gone down to 4 meq/l and gone up to 1 meq/l (Table 7), compares sodium difference in DM patients with gland size, resection time and irrigant volume.

Which shows irrigant volume was statistically significant. So, in DM patients with large irrigant volume > 24 liters showed high degree of hyponatremia. In less than 24 liters of irrigant volumes did not develop TUR syndrome.

Patients with HT, sodium value gone down in the range of 2 to 8 meq/l. Table 8, compares sodium difference in HT patients with gland size, resection time and irrigant volume. Which shows gland size and resection time were statistically significant. So, in HT patients with larger Gland>50 grams, prolonged resection time>45min showed high degree of hyponatremia.

Table 8: Hypertension (HT).

	Correlation coefficients	P value	Significance
Gland size	0.7252	0.018	Yes
Irrigant volume	0.5473	0.102	Not
Resection time	0.7494	0.013	Yes

Table 9: Diabetes mellitus/ hypertension.

	Correlation coefficients	P value	Significance
Gland size	0.1555	0.0401	Yes
Irrigant volume	0.2014	0.046	Yes
Resection time	-0.10000	0.001	Yes

Patients with DM/HT, sodium value gone down in the range of 2 to 4 meq/l. Table 9, compares sodium difference in DM/HT patients with gland size, resection time and irrigant volume. Which shows gland size and resection time and irrigant volume were statistically significant. So, in DM/HT patients with larger gland >50 grams, prolonged resection time >40 mins and using larger irrigation fluid >20 liters showed high degree of hyponatremia.

DISCUSSION

The results of the present study were analyzed and compared with other studies. There is rapid accumulation of fluid in intravascular space occurs during Transurethral Resection of prostate surgery, in this situation effective renal function is very important factor to clear this excess load. Effective renal function is impaired in condition like aged patients, renal failure patients. These patients are unable to distribute the excess fluid as rapidly as it is accumulated. This leads to “Dilutional Hyponatremia”, which is responsible for Transurethral Resection Syndrome.

Co morbid illness and sodium dynamics

In this study co morbid medical illness; coronary arterial diseases, both diabetes mellitus and hypertension and chronic kidney disease are significant factors which affects serum post-operative serum sodium values.

Coronary arterial disease

In patients with Coronary Arterial Disease Irrigant volume was a statistically significant factor in my study. In CAD Patients >=20 liters of irrigant fluid volume patient developed TURP syndrome. In Cardiac Patient fluid over load is the significant factor decides morbidity and mortality. Richard H. Harrison III et al has shown in his study that cardiac disease patient is the candidate for the TURP syndrome, due to low salt diet, digitalis, diuretics, and reduced exercise.

Diabetes mellitus

In patients with Diabetes Mellitus, large irrigant volume > 24 liters was a statistically significant factor in my study. Harrison RH III et al, has shown in his study that chronic illness like diabetes mellitus have markedly reduced total body water, electrolytes and blood volume, they are more prone for the Transurethral Resection reaction.⁸

Hypertension

In patients with hypertension, gland size and resection time were significant factor in this study. HT patients with larger gland >50 grams, prolonged resection time >45 minutes showed high degree of hyponatremia. Harrison RH III et al, has shown in his study that hypertension have markedly reduced total body water, electrolytes and blood volume, they are more prone for the Transurethral Resection reaction.⁸

Diabetes mellitus and hypertension

in patients with diabetes mellitus and hypertension, gland size, irrigant volume and resection time were significant factor in the present study. In DM/HT patients with larger gland >50 grams, prolonged resection time >40 minutes and using larger irrigation fluid >20 liters showed high degree of hyponatremia. Harrison RH III et al, has shown in his study that chronic illness like diabetes mellitus and hypertension have markedly reduced total body water, electrolytes and blood volume, they are more prone for the Transurethral Resection reaction.⁸

Chronic kidney disease (CKD)

Among this, CKD is the most significant co morbid illness. In the present study patients with CKD did not develop TURP syndrome, if gland size was <40 grams, resection time was < 40 minutes, and irrigant volume was <15 liters. Holtgrewe H and Valk W et al, have concluded Azotemia patients had TURP syndrome 1.7% than normal patients 0.7%.¹² The activity of healthy kidney to eliminate intra operative fluid load is thus a factor attaining statistical significance.¹² The patients who display nitrogen retention on admission experience ill effects from a prolonged operative procedure.¹²

CONCLUSION

In Renal insufficiency patients, it is safe to complete the procedure within 40 minutes or restrict irrigant volume 15 liters, whichever is earlier. In coronary artery disease patients, it is safe to restrict irrigant fluid volume less than 20 liters. In Diabetes mellitus patients, it is safe to restrict irrigant fluid volume less than 24 liters. In Hypertensive patients, it is safe to restrict the resection time less than 45 minutes. In patients with diabetes and

hypertension, it is better to complete procedure as quick as with low volume irrigation. It is safe to restrict the resection time less than 40 minutes or irrigant fluid less than 20 liters, whichever is earlier.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Rothenberg DM, Berns AS, Ivankovich AD. Isotonic hyponatremia following transurethral prostate resection. *J Clin Anesth.* 1990;2:48-53.
2. Henderson DJ, Middleton RG. Coma from hyponatremia following transurethral resection of the prostate. *Urol.* 1980;XV:267-71.
3. Mebust WK, Holtgrewe HL, Cockett AT, Peters PC. Transurethral prostatectomy: immediate and postoperative complications. A cooperative study of 13 participating institutions evaluating 3,885 patients. *J Urol.* 1989;141(2):243-7.
4. Butt AD, Wright IG, Elk RJ. Hypo-osmolar intravascular volume overload during anaesthesia for transurethral prostatectomy. A report of 2 cases. *S Afr Med J.* 1985;67:1059-61.
5. Lippmann. B.J.; Fluid and electrolytes management, manual of medical therapeutics. G.A Ewald, C.R Mckenzie, Eds, New York, little brown and co. 1995;28:89-97.
6. Tietz N.W. Clinical guide to lab tests. Philadelphia. W.B Saunders. 1995;3:512-537.
7. Watanabe H, Igari D, Tanahashi Y, Harada K, Saitoh M. Measurements of size and weight of prostate by means of transrectal ultrasonotomography. *Tohoku J Exp Med.* 1974;114(3):277-85.
8. Harrison 3rd RH, Boren JS, Robison JR. Dilutional hyponatremic shock: another concept of the transurethral prostatic resection reaction. *The J. Urol.* 1956;75(1):95-110.
9. Hahn RG, Sandfeldt L, Nyman CR. Double-blind randomized study of symptoms associated with absorption of glycine 1.5% or mannitol 3% during transurethral resection of the prostate. *J Urol.* 1998;160:397-401.
10. Hahn RG, Shemais H, Esse'n P. Glycine 1.0% versus glycine 1.5% as irrigating fluid during transurethral resection of the prostate. *Br J Urol.* 1997;79:394-400.
11. Olsson J, Nilsson A, Hahn RG. Symptoms of the transurethral resection syndrome using glycine as the irrigant. *J Urol* 1995;154:123-8.
12. Holtgrewe H, Valk W: factors influencing the mortality and morbidity of transurethral prostatectomy: a study of 2,015 cases. *J Urol.* 1962;87:450-9.

Cite this article as: Narayanan KJ, Kannan VP. Factors influencing development of trans urethral resection of prostate (TURP) syndrome in Benign prostatic hyperplasia patients with various co morbid medical illness: a prospective study. *Int J Res Med Sci* 2017;5:3317-21.