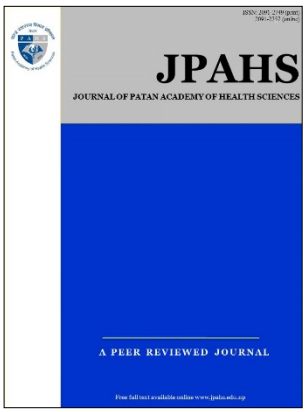

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Incidence and outcome of transurethral resection of prostate syndrome at a tertiary care hospital

Prabodh Regmi[1], Robin Bahadur Basnet[2], Dharma Dutta Subedi[3], Jay N Shah[4]

[1]Asst. Prof., Assoc. [2]Prof., Dept. of Urology, Bir Hospital, National Academy of Medical Sciences, Kathmandu, Nepal; [3]Prof., Dept. of Emergency Medicine, [4]Prof., Dept. of Surgery, Janaki Medical College, Janakpur, Nepal

Correspondence
Dr. Prabodh Regmi
Dept. of Urology, Bir Hospital, National Academy of Medical Sciences, Kathmandu, Nepal
Email: prabodhregmi2142@gmail.com

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Abstract

Introduction: Monopolar transurethral resection of prostate (M-TURP) is rarely complicated with the dreaded syndrome the TURP syndrome due to absorption of larger amount of non-electrolyte hypo-osmolar irrigation fluid (1.5% glycine), longer duration of surgery and larger amount of tissue resection. This study aims to find out the incidence and perioperative outcome of TURP syndrome after monopolar TURP.

Method: This was a cross sectional study of retrospectively collected data during the period of 4 years from June 1st 2018 to 30th May 2022, in Department of Urology of Bir Hospital, National Academy of Medical Sciences (NAMS), Nepal. Ethical approval was obtained from NAMS ethical committee. Microsoft Excel was used for descriptive analysis of the incidence of TURP syndrome, its relation with amount of resected tissue, duration of resection time, and the outcome (need of blood transfusion, length of hospital stay, mortality).

Result: Out of 208 cases of monopolar TURP, 8/208(3.8%) had TURP syndrome. Patients with TURP syndrome were age group 70-85 y. Duration of surgery was >60 min was in 5/8(62.5%), resection weight >20 gm 6/8(75.%), blood transfusion 1/8(12.5%), and hospital stay >3 days in all 8/8(100%) cases. Mortality was nil in patients with TURP syndrome.

Conclusion: The TURP syndrome was observed in 8/208(3.8%) and it was more common in older (>60y) with longer duration (>60 min) of surgery, and larger amount of prostatic tissue (>20gm) resection.

Keywords: hyponatremia, transurethral resection of prostate, transurethral resection of prostate syndrome

Introduction

Transurethral resection of the prostate(TURP) is the reference standard surgical treatment for enlarged prostate with lower urinary tract symptom[1] One of the dreaded complications of TURP is TURP syndrome, and it may occur due to absorption of larger amount of hypo-osmolar irrigation fluid (glycine 1.5%) and has a significant mortality.[2]

Predictors of TURP syndrome are age, type of irrigation fluid, size of prostate, amount of tissue resected, duration of surgery and presence of pre-operative comorbidities.[3,4] TURP syndrome may present as mild to severe form with cardiovascular and neurological clinical features such as blurred or temporary loss of vision, tingling sensation, muscle twitches, hypertension, hypotension, lung wheezes, dysrhythmia, confusion, coma and death.[2]

When TURP syndrome is suspected, surgery should be stopped after complete coagulation and therapeutic measures should be started: frusemide 1 mg/kg intravenously, 100% oxygen, correction of arterial blood gas (ABG), hemoglobin, blood sugar and serum electrolytes. In cases of hyponatremia with neurological symptoms, slow administration of 3-5% hypertonic saline at a rate of <100 ml/hr (0.5 meq/hour) should be started. [5]

Studies from Nepal reports TURP syndrome in 0%-5%, with no mortality.[6,7] However, the local studies lack details of outcome after TURP syndrome.

This study was designed to find out the incidence of TURP syndrome, and clinical features like duration of surgery, volume of resected tissue, and outcome (need of blood transfusion, length of hospital stay, mortality after TURP syndrome) patients.

Method

This cross sectional study was conducted to analyze the data of patients from the file obtained from the record section of the hospital and audit reports available at Department of urology to find out TURP syndrome after monopolar TURP during 4 years period from June 1st 2018 to 30th May 2022 at the Department of Urology, Bir Hospital. TURP syndrome during and on 1st postoperative day after surgery was included. Patient with history of previous prostate surgery, known case of prostate cancer, urinary bladder cancer, urinary bladder stone, urethral stone and urethral stricture, neurogenic bladder, severely trabeculated urinary bladder, urethral stricture surgery, pre-operative dys-electrolytemia (low sodium <135 mmol/l) were excluded.

Ethical approval was obtained from Institutional Review Board of National Academy of Medical Sciences, Nepal, (Ref. No. 476/2079/80).

All patients had pre-operative routine laboratory tests and radiological investigation as per hospital protocol: urine routine with culture and sensitivity, white blood cell count (WBC), hemoglobin (Hb), platelets, coagulation profile (bleeding time, clotting time, and prothrombin time), renal function test (urea, creatinine, sodium and potassium) and the radiological investigation ultrasonography (USG) of abdomen and pelvis and chest x-ray.

The monopolar TURP was performed using monopolar resectoscope 26 French continous flow with standard monopolar loop resectoscope (Karl Storz Germany) with generator set at 130 Watt cutting and 80 Watt coagulation mode. All patients underwent TURP on spinal anesthesia and the Irrigation fluid 1.5% Glycine was used. The adenoma was resected according to the technique of Mauermayer or Barnes. The weight of resected tissue and resected time noted. After completion of surgery, 20-22 French three-way Foley catheter was inserted and bulb inflated with a volume corresponding to the amount of tissue resected plus 10 ml. Inj. Lasix 20 mg and inj. Tranexamic acid 1gm was given to all patients. Bladder irrigation was continued till

the next morning. The catheter was removed on the second postoperative day after appearance of clear urine. Patients was discharged on the same day after two voids. If patient fails to void, he was sent home with an indwelling catheter and asked to return to the OPD for a week later. As per hospital practice, TURP patients are discharged in 2nd post-operation day if there is no complications.

Criteria of TURP syndrome was defined, when minimum one cardiovascular feature, one neurological feature and hyponatremia of <135 mg/dl

1. Cardiovascular features (any one): hypertension {Blood pressure (BP) of >160/90 or > 10% baseline increase}, hypotension BP <90/60, bradycardia (pulse rate of <60/min), tachycardia (pulse rate of >100/min), dysrhythmia*, shock*, sudden cardiac arrest*, pulmonary oedema*, cerebral and cardiac infarctions*.
2. Neurological features (any one): blurred or temporary loss of vision, tingling sensation, muscle twitches, confusion, seizure*, coma*. PLUS
3. Hyponatremia (<135mg/dl)

(*as mentioned in chart)

Hyponatremia was classified as mild 130-134 mg/dl), moderate (125-129 mg/dl) and severe (<125 mg/dl).

Incidence of TURP syndrome, clinicodemographic features (age, operation time, resection weight), and the outcome (length of hospital stay, blood transfusion rate, mortality) were analyzed descriptively using Microsoft Excel.

Result

During the period of 4 years from June 1st 2018 to 30th May 2022, total 236 M-TURP, data of 208 cases were analyzed (after exclusion of 28 cases- retropubic prostatectomy-2; bipolar TURP-8; TURP together with other procedures transurethral resection of bladder tumor-7, urinary bladder stone-9, and urethral stricture-2

Out of 208 cases of BPH patients who underwent TURP, 8 (3.8%) developed TURP syndrome, Figure 1.

Out of 208 TURP patients 31 (14.9%) developed hyponatremia with a serum sodium value of <135 mg/dl and 74.2% were mild, Table 1.

Among the patients who developed TURP syndrome, all were elderly (≥60 y), had longer resection time (>60 m), and required longer hospital stay (≥3 d). One patient 1(14%) with TURP syndrome required blood transfusion. Mortality was nil in our series, Table 2.

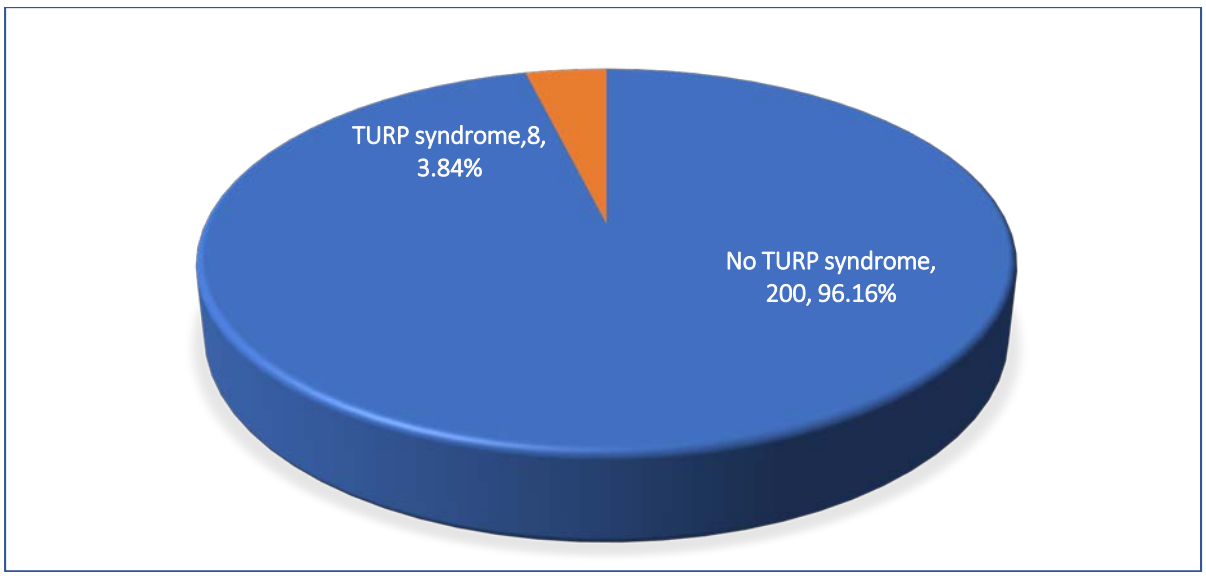

Figure 1. TURP syndrome in patients (n=208) who underwent TURP for benign prostatic hyperplasia.

Table 1. Hyponatremia in patients (n=31) who underwent TURP (n=208) for benign prostatic hyperplasia.

Variables	N	%
Hyponatremia	31	14.9
Mild	23	11.o
Moderate	6	2.8
Severe	2	0.96

Table 2. Clinicodemographic features and outcome of patients (N=8) with TURP syndrome who underwent transurethral resection of prostate (TURP) for benign prostatic hyperplasia.

Variables		N	%
Age			
	≤60 y	0	0
	>60 y	8	100
Operation time(min)			
	≤60 min	3	37.5
	>60 min	5	62.5
Resection weight(g)			
	≤20 g	2	25
	>20 g	6	75
Blood transfusion			
	Yes	1	14
	No	7	86
Mortality			
	Yes	0	0
	No	8	100
Average hospital stay (d)		5	
	≤3 d	0	0
	>3 d	8	100

Discussion

The incidence of TURP syndrome was 3.8% (8 out of 208) following TURP for BPH. Most of the studies reports similar incidence of this complication of TURP syndrome in a range of 0-10%.[6-8]

The term TURP syndrome, coined by Harrison in 1956 and described the pathophysiological basis of TURP syndrome as 'dilutional hyponatremic shock' establishing clinical use of 5% hypertonic saline (NaCl) for the successful treatment of this dreaded complication.[9] TURP syndrome results after absorption of larger amount of hypo-osmolar non-sodium irrigation fluid(e.g. glycine 1.5%) through the sinuses and/or venous system located just outside the capsule of adenoma, leading to dilutional hyponatremia, hypervolemia and toxic effects of glycine and its metabolites.[8,9] Some other factors may be involved in this syndromes are absolute loss of sodium by kidney, heart muscle hypokinesia.[10]

The hallmark of TURP syndrome is hyponatremia and associated symptoms at least one cardiovascular and one neurological. Study showed that the clinical features of TURP syndrome may be detected with decrease of serum sodium of 7 mmol/l baseline (normal serum sodium = 135-145 mmol/l). [11] The electrolyte and fluid exchange between interstitial-cellular and intravascular space demonstrates the manifestation of the clinical features of TURP syndrome, where with each 100 mL of fluid enterin to the interstitial compartment, 10-20 mEq of sodium also enters into it.[2,5,10]

In our study, we observed hyponatremia of less than 135mmol/l in 31/208(14.9%) total cases. The asymptomatic mild hyponatremia was observed in 23/208(11%) cases and

symptomatic hyponatremia (TURP syndrome) in 8/208(3.84%) cases. The serum sodium, potassium and hemoglobin were routinely measured immediately after completion of TURP surgery and then on daily basis for all cases in our hospital. Various studies showed the incidence of hyponatremia with monopolar TURP was up to 40%.[4,5,8] Our strict criteria for the diagnosis of TURP syndrome as mentioned above and also due to routine use of inj. Lasix 20 mg on operation table after completion of surgery may have limited the detection of the milder form of hyponatremia and possible TURP syndrome with isolated single clinical feature.

We found the severe hyponatremia of <125mmol/l in 2/8(25%) cases and moderate hyponatremia (126-130 mmol/l) In 6/8(75%) cases. So, all cases 8/8(100%) with moderate and severe hyponatremia met our diagnostic criteria as TURP syndrome. After correction with 3% NaCl (200ml/4- 6 hours) there was complete recovery in all cases. We use 3% saline cautiously, till the improvement of the symptoms and the serum sodium raises >125mmol/l. Further treatment was continued with fluid management and use of frusemide.

Various studies observed that the severe hyponatremia <125mmol/l may lead to coma, seizure or death and acute neurological symptoms such as seizure, confusion and coma and it must be treated with slow administration of 3-5% hypertonic saline at a rate of <100 ml/hr (0.5 meq/hour).[2,5,9] The hypertonic saline restores 2/3 intravascular serum sodium and the remained 1/3 is distributed to interstitial-cellular space.[2,5] The central pontine myelinolysis is the irreversible damage of myelin sheath may occur with rapid correction of hyponatremia which is manifested as decreased response, difficulty speaking and swallowing, impaired thinking, weakness or paralysis of extremities and poor coordination. [5, 12] Disseminated intravascular coagulation syndrome may occur in hyponatremia of <100mmol/l, release of thromboplastin substances of prostatic tissues and also if used distilled water in large amount as irrigation fluid.[2,9,12]

TURP syndrome may occur after few minutes during surgery to several hours after surgery, most often at the end of surgery.[2,9] We observed 5/8 cases during surgery and 3/8 cases after surgery at post operation observation ward. The half-life of glycine is 85 min therefore the TURP syndrome after 24 hours rarely occurs. The TURP syndrome after few hours of surgery may be precipitated due to longer bladder wash with glycine, instead of normal saline. Another mechanism may be the slower absorption of the deposited fluid in periprostatic, retroperitoneal or intraperitoneal space due to capsular perforation, injury of the urinary bladder or increased irrigation fluid pressure during prostatic resection.[2,5,12,13] The fluid absorption is slower by lymphatic system too.

In present study two patients 2/8(25%) were at the age of 70 years and others 6/8(75%) were >70 years, mean age of patients was 75.37 years. All our cases were American Society of Anaesthesiologists (ASA) score 1, 11. We did not study the associated comorbidities of our patients. Recent studies have reported the changing profiles of patients undergoing TURP procedure in recent years with older age, a larger sized prostate gland, and increased preexisting comorbidities. But they did not find the increased complications eg. hemorrage, clot retention, infection, TUR syndrome, and this may be due to improved health-care delivery.[14,15]

The duration of prostatic tissue resection, resected volume and gland size showed direct correlation with TURP syndrome. The larger the gland (>45 gm) has the larger surface area and the longer the duration of surgery (>60 min) lead to more fluid absorption as estimated rate of absorption of irrigating fluid is 10-30ml/min.[10,12,16] We found incidence of TURP syndrome in 3/8(37.5%) and 5/8(62.5%) cases with duration of resection <60 minutes and >60 min respectively. We also observed the higher incidence of TURP syndrome in 6/8(75%) with resected volume of >20gm. Other factors are height of irrigation fluid,[17] early capsular perforation, comorbidities and smoking status.[18] Study by Madsen and Naber

in 1973 showed the optimum height of irrigation bag is 60 cm and with 10 cm increase above 60 cm, the absorption of fluid doubles.[17] The normal prostatic venous pressure is 10 mmHg and the increasing height increases the intravesical and prostatic urethral fluid pressure, which ultimately lead to increase absorption of the irrigation fluid. The study by Hahn R.G. 2001 showed that the present and past smoking increase the relative risk of the fluid absorption by 2.8 and 2.1 times respectively and he hypothesized that this effect is due to altered vascular growth of the gland in smokers.[18] Our routine practice was fixed height approx. 60cm from the level of urinary bladder. Studies showed that the irrigation fluid height of 60 cm enables the flow of approximately 300ml/min which enhances the endovision, dilates the prostatic fossa, cuts tissue, evacuates the blood clots and debris.[8,19] Study has shown that the fluid absorption is reduced also by using intraprostatic vasopressin injection.[20]

In present study, the blood transfusion was required in one case 1/8(12.5%). Blood transfusion was done after the resolution of symptoms after 24 hours. The volumetric overload, impaired tissue perfusion and hyponatremic effect leading to the capillary-interstitial fluid exchange suggest that the controlled fluid management "guarded" blood transfusion is crucial for the management of blood loss in TURP syndrome.[5] Hemorrhage in TURP is proportionately related to the prostate size, resected volume, duration of surgery and presence of pre-operative comorbidities.[5,15] Hemorrhage may occur due to incomplete coagulation due to larger surface area of large gland resection, sloughed thrombosed vessel spontaneously or due to infection, disseminated intravascular coagulation and increased production of urokinase like substance in case of undiagnosed prostate cancer.[16,21]

The present study showed zero mortality. Various studies showed the mortality due to TURP syndrome ranges from 0% to 10%, even higher in severe cases.[6,7,10] The incidence and mortality due to TURP syndrome has decreased in recent years due to advances in pathophysiology, diagnostic criteria, limited resection time, better perioperative management, improved anesthetic technique, enhanced surgeon's expertise due to availability of simulation, teaching technique and better instrumentations, as well as the emergence of several other alternatives such as laser, bipolar and minimally invasive surgical techniques (MIST).[10,21-25]

Average hospital stay of TURP syndrome cases was 5.2 days, the shortest was 4 days and longest 8 days. As per our hospital practice, TURP patients are discharged in 3 days if there is no complications. Various studies had shown the more psychological and economic burden to the patient with longer duration of hospitalization.[26,27]

Though there are some limitations of our study being as retrospective nature and single institutional based. Other factors related to TURP syndrome such as patient's comorbidities, volume and types of irrigation fluid, were not studied. This study will add some valuable information to our patients, treating doctors as well as urologists about transurethral resection of prostate syndrome, its incidence and outcome (the need of blood transfusion, length of hospital stay and any mortality) in our local scenario.

Conclusion

We observed the incidence of TURP syndrome in 8/208(3.8%) and it was more common in older age (>60y), longer duration of surgery >60 min and larger tissue resection >20gm. There was no mortality after TURP syndrome at Bir Hospital during the period of study.

Conflict of Interest
None

Funding
None

Author Contribution

Concept, design, planning: PR, RB, DDS, JS; Literature review: PR, RB, DDS, JS; Data collection: PR; Data analysis. PR, RB, DDS, JS; Draft manuscript: PR, RB, DDS, JS; Revision of draft: PR, RB, JS; Final manuscript: PR, RB, DDS, JS; Accountability of the work: PR, RB, DDS, JS.

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