VOLUME - 14, ISSUE - 12, DECEMBER - 2025 • PRINT ISSN No. 2277 - 8160 • DOI : 10.36106/gjra

Original Research Paper

Anaesthesiology

ACUTE FLUID OVERLOAD DURING THULIUM LASER ENUCLEATION OF THE PROSTATE: A FLUID ABSORPTION SYNDROME CASE REPORT

Dr. Pranati Sharma*	Junior Resident, Department of Anesthesia , Dr.D Y Patil Medical College , Navi Mumbai, Maharashtra. *Corresponding Author
Dr. Kareddy Aishwarya Reddy	Junior Resident, Department of Anesthesia , Dr.D Y Patil Medical College , Navi Mumbai, Maharashtra.
Dr. Fayaz M Sultan	Senior Resident, Department of Anesthesia , Dr.D Y Patil Medical College , Navi Mumbai, Maharashtra.
Dr. Snehalata Tavri	Professor, Department of Anesthesia, Dr.D Y Patil Medical College, Navi Mumbai, Maharashtra.

ABSTRACT

Introduction: Benign prostatic hyperplasia (BPH) is common in elderly men and may lead to significant urinary and systemic complications. Although laser-based procedures such as thulium laser enucleation of the prostate (ThuLEP) using normal saline irrigation have largely reduced the incidence of classical TURP syndrome, excessive fluid absorption can still result in clinically significant fluid overload, especially in patients with comorbidities. **Case Report:** A 69-year-old male with diabetes mellitus and hypertension underwent ThuLEP under spinal anesthesia. During the prolonged procedure, he developed headache, nausea, respiratory distress, and hemodynamic instability, suggestive of acute fluid overload. Investigations revealed metabolic acidosis, hyponatremia, and hyperkalemia. The procedure was halted, and the patient was managed with oxygen therapy, diuretics, electrolyte correction, and intensive care monitoring, leading to complete clinical and biochemical recovery. **Discussion:** Fluid overload during endoscopic prostate surgery may present with variable neurological, respiratory, and cardiovascular symptoms and can be life-threatening in elderly patients with limited cardiac and renal reserve. Spinal anesthesia facilitates early recognition by allowing continuous neurological assessment in an awake patient. This case underscores the need for vigilant perioperative monitoring and prompt management, even with modern laser techniques and isotonic irrigation fluids.

KEYWORDS : Benign prostatic hyperplasia, fluid overload syndrome, thulium laser enucleation of prostate, spinal anesthesia, irrigation fluid absorption, TURP-like syndrome

INTRODUCTION

Benign prostate hyperplasia (BPH) may induce lower urinary tract symptoms and complications, such as urinary retention and renal failure. Many options are available to manage BPH, including medical drug and surgical treatment, and radiological embolization.[1] Transurethral resection of the prostate (TURP) has been the gold standard for prostate sizes ≤80 cc, and open prostatectomy for larger prostates. Endoscopic prostate enucleation was developed to overcome prostate size limitations and reduce the morbidity of open surgery. To further minimize perioperative morbidity, alternatives to conventional electrocautery TURP—such as transurethral contact vaporization, interstitial laser coagulation, laser resection, and laser enucleation—have been explored. Subarachnoid block is generally accepted as the anesthetic of choice for classical TURP.

This technique is favored because it is effective and efficient. However, the primary motivation is that it permits early detection of mental status changes associated with TURP syndrome. Fluid overload is a systemic complication caused by excessive absorption of irrigation fluids during transurethral resection of prostate or bladder tumors.[2] The recent introduction of laser technology for endoscopic resection of prostate tissue has nearly eliminated the risk of TURP syndrome.[3] The decreased amount of irrigation solution required, the decreased bladder pressures, and the improved hemostasis results in less absorption of irrigant.[4] Furthermore, it is irrelevant whether the irrigant can conduct electricity, and so normal saline may be used. This avoids the osmotic complications of absorbing large quantities of glycine, mannitol, or sorbitol. These benefits are offset, but only slightly, by the longer procedure times for laser resection and enucleation compared to traditional TURP.[5] Most patients affected by obstructive symptoms due to BPH are elderly and often present with additional comorbidities . Elderly patients frequently have cardiac disease, such as diastolic dysfunction, valvular dysfunction, heart failure, arrhythmias, and coronary artery disease. Geriatric patients poorly tolerate significant intravascular volume shifts due to age-related decline in renal function, which impairs sodium and water balance and increases the risk of fluid overload.Patients' comorbidities may impact the hemodynamic responses that occur during this complication. In cases of left ventricular dysfunction, excessive fluid absorption into the circulation may cause pulmonary edema.[6] Here we discuss the intraoperative management of symptomatic fluid overload in a patient posted for transurethral resection of prostate.

Case Report

A 69-year-old male, a known case of diabetes mellitus and hypertension on medication, was posted for thulium laser enucleation of the prostate at our hospital. No abnormalities were detected during preoperative evaluation. Preoperative serum electrolytes were as follows: Na 138 mmol/L, K 3.6 mmol/L, Cl 110 mmol/L; creatinine 1.8 mg/dL and urea 0.6 g/L. Two-dimensional echocardiography showed an ejection fraction of 55%, with mild concentric left ventricular hypertrophy and Grade I diastolic dysfunction, with no regional wall motion abnormalities. Ultrasonography of the abdomen revealed prostate hypertrophy with a volume of 150 cc.

The procedure was initiated after administration of spinal anesthesia with 3 mL of 0.5% hyperbaric bupivacaine. Sensory blockade extended to the T10 level, confirmed by pin-prick testing. At the start of the procedure, the patient's vital parameters were: pulse rate 82 bpm, blood pressure 116/72 mmHg, and SpO 98%. The patient was positioned in the lithotomy position, and the procedure commenced. Normal saline (0.9%) was used as the irrigation fluid, and TURP was performed using a thulium laser.

Approximately 130 minutes into the procedure, the patient

complained of sudden-onset headache and nausea, followed by difficulty in breathing. Vital parameters revealed initial hypertension followed by hypotension (80/65 mmHg), bradycardia (48 bpm) [Fig. 1], and hypoxemia (SpO 92%); however, the patient remained conscious and oriented. On examination, mild facial and neck swelling was noted, and auscultation revealed crepitations in the bilateral lower lung zones. Massive irrigation fluid absorption was suspected. The patient had received 960 mL of Ringer's lactate intravenously, and a total of 82 L of irrigation fluid had been used during surgery.

Figure 1 Intraoperative Monitoring

The surgeon was immediately alerted. Hemostasis was rapidly achieved, and the procedure was halted until the patient was stabilized and assessed. Oxygen supplementation was provided via face mask at 8 L/min for hypoxemia, and 6 mg of ephedrine was administered to correct hypotension. A TURP-like syndrome was suspected. Immediate arterial blood gas (ABG) analysis and serum electrolytes were sent, and intravenous furosemide 40 mg was administered due to suspected pulmonary edema.

ABG and electrolyte analysis [Table 1] demonstrated mild metabolic acidosis, with serum sodium decreasing from 138 to 130 mmol/L and potassium increasing from 3.8 to 5.8 mmol/L. The patient was immediately started on a 0.9% normal saline infusion and received a total of 100 mL of sodium bicarbonate intraoperatively for correction of metabolic acidosis. Nebulized salbutamol and intravenous calcium gluconate were administered to manage hyperkalemia. After stabilization, the patient was shifted to the intensive care unit for close monitoring. Postoperative chest X-ray and repeat 2D echocardiography were unremarkable. Serum electrolytes and ABG values normalized within 12 hours, and the patient was later discharged in a vitally stable condition.

Table 1. Arterial Blood Gas Values

	Intraoperative	12hrs postoperative	
pH	7.24	7.36	
pO2	206	88	mmHg
pCO2	38	31	mmHg
Bicarbonate	16	21	mmol/L
Sodium	130	142	mmol/L
Potassium	5.8	4.3	mmol/L
Chloride	118	102	mmol/L
Hemoglobin	10.2	14	mg/dl
Lactate	0.45	1.2	mmol/L

DISCUSSION

Fluid overload syndrome encompasses a spectrum of manifestations ranging from nausea, vomiting, apprehension, disorientation, and visual disturbances to severe neurological complications such as stupor, seizures, and coma due to excessive fluid absorption. Vigilant monitoring by anesthetists is essential for early diagnosis, and spinal anesthesia facilitates this by allowing the patient to remain awake and responsive. Currently, it is the most commonly employed technique, as it theoretically allows earlier detection of fluid overload and emerging neurological signs in a conscious patient. [7]

The present case report aims to discuss the signs and symptoms, severity of fluid overload and urgent management undertaken in a patient who underwent Thulium Laser Enucleation of the Prostate .Systemic fluid absorption frequently occurs during endoscopic surgery. When large volumes are absorbed, fluid overload is the result. The advent of laser technology enabled the use of normal saline (0.9% sodium chloride) as an irrigating solution in endoscopic prostate surgery. While this largely eliminated the traditional transurethral resection (TURP) syndrome, excessive absorption of normal saline can still trigger serious and potentially catastrophic complications. The reason being that the irrigation fluid used in endoscopy is absorbed into the systemic circulation through the prostate venous sinuses, changing the circulating volume, disturbing the water balance of electrolytes, especially hyponatremia, and reducing serum osmolality, affecting the cardiovascular system, respiratory and nervous system.[8] Symptoms are frequently irregular, variable, and nonspecific, and in some cases, serious complications such as sudden coma, heart failure, cardiovascular collapse, and respiratory failure have been documented.[9.,10]

Excessive absorption of irrigation fluids can cause dilutional hyponatremia and decreased serum osmolality, leading to severe neurological symptoms that typically appear when serum sodium levels fall below 120 mmol/L.[11-14]

Early changes may also be related to the cardiorespiratory system and include decreased oxygen saturation and ECG changes. Early recognition is fundamental to managing fluid overload effectively. Treatment should be initiated promptly and tailored to the severity of symptoms. The primary steps include removing the excess absorbed fluid, temporarily or permanently stopping the procedure, and addressing hypoxemia and hypoperfusion. Loop diuretics such as furosemide aid in fluid elimination, while supplemental oxygen corrects hypoxemia and vasopressors help sustain adequate perfusion.[15,16]

In our case, clinical manifestations were mild along with serum sodium values monitored perioperative helped us diagnose and manage the patient. Regional anaesthesia gave us the advantage of clinical manifestations being monitored easily in an alert patient.

This case report demonstrates that advanced age, enlarged prostate size, extended surgical duration, and capsular perforation contributed to the development of fluid overload syndrome. Urologists should recognize that fluid overload can be a potentially life-threatening complication and must be identified at the earliest possible stage.

Only a limited number of studies focus on anesthetic management for prostatomegaly patients undergoing modern laser-based procedures. This case report highlights the necessity for additional clinical research to better understand anesthetic considerations and address potential life-threatening complications associated with laser endoscopic prostate resection.

CONCLUSION

Fluid overload syndrome remains a potentially life-threatening complication of endoscopic prostate surgery, even with modern laser techniques using normal saline. Early

recognition—enabled by regional anesthesia and close clinical and electrolyte monitoring—is essential for prompt management. This case underscores key risk factors such as advanced age, large prostate size, and prolonged operative time. Greater awareness among anesthetists and urologists is crucial, and further studies are needed to refine anesthetic strategies and enhance safety in laser-based endoscopic urologic procedures.

REFERENCES

1. Gravas S, Cornu J, Gacci M, et al. EAU Guidelines on Management of Non Neurogenic Male Lower Urinary Tract Symptoms (LUTS), including Benign Prostatic Obstruction (BPO). EAU Guidelines. 2022.
2. Kumar V, Vineet K, Deb A. TUR syndrome - a report. Urol Case Rep 2019;26:100982.
3. Tan AH, Gilling PJ. Lasers in the treatment of benign prostatic hyperplasia: an update. Curr Opin Urol 2005;15:55–8
4. Akata T, Yoshimura H, Matsumae Y, Shiokawa H, Fukumoto T, Kandabashi T, Yamaji T, Takahashi S. Changes in serum Na_ and blood hemoglobin levels during three types of transurethral procedures for the treatment of benign prostatic hypertrophy. Masui 2004;53:638–44
5. Kuntz R. Current role of lasers in the treatment of benign prostatic hyperplasia (BPH). Eur Urol 2006;49:961–9
6. Hahn RG. Fluid absorption in endoscopic surgery. Br J Anaesth 2006;96:8–20.
7. McGowan-Smyth S, Vasdev N, Gowrie-Mohan S. Spinal anesthesia facilitates the early recognition of TUR syndrome. Current Urol. 2016;9(2):57-61.
8. Gravenstein D. Transurethral resection of the prostate (TURP) syndrome: a review of the pathophysiology and management. *Anesth Analg*. 1997;84:438–446. doi:10.1213/00000539-199702000-00037
9. Gupta K, Rastogi B, Jain M, et al. Electrolyte changes: an indirect method to assess irrigation fluid absorption complications during transurethral resection of prostate: a prospective study. *Saudi J Anaesth*. 2010;4(3):142–146. doi:10.4103/1658-354X.71505
10. Hahn RG. Fluid absorption in endoscopic surgery. *Br J Anaesth*. 2006;96:8–20. doi:10.1093/bja/aei279
11. Rassweiler J, Teber D, Kuntz R, Hofmann R. Complications of transurethral resection of prostate (TURP)-incidence, management, and prevention. Eur Urol. 2006;50:969-80.
12. Rao PN. Fluid absorption during urological endoscopy. Br J Urol. 1987;60:93-9.
13. Clemente RL, Ramasco RF, Platas SA, Archilla EJ, Romero CI, Corbacho FC, et al. Reabsorption syndrome after transurethral resection (TUR) of the prostate: review of physiologic, diagnostic, and therapeutic features. Actas Urol Esp. 2001;25:14-31.
14. Gray RA, Lynch C, Hehir M, Worsley M. Intravesical pressure and the TUR syndrome. Anaesthesia. 2001;56:461-5.
15. Hahn RG, Essén P. ECG and cardiac enzymes after glycine absorption in transurethral prostatic resection. Acta Anaesthesiol Scand. 1994;38:550-6.
16. Demirel I, Ozer AB, Bayar MK, Erhan OL. TURP syndrome and severe hyponatremia under general anaesthesia. BMJ Case Reports; 2012.