IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 14, Issue 11 Ver. I (Nov. 2015), PP 55-59
www.iosrjournals.org

Intra Operative and ICU Management of Transurethral Resection of Prostrate Syndrome: A Case Report

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Abstract: *We report a case of transurethral resection of prostrate syndrome in a 56 year old man, who underwent transurethral resection of prostrate (TURP) under spinal anaesthesia for a duration of 150 minutes using glycine as the irrigant solution and developed nausea vomiting hypoxaemia , pulmonary oedema intraoperatively and later in the post of period had profound hypotension, frank pulmonary oedema. Serum electrolyte report showed sodium was 118 meq/L. Medical management consisted of diuretic therapy, volume restriction, treatment of pulmonary oedema , mechanical ventilation. Patient received proper and timely treatment and was finally discharged.*

➢ Introduction

TURP SYNDROME is used to describe a wide range of neurological and cardiopulmonary symptoms that occour due to absorption of irrigation fluid used during resection into systemic circulation,specially TURP.[1] The main problems associated with it are **rapid intra vascular fluid expansion** , **hyponatremia, hypoosmolarity** and **problems due to the type of irrigation fluid used**.

➢ Case Findings And Management

A 56 year ASA I male patient weighing 60kgs underwent transurethral resection of prostrate on 15th may 2015 at Gauhati Medical College, Urosurgery Department. Patient gave no history of any coexisting disease or medications. Preoperative serum Sodium was 142 meq/L, serum Potassium was 3.8 meq/L, Urea 40 mg%, Creatinine 1.8 mg%. On table vitals noted were a Heart Rate of 90 per min, Blood Pressure of 140/90 mm Hg, a normal ECG and SpO_2 of 98% with room air. Patient was adminstered spinal anaesthesia with 3ml of Bupivacaine Heavy(0.5%), whose upper level extended to T8 dermatome, confirmed by pinprick method. Post spinal vitals being Heart Rate of 80/min and Blood Pressure of 130/80 mm Hg. Patient was placed in lithotomy position and surgery was started. Irrigation fluid used was 1.5% Glycine and resection was done using monopolar instrument. The height of the irrigation fluid was kept fixed at 60 cms from the table. The intraoperative vitals varied between 120 to 140 mm Hg Systolic and 70 to 100 mm Hg Diastolic, Heart Rate of 70 to 90 beats per minute. The whole procedure lasted 150 minutes with a estimated blood loss of 550 ml. Intraoperatively patient received 1600 ml of isotonic saline. Just as the operation was about to end, patient became increasingly restless, agitated with complaint of nausea vomiting and respiratory distress. Vitals noted were Blood Pressure of 140/90 mm Hg, Heart Rate of 110/min and SpO2 of 93% with high flow oxygen. Chest auscultation revealed bilateral mild basal crepitations. Patient was given Inj Lasix 40mg IV, surgeon was informed about the event and the flow of the irrigation fluid was minimised. Positive pressure bag mask ventilation was initiated. Despite positive pressure ventilation with high flow oxygen, patient SpO_2 was less than 90%, so patient had to be intubated. Electrolytes, Complete Blood Count, Urea, Creatinine were sent urgently for evaluation. Patient was transferred post-operatively to Intensive Care Unit (ICU) . In the ICU Blood Pressure of 110/70 mm Hg, Heart Rate of 72/min and SpO_2 of 99% with 10L/min oxygen, on T piece was noted. Patient had a GCS of 7/15 but was restless. A Central Venous Catheterization was done in right internal jugular vein, opening CVP was 18 cm of water. Patient's Blood Pressure & Heart Rate further detoriated to of 70/40 mm Hg & 50 beats per minute, chest auscultation revealed bilateral extensive crepitations. Patient was started on infusion Dopamine and later infusion Noradrenaline was added. Even after starting inotropes patient was persistently hypotensive. 30 minutes later pink froth was noticed through the patients endotracheal tube, his Blood Pressure noted was 80/40 mm Hg. Patient's GCS further detoriated to 4/15. Patient was immediately put on mechanical ventilation and Dopamine & Noradrenaline infusion were increased to their maximum doseage. 30 minutes later patients Blood Pressure was 100/70 mm Hg. Over the next 3 to 4 hours patient's Blood Pressure gradually stabilized and ventilatory PEEP was added and gradually increased upto 8 cm of water. Blood investigations showed serum Sodium of 118 meq/L, Potassium 3.8 meq/L, Urea 58 mg%, Creatinine 1.8 mg%, so it was a clear cut case of TURP syndrome with acute pulmonary odema. With medical therapy and mechanical ventilation CVP gradually came down to 12 cm of water and pulmonary odema subsided. Blood Pressure stabilized at 125/80 mm of Hg with Noradrenaline inf @ 10 ml/hour and Dopamine inf @ 5ml/hour.

Blood investigations were sent 4 hours later revealed serum Sodium of 122 meq/L, Potassium of 3.6 meq/L, Urea-70 mg%, Creatinine- 1.9 mg%, Haemoglobin 7.8 gm%, PCV-27%, negative Troponin t. Serum ammonia and glycine levels could not be estimated. 100 ml of 3% hypertonic saline was started @ 20 ml per hour over the next 5 hours. Measurement of all irrigating fluid gave a rough estimate that probably 60 liters of irrigation fluid was used of which 5.5 L was absorbed intravascularly. Later one unit packed cell was transfused . Electrolytes sent 12hours later showed a serum Sodium of 128 meq/L. From the second post operative day patient was fluid restricted, and regular CVP monitoring was done. Serum Sodium report came as 134meq/L, Ammonia was 90 mg%, Troponin t was positive, inotropes were gradually tapered off and patient was extubated on the third post operative day. Patient progressed favourably in ICU and was shifted out on 4th postoperative day and subsequently discharged after a week.

➢ Discussion

Wier and associates reported **Water Intoxication** in **1922** as excess water intake that resulted in disorders of consciousness and convulsions.[2] Transurethral resection (**TUR**) syndrome is an iatrogenic form of water intoxication, a combination of fluid overload and dillusional hyponatremia that is seen in a variety of endoscopic surgical procedures and specially after transurethral resection of prostrate. It has also been observed in other procedures using irrigation fluid like **transurethral resection of bladder tumors (TURBT)**, **diagnostic cystoscopy**, **percutaneus nephrolithotomy**, **arthroscopy** and various other **endoscopic gynecological procedures**.[3] Recent studies show, the incidence rate of **mild to moderate TURP syndrome** is **0.78%** and **1.4%** [4,5] and **Severe TURP** syndrome though rare, but is associated with a high mortality rate of **25%**.[6] TURP syndrome has been observed as early as 15 minutes following the start of surgical procedure[7] , sometimes upto 24 hours postoperatively.[8] So the patients undergoing such intervensions require thorough intraoperative and postoperative monitoring for timely diagnosis and management of TURP syndrome.

➢ Signs And Symptoms

SIGNS AND SYMPTOMS OF TRANSURETHRAL RESECTION OF THE PROSTATE SYNDROME.[3]		
Central Nervous System	**Cardiovascular And Respiratory**	**Metabolic And Renal**
Restlessness, headache , confusion	Hypertension, tachycardia , tachypnea	Hyponatremia, hyperglycinemia, intravascular haemolysis
Visual disturbances, nausea and vomiting	Hypotension, bradycardia	Acute renal failure
Convulsion and coma	Hypoxia , pulmonary oedema	

TURP syndrome is mainly caused by the absorption of irrigation fluid that leads to cardiovascular, central nervous system (CNS) and metabolic changes. The clinical picture varies according to the severity of the condition, the type of irrigant fluid used, patient factors and surgical factors. Earliest sign consists of transient prickling and burning sensations in the face, neck accompanied with lethargy and apprehension, often the patient may become restless with complaint of headache. The most common signs are bradycardia and arterial hypotension, which may be the first presentation to be detected in the perioperative period by the attending anaesthesia team. In about 10% of patients a general nonspecific sense of being unwell is seen, which is a commoner symptom than perioperative nausea or vomiting.[9] Abdominal distention secondary to absorption of the irrigating fluid through perforations in the prostatic capsule or secondary to bladder rupture may occour.[10]

In the later postoperative period visual disturbances, twitches, focal or generalized seizures with altered state of consciousness, ranging from mild confusion to stupor & coma have been reported.[11,12,13]
Our patient experienced nausea vomiting, restlessness & agitation followed by respiratory distress and subsequently developed hypoxia and hypotension intraoperatively.

Pathophysiology

The pathophysiology of TURP syndrome is complex, the typical sign and symptoms could be explained by the following pathological changes **fluid overload**, **hyponatremia**, **hypo-osmolality**, **hyperammonemia.**

Fluid overload:- Small amounts of irrigant fluid continuously gets absorbed through the open prostatic venous sinuses during TURP. If 1 L of irrigant fluid is absorbed into the circulation within 1 hour , it causes an acute decrease in the serum sodium concentration of 5 to 8 meq/L and hence increases risk of absorption related symptoms.[14,15] Both hypertension and hypotension may be associated with TURP syndrome. Hypertension may be due to the rapid intravascular irrigant fluid absorption . Hypotension may due to pulmonary interstitial odema, hypovoalaemic shock[16], release of endotoxins into circulation and metabolic acidosis.[17,18]

Hyponatremia:- Serum sodium concentration of <120 meq/L is defined as severe TURP syndrome.[11] This decrease in sodium concentration builds up an osmotic gradient between intracellular and extracellular fluid within the brain, which results in a fluid shift away from the intravascular space leading to brain edema, raised intracranial pressure and neurologic symptoms.[19] Severe and rapidly evolving hyponatremia may manifest with seizures, coma, permanent brain damage, respiratory arrest, brain stem herniation ultimately causing death.[20]

Hypo-osmolality:- The blood-brain barrier is virtually impermeable to sodium but freely permeable to water.[21] The brain reacts to hypo-osmotic stress with intracellular decreases in Sodium, Potassium and Chloride. This decrease in intracellular Sodium, Potassium, and Chloride helps to reduce intracellular osmolality and prevent swelling.[22] Brain edema is a serious issue, leading to cerebral herniation,which is the major cause of death in these patients.[21]

Hyperammonemia:- Glycine (used as irrigant during TURP) is metabolised in brain to release ammonia. Hyperammonemic encephalopathy develops as a result of the formation of ammonia. Blood ammonia concentrations **>100 mmol/L** (normal range **10–35**) are associated with neurologic signs and symptoms.[23]

Irrigation Fluid:- An ideal irrigating fluid should be isotonic, nonhemolytic, electrically inert, nontoxic, transparent, easy to sterilize, and inexpensive. **Glycine , cytal, isotonic saline** are used as irrigation fluid.

Our patient was drowsy with a detoriating GCS due to severe hyponatremia(118 meq/l), hyperammonemia (90 mg%), accompanied with hypotension.

➢ Management Of Turp Syndrome

➢ Proper estimation of amount of irrigation fluid absorbed by

- Ethanol monitoring method.
- Central venous pressure measurements.
- Gravimetry methods.

In our patient we did not specify the method of estimation of absorbed irrigation fluid.

➢ Prevension of TURP syndrome.

- Keeping the patient in **Trendelenburg** positioning on the operating table, especially in high-risk patients.[24]
- Operative time & prostrate gland size:- It is recommended that the operative time be limited to less than **60 minutes**. **Mebust et al.** [25] retrospectively reviewed 3885 patients who underwent TURP and found that with a resection time more than 90 minutes, incidence of development of TURP syndrome was 2% compared with the group with a resection time of less than 90 minutes, the incidence of intraoperative bleeding was significantly higher (7.3%) with resection time >90 minutes as compared to 0.9% in patients with resection time <90 minutes. In this study the incidence of TURP syndrome was 0.7%. **Patients with prostrate gland size larger than 45 g have a greater risk of developmen**t **of TURP syndrome**.
- **Madsen et al.** [26] demonstrated that the pressure in the prostatic fossa and the amount of the irrigation fluid absorbed depend on the height of the irrigating fluid above the patient and suggested that the optimum height should be **60 cm** above the patient. Performing TURP under low pressure prevents absorption of large volumes of irrigation fluid from the open prostatic sinuses.
- Operative experience:- The more experienced the surgeon the lesser is the resection time and lesser is the chance of development of **TURP** syndrome.
- Intraprostatic vasopressin injection:- **Sharma et al**.[27] studied the effect of transrectal intraprostatic vasopressin (**IPVP**) injection in patients who were undergoing TURP. TURP syndrome did not develop in any of the patients, and there was reduced blood loss during the resection, which further limited the amount of irrigant that entered the systemic circulation.
- Performing a **BIPOLAR TURP, LASER TURP** decreases the chances of development of TURP syndrome.[3]

In our patient the irrigation fluid level was maintained at 60 cms above patient and monopolar resection was done.

➢ Treatment of TURP Syndrome And Anaesthetic Considerations.

- Prevension of development of TURP syndrome is of utmost importance. Proper timely diagnosis of symptoms is necessary.

- Upon diagnosis/suspicion ask surgeon to stop/complete surgery as soon as possible with thorough cauterization of all open prostatic venous plexuses.[3]
- Supporting respiration and supplemental oxygenation is always necessary, and intubation and ventilation may also be needed along with intravenous anticonvulsants.[28] Anticonvulsants mainly NMDA receptor antagonist may be used.
- Intraoperative bradycardia and hypotension to be treated using atropine, adrenergic drugs and calcium.[29] Plasma volume expansion and inotrope therapy may be needed in patients with persistent hypotension.
- Administer hypertonic saline **3%** only if severe hyponatremia (serum Sodium < 120 mmol/L), raising serum Sodium concentration by **1 mmol/L/hour** decreases the chances of central pontine myelinolysis. In cases of mild to moderate hyponatremia consider volume restriction. Diuretics are specially used in a case TURP syndrome with pulmonary odema but should be avoided if patient is haemodynamically unstable.[3]
- Spinal anaesthesia is the most common anesthetic technique of choice for TURP. Spinal anesthesia reduces the risk of pulmonary edema, allows early detection of mental status.[30] Spinal anesthesia however reduces CVP, resulting in greater absorption of irrigating fluid compared to general anesthesia.[31] Fluid loading during spinal anaesthesia should be done with caution specially in elderly patients undergoing TURP.
- Under general anesthesia, the diagnosis of TURP syndrome may be difficult, because patients are unable to complain of early symptoms, and anaesthesist must solely rely on the changes in blood pressure and pulse together with electrocardiographic changes for intraoperative diagnosis.[3]
- The short term and long term cardiac morbidity and mortality after TURP syndrome are compareable for general and regional anesthesia.[32]
- Post operative ICU/ITU care is necessary for these patients.

Our patient had episodes of persistent hypotension both intraoperatively and postoperatively and had to be kept on inotrope infusion and later one unit blood was transfused postoperatively. Our patient received postoperative ICU care. Sodium correction in our patient was done gradually mainly by hypertonic saline infusion, diuretics and volume restriction.

➢ Conclusion

So we may conclude that there may be variable presentation of a patient developing intraoperative TURP syndrome and so defining a particular protocol of management in these patients is not always feasible and a thorough understanding of the pathophysiology of this syndrome is necessary for instituting proper and timely treatment in these patients. Prevension of development of TURP syndrome is more important than its management.

➢ Disclosure Statement

No competing financial interests exist.

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