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TURP Syndrome and Relevant Consideration during Anaesthesia for Monopolar Transurethral Resection of Prostate

Fiekabo Ogan[1], John E. Raphael[2,*]

[1]Department of Anaesthesiology, University of Port Harcourt Teaching Hospital, Port Harcourt, Rivers State, Nigeria
[2]Department of Urology, University of Port Harcourt Teaching Hospital, Port Harcourt, Rivers State, Nigeria
*Corresponding author: drraphaeljohn@gmail.com

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Abstract **Background:** There are many options for managing benign prostatic hyperplasia (BPH). They include medical treatment with alpha-blockers, 5-alpha reductase inhibitors, minimally invasive therapy, endoscopic and open surgical surgery. Transurethral resection of the prostate (TURP) is the gold standard for treating patients with BPH. Monopolar resection is the most available method of endoscopic treatment of prostate enlargement. Successful outcome requires a good understanding of the prostate gland and the peculiarities of the procedure. TURP syndrome is one of the most significant and limiting complications of monopolar TURP. We aim to highlight the pertinent anaesthesia considerations during monopolar TURP and the aetiology, presentation and management of TURP syndrome. **Methods:** We reviewed the anaesthesiology aspects of monopolar TURP at the University of Port Harcourt Teaching Hospital, Port Harcourt Rivers, Nigeria and considered pre-anaesthetic clinical concerns, along with the preoperative preparation and approach. The equipment and accessories for the procedure were identified, along with the intraoperative techniques for performing monopolar TURP, emphasizing the anaesthetic considerations. We then performed a literature review using Medline, PubMed, Google Scholars search engines; and discussed the primary concerns during monopolar TURP and the perioperative management of TURP syndrome. **Conclusion:** Administration of anaesthesia for patients undergoing monopolar TURP involves applying relevant anaesthetic principles and understanding the nuances of the procedure. Proactive measures, adequate perioperative evaluation and monitoring, and prompt diagnosis and treatment are pertinent to avoid potentially fatal TURP syndrome.

Keywords: *Anaesthesia, BPH, monopolar TURP, TURP syndrome, urology*

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1. Introduction

The prostate is a walnut-shaped organ encapsulating the posterior urethra between the urinary bladder and pelvic floor. [1] Disease of the prostate glands is one of the most frequent afflictions that many men suffer. The commonest conditions that affect the prostate are benign prostatic hypertrophy (BPH) and prostate cancer (PCa) [1]. The prostate gland receives autonomic innervations from the spinal cord. Both sympathetic and parasympathetic supplies arise from T11 to L2 (sympathetic) and S2 to S4 (parasympathetic). [1,2] The goal of the anaesthesiologist ultimately is to provide safe and effective anaesthesia by blocking pain and other sensory pathways mediated via these neural innervations.

There are many options for managing BPH. This includes medical treatment with alpha-blockers and 5-alpha reductase inhibitors, minimally invasive treatment, endoscopic and open treatments. The objective of all these modalities is to reduce bladder neck resistance to urine flow. [1,3]

Transurethral resection of the prostate (TURP) is the gold standard treatment for BPH. The procedure entails using specialized surgical equipment to resect the enlarged adenoma with the aid of endoscopic equipment. [2] The most commonly performed type of TURP in developing countries like Nigeria is monopolar TURP. This has attending complications that the anaesthesiologist needs to be familiar with, maintaining a high index of suspicion while providing anaesthesia for the procedure. [3,4] A good appreciation of the anatomy of the prostate gland, the surgery and the post-operative management after monopolar TURP is essential for optimal surgical outcomes. TURP syndrome is one of the most significant and limiting complications of monopolar TURP. We aim to highlight the pertinent anaesthesia considerations during monopolar TURP and the aetiology, presentation and management of TURP syndrome.

2. Methods

We reviewed the anaesthesiology aspects of monopolar TURP at the University of Port Harcourt Teaching Hospital, Port Harcourt Rivers, Nigeria and considered pre-anaesthetic clinical concerns, along with the preoperative preparation and approach. The equipment and accessories for the procedure were identified, along with the intraoperative techniques for performing monopolar TURP, emphasizing the anaesthetic considerations. We then performed a literature review using Medline, PubMed, Google Scholars search engines, and discussed the primary concerns during monopolar TURP and the perioperative management of TURP syndrome.

3. Results and Discussion

3.1. Anatomy

The prostate gland is about 5- 20g in weight. It surrounds the urethra as it emerges from the bladder base and is composed of glandular and fibromuscular components enclosed by a fibrous capsule. The blood supply and venous drainage come from large, thin-walled sinuses adjacent to the capsule. The nervous innervation arises from the prostatic plexus, originating from the inferior hypogastric plexus. It carries sympathetic fibres from T11 to L2 and parasympathetic fibres from S2 to S4. Pain fibres originate primarily from sacral nerves S2 to S4. Pain from bladder distension is transmitted with sympathetic fibres originating from T11–L2/3.

3.2. TURP Surgery

The procedure is performed with a resectoscope, through which a resecting loop is introduced. The enlarged gland is resected up to the surgical capsule of the prostate in small chips under direct vision with magnification using the resecting loop. Cutting and coagulation can be achieved using the loop. The continuous irrigation fluid enhances vision into the bladder, removing debris and blood. Three-way catheter irrigation is commenced at the end of the procedure and continued for 24hours after the operation. The recommended resection time should be about 60minutes with monopolar resection, depending on the size of the prostate and the level of experience of the resectionist. Dorsal lithotomy position with sometimes head-down tilt is often the preferred position. [4,5]

The ideal irrigation fluid should be transparent to allow clear visualization, non-conductive, isotonic, non-toxic, non-haemolytic, not absorbable, not metabolised, sterile, and inexpensive. However, no solution fulfils all of these criteria. The most frequent and available irrigation fluid includes 1.5% glycine, water, mannitol, 3.5% sorbitol. [4,6,7] We most often use water because it is the cheapest.

3.3. Anaesthesia

3.3.1. Preoperative Evaluation

Patients presenting for TURP are often middle-aged and elderly and have co-existing morbidities. [7] Cardiorespiratory diseases are not uncommon, and the patient is often on various medications. Complications associated with the BPH may impact the surgery. This includes renal impairment, anaemia from recurrent haematuria, and urinary tract infection. When indicated, pre-operative investigations such as full blood count, electrolytes and creatinine and electrocardiography, echocardiography, and chest X-ray are carried out. Urinary tract infections should be identified and treated. Urinalysis should be targeted to investigate these and any other medical problems. [6]

Medications that increase bleeding tendencies, such as antiplatelets such as aspirin and non-steroidal anti-inflammatory drugs should be discontinued. Patients on anticoagulants like warfarin must be considered on an individual basis. Patients requiring continuous anticoagulation may need to be changed into intravenous heparin, which can then be stopped before the duration of surgery. [6,7]

3.4. Intra-Operative Considerations

3.4.1. TURP Syndrome

The irrigating fluid used for monopolar TURP is absorbed through the large prostatic venous sinuses. The degree of absorption depends on the height of the irrigating solution fluid above the patient on the table, the resection time, and the patient's body mass. The resulting hydrostatic pressure drives the fluid into the prostatic sinuses. [6] Electrolyte solutions cannot be used for monopolar resection as they are highly ionized and facilitate the spread of diathermy current. The fluid used includes distilled water. While water is cheap, readily available and provides clear vision, absorption of large quantities can lead to red blood cell haemolysis and fatal hyponatraemia. Glycine, an isosmotic, non-electrolytic solution, is the commonest irrigation fluid used in developed countries. It is expensive and not readily available in our region. [7,8] Cytal, a combination of mannitol and sorbitol is another frequently used solution. Excessive absorption of these solutions could result in circulatory overload, pulmonary oedema, cardiac failure and even cardiac arrest. Another manifestation of hyponatraemia is on the central nervous system with agitation, confusion, convulsions and coma. This is a consequence of abnormal axonal transmission in the brain. [7,9]

Elevated blood levels of glycine may also cause CNS symptoms because it is an inhibitory neurotransmitter in the brain and is metabolized into ammonia. High levels of ammonia have been associated with delayed awakening and transient blindness. after TURP. [6]

To prevent TURP syndrome, strategies include keeping the height of the irrigating solution container to 60cm above the patient, minimizing the volume of irrigant fluid used and keeping the resection time to 60 minutes and under when carrying out monopolar TURP. The surgeon's experience and good resection technique are other factors associated with TURP syndrome. Definitive treatment depending on the severity of the syndrome includes the use of loop diuretics such as furosemide, normal saline and supportive care. Hypertonic saline is ideal for

correcting hyponatraemia but should be used caution because it is capable of causing CNS complications. Other systemic involvements such as cardiac failure and CNS effects are managed supportively. Intensive care with ventilation may be required in extreme cases. [3,7,10,11]

Bleeding could be substantial and depends on the size of the prostate, duration of surgery and surgical technique. Breaching the capsule of the prostate is another risk factor for primary haemorrhage. It may be difficult to estimate bleeding due to dilution during preloading for spinal anaesthesia and irrigant fluid absorption. A rough estimate of blood loss is 2-5mL/minute of resection time and 20-50mL/gram of resected prostate tissue. Monitoring the patients' vital signs and haematocrit level ha also been used to assess blood loss. [8,9,10]

Significant heat loss may result from the use of cold irrigating fluid. Forced air warmer is helpful along with the use of warm intravenous and irrigating fluids. [11]

3.4.2. Choice of Anaesthesia

Regional techniques may be better in the elderly and avoid the cardiorespiratory depressant effects of general anaesthesia. Other advantages of regional anaesthesia include reduced blood loss and possibly fewer thromboembolic events. It also aids in diagnosing signs and symptoms of TURP syndrome and bladder perforation. The classic "pop" sound and sudden onset unusual lower abdominal pain should arouse suspicion in bladder perforation. The sympathetic block and vaso-dilatation may reduce the effects of intraoperative fluid overload, and TURP symptoms may then occur as the effects of the spinal anaesthesia wear off. [1,12]

3.4.3. Patient Positioning

This should also be considered as patients with severe cardiac or respiratory disorders may not easily withstand the lithotomy position with slight Trendelenburg tilt preferred during TURP. It is elevating the head and shoulders of these patients may be helpful in these patients. Carefully padding pressure areas as the lithotomy position may injure the common peroneal, femoral and sciatic nerves.

3.4.4. Pain

Sometimes, restlessness occurs during regional anaesthesia. The possible causes should be identified before administering sedatives, which could increase agitation in some instances. An ineffective block should be considered in addition to the bladder or rectal perforation, which could require general anaesthesia for open abdominal exploration. [4]

3.4.5. Infection

Urinary tract infection is frequent in patients with BPH. The use of indwelling urethral catheter is a risk factor for bacteraemia, which could occur peri-operatively. Septicaemia is seen in up to 7% of patients undergoing TURP, and all patients should be given pre-operative antibiotic cover for gram-positive and gram-negative organisms. [1]

Intravenous fluids are usually are essential if regional techniques are given. Normal saline is the fluid of choice for TURP to decrease the risk of potential effects of dilutional hyponatraemia. Fluids should be given cautiously as the patients are usually elderly and prone to fluid overload. This is particularly important in those with cardiac impaired renal function. [1,13]

3.5. Postoperative

Thromboprophylaxis measures include early mobilization for patients, especially those with prolonged hospitalization. Chest physiotherapy may be required in those with restrictive lung disease.

Bladder spasms may also occur postoperatively can be treated with bladder anti-muscarinic medications such as tolterodine and solifenacin. They should be used with caution as they can cause urinary retention in patients with impaired detrusor function. Low dose benzodiazepines have also been used. [4]

4. Conclusion

Administration of anaesthesia for patients undergoing monopolar TURP involves applying relevant anaesthetic principles and understanding of nuances of the procedure. Proactive measures and adequate perioperative evaluation and monitoring, and prompt diagnosis and treatment are pertinent to avoid potentially fatal TURP syndrome.

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