Transurethral resection of the prostate (TURP)

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Transurethral resection of the prostate (TURP), the current gold standard surgical treatment for BPH, Transurethral resection of the prostate (TURP) is performed by inserting a resectoscope through the urethra and resecting prostatic tissue with an electrically powered cutting-coagulating metal loop. As much prostatic tissue as possible is resected, but the prostatic capsule is usually preserved.

The ideal safe irrigating fluid for use during TURP is one which is
- isotonic,
- non hemolytic
- nontoxic
- not metabolized
- excreted rapidly if absorbed.
- electrically inert
- transparent to allow clear visibility
- easy to sterilize,
- inexpensive.

Such an ideal fluid does not exist. Glycine is most commonly used one.

<table>
<thead>
<tr>
<th>SOLUTION</th>
<th>OSMOLALITY (mOsm/L)</th>
<th>ADVANTAGES</th>
<th>DISADVANTAGES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Distilled water [%200x628] [Extremely hypotonic]</td>
<td>0</td>
<td>electrically inert inexpensive excellent optical properties</td>
<td>Hemolysis, shock &amp; renal failure Hemoglobinemia Hemoglobinuria Hyponatremia</td>
</tr>
<tr>
<td>2 Glycine (1.5%) [%200x628] [nearly isotonic]</td>
<td>220</td>
<td>Less likelihood of TURP syndrome</td>
<td>Transient postoperative visual syndrome Hyperammonemia Hyperoxaluria</td>
</tr>
<tr>
<td>3 Sorbitol (3.3%) [%200x628] [nearly isotonic]</td>
<td>165</td>
<td>Same as glycine</td>
<td>Hyperglycemia, possible lactic acidosis Osmotic diuresis</td>
</tr>
<tr>
<td>4 Mannitol (5%) [%200x628] [nearly isotonic]</td>
<td>275</td>
<td>Isosmolar solution Not metabolized</td>
<td>Osmotic diuresis Possibility of acute intravascular volume expansion</td>
</tr>
</tbody>
</table>
Glycine
- Nonessential amino acid, is normally metabolized by oxidative transformation into ammonia.
- Normal plasma glycine levels are 13 to 17 mg/L
- Produces depressed mental status and coma lasting 24 to 48 hours postoperatively, related to hyperammonemia.
- An inhibitory retinal action of glycine - transient blindness seen in these patients.
- Glycine has structural similarities to aminobutyric acid, an inhibitory spinal cord and retina neurotransmitter.
- Glycine also has been implicated in the myocardial depression and hemodynamic changes

Problems associated with TURP

1. **TURP syndrome**

**Signs and Symptoms of Transurethral Resection of the Prostate Syndrome**

<table>
<thead>
<tr>
<th>CVS and Respiratory</th>
<th>CNS</th>
<th>Metabolic</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension</td>
<td>Agitation/confusion</td>
<td>Hyponatremia</td>
<td>Hypo-osmolality</td>
</tr>
<tr>
<td>Bradyarrhythmias/tachyarrhythmias</td>
<td>Seizures</td>
<td>Hyperglycinemia</td>
<td>Hemolysis</td>
</tr>
<tr>
<td>Congestive heart failure</td>
<td>Coma</td>
<td>Hyperammonemia</td>
<td></td>
</tr>
<tr>
<td>Pulmonary edema and hypoxemia</td>
<td>Visual disturbances (blindness)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Myocardial infarction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypertension</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**Diagnosis**

breathalyzer testing patients after use of ethanol-labeled irrigating fluid can accurately assess the degree of fluid absorption during TURP procedures

**Cause**
- *circulatory overload* caused by significant absorption of irrigating fluid
- *hyponatremia*
- *hypo-osmolality*.
- *hyperglycinemia*.
- *hyperammonemia*.
- *hypervolemia*. 
### SIGNS AND SYMPTOMS OF ACUTE HYponatREMIA

<table>
<thead>
<tr>
<th>SERUM Na⁺ (mEq/L)</th>
<th>CNS CHANGES</th>
<th>ECG CHANGES</th>
</tr>
</thead>
<tbody>
<tr>
<td>120</td>
<td>Confusion</td>
<td>Possible widening of QRS complex</td>
</tr>
<tr>
<td></td>
<td>Restlessness</td>
<td></td>
</tr>
<tr>
<td>115</td>
<td>Somnolence nausea</td>
<td>Widened QRS complex</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Elevated ST segment</td>
</tr>
<tr>
<td>110</td>
<td>Seizures Coma</td>
<td>Ventricular tachycardia or fibrillation</td>
</tr>
</tbody>
</table>

**Treatment of the Transurethral Resection Syndrome**

- Ensure oxygenation and circulatory support.
- Notify surgeon and terminate procedure as soon as possible.
- Consider insertion of invasive monitors if cardiovascular instability occurs.
- Blood to laboratory for evaluation of electrolytes, creatinine, glucose, and arterial blood gases.
- Obtain 12-lead electrocardiogram.
- Treat mild symptoms (serum Na⁺ >120 mEq/L) with fluid restriction and loop diuretic.
- Treat severe symptoms (serum Na⁺ <120 mEq/L) with 3% sodium chloride IV at a rate <100 mL/hr. Discontinue 3% sodium chloride when serum Na⁺ >120 mEq/L.

- **hallmark of patient treatment is to restore extracellular tonicity.**

  - Although the traditional recommended rate of serum sodium correction is 0.5 mEq/L/hr, this is for chronic hyponatremia and no established rate for correction of acute hyponatremia exists.

**2. Blood loss**

- During a resection is 2 to 4 mL/min.
- The open venous sinuses are the most likely site of bleeding.
- Blood loss is very difficult to assess because of mixing with the irrigating fluid. With prolonged resections,
- Serial hemoglobin levels and the patient’s vital signs should be evaluated to guide the need for transfusion.
- The incidence of intraoperative blood transfusion is approximately 2.5%.
- Abnormal bleeding after TURP occurs in less than 1% of resections.

Abnormal bleeding after TURP occurs in less than 1% of cases; it is believed by some clinicians to be due to systemic fibrinolysis secondary to plasmin.
Additional factors influencing blood loss during TURP are:

- Regional anaesthesia - less blood loss
- Vascularity
- Size of the gland
- Duration of surgery.
- An increase in fibrinolysis during prostate resection as a result of the release of urokinase from prostate tissue also factors into the blood loss that occurs.
- Number of sinuses opened during resection,
- Presence of infection,

Prostate inflammation from repeated or recent catheterizations.

3. Disseminated intravascular coagulation
   - Thromboplastin, a thrombogenic stimulant found in high concentrations in prostate cancer cells, can rarely trigger.
   - Another cause of post-TURP bleeding is release of prostatic tissue plasminogen activators. These factors convert plasminogen to plasmin, causing fibrinolysis.
   - Treatment of these conditions is supportive and may include transfusion of coagulation factors and platelets.

4. Surgical perforation of the prostatic capsule
   - Occurs in 2% of TURP procedures, usually resulting in extraperitoneal fluid extravasation. Awake patients often complain of pain localized to the lower abdomen and back. This complication occurs more commonly during transurethral bladder tumor resection.
   - Extraperitoneal perforation may be manifested as pain in the periumbilical, inguinal, or suprapubic area.
   - Intraperitoneal bladder perforation, a less frequent event, may cause symptoms related to diaphragmatic irritation (i.e., pain referred to the upper part of the abdomen, precordial area, shoulder region, or neck).

5. Bacteremia
   - The prostate harbors many bacteria, which can be a source of intraoperative and postoperative bacteremia through the prostatic venous sinuses.
   - This risk is increased further by the presence of an indwelling urinary catheter.
   - Bacteremia is usually asymptomatic and easily treated with commonly used antibiotic combinations that are effective against gram-positive and gram-negative bacteria.
   - In 6% to 7% of patients, septicemia may occur.
   - Common manifestations include chills, fever, and tachycardia.
   - In severe cases, bradycardia, hypotension, and cardiovascular collapse may occur, with mortality rates of 25% to 75%.

6. Hypothermia
   - Body temperature decreases approximately 1°C/hr of surgery.
   - Shivering occurs in 16% of patients who receive room-temperature irrigation fluids.
   - Hypothermia does not develop if irrigation solutions are warmed to body temperature.
• Although one may believe that warming of fluids might cause increased bleeding because of vasodilation, such is not the case; use of systemic and intrathecal opioids decreases postoperative shivering from cold.

7. Postoperative cognitive dysfunction
8. Perioperative myocardial ischemia

Anesthetic considerations
A. Positioning.
• TURP is usually performed in the lithotomy position with a slight Trendelenburg tilt.
• Decrease in pulmonary compliance; a cephalad shift of the diaphragm; and a decrease residual volume, functional residual volume, tidal volume, and vital capacity.
• Cardiac preload may increase.
• Nerve injuries to the common peroneal, sciatic, and femoral nerves are likely.

B. Anesthetic Techniques for Transurethral Resection of the Prostate

1. Regional anesthesia

SAB has long been considered the anesthetic technique of choice for TURP.

Aim
• Satisfactory regional anesthesia for TURP involves achieving an anesthetic block level that interrupts sensory transmission from the prostate and bladder neck. In addition, the uncomfortable sensation of bladder distention must be considered.

• Block level of T 10

Advantages of regional Anaesthesia
• patient remain awake- early diagnosis of TURP syndrome
• Accidental bladder perforation also is recognized easily if the spinal level is limited to T10 because the patient would experience abdominal or shoulder pain
• The incidence of deep vein thrombosis is decreased
• The amount of operative blood loss is reduced with regional anesthesia compared with general anesthesia.
• Better post operative analgesia
• cardiovascular depression associated with the administration of potent inhaled anesthetics is avoided

Disadvantages
• lower CVP associated with regional anesthesia may actually increase the absorption of irrigation fluid.
2. Epidural anesthesia

- Subarachnoid anesthesia is generally preferred over continuous epidural anesthesia
- easier to perform in elderly patients
- duration of surgery is generally not very long.
- The incomplete block of sacral nerve roots that occasionally occurs with the extradural technique is usually avoided with subarachnoid anesthesia.

3. General anesthesia

- In patients who require ventilator or hemodynamic support,
- contraindication to regional anesthesia, or refuse regional anesthesia

4. Caudal and sacral blockade

- Used effectively for prostate surgery
- Caudal anesthesia has been used effectively in high-risk patients undergoing laser prostatectomy
- Hemodynamic stability is the main advantage with this technique.

5. Local anesthesia has been used for TURP procedures in patients with small-to-moderate size prostate glands, with limited success. Local infiltration of the perineum and the prostatic fosse also has been advocated by some anesthesiologists for limited TURP procedures, although the operative analgesia afforded by local infiltration is not comparable in quality to spinal anesthesia

Future

The rate of TURP procedures has declined, largely because of the development of selective and specific medical strategies for BPH management.

Less-invasive surgical treatments

These procedures may be preferable for elderly patients with significant co morbidities because they can usually be performed on an outpatient basis, and decrease or avoid the risk of TURP syndrome

- Balloon dilatation,
- Intra prostatic stents,
- Trans urethral incision
- Needle ablation
Laser Prostatectomy

- The neodymium: yttrium-aluminum-garnet (Nd-YAG) laser has been replaced by holmium and potassium-titanyl-phosphate (KTP) lasers.
- These lasers produce varying degrees of coagulation and vaporization of prostate tissue. The main advantages over conventional TURP include minimal blood loss (50 to 70 mL) and minimal fluid absorption, which should nearly eliminate these two major complications of TURP.
- In a systematic review of randomized, controlled trials evaluating the efficacy and safety of laser prostatectomy techniques versus TURP for symptomatic benign prostatic obstruction, the authors observed that TURP provided slightly greater improvement in urinary symptoms and flow. Laser procedures resulted in fewer transfusions and strictures and shorter hospitalizations. Reoperation was required more often after laser procedures.

Cryosurgery

- Cryosurgery has proved to be technically complex and has not attained much popularity.

Microwave Ablation

- Microwave ablation of the prostate is another promising technique that can be performed on an outpatient basis under local or sacral block.

New Therapies for Transurethral Resection of the Prostate

- **Bipolar electrode resection** and next-generation prostate lasers are proving to be alternative surgical therapies for benign prostatic hyperplasia resection.
- **Advantage** of bipolar electrode resection is that normal saline can be used to avoid morbidity associated with hypo-osmolar bladder irrigants such as glycine.

Conclusion

Despite these other surgical options, TURP has not been displaced as the best treatment for BPH, particularly in highly symptomatic patients and those with recurrent urinary tract infections related to incomplete bladder emptying. TURP has evolved into a safer operation while maintaining its efficacy.
postoperative cognitive dysfunction

- Because many patients having prostate surgery are elderly, consideration should be given to prevention of postoperative cognitive dysfunction. A prospective study comparing cognitive function after TURP using general versus spinal anesthesia found a significant impairment in both groups at 6 hours after surgery, but no differences between approaches at any time in the first 30 days after surgery.\textsuperscript{159}

perioperative myocardial ischemia

- In patients undergoing transurethral surgery, assessed by Holter monitoring, increases following TURP surgery, but this also appears unaffected by choice of anesthesia.\textsuperscript{160} Thus, choice of anesthetic technique for TURP procedures should be tailored to the individual and can be performed safely with either general or regional anesthesia.