Tip Sheet for Anesthesiologists Taking Care of EP Patients

Over the past few years, the partnership between electrophysiologists and anesthesiologists has grown significantly as more complex procedures are being performed in the cardiac electrophysiology (EP) lab. More EP procedures now require transesophageal echocardiography (TEE) guidance and more patients with cardiac implantable electronic devices (CIEDs) are also presenting to the operating room (OR) for noncardiac surgery. The partnership between electrophysiologists and anesthesiologists is critical. The following list can serve as a tip sheet for anesthesiologists when taking care of patients with a CIED during procedures in the EP lab or OR.

1. Management of CIEDs in the OR using a doughnut magnet.

When a patient with a pacemaker or an implantable cardioverter-defibrillator (ICD) presents to the OR for a surgery in which the use of electrocautery is anticipated, a doughnut magnet can be used to reduce the risk of interference with the device. For surgery below the umbilicus, electrocautery is unlikely to be detected by the device and no action is needed. For all other surgeries, a magnet can be applied to pacemakers to inhibit sensing by the device and impose asynchronous pacing (for patients who are pacemaker dependent) and can be applied to ICDs to temporarily suspend tachycardia therapies to prevent inappropriate shocks. The exception is the patient with an ICD who is pacemaker dependent because a magnet applied to an ICD will not force pacing—the device must be reprogrammed in this scenario. For cases in which the CIED will be in the sterile field, such as heart transplantation, the device should be reprogrammed. Also, be on the alert for patients with a leadless pacemaker that does not respond to a magnet.

2. Indications for general anesthesia (GA) and monitored anesthesia care (MAC) in the EP lab.

The following scenarios are common reasons why electrophysiologists would schedule a case with anesthesia support. These may vary from hospital to hospital.

- Cases that require sedation, but the patient is at high risk for sedation
    - High-risk airway
    - Low respiratory reserve
- Cases for which local anesthesia and moderate sedation may not be adequate
    - Procedure duration expected >4 hours
    - Many ablation procedures for ventricular tachycardia and atrial fibrillation (AF)
    - Epicardial ablation procedures that require pericardial access
    - Cases for which TEE guidance is needed
      e. Procedures that require subcutaneous tunneling of leads
- Urgent procedures (e.g., pacemaker implant in a patient with advanced heart failure)
- Preparation for potential emergent cardiac surgery (e.g., high-risk lead extractions)
- Failed sedation case after the procedure has already started

3. Role of the cardiac anesthesiologist during left atrial appendage closure (LAAC) procedures.

Most LAAC cases, such as implantation of the Watchman (Boston Scientific) or Amplatzer Amulet (Abbott) device, are guided by TEE. These images are used to size the device, guide deployment, and confirm that the position and compression of the device are appropriate before releasing the device. In some hospitals, an imaging cardiologist supports the case with the anesthesiologists. At other hospitals, cardiac anesthesiologists guide the procedure with TEE to minimize the number of physicians required to support the procedure.

4. Role of cardiac anesthesia during lead extractions.

Extraction of transvenous pacing or ICD leads that have been implanted for years can be difficult to remove due to adhesions along the vasculature and in the heart. Such extraction procedures can be associated with tearing of the superior vena cava or perforation of the heart, resulting in cardiac tamponade. Most high-risk lead extractions are performed in the OR under GA with TEE guidance and a cardiac surgeon immediately available.

5. Importance of hypotension in the EP lab.

One of the most severe complications during ablation procedures and intracardiac lead placement in the EP lab is cardiac perforation, which can result in pericardial effusion and tamponade. It is critical that the anesthesia team communicate to the electrophysiologist when there is a significant reduction in blood pressure. The electrophysiologist wants to know so the patient can be evaluated for tamponade. Assuming the hypotension is due to vasodilation from the anesthetics and empirically treating the hypotension with vasopressors, when the actual problem is tamponade, can result in life-threatening delays in pericardiocentesis.

6. Value of intracardiac echo (ICE) in the EP lab.

In the United States, most AF and ventricular tachycardia ablation procedures are guided by ICE. This is a valuable tool to monitor for a pericardial effusion and can be used by the electrophysiologist during the procedure to quickly rule out a mechanical complication when the patient experiences hypotension.

7. Assistance to avoid collateral injury during AF ablation procedures.

Ablation procedures for AF can result in injury to collateral structures, such as the phrenic nerve and esophagus. During cryoballoon pulmonary vein isolation procedures for AF, the phrenic nerve is stimulated by pacing from the right subclavian vein when the right-sided pulmonary veins are being frozen. It is important that no paralytics are on board at that time. When radiofrequency or cryoballoon ablation is performed along the posterior left atrium, the temperature of the esophagus is measured. Ablation is terminated when the esophageal temperature increases by 1 degree or decreases to 20°C-25oC. When using a single thermistor

temperature probe, the electrophysiologist relies on a member of the anesthesia team to adjust the depth of the probe to the level of ablation. In other situations, the anesthesiologist is needed to insert and manage an esophageal cooling or deviation device.

8. Avoidance of Foley catheters in AF ablation procedures.

Catheter ablation procedures for AF or other supraventricular arrhythmias rarely last more than 4 hours. It would be rare for the patient to need a urinary catheter during such procedures. There are randomized trials demonstrating that Foley bladder catheters are associated with an increased risk of postprocedural hematuria, infections, and urinary retention,1 and therefore, should be avoided for most EP procedures.

9. Use of regional anesthesia.

Regional anesthesia is increasingly being used in the EP lab. There is growing experience using nerve blocks for some EP procedures that require larger incisions and subcutaneous tunneling, such as for the totally subcutaneous ICD.

10. Beware of moving fluoroscopy equipment.

During an EP procedure, the fluoroscopy equipment is frequently moving to obtain different imaging views. For biplane systems, the lateral C-arm is moved in and then back out from the procedure table at the beginning and end of each EP procedure. It is important that the EP team and anesthesia personnel are aware of when these parts are moving and work together to avoid personal injury or collision with the equipment.

Anesthesia support is much appreciated in the EP lab to allow for successful completion of complex procedures as well as a positive patient experience. A consistent dedicated anesthesia team for the EP lab is a good approach to promote a positive partnership. This list can serve as a useful reference for members of the anesthesia team, particularly for those in training and for those who do not regularly spend time in the EP lab.

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