

Considerations for Propofol Use in the MRI

Chris Cavanaugh, RN, BSN, CRNI
Clinical Nurse Educator, IRadimed Corporation
Orlando, FL

*Case Study: A 19 year old, 68 kg. male with cerebral palsy was scheduled to have an MRI of his brain without contrast. Due to his cerebral palsy, he was unable to lie still while in the MRI scanner while the scans were being completed, as he did not have conscious control over the muscles in his arms and legs. In addition, he was extremely anxious regarding the procedure and the length of time he had to be in the bore of the MRI under such close conditions. His disease put him at increased risk during general anesthesia¹ of seizures, respiratory depression and hypothermia. Based on this assessment, the anesthesiologist decided to use Diprivan® 1% [propofol]. A loading dose of 1mg/kg was given, at 20 mg every 10 seconds up to 68 mg or onset of sedation. After further diluting the Diprivan® to a 2 mg/mL solution by injecting 20 mL of the 10 mg/mL solution into a 100 mL bag of Normal Saline, the maintenance infusion of 100 mcg/kg/min or 204 mL/hour was started, using the MRidium™ 3850 Infusion pump and titrated to response. The patient remained completely and comfortably sedated throughout the MRI, his vital signs remained stable and within normal limits. At the conclusion of the MRI scan, the infusion pump was turned off and the patient was allowed to wake up on his own. His Glasgow Comma Scale was 15 and he was alert and oriented within 5 minutes of the infusion being stopped. No reversal agents were needed or given. The patient reported being comfortable throughout the MRI procedure. The IV site was removed without complications and the patient was released to home. ***

Diprivan® 1% (propofol) injectable emulsion has been safely and effectively used for sedation in the ICU setting for ventilated patients for the more than 10 years. It has provided improved patient care, comfort and safety by facilitating sleep, reducing anxiety and discomfort due to endotracheal tube placement and ventilation assistance and facilitated and prevented adverse effects of pulmonary suctioning.²

There is an increasing need for an efficient, effective method of sedation in the MRI for those patients who are unable to lie still during the scan, due to anxiety or a disease process. Since many MRI procedures are done on an outpatient basis, the use of General Anesthesia is not ideal in this situation, due to the time involved for induction, recovery and the side effects to the patient. The ideal sedation agent for this type of setting would have a rapid onset, rapid recovery, be easily titrated for varying levels of sedation, be safe for both pediatric and adult patients, allow patients to remain hemodynamically stable, and have a low cost³.

Propofol meets all of these requirements. It is also compatible via a Y-site with Gadolinium, the contrast agent used in MRI. Diprivan®1% (propofol) is a lipid based emulsion available in 20 mL, 50 mL and 100 mL vials and 50 mL syringes. Because dosing of propofol needs to be closely controlled and possibly titrated for effect, an electronic infusion pump is recommended for administration. This limited the use of propofol in the MRI department until a suitable MRI compatible infusion pump was available. With the introduction of the MRidium™ 3850 Infusion pump, there is a safe way to administer and titrate propofol in the MRI suite. When administering propofol in the MRI suite, the patient's EKG, heart rate, oxygen saturation, respirations and blood pressure should all be monitored.⁴

Diprivan®1% (propofol) has been proven a safe and effective sedative agent for both the adult and pediatric populations. It is not recommended for induction of anesthesia in pediatric patients below the age of 3 years or for maintenance of anesthesia in pediatric patients below the age of 2 months because its safety and effectiveness have not been tested⁴. Dr. B. Draskovic noted in his study in 1998 which focused on children age 7-16, that children may need larger doses of propofol for induction and maintenance of anesthesia, because it is metabolized faster in children than in adults. His study also concluded that the use of propofol provided satisfactory, stable anesthesia using TIVA (total intravenous anesthesia) as well as a rapid and complete recovery, with limited, if any side effects. Propofol can be more cost effective than barbiturates in sedating children for MRI⁵. The added drug costs are significantly offset by the savings in nursing time in the PACU, and the patient outcomes did not differ significantly between the two groups.

Propofol is an excellent choice for adult outpatient anesthesia use in the MRI because of its low side effect profile, rapid onset, rapid recovery time and because it maintains hemodynamic stability. The loading dose for an adult, 2-2.5 mg/kg in 40 mg doses every 10 seconds until onset should be given via IV push⁶. The maintenance dose of 100-200 mcg/kg/minute can then be started either direct from the vial, syringe, or further diluted in a NS bag. The dose rate calculator feature of the MRidium™ 3850 infusion can be used to calculate the rate of infusion, decreasing the risk of medication errors.

Giving propofol as a continuous infusion avoids the peaks and valleys of intermittent injections of sedation agents, which in turn can lead to oversedation or transient hypotension. This is especially important in the MRI if a scan takes longer than anticipated, or needs to be repeated. Propofol provides an easily controlled treatment for procedural anxiety, while at the same time; the patient can be alert enough to follow commands. Rapid recovery time, combined with not needing additional medications for anxiety or reversal medications provides an overall cost savings when using propofol. In addition, patients who may have developed a tolerance to benzodiazepines and opioids may be more effectively sedated using propofol⁷.

Until recently, propofol use in the MRI has been limited because of the need to closely monitor and titrate the infusion and lack of an MRI compatible infusion pump. In fact, a death occurred when a gravity drip of propofol ran uncontrolled during an MRI scan⁸. Now that such pumps are available, there are important factors to consider when choosing a pump. The pump should have both visible and audible alarms to alert the user to a potential or actual problem. These alarms should be able to be seen and heard from

the control room and not affected by the Faraday cage screening. The pump should be easy to operate and have features familiar to the anesthesia department personnel that will be using it. Unfamiliarity of operation can add to the risks of the procedure. Most importantly, it should be truly non-magnetic and compatible with the magnet strength of the MRI in the facility. MRI compatible/safe products are rated according to the strength of the magnet they will work in, in Tesla. For instance, if your facility has a 3.0 Tesla magnet, be sure that the pump you choose has been proven to be safe in a 3.0 Tesla environment. As Kempen stated in his letter to the Anesthesia Patient Safety Foundation newsletter in the Summer of 2005, “Oddly enough, even some of these MRI-approved devices are highly magnetic...”

TIVA with propofol is an excellent, efficient and cost effective method of sedation for both pediatric and adult populations in the MRI department. The low side effect profile and rapid induction and recovery make it a preferred agent for outpatient procedures, and the availability of MRI compatible infusion pumps, such as the MRidium™ 3850 provides a safe method of infusion preventing potentially fatal medication errors.

**Actual case performed in MRI suite using MRidium™ 3850 MRI Infusion pump, patient and hospital not identified to insure confidentiality.

References:

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