

# ADVANCES IN ENDOSCOPY

Current Developments in Diagnostic and Therapeutic Endoscopy

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## Nonanesthesiologist-Administered Propofol Sedation in Endoscopic Practice

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**G&H** Could you describe the chemical properties and mechanism of action of propofol?

**MB** Propofol, or 2,6-diisopropyl phenol, is a sedative hypnotic usually administered intravenously for general anesthesia, often in combination with other agents such as nitrous oxide and muscle relaxants. In lower doses it is used for conscious sedation.

**G&H** What are the properties of propofol that make it particularly useful in endoscopic procedures?

**MB** Propofol has a very short half-life, between 2 and 4 minutes, so there is a much shorter time to recovery from the drug than with more commonly used agents, such as the benzodiazepine midazolam, which has a 30-minute half-life. Studies suggest that recovery from propofol is 75% faster than from midazolam. The onset is also very rapid compared to traditional agents. There are delayed benefits as well: 24 hours after the procedure, neurological and social functioning is at a higher level than after administration of traditional agents. Propofol is quickly cleared by the liver as it has no active metabolites. Also, nausea is rare following the use of propofol.

**G&H** Are there other advantages, from the patient's point of view, to the use of propofol?

**MB** Some studies suggest that patients find procedures more comfortable when performed under propofol sedation. Other, admittedly weak, data suggest that propofol

sedation may shorten the length of a procedure when compared to other agents.

Propofol has little or no analgesic action. Several studies have shown that, when necessary, it is safe to coadminister low doses of analgesic opiates with propofol during a procedure. However, this is not usually required. Patients sometimes experience pain after endoscopy, including endoscopic retrograde cholangiopancreatography (ERCP). Because propofol wears off so quickly, it is perfectly safe to use standard analgesic agents, if needed, in postprocedure care.

**G&H** What concerns exist with the use of propofol in endoscopic procedures?

**MB** There are no known antidotes to propofol, so no reversal agent can be given if there is a problem. The main concern is that it can cause significant respiratory depression. Because propofol is a general anesthetic agent, patients can very quickly go from light to much deeper sedation where they lose all of their normal protective reflexes. This creates potential for apnea, prolonged hypoxia, and aspiration of gastric contents.

**G&H** Why is there particular concern with regard to nurse administration of this drug?

**MB** The concern is that nurses do not have the appropriate training for what is known as "monitored anesthesia care" for deep sedation. The American Society of Anesthesiologists and some of the organizations representing specialist nurse anesthesiologists oppose the use of this drug by any nonanesthesiologist, whether it be a physician or a nurse, because they do not have specific training and skills for maintaining an airway, including endotracheal intubation.

**G&H** What data are available regarding the safety of nonanesthesiologist administration of propofol?

**MB** In the past 5 years, several studies have looked at the safety of propofol in conscious sedation, particularly in its administration by nonanesthesiologist physicians, as well as several looking at nurse-assisted propofol sedation. Most recently, a study by Rex and colleagues

published in *Gastroenterology* in 2005 examined the safety of nurse-administered propofol for endoscopy in over 36,000 patients at three centers. One center was essentially a community hospital with community physicians, rather than a tertiary referral or teaching center, and therefore its experience was more applicable to general use. In the total cohort of over 36,000 patients, none needed endotracheal intubation. There were no deaths or injuries. Assisted, or mask-bag, ventilation was rarely needed, comparable to more traditional forms of sedation. Fewer than 1 in 1,000 cases in the three centers required a brief period of assisted ventilation.

Collectively, in all the studies that have examined administration of propofol for endoscopy by nonanesthesiologists, whether by nurses or physicians, over 80,000 procedures have been evaluated; not a single patient has required endotracheal intubation. There have been no procedure-related deaths. Some authors suggest that propofol may be safer than traditional benzodiazepine and narcotic combinations for endoscopy, although trials directly comparing the two methods head-to-head have not been performed.

**G&H** With all of these safety data available, why is there still concern about nonanesthesiologist propofol use within the community?

**MB** There will always be resistance to bringing what is really a drug for general anesthesia into a setting where it is given by people who are not trained in the care of deeper sedation. The data on propofol are derived from studies designed and performed by gastroenterologists, which may potentially bias the results. I think there were legitimate concerns in the past about the safety of propofol in this setting. I suspect that ongoing concerns may relate to the lack of strict guidelines for appropriate training of nonanesthesiologists who may administer the drug. The American College of Gastroenterology (ACG) has suggested guidelines but none have been formalized. In a 2004 survey of US gastroenterologists, 17% reported using propofol and 43% said that they planned to use it in the following year. In the survey population, propofol was almost always administered by an anesthesiologist. As the gastroenterologist and anesthesiologist bill separately for their services, anesthesiologist-assisted endoscopy is an expensive proposition.

**G&H** What kinds of standardized training could be put in place for nurses to be formally certified for propofol administration?

**MB** It has been suggested that nurses or physicians who give propofol for conscious sedation undergo independent courses for propofol administration as well as undertaking

advanced cardiac life support (ACLS) training. Hospitals grant the privilege to use the drug but their requirements vary from institution to institution. Training for nurses is not yet formalized but several studies describe a range of training from a 2-week course looking at the pharmacology of the drug, airway management, and ACLS, to a 3-month course where nurses sit in with anesthesiologists and observe cases.

The proposed ACG guidelines for administration of propofol suggest that at least one person in the room have basic and advanced life support skills. There should be regular monitoring, as there generally is, via pulse oximetry, electrocardiography, and blood pressure monitoring. Equipment should be immediately available for airway management and resuscitation. Also, the person giving the drug should be dedicated to that task and to monitoring the patient, and not involved in the endoscopic procedure. These guidelines also suggest that someone in the room should be able to perform endotracheal intubation if necessary, but recent studies suggest that this is impractical and probably unnecessary. As noted above, in a collective experience of over 80,000 patients, none required endotracheal intubation. It would be very difficult or impossible for an individual to maintain his or her intubation skills with such infrequent need to use them.

**G&H** Is there a specific dosing regimen that can be applied to propofol sedation?

**MB** There is no specific dosing schedule. Propofol is generally given as a single agent via bolus administration, generally loading the patient with 40–50 mg, depending on their weight (0.5–1.0 mg/kg over 1–5 minutes). There is no official upper limit because the drug acts and wears off very quickly, so it is administered with cumulative dosing. In the literature, the typical total dose for endoscopy seems to be anywhere from 100 mg to 300 mg. There have been some reports of continuous infusion to a total of 100–200 mg/h, but most studies suggest that propofol is best given in bolus loads.

**G&H** Are there other procedures that could be put in place to help make propofol use safe in conscious sedation?

**MB** Studies have looked at capnography, which is a method to detect expired carbon dioxide using a device attached to the bite block. This could aid in quickly detecting respiratory difficulties. There is also a method called bispectral monitoring (BIS), which utilizes a continuous electroencephalogram (EEG) recording to measure the level of sedation.

A laryngeal mask device can help protect the airway during deeper sedation by providing a seal over the vocal

cords. No data are available about the use of this technique when propofol is being given for endoscopy.

### **G&H** How would the adoption of nonanesthesiologist administration of propofol affect per-procedure costs for endoscopy?

**MB** A 2002 study looked at the cost of having an extra gastroenterologist in the room—in addition to the endoscopist—whose job is solely to give the propofol and monitor the patient. The estimated cost for the extra physician in attendance was \$403 per patient. In their discussion, the authors speculated that there would be no additional cost if the sedation were given by a nurse, when compared to traditional sedation with midazolam. A cost of \$1,000 or more has been suggested when an anesthesiologist gives the drug.

None of the above takes into account the increased efficiency of the endoscopy unit, which, in theory, should improve because of quicker patient turnover with propofol. Nor does it factor in patient and physician satisfaction. Recovery would be faster and patients would require less postsurgical monitoring in terms of pulse oximetry and

blood pressure readings. This would allow more patients to move through the endoscopy unit in a given day and for them to leave more quickly after their procedures.

### **Suggested Reading**

Rex DK, Heuss LT, Walker JA, Qi R. Trained registered nurses/endoscopy teams can administer propofol safely for endoscopy. *Gastroenterology*. 2005;129:1384-1391.

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Rex DK, Overley C, Kinser K, et al. Safety of propofol administered by registered nurses with gastroenterologist supervision in 2000 endoscopic cases. *Am J Gastroenterol*. 2002;97:1159-1163.