

## **Factors to be considered regarding sedation for prolonged procedures**

### **What is prolonged sedation: a definition and introduction**

There is an escalation in the demand for procedures to be done outside the traditional operating theater in rooms and facilities. The demand for this will increase further in future, as medical insurance will also become increasingly aware of the safety and cost effectiveness of procedures done outside the traditional hospital setting. This may mean that procedures will be done which will take substantially longer as is currently the case. Some procedures usually done under general anaesthesia in hospitals will probably increasingly be done outside the operating room if we can prove that it is safe and effective.

A majority of the procedures will be done under moderate sedation and analgesia or conscious sedation. Some procedures may need deeper levels of sedation. This option is not acceptable in all countries in the world.

As sedation practitioners we will be faced with decisions as to how long can a patient be kept safely under sedation outside the operating theater. What are the clinical implications and risks involved in prolonged sedation? How should we monitor the patients. In effect how are we going to sedate these patients and what mechanisms are we going to put in place to make our patients safe. Are there risks involved in prolonged sedation. There will be a substantial number of factors we will need to take into consideration.

Other factors i.e., type of surgery may also influence our definition of prolonged sedation. Can we compare sedation for "minor" surgery with sedation for plastic procedures as far as the length of the sedation is concerned. Dental surgery could probably be labeled as minor surgery whereas plastic surgery could be labeled as major surgery because of the prolonged procedures that may affect haemodynamic parameters.

There is no guidance for sedation practitioners as to what do we mean by prolonged sedation. There are no sedation guidelines as to our approach and no definition. If we accept that only ASA 1 and 11 patients qualify for sedation outside the operating theater then it is probably safe to say that it is not the sedation that will cause complications but the duration of the

procedure. But even with this argument we have questions. How safe is it to do the fragile ASA 11 patients e.g. a hypertensive patient who is controlled according to our definition. Can we expose this sort of patient to the fluid shifts that we get with prolonged procedures. It is probably fair to use some of the recommendations for longer procedures during anaesthesia and apply that to sedation practice.

Sedation experts are of the opinion that any sedation procedure lasting more than 4 hours should be defined as prolonged sedation. If any procedure will last longer than 4 hours then it is probably best that it be staged into two different procedures. But is this approach practical. Maybe in the end if a procedure is going to last for 8 hours and there is the possibility of adverse events, it is best to do it in-hospital under general anaesthesia.

This article will try and address the possible risks, what we can do to prevent complications, which drugs should be the safest for use, and how to approach the patients for prolonged sedation.

There are no guidelines available for prolonged sedation, so the aim is to give some guidance with this document.

## **Are there risks with prolonged sedation**

As a general statement we can say that,

- The majority of sedation adverse events are related to respiratory depression. This already gives an indication of a possible complication with prolonged sedation where we use combinations of drugs that work synergistically.  
Airway obstruction can occur with resultant hypoxaemia that is an adverse event we do not want. Airway preservation is taken from self-control by the patient to dependence on the expertise and presence at all times of the sedation practitioner.
- The majority of poor outcomes related to sedation practice are due to "taking short cuts", rule violation, and insufficient skills and knowledge of the sedation practitioner. This is often called the human factor.
- We need information regarding the procedure not only from the patient but also from the surgeon: indications and also the urgency.
- Information to and from the patient remains crucial components of safe sedation practice.

What would the patient safety issues then be during prolonged sedation. In answering these questions we can relate to possible risks during sedation.

- The importance of respiratory depression in sedation adverse events i.e., the drugs we administer.
- The different levels of sedation we practice. Deeper levels of sedation have implications for patient safety; the deeper the level of sedation the higher the incidence of adverse events.
- Adherence to Sedation Guidelines for sedation and analgesia. The essential components required to conduct safe sedation and analgesia are in the sedation guidelines i.e., assessment, monitoring, documentation, drug administration, team support.
- The importance of a systematic approach to sedation and analgesia that promotes safety and efficacy, a structure, a vision, a plan; all the things you need to do before you start with administration of drugs.

At this stage we can probably say,

- Available sedation techniques are effective and safe in the hands of the trained sedation practitioner.
- Adverse events are seen even with trained, experienced practitioners. If the patients are not managed well, sedation can progress to poor outcomes or even death.
- Safety will only be optimised if practitioners use defined methods of sedation for which they have received formal training, including the skills required to rescue patients when it becomes necessary.
- We need to define competencies, training and assessment required for the safe and appropriate use of sedation.

As said it is probably fair to use some of the recommendations for longer procedures during anaesthesia and apply that to sedation practice. The following quotes are worth looking at,

- "Of course many plastic surgery patients are in good health, and therefore represent lower anaesthetic risks. But in any case general anaesthesia risks (prolonged sedation) should not be discounted".
- "An analysis of numerous studies shows that the duration of anaesthesia is an independent risk factor for morbidity and mortality".

John Giles once said, "The problem is not simply the time taken to perform the operation, but the period during which the patient is subjected to the influence of depressant drugs". "This is the reason why surgeons have done staged operations in the past". (Lecture Dr Harry Shields, University of Toronto, 1964).

From the above, and other anaesthetic studies, one can conclude that the risk of postoperative mortality and morbidity correlates significantly with the duration of general anaesthesia (sedation).

There seems to be an increase in the incidence of relatively minor complications, such as postoperative nausea and vomiting, but also more significant risks i.e., loss of cognitive function, infection, thrombosis, hypothermia, and even mortality.

An important question to answer for us when trying to define risks is what are the areas of concern. This we will address as we proceed with the articles on prolonged sedation. This will include,

- Inadequate pre-sedation evaluation and assessment. A patient must be seen and examined before any sedation procedure. A focused airway examination must be done. One cannot simply arrive, and this especially so for a prolonged sedation, and do a sedation procedure without a comprehensive knowledge of the medical history of the patient, and an evaluation of all factors concerned. It may be necessary to do special investigations. This approach is called "to have a sedation plan" before proceeding with the procedure. All patients presenting for surgery must undergo adequate preoperative evaluation.
- Assessment of the 'high risk' surgical patient should quantify the risk of an adverse outcome for each individual. This should be made explicit to the patient, clearly documented, and used to stratify patients to receive an appropriate level of perioperative (and postoperative) care. In instances where a surgical procedure presents a substantial risk of short-term mortality or severe morbidity (like possible prolonged sedation), then judicious decision-making is required about whether to proceed to surgery at all outside the traditional operating theater. It is necessary to inform the patient about the possible risks involved in prolonged sedation.
- Inadequate monitoring of patient during the sedation i.e., electronic and clinical monitoring of the patient. The patient cannot be left alone at any period of time during the operation.

- Excessive doses of drugs to patient. The sedation practitioner needs to understand the pharmacokinetics and pharmacodynamics of sedative and analgesic drugs. The issue of context-sensitive half-times must be understood in the selection of the right drug as some drugs may accumulate over time which may lead to prolonged recovery (to be discussed later in detail).
- Titration to effect is the way to go when giving intravenous drugs to patients: it eliminates guess work!
- It is especially important not to overdose the elderly and possible frail patients. Often only small doses of drugs are all that is necessary to keep the patient comfortable and safe especially if there is adequate analgesia because of the use of local anaesthetic agents.
- Sedation practitioners must be aware of implicit risks in the use of drugs i.e., synergism. Drugs working at different receptor sites are at risk for synergism.

As sedation practitioners I believe we should ask ourselves four questions before we administer drugs; what do I want from the drug i.e., if only a sedative effect is needed we don't need more than a sedative; what is the side-effect profile of the drug; how quick is the offset of the drug, and is there a possible reversal agent for the drug(s) I am using available where I do the sedation.

It must be remembered that the use of flumazenil, a benzodiazepine antagonist, especially with the use of excessive doses of benzodiazepines for prolonged sedation, may place the patient at risk because of the short half-life of flumazenil; patients may re-sedate after leaving the facility after sedation.

- Training of sedation practitioners. Prolonged sedation means combinations of drugs will be used. This means advanced sedation techniques. Few Universities offer accredited training in advanced sedation techniques. Sedation guidelines acknowledge the importance of training in specific sedation techniques.

An area of great concern is the use of local anaesthetic (LA) agents for prolonged procedures. It is crucial to recognize, treat, and be aware of the possibility of LA toxicity. Some of the plastic procedures done under moderate or conscious sedation will need a significant dose of LA agents for analgesia. The clinical recognizable effects are concentration dependent.

The use of tumescent infiltration is widely used and has been proven safe when used with care. It is also being used in many different surgical procedures. It is commonly prepared by adding adrenaline, lignocaine and sodium bicarbonate to saline<sup>1</sup>. Lignocaine doses of up to 55mg/kg in tumescent infiltration have been used without reaching toxic plasma levels<sup>2</sup>. Various different local anaesthetic solutions that use other local anaesthetic agents are also used for local infiltration.

Whatever local anaesthetic solutions are used, the patients must be monitored closely for local anaesthetic toxicity. Symptoms and signs of LA toxicity may include numbness of the tongue, a metallic taste, restlessness (often sedation practitioners may see this as a sign of under sedation and administer more sedative/analgesic drugs), vertigo, tinnitus, slurred speech, collapse, and convulsions.

In the patient with suspected LA toxicity, the initial step is stabilization of potential threats to life. Attention to impending airway compromise, significant hypotension, dysrhythmias, and seizures takes precedence. Once other possible etiologies of the patient's new symptoms have been excluded, management of the specific symptoms can begin.

Hypoxemia and metabolic acidosis may potentiate the cardiovascular toxicity of LA agents. Early control of seizures and aggressive airway management to treat hypoxemia and acidosis may prevent cardiac arrest. Use of sodium bicarbonate may be considered to treat severe acidosis. Cardiac arrest due to LA toxicity is a rare but well recognized complication that may occur in cases of large overdose, especially those involving inadvertent intravascular injection.

These patients have a favourable prognosis if circulation can be restored before hypoxemic injury occurs. Increasing evidence suggests that the intravenous (IV) infusion of lipid emulsions can reverse the cardiac and

---

neurologic effects of LA toxicity. Studies in animal models and multiple case reports in human patients have shown favourable results. Some case reports support the early use of lipid emulsion at the first sign of arrhythmia, prolonged seizure activity, or rapid progression of toxic manifestations in patients with suspected LA toxicity.

It is rare but possible that LA may provoke an allergic or hematologic reaction. Local ischemic or nerve toxicities may occur, particularly in the extremities with prolonged anaesthesia/sedation or use of agents containing epinephrine.

Suspected nerve damage should prompt neurologic consultation for urgent peripheral nerve studies. If vascular compromise, such as limb ischemia, is suspected, consult a vascular surgeon immediately.

Finally, the prevention of local anesthetic toxicity should always be the primary consideration. Although all adverse reactions cannot be anticipated, complications can be minimized by strict adherence to the guidelines of LA dosing, identification of patients at increased risk, and avoidance of unintentional intravascular injection.

It is necessary to remember that LA may also cause respiratory compromise.

What then about the availability and use of Intralipid®. Intralipid® is usually not kept as an “emergency drug” for out of hospital procedures. With prolonged sedation it should be considered to have Intralipid® 20% (20% I.V. Fat Emulsion) available for treatment of any early signs of LA toxicity.

There is an interesting article on “Lipid rescue: does the sink hold water?”<sup>3</sup>. Everybody involved (including sedation practitioners) in the administration of significant doses of local anaesthetic agents should read this. It is claimed that the first reports of successful use of intravenous lipid emulsion (ILE) for local anaesthetic toxicity came from the laboratory of Guy Weinberg in 1998<sup>4</sup>.

New researchers have reported of the potential use of ILE for rescue in animal models for calcium channel blockers, tricyclic antidepressants<sup>5</sup>, antipsychotics<sup>6</sup>, and also anti-arrhythmic drugs. This is something very significant for us as sedation practitioners to take note of. The WHO has already predicted that depression will be the second biggest cause of morbidity by 2020. More patients will be on antidepressants with implications for us as sedation practitioners.

## Conclusion

We do not have all the answers regarding the use of ILE for LA toxicity. A clinical recommendation is that the clinician must continue with immediate advanced life support, including the use of adrenaline, and immediate use of ILE in LA cardio toxicity. It seems clear that the use of ILE has a beneficial role in the treatment of cardio toxicity from lipophilic LA overdose.

## References

1. Hausman LM. Advances in office-based anesthesia. *Current Opinion Anaesthesiology* 2003; 16: 421 – 424.
2. Ostad A, Kageyama N, Moy RL. Tumescence anesthesia with lidocaine dose of 55mg/kg is safe for liposuction. *Dermatology and Surgery* 1996; 22: 921 – 923.
3. Harvey M, Gave G. Lipid rescue: does the sink hold water? And other controversies. *BJA* 2014; 112 (4): 622 – 625.
4. Weinberg G, VadeBoncouer T, Ramaraju G et al. Pretreatment or resuscitation with a lipid infusion shifts the dose-response to bupivacaine-induced asystole in rats. *Anesthesiology* 1998; 88: 1071 – 1075.
5. Bania T, Chu J. Hemodynamic effect of intralipid in amitriptyline toxicity. *Acad Emerg Med* 2006; 13 (Supl. 1): 117.
6. Krieglstein J, Meffert A, Niemeyer D. Influence of emulsified fat on chlorpromazine availability in rabbit blood. *Experientia* 1974; 15: 924 – 926.