

Sedation and the VCUG

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A voiding cystourethrogram is frequently a stressful procedure for pediatric patients, parents and occasionally the radiology staff. I believe most radiologists would agree with that statement but if doubt exists, there is research that supports it [1, 2].

I have been a pediatric radiologist for more than 25 years. During the first half of my career I never offered sedation to patients undergoing voiding cystourethrography. The occasional patient had the procedure cancelled due to inability to cooperate or inability of our staff to safely restrain the patient. The occasional referring physician ordered pre-procedural sedating medications or performed cystography under general anesthesia for patients they knew could not tolerate a routine VCUG while awake. I was taught during residency and fellowship that the patient needs to be conscious for voiding and that the procedure is not painful. I believed it. I took pride in my ability to calmly wait and offer reassurance to parents that though their child was crying and screaming the child was not really in pain and that it would be over in a few minutes. Sometimes, those minutes seemed like forever to everyone in the room.

During those years no drugs were known to be safe and effective and readily available for administering in a radiology department. There was minimal nursing presence in most radiology departments, with the exception of those used for sedation for CT or interventional procedures. The times, however, have changed. Some things we were taught in medical

school or postgraduate training turn out not to be true. A new procedure, further knowledge or a new drug changes the way we practice medicine. In recent years, far more emphasis has been placed on alleviating patient pain and discomfort. Nurses are required to routinely assess and document patients' level of pain. Physicians are able to consult with other physicians specialty-trained in pain medicine and palliative care. Sedation and pain relief are being offered for other minor procedures in hospitals such as intravenous access, lumbar punctures and suture placement. Radiology departments need to make similar changes as medical care evolves.

Current knowledge in pain management suggests that pain associated with medical procedures should be avoided when possible and that fear and anxiety will intensify the perception of pain. Pre-operative anxiety in young children is associated with a more painful and difficult post-operative course [3]. I see fear and anxiety daily when performing VCUGs. In addition, the memory of previous painful experiences has effects on pain experience during subsequent procedures. The amount of pain and anxiety experienced during a child's second visit to the dentist is best predicted by the amount of anxiety and pain experienced the first time [4]. About one-third of VCUG patients will have vesicoureteral reflux and will need to have follow-up imaging studies or surgical procedures. Inadequate analgesia for initial procedures may diminish the effect of adequate analgesia in subsequent procedures. The level of effectiveness of topical anesthetics for intravenous catheter insertion can be partially predicted by the number of previous painful medical procedures experienced by the child [5, 6].

In the past physicians including radiologists tended to avoid the use of sedation for procedures thought to cause relatively little physical pain though there might have been large amounts of anxiety associated with them for children. The VCUG is a good example of such procedures, along

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with IV starts, lumbar punctures, minor dental procedures and suture placement. More recently attitudes have changed and knowledge has advanced such that effective and safe sedation can now be utilized for these minor medical procedures. Parents are aware of this and look to us to relieve their child's pain and distress during these procedures [7, 8].

Conscious sedation utilizing either midazolam or inhaled nitrous oxide has been shown to be safe and to reduce distress in children undergoing VCUG without compromising the procedure results. The patients achieve sedation but are awake and able to respond to questions and to void [8–12].

The ideal sedative has a non-painful route of administration, predictable rapid onset with a duration of action suitable for the procedure and lack of adverse effects. Both midazolam and nitrous oxide meet these criteria to varying degrees. I have used both extensively and favor nitrous oxide as the first choice for VCUG sedation and reserve midazolam as a second choice. There are certainly obstacles to establishing a nurse-administered nitrous oxide program, which include obtaining the support of nursing and anesthesia. However, the benefits of nitrous oxide make it worthwhile. At the three facilities of my hospital system, nitrous oxide is administered by a trained sedation nurse in the fluoroscopic room after a pre-sedation evaluation. The sedation is ordered by a credentialed physician who may not be present in the procedure room. The patient is monitored by nursing staff during the procedure and discharged from the fluoroscopy room.

Nitrous oxide provides anxiolysis, amnesia and mild analgesia. Midazolam does not provide any analgesia though it does provide anxiolysis and amnesia. The onset of action is 30–60 s for nitrous oxide and termination of its effects is in a similar time frame so that the patient is discharged immediately after the procedure. The nitrous oxide can be titrated up and down during the procedure such that it can be administered during the catheterization and then turned down or off if the child is calm during the bladder filling phase, and then restarted if the child experiences discomfort from a full bladder and difficulty voiding. Oral midazolam has a 20- to 30-min onset of action, making the scheduling of a busy fluoroscopic room more difficult. There is also a more prolonged duration of action for midazolam, requiring the child to remain for observation after the VCUG. In my own experience the degree of effective sedation is more variable with midazolam than nitrous oxide. In addition midazolam results in significant behavioral side effects including anger and inconsolability in up to 12% of patients, usually in the post-procedural time. When this occurs it is problematic for the patient, family and staff [13]. In my experience, however, in such a situation, parents are still satisfied that the child received sedation for the VCUG in spite of the adverse effect. Both nitrous oxide and midazolam

are safe to administer in a radiology department with minimal cardiorespiratory effects. Both require involvement of nursing and monitoring of the patient. Nitrous oxide might be refused by patients who will not allow the mask to be held on their face. It is in these patients that I would recommend midazolam.

As in most areas of medicine, we are still in a learning phase regarding the sedating of patients for VCUG. I am offering sedation to more and more patients for VCUG and their parents seem grateful. This is because of increasing knowledge that patient distress is real and can affect future medical procedures. Parents want us to alleviate the child's distress during this procedure, and safe resources are available to me for sedation. In my department we currently sedate approximately 25% of VCUGs. Sedation is offered upon request of either the referring physician or parent. Not all children need to be sedated. Not all parents want their child to be sedated. But when non-pharmacological methods of calming a child do not work effectively, sedation should be available. Currently we do not routinely sedate children younger than 2 years. However, there is research suggesting that even newborns have a more prolonged effect from the pain and distress of medical procedures for which most practitioners currently don't offer sedation [14].

In summary, recent research in the area of pain medicine has revealed that high-anxiety and low-pain procedures such as a VCUG cause true distress to patients that can last beyond the time of the procedure. Parents are concerned and want us to alleviate this distress, and we have the capability of safely doing this.

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