Table of Contents

Airway

The McGrath Series 5 videolaryngoscope vs the Macintosh laryngoscope: a randomised, controlled trial in patients with a simulated difficult airway .........................................................3

Pain

Perioperative single dose systemic dexamethasone for postoperative pain: a meta-analysis of randomized controlled trials ..................6

Patient Safety

Patient-maintained propofol sedation using reaction time monitoring: a volunteer safety study .................................................9

Pediatric Anesthesia

Comparison of buccal and nasal dexmedetomidine premedication for pediatric patients .........................................................11

Pharmacology

A randomized controlled trial of dexmedetomidine for suspension laryngoscopy .................................................................14

Policy, Process, & Economics

A cost analysis of neuraxial anesthesia to facilitate external cephalic version for breech fetal presentation .................................17
Indicates Continuing Education Credit is available for this abstract and comment during the CE approval period.
Continuing Education Credit is available to individual subscribers on the Anesthesia Abstracts web site at www.AnesthesiaAbstracts.com.

New health information becomes available constantly. While we strive to provide accurate information, factual and typographical errors may occur. The authors, editors, publisher, and Lifelong Learning, LLC is/are not responsible for any errors or omissions in the information presented. We endeavor to provide accurate information helpful in your clinical practice. Remember, though, that there is a lot of information out there and we are only presenting some of it here. Also, the comments of contributors represent their personal views, colored by their knowledge, understanding, experience, and judgment which may differ from yours. Their comments are written without knowing details of the clinical situation in which you may apply the information. In the end, your clinical decisions should be based upon your best judgment for each specific patient situation. We do not accept responsibility for clinical decisions or outcomes.
Airway

THE McGrath Series 5 videolaryngoscope vs the Macintosh laryngoscope: a randomised, controlled trial in patients with a simulated difficult airway

Anaesthesia 2013;68:142-47
Taylor AM, Peck M, Launcelott S, Hung OR, Law A, MacQuarrie K, McKeen D, George RB, Ngan J

Abstract

Purpose The purpose of this study was to compare the laryngoscopic view with a McGrath series 5 videolaryngoscope to that with a Macintosh laryngoscope blade in a simulated difficult airway. A secondary aim was to compare the rates of successful intubation between the two devices.

Background Failure to secure the airway during tracheal intubation is associated with significant morbidity and mortality in trauma patients. Manual in-line stabilization is commonly used in this circumstance. However, in-line stabilization is associated with a poorer glottic view during direct laryngoscopy. A reduced view contributes to failed intubation. The McGrath Series 5 is an indirect videolaryngoscope which has an adjustable length, angulated, single-use blade. It provides a better laryngeal view than a Macintosh laryngoscope. The McGrath videolaryngoscope may provide a better glottic view during in-line stabilization, and thus may reduce the incidence of failed intubation in trauma patients.

Methodology This was a prospective, randomized clinical trial comparing the laryngoscopic view with the McGrath series 5 videolaryngoscope (size 3) and a Macintosh 3 laryngoscope blade in a simulated difficult airway using in-line stabilization. A total of 88 ASA 1-2 patients scheduled for elective surgery under general anesthesia were enrolled. Patients were excluded if they had a history of difficult airway or required awake intubation; if they had coronary artery disease or cervical spine instability; or if they were at risk for aspiration. A standardized induction was used in all patients with fentanyl, propofol, and rocuronium. Anesthesia was maintained with sevoflurane 2% to 4%. Neuromuscular blockade was confirmed with loss of train of four prior to laryngoscopy. Manual in-line stabilization of the cervical spine was applied by an experienced investigator.

Prior to intubation, a sealed envelope was opened with the subject's group assignment. Subjects in the McGrath group first underwent laryngoscopy with a Macintosh blade. The Cormack and Lehane grade view was recorded. The Macintosh blade was then removed and the McGrath videolaryngoscope was used to perform a second laryngoscopy and the grade view was again recorded; then the trachea intubated. In the Macintosh group the process was reversed. A styleted 7.0 mm endotracheal tube was used in female patients and a 7.5 mm ETT in male patients. Only one intubation attempt was allowed. No external manipulation of the airway was allowed. Intubation
failure was defined as inability to intubate due to difficulty viewing the glottis; intubation attempt > 60 seconds; oxygen desaturation; or if the anesthetist felt continuing intubation attempts were unsafe. If intubation failed the alternative airway device was used.

A Cormack and Lehane grade 1 or 2 view was defined as an “easy” intubation and a grade 3 or 4 as a “difficult” intubation. Statistical analysis was appropriate. A P < 0.05 was considered significant.

**Result**  
Demographics and airway assessment measures for the two groups were similar. The average age was 53 ± 14 years and BMI was 29 ± 6 kg/m². In the McGrath group 82% of subjects had a Mallampati class 1 or 2 compared to 93% in the Macintosh group (P = NS). Thyromental distance, mouth opening and jaw protrusion distances were similar in the two groups.

In the McGrath group all 44 subjects were successfully intubated on the first attempt. In the Macintosh group, only 26 of 44 subjects were successfully intubated (100% vs. 59%; P < 0.001). There were 18 failed intubations in the Macintosh group (41%). Time to intubation was longer in the McGrath group, 36 ± 20 sec vs. 22 ± 10 sec (P = 0.0001).

Comparison of Cormack and Lehane glottic view is presented in Figure 1. In the McGrath group, 100% of subjects were “easy” intubations, whereas only 53% of subjects in the Macintosh group were “easy” intubations (grade 1 or 2 view; P < 0.0001). In 66 of 88 subjects the McGrath videolaryngoscope improved the glottic view by 1 to 3 grades (P < 0.001; Figure 2).

**Conclusion**  
The McGrath Series 5 videolaryngoscope resulted in superior intubating conditions compared to a Macintosh blade when the neck was immobilized using in-line stabilization.
Comment

The approach to difficult airway management is rapidly changing. Video laryngoscopes are rapidly becoming the “go-to” devices when anesthesia providers are faced with a difficult airway. Investigators in this study demonstrated that the McGrath Series 5 videolaryngoscope had a higher success rate due to an improved glottic view compared to a Macintosh size-3 blade in a simulated difficult airway using in-line stabilization. The results in this study are consistent with other studies which found superior intubating conditions with the McGrath videolaryngoscope. In addition, metaanalysis findings demonstrate in anticipated or simulated difficult airways that indirect videolaryngoscopes are 3.5 times more likely to result in a grade 1 view compared to a ≥2 grade view (i.e., GlideScope).1

There still are several unanswered questions with indirect videolaryngoscopy. First, the predictors of difficult intubation may not necessarily apply when these devices are used. All the studies that examined predictors of difficult airway are based on direct laryngoscopy.3 Further studies are needed to identify predictors of difficult intubation when indirect devices are used. However, I think we should take a conservative approach and still use the current predictors of a difficult airway and plan accordingly. This means that anesthesia providers should do a thorough preoperative airway exam and become experts with indirect videolaryngoscopy. I encourage Anesthesia providers to attend difficult airway workshops and to review the 2013 update to the ASA Difficult Airway Algorithm.

Dennis Spence PhD, CRNA


The views expressed in this article are those of the author and do not reflect official policy or position of the Department of the Navy, the Department of Defense, the Uniformed Services University of the Health Sciences, or the United States Government.
Pain

PERIOPERATIVE SINGLE DOSE SYSTEMIC DEXAMETHASONE FOR POSTOPERATIVE PAIN: A META-ANALYSIS OF RANDOMIZED CONTROLLED TRIALS

Anesthesiology 2011;115:575-88
De Oliveira GS Jr, Almeida MD, Benzon HT, McCarthy RJ

Abstract

Purpose The purpose of this metaanalysis was to examine the effectiveness of dexamethasone as part of a regime to prevent postoperative pain. A secondary purpose was to identify the dose needed to contribute to analgesia and any side effects of that dose.

Background Postoperative pain is uncomfortable and can impede recovery. Multimodal analgesia is accepted as one of the most effective ways to minimize postoperative pain. Drugs such as ketamine, gabapentin, acetaminophen, and NSAIDs have been shown to reduce pain and/or opioid consumption when used as part of multimodal analgesia. While most commonly used as part of a strategy to prevent PONV, dexamethasone may also offer benefits as part of multimodal analgesia. The timing of dexamethasone administration may be important to achieve pain relieving effects as the onset of an IV dose is about 1 hour.

Methodology PubMed, the Cochrane Database, and Google Scholar were searched for randomized controlled trials of dexamethasone and postoperative pain. Studies included looked at single doses of dexamethasone compared to a control group. The reference lists in these studies were also examined to find additional studies not located with the search described above. The dose of dexamethasone, time of administration, number of patients in the study groups, patient weight, type of surgery, pain scores, and opioid use were extracted from selected studies. Three different dose ranges of dexamethasone were studied:

- 0.10 mg/kg or less (low dose)
- 0.11 mg/kg to 0.2 mg/kg (middle dose)
- more than 0.2 mg/kg (high dose)

When patient weight was not reported it was assumed to be 70 kg. When pain was reported as a visual analog scale it was “converted” [emphasis added] into a 0 - 10 numeric rating scale. “Early” pain was defined as pain within the first 4 hours postoperatively. “Late” pain was assessed at 24 hours. Opioids administered were converted into morphine equivalents for reporting. Adverse events associated with dexamethasone administration were also noted; including wound, urinary tract, or pulmonary infection; hyperglycemia; and delayed wound healing.
Result  Following the literature search, 38 studies met inclusion criteria. Of these, 14 were excluded because needed data could not be extracted; leaving 24 studies in the metaanalysis. These studies included 2,751 patients.

Early Pain 0 - 4 hours Postoperatively
Overall (all three dose ranges), dexamethasone improved early pain at rest slightly compared to controls. Low dose dexamethasone provided no improvement in pain relief. Middle dose dexamethasone improved pain relief slightly. High dose dexamethasone was no better than the middle dose.

Overall, dexamethasone improved early pain with movement noticeably; and to a greater extent and with less variability than pain at rest. Low dose dexamethasone improvement pain during movement compared to controls. As the dose increased to middle dose and high dose the improvement in pain relief during movement grew larger compared to controls.

Late Pain 24 hours Postoperatively  Overall (all three dose ranges), dexamethasone improved late pain at rest to a greater degree than it improved early pain at rest. Both small dose and middle dose dexamethasone produced a similar reduction in late pain. High dose dexamethasone was no better than middle dose.
Overall, dexamethasone improved late pain with movement about as well as late pain at rest. Both low dose and middle dose dexamethasone improved late pain with movement to about the same degree. High dose dexamethasone, however, improved late pain with movement about 6 times better than low dose or middle dose dexamethasone ($P \leq 0.004$).

In studies of late pain, dexamethasone was sometimes administered preoperatively and other times intraoperatively. Late pain relief at rest was significantly better when dexamethasone was administered preoperatively ($P < 0.001$).

Opioid Consumption  Low dose dexamethasone had no effect on postoperative opioid consumption. Both middle and high dose dexamethasone decreased opioid consumption compared to controls and compared to low dose dexamethasone ($P < 0.003$). The opioid sparing effect of middle dose dexamethasone was much greater when the dexamethasone was administered preoperatively ($P = 0.1$).

There were no differences in the incidence of wound, urinary tract, or pulmonary infection; hyperglycemia; or delayed wound healing in any dexamethasone patients.

Conclusion  Dexamethasone doses of 0.1 mg/kg or less had little, if any, effect on early pain, late pain, or opioid consumption. Dexamethasone 0.11 mg/kg to 0.2 mg/kg reduced both early and late pain somewhat and had a definite opioid sparing effect. Doses of dexamethasone greater than 0.2 mg/kg did not
offer much more than middle dose
dexamethasone for relief of early or late pain at
rest but did further improve pain with movement.
Similarly, high dose dexamethasone had an
opioid sparing effect. Preoperative dosing resulted
in greater pain relief and opioid sparing effects
than intraoperative dosing. A single dose of
dexamethasone did not result in adverse effects
such as wound infection or poor wound healing.
Dexamethasone 0.11 mg/kg to 0.2 mg/kg was
safe and effective as part of a multimodal pain
relief strategy.

Comment
Time was, we didn’t understand how helpful
dexamethasone could be in preventing PONV.
When we did come to understand it, we used it
sparingly for some time over concerns that
steroids would prevent all the wounds from
healing and do other bad things. Now we’re
beginning to learn how Decadron can be part of
a multimodal pain relief strategy.

This study was a metaanalysis, a study of studies.
Because of this, the investigators didn’t always
have all the data they needed available in the
studies they examined. In some cases they were
able to get the data by contacting the authors of
the original study. In other cases they did their
best to read the data from figures. And,
sometimes they simply couldn’t obtain it. Some of
the data they did have was collected so differently
from study to study that the results of the original
studies were very different from each other. Thus,
a few studies that collected data one way, may
have biased the overall results of the
metaanalysis. Overall, some of the data was only
an estimate of the “real” data, and this makes me
want to see a more significant result before I
believe what this study says.

Despite the limitations of this study, here is what I
feel comfortable concluding after examining it
carefully.
1. Doses of 0.1 mg/kg or less are great for
PONV but don’t help with pain relief.
2. Doses of about 0.15 mg/kg cover PONV and
reduce postoperative pain and opioid
demand.
3. Doses above 0.2 mg/kg don’t get you any
more pain relief. An exception may be
greater pain relief with movement (e.g. early
ambulation in total joint patients?).
4. Giving dexamethasone preoperatively improves
pain relief considerably more than giving it
after induction. (Optimally 1-2 hours before
incision.)
5. In general, we need not worry about side
effects with 0.15 mg/kg any more than we do
with current PONV doses.

So my overall recommendation is to consider
about 12 mg dexamethasone (± 0.15 mg/kg) for
cases where more postoperative analgesia is
needed. It should also be considered when it can
be substituted for other drugs, such as opioids,
thus reducing side effects. You may want to
increase the dose a bit if the surgical site is going
to be subject to motion early in the postoperative
period.

Michael A. Fiedler, PhD, CRNA
Patient Safety

Patient-Maintained Propofol Sedation Using Reaction Time Monitoring: A Volunteer Safety Study

Anaesthesia 2013;68:154–158

Abstract

Purpose The purpose of this study was to examine whether or not adding reaction time monitoring to automated propofol sedation would prevent over-sedation in volunteers.

Background Patient-maintained propofol sedation is faster acting and wears off faster than sedation with midazolam. Patient maintained propofol sedation using an automated infusion system similar to PCA is designed to allow patients to control their level of sedation while preventing over-sedation. Unlike PCA, for sedation, in place of a lock out period, additional medication administration is prevented until the patient’s plasma concentration falls to a point near a predetermined level. However, in previous studies of these systems, some subjects achieved unsafe levels of sedation with arterial oxygen desaturation. Before such a system may be considered safe in the absence of an anesthetist, it must be modified to prevent intentional over-sedation.

Methodology In previous studies, subjects were required to press their demand button twice in a row to administer more propofol. This was not an adequate safeguard against over-sedation. For this study, the automated propofol sedation device was modified to include reaction-time monitoring. As the effect-site concentration of propofol (and thus depth of sedation) increases, reaction time increases as well. Reaction time was measured as the time between vibration of the demand button handset and pressing the demand button. When reaction time was being assessed a button press did not trigger delivery of a demand propofol dose. Pressing the demand button twice in a row was still required to deliver more propofol, but only at a time when the handset had not vibrated first. As reaction times increased, at first the system responded to prevent deepening sedation. As reaction times continued to increase the system responded to reduce the effect-site concentration of propofol.

Twenty healthy ASA class 1 or 2 volunteers were fasted for 6 hours. An IV was started, monitoring was applied, and baseline data collected. Subjects had been instructed to purposefully attempt to over-sedate themselves. An anesthetist was present continuously during sedation. The Observer’s Assessment of Alertness/Sedation (OAAS) was recorded every minute to assess the depth of sedation. Patient-maintained propofol sedation was begun at a target effect-site concentration of 1 µg/mL. When allowed, demand doses triggered by the subject increased the target effect-site concentration by 0.2 µg/mL. Supplemental oxygen was not administered. Reaction time was assessed by the response to handset vibration every 1 minute throughout sedation. Baseline reaction times were averaged before sedation. During sedation, the patient-maintained propofol sedation system reacted to increased time between handset vibration and the push of the button as shown in table 1.
The study included 12 men and 8 women with an average age of 36 years and average weight of 74 kg. The average maximum propofol effect-site concentration was 1.7 µg/mL or 70% higher than the starting concentration (range was 1.2 to 2.4 µg/mL maximum). All subjects continued to respond to verbal command throughout the sedation period. The deepest sedation achieved corresponded to an OAAS score of 3 (“Responds only after name is called loudly and/or repeatedly”). Half the subjects reached this level of sedation. The average minimum oxygen saturation on room air was 97%. Satisfaction was high, with all but one subject saying they were “happy” with the sedation and would use it in the future.

Conclusion
Reaction time monitoring improved the safety of automated patient-maintained propofol sedation in volunteers. No subject succeeded in over-sedating themselves.

Comment
I try to be analytical, but I have a hard time imagining an automated system to sedate patients with propofol that is both effective and safe. I acknowledge that bias. This study apparently grew out of the desire of dentists to sedate their patients with propofol. I admit; that scares me. Having said that, let us first agree that if these subjects were able to respond to command verbally and their sats averaged 97% on room air while no procedure was taking place their sedation was very, very light. I’m not certain how relevant the “safety” of such sedation might be. If such light sedation is sufficient, is sedation really needed at all? Is propofol better than small doses of midazolam or just letting the patient listen to their favorite music through headphones?

The whole idea behind automated sedation devices is to enable the administration of propofol without an anesthesia provider. Anesthesia providers are needed when sedation is moderately deep or very deep; bordering on general anesthesia. Devices like the one used in this study don’t seem to have potential for those uses, and they can’t manage the airway. But, reality check, an automated propofol sedation device called the Sedasys is before the FDA right now seeking approval for sale in the USA. This despite earlier being turned down by the FDA because airway problems developed during sedation with the device. This is why anesthesia providers should be involved in regulatory and policy discussions.

Michael A. Fiedler, PhD, CRNA

Observer’s Assessment of Alertness/Sedation Scale

<table>
<thead>
<tr>
<th>Response</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Responds readily to name spoken in normal tone</td>
<td>5</td>
</tr>
<tr>
<td>Lethargic response to name spoken in normal tone</td>
<td>4</td>
</tr>
<tr>
<td>Responds only after name is called loudly and/or repeatedly</td>
<td>3</td>
</tr>
<tr>
<td>Responds only after mild prodding or shaking</td>
<td>2</td>
</tr>
<tr>
<td>Responds purposefully only after painful trapezius squeeze</td>
<td>1</td>
</tr>
<tr>
<td>No response after painful trapezius squeeze</td>
<td>0</td>
</tr>
</tbody>
</table>
COMPARISON OF BUCCAL AND NASAL DEXMEDETOMIDINE PREMEDICATION FOR PEDIATRIC PATIENTS

Paediatr Anaesth 2013;23:134-138
Cimen ZS, Hanci A, Sivrikaya GU, Kilnc LT, Erol MK

Abstract

Purpose The purpose of this study was to compare intranasal and buccal administration of 1 µg/kg dexmedetomidine in pediatric patients 2-6 years old undergoing minor elective surgery.

Background Surgery can be a traumatic experience for pediatric patients. Many times effective premedication is needed to facilitate separation from parents and a smooth induction of general anesthesia. Intranasal and oral transmucosal administration of sedatives is an easy way of administering sedation while avoiding the pain of intramuscular injections and problems with first pass-metabolism after oral administration.

Alpha-2 adrenergic agonists, such as dexmedetomidine, have a more selective action and a shorter half-life than currently used premedications. After oral buccal administration of dexmedetomidine the bioavailability is as high as 82% and is 65% after intranasal administration in adults. In adults, following administration of 84 µg of intranasal dexmedetomidine the peak plasma concentration was reached in 38 minutes (range 15-60 min.). Following intranasal administration of 1 µg/kg and 1.5 µg/kg dexmedetomidine in adults, significant sedation occurred at 45 to 60 minutes, and peak sedation at 90 to 105 minutes. Buccal and intranasal administration of dexmedetomidine have both been found to be an effective premedication in pediatric patients. However, there has not been a comparative study of intranasal and buccal administration of dexmedetomidine for premedication in pediatric patients.

Methodology This was a prospective, randomized, double blind, study of pediatric patients, aged 2 to 6 years undergoing elective surgery at a hospital in Turkey. Subjects received dexmedetomidine 1 µg/kg orally or intranasally for premedication 45 minutes before induction of anesthesia. Vital signs and the level of sedation were evaluated every 10 minutes after administration of dexmedetomidine. Level of sedation was assessed using the Observer Assessment of Alertness and Sedation Scale (OAA/S). A sedation score of ≤4 was considered satisfactory. A 4-point likert scale was used to measure parental separation anxiety and mask acceptance. A score of 3 or 4 was considered a satisfactory parental separation and mask acceptance score.

The primary aim of the study was to compare sedation score at the time of parental separation. The secondary aims were to compare anxiety at parental separation, quality of mask induction, as well as heart rate, respiratory rate, and S\textsubscript{p}O\textsubscript{2} changes during the sedation. Investigators hypothesized they would find a
30% difference in satisfactory sedation scores between the two routes of dexmedetomidine administration. A P < 0.05 was considered significant.

Result A total of 62 pediatric patients were included in the study (31 per group). No significant differences were found in baseline demographics or vital signs between the two groups. Sedation scores were significantly lower at every time point in the intranasal dexmedetomidine group compared to the buccal group (P < 0.05). At 45 minutes satisfactory sedation was achieved in 100% of patients in the intranasal group and in 51% of the buccal group (OAA/S score ≤4; P <0.0001). The proportion of patients with satisfactory parental separation, mask acceptance, and sedation score at parental separation, was significantly higher in the intranasal group (Figure 1; P <0.001). Drug acceptance was high in both groups (intranasal group = 94%, buccal group = 100%, P = NS). No complications occurred in either group.

Conclusion Intranasal administration of dexmedetomidine 1 µg/kg was a more effective sedative premedication than 1 µg/kg buccal dexmedetomidine in pediatric patients aged 2-6 years old undergoing elective surgery.

Comment I think it is important whenever possible to provide sedation and anxiolysis for pediatric patients undergoing elective surgery. We do this routinely for adults, but sedative use in pediatric patients varies from provider to provider and facility to facility. There are many reasons for this; not the least of which is we do not routinely start IVs on children until after an inhalation induction. Some providers may not think sedation is needed, and some may be worried it will delay emergence and discharge times. Finding an effective premedication that avoids painful injections and has a relatively rapid onset and short to moderate duration would be ideal. It should also not delay emergence or discharge. Unfortunately, I do not think any of the current medications and the routes used meet these goals.

Figure 1. Comparisons of Separation, Mask Acceptance, and Sedation Scores

Note: Compared intranasal vs. buccal administration of 1 µg/kg dexmedetomidine in pediatric patients aged 2-6 years old.
In this study, the investigators clearly demonstrated that 1 µg/kg intranasal dexmedetomidine was significantly more effective in providing satisfactory sedation than buccal administration in pediatric patients aged 2-6 years old. I would have expected better sedation with the buccal route; given it has higher bioavailability than the intranasal route. I suspect many children swallowed the drug after buccal administration and thus actually decreased the bioavailability of the drug. Previous investigations that have examined the pharmacokinetics of intranasal dexmedetomidine have been done in adults, and thus the pharmacokinetic data may not apply to pediatric patients.¹ I suspect if you wanted to use the buccal route to administer dexmedetomidine to a child then you may have to use a larger dose. Previous studies have examined buccal doses of 3 to 4 µg/kg.²

If you are going to use intranasal or buccal dexmedetomidine then you probably need to administer it approximately 45-60 minutes before induction of anesthesia. This can be a little challenging, especially in a busy operating room. Anesthesia providers should examine local policies and procedures and determine how they can safely and effectively administer sedation to pediatric patients.

Dennis Spence, PhD, CRNA


The views expressed in this article are those of the author and do not reflect official policy or position of the Department of the Navy, the Department of Defense, the Uniformed Services University of the Health Sciences, or the United States Government.
Pharmacology

A randomized controlled trial of dexmedetomidine for suspension laryngoscopy

Anaesthesia 2013;68:60-66
Liu C, Zhang Y, She S, Xu L, Ruan X

Abstract

Purpose The purpose of this study was to assess clinical responses to suspension laryngoscopy using varying pre-induction single doses of dexmedetomidine.

Background The sympathetic response to suspension laryngoscopy is typically pronounced; tachycardia and hypertension are common. Different drugs have been used (e.g. beta blockers) to minimize these responses, however they reduce the utility of assessing vital signs to indicate anesthetic depth. Dexmedetomidine is an alpha$_2$ receptor agonist that causes a reduction in sympathetic outflow. Additionally it has sedative, opioid sparing, and analgesic properties. Its use as an anesthetic adjunct may be beneficial during suspension laryngoscopy, however, due to its sedative properties, recovery may be prolonged, especially if administered by infusion. A single dose of dexmedetomidine may therefore be a solution for use during suspension laryngoscopy.

Methodology This was a randomized, blinded, placebo controlled clinical trial comparing various single doses of dexmedetomidine to placebo during suspension laryngoscopy. Patients who met the inclusion criteria; 20-60 years of age, scheduled for elective suspension laryngoscopy, ASA physical status I or II; were randomized to one of four groups, as follows:

- **Group 1**: IV placebo infusion over 10 min (n=20)
- **Group 2**: dexmedetomidine 0.25 µg/kg over 10 min (n=20)
- **Group 3**: dexmedetomidine 0.5 µg/kg over 10 min (n=20)
- **Group 4**: dexmedetomidine 1.0 µg/kg over 10 min (n=20)

Each group began receiving their infusion 15 minutes prior to induction of a standardized TIVA general anesthetic. Propofol infusions started 15 minutes after the study drug was started. It was infused to a target plasma concentration of 2.5 µg/mL. The propofol was adjusted based on electroencephalography readings suggestive of adequate depth of anesthesia. A remifentanil infusion was also begun to achieve a target plasma concentration of 3.0 ng/mL. After the patient was unconscious, rocuronium was administered and the trachea intubated. The remifentanil infusion was titrated down to maintain the systolic BP within 25% of the preoperative value and a heart rate less than 90 bpm. When the operative laryngoscope was removed (procedure completed), both the propofol and remifentanil infusions were stopped, anticholinesterase/anticholinergic agents were administered, and patients were taken to the PACU with the ETT in place. Extubation took place in the PACU when criteria were met.

The following outcome variables were compared between the 4 groups:
1. Propofol and remifentanil required to maintain anesthetic depth
2. Hemodynamic response to intubation and extubation
3. Time from stopping the propofol and remifentanil infusions to return of adequate spontaneous ventilation
4. Time to return of consciousness
5. Time to extubation
6. Patient satisfaction

Result
There were no demographic differences between the four groups including duration of surgery/duration of anesthesia. In terms of the specific 4 outcome variables, the findings included:

1. Dexmedetomidine (all 3 doses) reduced the mean propofol infusion rate compared to placebo at intubation, the start of the surgical procedure, and completion of the procedure (P < 0.05). *(Exception: the 1 µg/kg group at intubation time only)*

2. Remifentanil infusion rates were reduced compared to placebo for all 3 doses of dexmedetomidine at the start of the surgical procedure and upon completion of the procedure (P < 0.05). *(Exception: the 0.25 µg/kg dexmedetomidine group.)*

3. Patient Satisfaction trended toward favoring the dexmedetomidine groups, but was not statistically significantly different than placebo.

4. The effects on time to spontaneous ventilation, time to consciousness, and time to extubation versus placebo are shown in Table 1.

Conclusion
A single 0.25, 0.5 or 1 µg/kg dose of dexmedetomidine administered over 10 minutes pre-induction, reduced the anesthetic requirements of propofol and remifentanil during suspension laryngoscopy. Mixed effects were observed when assessing both hemodynamic and recovery profiles after varying single doses of dexmedetomidine.

Comment
Dexmedetomidine is an alpha 2 receptor agonist which decreases sympathetic catecholamine release within the brain and increases vagal activity. It has sedative, anxiolytic, and analgesic properties (activation within locus ceruleus of the brain and alpha 2c receptor subtypes). As a result of its mechanism of action, part of its cardiovascular adverse effect profile includes bradycardia and hypotension. It is not, however, an antihypertensive. Dexmedetomidine can be an excellent adjunct to include in an anesthetic plan; especially when the risk of sympathetic stimulation can create unfavorable outcomes and sedation, anxiolysis, and analgesia are needed without respiratory depression. This can be especially advantageous during complex ENT procedures like suspension laryngoscopy.

<table>
<thead>
<tr>
<th>Table 1: Recovery Times by Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Ventilation*</td>
</tr>
<tr>
<td>Consciousness</td>
</tr>
<tr>
<td>Extubation*</td>
</tr>
</tbody>
</table>

Note: Dex = dexmedetomidine. * = highly statistically significant vs. placebo. Time in minutes. Placebo times are actual times from end of propofol/remifentanil infusion. Dexmedetomidine times are the reduction in time compared to placebo.
Suspension laryngoscopy is typically very sympathetically stimulating, does not typically take long, and can be quite painful postoperatively. “Deep” anesthesia is an absolute requirement, as is total muscle paralysis. (Sugammadex would be perfectly suited here as a non depolarizing muscle relaxant reversal agent!) Additionally, subsequent to suspension laryngoscopy, airway compromise may occur, so any adjunct that is administered should not cause respiratory depression. Dexmedetomidine offers all that is needed for this type of procedure. While I would have liked to have seen a larger sample size in this study, and I question the method of anesthetic emergence, I thought the methodology used was robust and most appropriate to answer the research question.

Mary Golinski, PhD, CRNA

NOTE: Time to adequate spontaneous ventilation was defined as: when artificial ventilation was stopped and the respiratory rate was > 8 breaths per minute, SpO2 >90% on room air for at least 5 minutes. Satisfaction was rated as a verbal response by patients upon discharge from the recovery unit and was graded as highly satisfactory, acceptable or unacceptable.
Abstract

**Purpose**  The authors hypothesized that the added cost of regional anesthesia during an external cephalic version (“version”) procedure would be less than the increased cost of performing a C-section. The purpose of this study was to produce a financial model to discover the impact of providing regional anesthesia for version on the overall cost of delivery.

**Background**  Breech fetal presentation occurs in up to 4% of term pregnancies. Breech presentations are managed with C-section, assisted vaginal delivery, and external cephalic version. Turning the fetus in utero (version) significantly decreases the incidence of C-section delivery. In the USA, 87% of breech presentations are delivered by C-section, which costs more than a vaginal delivery. Spinal or epidural anesthesia is sometimes, but not always, used to facilitate version. Providing regional anesthesia can reduce maternal discomfort and provide muscle relaxation that improves the chance of successfully turning the fetus to a head first presentation. Using techniques that provide surgical anesthesia, rather than analgesia, are associated with higher version success rates.

### Table 1: Probabilities from Previous Studies

<table>
<thead>
<tr>
<th>Event</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>version success rate without anesthesia</td>
<td>38%</td>
</tr>
<tr>
<td>version success rate with regional anesthesia</td>
<td>60%</td>
</tr>
<tr>
<td>fetus reverting to breech after version</td>
<td>6%</td>
</tr>
<tr>
<td>second attempt at version successful</td>
<td>51%</td>
</tr>
<tr>
<td>C-section still required after successful version</td>
<td>27%</td>
</tr>
<tr>
<td>post dural puncture headache</td>
<td>1%</td>
</tr>
<tr>
<td>need for emergency C-section during version</td>
<td>0.35%</td>
</tr>
<tr>
<td>complication from emergency C-section</td>
<td>1%</td>
</tr>
</tbody>
</table>

**Methodology**  The financial model developed considered potential outcomes and complications, the probability that these outcomes might occur, the cost of regional anesthesia and version, and overall delivery costs. The probability that version would be successful was taken from six published randomized controlled trials. Other probabilities taken from the literature are in Table 1.

The financial model was created using the actual cost of care, rather than charges billed by the hospital. CPT codes and 2010 Medicare payment rates were used for professional fees. The average total cost of care (in 2010 US dollars) used for comparisons were as follows [Editor’s reminder – these are costs of care, not charges]:

- version without anesthesia $1,087
- version with regional anesthesia $1,221
- vaginal delivery $6,275
- elective C-section $8,956
- emergency C-section $9,372
Result  Providing regional anesthesia for a version procedure added $134 to the cost of the procedure. The total cost of care for a delivery, when version with regional anesthesia was attempted, was $8,931. The total cost of care for delivery, when version was attempted without regional anesthesia was higher at $9,207. The financial model predicted that providing regional anesthesia for version would reduce the cost of care when anesthesia increased the version success rate by at least 11% over that obtained without anesthesia.

Conclusion  Providing regional anesthesia for version procedures adds approximately 12% to the cost of the procedure, and only about 3% to the total cost of care for delivery. Additionally, the cost of providing regional anesthesia for a version is easily outweighed by the reduced total cost of care associated with fewer C-sections. Regional anesthesia should not be withheld during external cephalic version due to cost concerns.

Comment  This was a fairly straightforward cost analysis showing how anesthesia costs can impact the total cost of care. It is limited by what has been published about the success rates of the various procedures considered. For example, in the six studies of version with and without regional anesthesia, the success rate with anesthesia varied from a low of 44% to a high of 87%. These six studies, and six success rates, employed widely different anesthetic techniques. The 44% success rate used a spinal technique likely to produce only analgesia, not anesthesia. The high success rates used techniques that would be expected to produce anesthesia often sufficient for a C-section. Nevertheless, the average success rate without anesthesia was 38% and only an 11% increase to 49% was needed to make regional anesthesia cost effective. Since the overall version success rate with regional anesthesia has historically been 60%, even with techniques that produce only analgesia, this is a win win for patients and healthcare finance.

So often we are short sighted when looking at costs. It is much easier to focus on any extra costs right now than to consider the total costs in the long run. In healthcare, though, we must also consider patient safety and service. While the absolute risk from a C-section is low, any risk avoided by safely reducing the need for a surgical procedure is good for patients. Providing regional anesthesia for versions is a happy conjunction of lower cost and better patient care.

Michael A. Fiedler, PhD, CRNA