"For some must watch, while some must sleep"

HAMLET - Act. III, Sc.ii
The Middle East Journal of Anesthesiology is a publication of the Department of Anesthesiology of the American University of Beirut, founded in 1966 by Dr. Bernard Brandstater who coined its famous motto: “For some must watch, while some must sleep” (Hamlet-Act. III, Sc. ii).

and gave it the symbol of the poppy flower (Papaver somniferum), it being the first cultivated flower in the Middle East which has given unique service to the suffering humanity for thousands of years. The Journal’s cover design depicts The Lebanese Cedar Tree, with’s Lebanon unique geographical location between East and West. Graphic designer Rabi Moukalled

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References:

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University of Birmingham Interventional Pain Management Pain Forum and Cadaver Workshop

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<td>Pain Unit</td>
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<td>Nuffield House, 3rd floor</td>
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<td><a href="mailto:lynne.murphy@uhb.nhs.uk">lynne.murphy@uhb.nhs.uk</a></td>
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“NEOSTIGMINE-RESISTANT CURARIZATION”

The concept of “neostigmine-resistant curarization” was introduced by Hunter 1956. However, Churchill-Davidson 1959 stated that before the concept of “neostigmine-resistant curarization” can be accepted, it is first necessary to prove that a neuromuscular block was in fact present, and second, that neostigmine failed to reverse the blockade.

Baraka has shown in–vitro using the isolated phrenic nerve-diaphragm preparation, as well as in the anesthetized human, that neostigmine can only reverse a blocking dose of tubocurarine. In contrast, an overdose cannot be readily reversed by neostigmine, confirming the statement that “neostigmine-resistant curarization” really exists. Using the isolated phrenic nerve-diaphragm preparation of rats, the addition of neostigmine to the perfusion bath of a preparation just blocked by tubocurarine could reverse completely the neuromuscular block. However, if an overdose of tubocurarine is added to the perfusion bath, complete neuromuscular block occurred despite the presence of a reversal dose of neostigmine in the bath. Further additional dose of neostigmine could not reverse the block. These results have been confirmed in man by showing that adequate reversal of neuromuscular block by neostigmine is only achieved against doses of tubocurarine that are not much greater than the blocking concentrations. Doubling the dose of tubocurarine was only partially reversed, while tripling the dose could not be reversed irrespective of using additional doses of neostigmine.

The reversal effect of neostigmine is secondary to its antiacetylcholinesterase activity. The accumulated acetylcholine does not reverse nondepolarizing neuromuscular block by displacing the relaxant molecules from the receptors (i.e. pharmacokinetic effect), but probably by its action on the free endplate cholinergic receptors (i.e. pharmacodynamic action). This has been shown by Waser 1967 in the mouse diaphragm autoradiographs by the use of labeled curarine; the minimum lethal dose of radiocurarine was mixed with the reversal dose of neostigmine; although neuromuscular transmission was restored, radioactivity in the endplate was not noticeably diminished.

In contrast with the pharmacodynamic reversal by neostigmine, the mechanism of reversal of aminosteroidal NMBs such as rocuronium by the $\text{\ensuremath{\delta}}$-cycloextrin sugammadex is a pharmacokinetic process secondary to encapsulation of the steroid relaxant molecule in the central compartment. This process will decrease the plasma level of the free (unbound) NMB concentration. Due to the binding of NMB, a concentration gradient develops that moves the relaxant molecules from the biophase towards the central compartment by diffusion. This causes liberation of the acetylcholine receptors to which acetylcholine can then bind.

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In non-curarized muscles, the cholinergic endplate receptors are around 5,000,000, while the released acetylcholine needs to attach itself to only 500,000 receptors to result in muscle contraction. The rest of the receptors can be considered according to Paton and Waud as “safety margin”. Thus, to achieve neuromuscular block by one ED95 of a nondepolarizing relaxant about 75%-90% of the receptors (i.e. the safety margin) need to be occupied, and only 10-25% of the receptors are free. An overdose of curare will occupy the remaining 10-25% of the receptor sites, and hence the neuromuscular cannot be reversed, irrespective of the neostigmine dose used.

Normally, the ACh released is rapidly hydrolysed by the acetylcholinesterase enzyme in less than 1 millisecond. The addition of neostigmine which inhibits the enzyme will delay the hydrolysis of the released acetylcholine resulting in an increase of its concentration and its duration of action. Initially, it has been thought that reversal of nondepolarising block by neostigmine is due to displacement of the curare molecules from the endplate receptors by the accumulated acetylcholine. However, it has been shown by Waser using the radioactive curare that the concentration of curare at the receptors remains constant following reversal of the neuromuscular block by neostigmine. This has been confirmed by Baraka in-vivo who showed in man that the serum concentrations of tubocurarine were not different whether reversal could be achieved or not achieved. Thus, the results of Waser in animals, and by Baraka in man confirm that reversal of antidepolarizing neuromuscular block by neostigmine is a pharmacodynamic and not pharmacokinetic effect. It also confirms that overdose of relaxant which occupies the endplate receptors explains the so called “neostigmine-resistant curarization”.

Neostigmine reverses nondepolarising neuromuscular block by inactivating acetylcholinesterase. There is an optimal dose of neostigmine for reversal. Doses exceeding 0.05-0.07 mg.kg-1 are unlikely to achieve any additional effect and may decrease rather than improve neuromuscular transmission. Neostigmine may even cause neuromuscular transmission failure when given in overdose to patients who have already recovered from neuromuscular block. This can impair upper airway dilator volume, geniglossus muscle function and diaphragmatic function.

Incomplete recovery of neuromuscular transmission is an important contributing factor in the development of postoperative respiratory events. In a prospective blinded study, Berg et al have shown that the incidence of postoperative pulmonary complication was <5% in patients receiving the intermediate-acting muscle relaxants such as atracurium and vecuronium, and in those patients who received pancuronium and had T-O-F ratios ≥0.7 at the end of surgery. However, pancuronium when associated with a T-O-F ratio <0.7 resulted in a threefold increase in the probability of respiratory complications. The authors concluded that residual curarization caused by a long-acting neuromuscular blocker is a significant risk factor for postoperative pulmonary complications.

**Monitoring Of Postoperative Residual Curarization (PORC)**

For many years, a train-of-four T-O-F ratio 0.7 was considered sufficient to exclude PORC. Clinically, this level of neuromuscular block is characterized by the ability to maintain 5 seconds head lift and hand grip, to protrude the tongue, as well as a return to normal eye-lid tone and jaw tone, and recovery to an adequate tidal volume, vital capacity and inspiratory force. However, in recent years, a T-O-F ratio of 0.7 does not guarantee sufficient neuromuscular recovery, and today’s general consensus is that to exclude clinically significant PORC, the T-O-F ratio should be ≥0.9. Even at a T-O-F ratio of ≥0.9 or 1.0 measured at the adductor pollicis muscle, some subjects still have impaired pharyngeal or respiratory function.

Subjective monitoring of neuromuscular block by visual or tactile evaluation of the response to nerve stimulation may decrease but does not exclude the risk of PORC. Objective monitoring by actual quantification of the T-O-F ratio is ≥0.9. Good practice based on evidence dictates that objective monitoring should be the acceptable standard of care whenever neuromuscular block is used. T-O-F ratio ≤0.9 patients are more likely to develop postoperative hypoxemia and to experience symptoms of muscle fatigue than those whose T-O-F ratio equaled or exceeded this ratio.
Skeletal muscles such as masseter muscle\textsuperscript{16} contract not as a single twitch response but as a tetanic response usually above 10-20 Hz, and not at 2 Hz which is the frequency of stimulation by the T-O-F. Thus, a T-O-F ratio of 0.7 or even 0.9 does not guarantee complete neuromuscular recovery. Therefore, it may be advisable, before recovery of patient from anesthesia, to check the recovery of neuromuscular transmission by the traditional tetanic fade and post-tetanic facilitation, using tetanic stimulation at high frequency of 50 Hz applied for 5 seconds. The muscular response is perceived as a sustained forceful contraction with no fade when neuromuscular recovery is achieved. In the presence of residual neuromuscular block, tetanic fade is observed. Double-burst stimulation may be a suitable alternative; it consists of two bursts of stimuli at 50 Hz with an interval of 750 ms. Each burst consists of 3 impulses. A fading of the second impulse series compared to the first correlates with an incomplete neuromuscular recovery\textsuperscript{17}. The method is more sensitive for tactile evaluation of a residual blockade in comparison with a tactile evaluation of the fade using TOF stimulation\textsuperscript{18}.

In conclusion, "neostigmine-resistant curarization" does exist. An overdose of the antidepolarizing neuromuscular blockers, whether absolute or relative, is the most important contributing factor. Objective monitoring should be the acceptable standard whenever neuromuscular blockers are used during anesthesia. However, clinical evaluation should remain as the golden standard of care.

Anis Baraka, MD, FRCA (Hon)
Emeritus Professor of Anesthesiology
American University of Beirut, Lebanon
References

AIRTRAQ OPTICAL LARYNGOSCOPE: ADVANTAGES AND DISADVANTAGES

KEMAL TOLGA SARACOGLU*, ZEYNEP ETI**, AND FEVZI YILMAZ GOGUS**

Abstract

Difficult or unsuccessful tracheal intubation is one of the important causes for morbidity and mortality in susceptible patients. Almost 30% of the anesthesia-related deaths are induced by the complications of difficult airway management and more than 85% of all respiratory related complications cause brain injury or death. Nowadays, due to the advances in technology, new videolaryngoscopic devices became available. Airtraq is a novel single-use laryngoscope which provides glottis display without any deviation in the normal position of the oral, pharyngeal or the tracheal axes. With the help of the display lens glottis and the surrounding structures are visualised and under direct view of its tip the tracheal tube is introduced between the vocal cords. In patients having restricted neck motion or limited mouth opening (provided that it is greater than 3 cm) Airtraq offers the advantage of a better display. Moreover the video image can be transferred to an external monitor thus an experienced specialist can provide assistance and an educational course can be conducted simultaneously. On the other hand the Airtraq videolaryngoscopic devices possess certain disadvantages including the need of experience and the time demand for the operator to learn how to use them properly, the rapid deterioration of their display in the presence of a swelling or a secretion and the fact that they are rather complicated and expensive devices. The Airtraq device has already documented benefits in the management of difficult airways, however serial utilization obviously necessitates experience.

Conflict of interest: The authors state no conflict of interest.

Key words: airtraq, airway management, videolaryngoscope.
Introduction

Difficult or unsuccessful tracheal intubation is one of the important causes for morbidity and mortality in susceptible patients. Cormack and Lehane laryngoscopic view grade 3 or 4 difficult intubation occur in between 0.3-20% of laryngoscopies. Almost 30% of the anesthesia-related deaths are induced by the complications of difficult airway management and more than 85% of all respiratory related complications cause brain injury or death. The incidence of difficult intubation is 1.15-3.8%, on the other side the incidence for failed intubation is 0.13-0.3% in the general population. Furthermore failed intubations using Macintosh laryngoscopes were reported in up to 30% intubations by paramedics.

In addition to the operating theatre, the need for emergent endotracheal intubation is also high in intensive care unit, emergency intervention room and emergency ward; thus this subject obviously is of particular concern to many physicians of various specialties. Trauma to the airways, esophageal intubation, pulmonary aspiration, systemic complications secondary to hypoxia and undesired hemodynamic changes are some of the unwanted conditions which could accompany emergent endotracheal intubation. Nowadays, due to the advances in technology, new videolaryngoscopic devices became available. Optical systems with adjustable position capability and modified blades with LED lights, rechargeable batteries, accelerated the developmental progress of these devices, which include Airtraq, Glide scope, LMA C Trach, Airway scope, Storz V-Mac, lightwand, Mc-Grath video laryngoscope or True-view laryngoscope. These devices are originally designed to handle difficult intubation, and with time they become regular for management of the normal airways, as well.

Airtraq Optical Laryngoscope

The standard direct laryngoscopy procedure requires the proper alignment of the oral, pharyngeal and laryngeal axes in order to provide the necessary display of the vocal cords. Airtraq is a novel single-use laryngoscope which provides glottis display without any deviation in the normal position of the oral, pharyngeal or the tracheal axes. The Airtraq blade is composed of two channels running parallel to each other. The more externally positioned channel serves as a conduit for the introduction of the tracheal tube (Figure 1). The exaggerated curvature of the blade and the combination of the lens with the prism ensure the transmission of the image to the proximal field. A battery-powered light source is located on the edge of the blade. The purpose of this configuration is to enable intubation with minimal movement of the cervical spine (Figure 2). With the help of the display lens, the glottis and the surrounding structures are visualised and under direct view of its tip the tracheal tube is introduced between the vocal cords.
**Advantages**

In patients having restricted neck motion or limited mouth opening (provided that it is greater than 3 cm) Airtraq offers the advantage of a better display. Moreover the video image can be transferred to an external monitor thus an experienced specialist can provide assistance and an educational course can be conducted simultaneously. Alignment of the airway with the eye of the operator is deemed unnecessary. Compared to Macintosh laryngoscope, Airtraq requires less operator skills thus it constitutes an advantage to the emergency service staff and the ambulance personnel who have limited or no intubation experience. Nowadays it is a prerequisite for the medical and paramedical health professionals to know these instruments as much as possible. Shorter duration of intubation, fewer complications during procedure and lower intubation difficulty scores were reported using Airtraq.

Macintosh laryngoscope being the gold standart device for tracheal intubation has been utilized for many years. Despite all of the developed videolaryngoscopic devices, it is still the most frequently used intubation device. Previous studies have demonstrated that the learning process of intubation with Macintosh laryngoscope is quite difficult and necessitates a long period of time. However Airtraq laryngoscope is a novel intubation device which has been introduced to the clinical practice in recent years during the videolaryngoscopic revolution and its utilization is rapidly becoming more and more widespread. Airtraq was previously used in normal and difficult airways to compare with both Macintosh laryngoscope and other videolaryngoscopic devices. One of the greatest advantage of this device is the provision of intubation conditions with the least amount of cervical spine movement, due to the lens and prism configuration. In comparison to Macintosh laryngoscope, the reduction of the cervical spine mobility to a minimum level during Airtraq utilization was also demonstrated fluoroscopically. It was observed that all of the Cormack and Lehane grade 4 appearances were reduced to grade 1. Additionally, Airtraq can shorten the duration of intubation in difficult airways as well as normal airways. It was demonstrated that Airtraq influenced the hemodynamic changes to a lower extent than Macintosh laryngoscope and thus it was emphasized that Airtraq could be safely utilized in patients with coronary artery disease or arrhythmia. Airtraq was also successfully applied in awake intubation; before the procedure a lidocaine injection was performed through the Airtraq channel and thus successful intubations were achieved. Moreover, Airtraq was also utilized for transesophageal echocardiography probe placement, bronchial bloker placement, and bilateral tube insertion.

In one study 40 medical students with no previous intubation experience have performed intubations easier with Airtraq compared to Macintosh laryngoscope; in another study the dental trauma incidence was found to be lower with Airtraq. Arslan et al. comparing Airtraq with Macintosh laryngoscope, concluded that the duration of intubation was shorter and the severity of mucosal damage was found to be lower with Airtraq. Compared to Macintosh laryngoscope, the success rate of the first intubation attempt in experienced as well as unexperienced staff was found to be significantly higher with Airtraq. In this study the rate of esophageal intubation was reported to be 65% with Macintosh blade and 13% with Airtraq. A comparative study of Airtraq with Lightwand revealed no significant difference for the hemodynamic changes. The disposable nature of the device decreases the risk of a possible prion contamination and thus the occurrence of Creutzfeld Jacob Disease.

Savoldelli GL, et al. concluded that time taken to position the endotracheal tube was shorter for the Airtraq when compared with the McGrath and Glidescope. The Airtraq had the most favourable learning curve in this study. In another study which is conducted in 318 morbidly obese patients, the duration tracheal intubation has been found shorter with the Airtraq laryngoscope than with the LMA CTrach. The evaluation of ease of intubation in patients immobilised with cervical collar proved that Airtraq improves the ease of intubation when compared to laryngoscopy with Mc Coy blade. Airtraq aided intubation without requiring the removal of the collar. Airtraq has also been shown to reduce the Intubation Difficulty Scale score and the need for optimization manoeuvres, improving the Cormack and Lehane glottic view when compared with the C-MAC®.
study of endotracheal intubation with Airtraq versus Storz videolaryngoscope in children younger than two years, the Airtraq has been found significantly faster in all measured procedural elements of intubation.40

**Disadvantages**

On the other hand Airtraq videolaryngoscopic devices possess certain disadvantages including the need of experience and the time demand for the operator to learn how to use them properly, the rapid deterioration of their display in the presence of a swelling or a secretion and the fact that they are rather complicated and expensive devices.16

The disposability of the device necessitates the provision of backups, which increases the expenditures and represents a disadvantage for its utilization. That’s why it inevitably directs us into the search of a reusable videolaryngoscope among the equipments for the management of difficult airways.

In the literature there are previous studies comparing Airtraq with videolaryngoscopic devices such as airway scope41 and True-view42, in addition to the comparative studies of Airtraq with Macintosh laryngoscope. In a study comparing Airtraq, Macintosh laryngoscope and airway scope blades the duration of intubation as well as the success rate of the intubation attempts were compared in resuscitation cases which underwent chest compression43. Both of these parameters were found to be significantly more favorable for airway scope. One of the reasons for the increase in duration of intubation with Airtraq is the fact that during the procedure the eye needs to be fully approximated to the laryngoscope and even a small movement of the head can compromise the visibility of larynx. However with increasing experience on how to use the device, the proper application of optimisation maneuvers are learned and the problems can be solved.

Airtraq device also requires some time for set-up. Upon activation of Airtraq approximately 30-60 seconds of time is needed to warm-up the lens and to prevent fogging23. That is a disadvantage of the Airtraq device during emergency situations. There are reports of tonsillar injury in children during the intubation attempts with Airtraq44. Certain factors, including the blurred vision provided by the Airtraq laryngoscope, the accidental extubation of a patient upon the retraction of the device following a successful intubation and the inability to place Airtraq into the oral cavity of a patient with a rather limited mouth opening can contribute to the failure of intubation by even some of the experienced anesthesiologists.45

In a study conducted on morbidly obese patients, although Airtraq was found to be a faster and safer way of intubation compared to Macintosh laryngoscope, the patients were preoperatively warned about the risk of tissue trauma10.

Airtraq is a device with 1.8 cm thickness and 2.8 cm width.46 It is not possible to use it in patients with restricted mouth opening. Airtraq provides a better laryngoscopic view but this does not always mean that the intubation will be easier. Even in cases with excellent visibility additional manipulations might be necessary and the duration of intubation could be longer. In fact, during a case Cormack and Lahen Grade 3 difficult intubation was detected with Macintosh laryngoscope, followed by several intubation attempts with Airtraq, which has yielded an excellent display, and upon the failure of these attempts a fiberoptic bronchoscope was introduced through the Airtraq device and the intubation was completed under its guidance.47

The insertion of Airtraq can damage the mucosal tissue because of its 2.8 cm width. Moreover the pressure exerted by the device through the oropharyngeal region may result in postoperative emergence of sore throat. Holst et al. [48] reported a 2 cm long vertical laceration due to the utilization of Airtraq in oropharyngeal airway areas. The exaggerated curvature and the large anteroposterior diameter of the Airtraq blade might lead to difficulties during its intraoral insertion. Moreover the tip of the blade does not have a rounded vallecular ending like the Macintosh blade thus the risk of trauma increases during the placement of the Airtraq blade behind the tongue. Ndoko SK et al.49 have reported that the standard Airtraq insertion technique might cause bleeding and the reverse maneuver could be utilized to decease the complication rates in morbidly obese patients.

Especially for patients with restricted mouth opening Airtraq is not the best choice in every circumstances. Compared to Airtraq, the Glidescope,
Trueview or Storz videolaryngoscope seem to be better choices for patients having limited mouth opening\textsuperscript{50}. It should always be kept in mind that a successful intubation could never be guaranteed for each and every case despite the good visualisation of glottis obtained by Airtraq.

**Conclusion**

The Airtraq device has already documented benefits in the management of difficult airways, however serial utilization obviously necessitates experience.
References


AIRTRAQ OPTICAL LARYNGOSCOPE: ADVANTAGES AND DISADVANTAGES


POST-OPERATIVE COGNITIVE FUNCTIONS AFTER GENERAL ANESTHESIA WITH SEVOFLURANE AND DESFLURANE IN SOUTH ASIAN ELDERLY

Telugu Seetharam Deepak*, Srisha Vadlamani**, K. Sunil Kumar*** and Punith Kempegowda****

Abstract

**Background:** The duration of the recovery of cognition after anesthesia and surgery is multifactorial and is dependent on the type of anesthesia used, the type of surgery, and the patient. The present study compared the speed of recovery in elderly patients undergoing general anesthesia with sevoflurane or desflurane and the incidence and duration of cognitive impairment in them.

**Methods:** The prospective study was conducted at a tertiary care centre in Bangalore from November 2008 to March 2010. Patients aged above 65 years with American Society of Anaesthesiology (ASA) physical status I, II, III undergoing surgeries under general anesthesia lasting from 45 min up to 3 hours were included in the study. The times from discontinuing nitrous oxide to eye opening, tracheal extubation, obeying commands, and the time to orientation to name and place were assessed at 30-60 s intervals. At 1, 3, 6 h after the end of anesthesia, the patient’s cognitive functions were assessed by asking them to repeat the Mini Mental Score Examination.

_Statistical analysis used:_ Student t-test, Chi-square test

**Results:** The time to eye opening, time until extubation, time to follow commands and orientation to time, place were significantly better with desflurane compared to sevoflurane (p<.001). Hundred percent of patients in the desflurane group and 97% in the sevoflurane group demonstrated completely normal cognitive function at 6 h postoperatively (p=0.31).

**Conclusion:** Desflurane was associated with a faster early recovery than sevoflurane in elderly patients. However, postoperative recovery of cognitive function was similar with both volatile anaesthetics.

**Conflict of interest:** none

**Sources of financial support:** none

**Key words:** Desflurane, Sevoflurane, Cognition, Recovery, Elderly

* MD, Department of Critical Care.
** MD, Department of Anesthesia.
*** MD, Lecturer, Department of Medicine.
**** MBBS, MSc, Clinical Fellow Post-graduate, Level 3, Ealing Hospital NHS Trust, Uxbridge Road, Southall, UB1 3HW, London, UK.

_corresponding author:_ Dr. T S Deepak, Department of Critical Care, M S Ramaiah Medical College, Bangalore-560054. Email: deepak70ts@yahoo.co.in
Introduction

Surgical intervention in the elderly population is associated with significant postoperative morbidity and mortality due to various reasons. Brain function is usually altered post-anesthesia, with altered level of consciousness and impairment of attention, memory, and reaction time. The incidence of Post-Operative Cognition Dysfunction (POCD) has been reported to be between 1% and 60%, depending on the type of operation.

Few studies suggest that use of volatile anaesthetics that are rapidly eliminated with minimal metabolic breakdown may reduce postoperative delirium and cognitive dysfunction in elderly surgical patients by facilitating a faster recovery from general anesthesia. Sevoflurane and desflurane have pharmacokinetic properties that favour rapid emergence from anesthesia. A lower blood/gas partition coefficient (0.42 vs 0.65) and fat/blood partition coefficient (27 vs 48) of desflurane versus sevoflurane respectively, favour its more rapid elimination from the body and also provide shorter emergence times. Cognitive decline after cardiac operations has been studied extensively but cognitive decline after non-cardiac operations is not as well studied. Chen et al compared POCD following sevoflurane and desflurane use in elderly patients mostly consisting of American Caucasians. They reported that there was no difference in the total incidence of POCD between the desflurane and sevoflurane groups; however, desflurane was associated with a faster cognitive recovery than sevoflurane. A similar study done in European population by Rortgen and group also found the same results.

Miles and group demonstrated that the clinical and molecular aetiologies of dementia differ between ethnic groups. Genetic factors and educational achievement together accounted for over half of variance in cognitive functioning of older men in a study done by Brandt and colleagues. The Baltimore Memory Study had similar reports with regards to cognition and ethnicity. While we are still not yet clear on the exact mechanism of producing loss of perception and or inducing unconsciousness of either sevoflurane and desflurane, we cannot rule out genetic influences on their mechanism of action. No previous studies compared the effects of the two anaesthetics in South Asian population.

We designed this study to investigate the speed of recovery in elderly patients undergoing general anesthesia with sevoflurane or desflurane and compared the incidence and duration of cognitive impairment in South Indian population. The level of cognitive impairment as measured by MMSE scale six hours post-operatively was defined as the primary outcome in the present study.

Methods

This prospective randomized study was conducted in a tertiary care medical teaching hospital from November 2008 to March 2010. The study was approved by the Institution’s Ethical Committee. We designed the study in lines with the methodologies of studies done by chen et al and Rortgen et al to facilitate comparisons between the findings from the three studies. Patients above 65 years of age with American Society of Anaesthesiology (ASA) physical status I, II, III undergoing surgeries under general anesthesia lasting from 45 min up to three hours were included in the study following a written informed consent. Patients who underwent general anesthesia within seven days prior to the procedure under study and those undergoing surgeries that required trendelenberg position were excluded from the study. Also, patients with history of neuropsychiatric disorders, alcohol consumption, BMI>30 were excluded from the study. Patients with clinically significant cardiovascular, respiratory, hepatic, renal, neurological, psychiatric and metabolic disease were also excluded from the study. Patients unable to read and write and with impaired hearing were excluded as they would not be able to comprehend the guidelines of the study.

In the preoperative holding area, the Mini-Mental State Examination (MMSE) test was conducted. The MMSE is a screening test that quantitatively assesses cognitive impairment by asking patients a variety of questions. The maximum MMSE score is 30 points, with scores of 23 or less being indicative of cognitive impairment. Hence patients with pre-operative MMSE score <23 were excluded from the study. The
criterion used to define a decline in cognitive function in our study was a decrease of 2 or more points on the MMS test compared to the pre-operative value.

The present study was double-blinded where both patients and investigators were blinded to the group. Patients were randomized to two groups using a computer generated table. As soon as the patient arrived in the operating room, an intravenous infusion of ringer lactate was started at 100 ml/hr, and monitors such as Non-invasive blood pressure (NIBP), electrocardiogram (ECG), Pulse-oximeter were applied. All patients received midazolam 1 mg intravenously (IV) for preoperative medication.

Tracheal intubation was facilitated with vecuronium (0.1mg/kg IV) or atracurium (0.5mg/kg IV). Anesthesia was induced with fentanyl (1.0-2 mcg/kg IV) and propofol (1.0-2.0 mg/kg IV) until loss of response to oral commands. After loss of consciousness, patients received either desflurane 5% or sevoflurane 2% (volume percent) through the tec6 and tec7 vaporizer.

Anesthesia was maintained with desflurane 2-6% or sevoflurane 1-1.5% in combination with nitrous oxide 66% in oxygen which corresponded to 1-1.8 MAC (Age adjusted MAC)\(^4\).

NIBP, heart rate and oxygen saturation were recorded before induction of anesthesia then, along with end-tidal carbon dioxide, every 2 min after induction of anesthesia for 15 min and then every 5 min until the end of surgery. Temperature was monitored and was maintained at 36\(^\circ\)C.

Inspired volatile anaesthetic concentration was adjusted as necessary to maintain pulse and NIBP within 20% of pre-induction values. If acute increases occurred, the inspired concentration of desflurane/sevoflurane was increased by up to 50%. Supplemental doses of fentanyl, 0.5–1.0 mcg/kg IV (to maximum dose of 200 mcg), was used to control acute changes that did not respond to two consecutive 50% increases in the inspired concentration of desflurane/sevoflurane or if there were other signs of inadequate analgesia. Patients who required higher inspired inhalational agent concentration and patients who became haemodynamically unstable during the procedure were excluded from the study.

Atracurium/vecuronium was administered during the maintenance period. All patients received paracetamol infusion 15 mg/kg during intra-operative period. During the maintenance period, ventilation was controlled to maintain normocarbia using a semi closed circle system with a total fresh gas flow rate of 3 L/min.

Ten minutes before the estimated end of surgery the inhaled anaesthetics were reduced to 0.5 MAC. At the end of surgery, residual neuromuscular blockade was reversed using glycopyrrolate (0.01 mg/kg IV) and neostigmine (0.05 mg/kg IV). Sevoflurane or desflurane was discontinued at the start of skin closure, and nitrous oxide was discontinued at the end of surgery. The lungs were ventilated with 100% \(O_2\) at a fresh gas flow rate of 8 L/min.

The times from discontinuing nitrous oxide to eye opening, tracheal extubation, obeying commands (e.g., squeeze the investigator’s hand), as well as the time to orientation to name and place were assessed at 30-60 s intervals. The durations of anesthesia (from the start of induction to discontinuation of nitrous oxide) and surgery (from surgical incision to skin closure) were also recorded. At 1, 3, 6 h after the end of anesthesia, the patient’s cognitive functions were assessed by asking them to repeat the MMSE. Adverse side effects like dizziness, headache, drowsiness, nausea, vomiting, anxiety and restlessness were recorded.

The primary and secondary outcome of the study was to compare the incidence of POCD in both groups and to determine the speed of recovery respectively.

**Statistical Analysis**

A sample size of 35 was determined by using power analysis based on an alpha error of 0.05, beta error of 0.2 and the assumptions that a) the incidence of postoperative cognitive impairment at one hour after anesthesia would be 50%; b) 70% reduction (eg: from 50% to 15%) would be of clinical significance. Statistical analyses were performed using Statistical Package for the Social Sciences (SPSS) for Windows 16.0 (SPSS Inc., Chicago, USA). The results for each parameter (numbers and percentages) for discrete data and average (mean ± standard deviation) for continuous data are presented in tables and figures using Microsoft office 2007 software package.
Student \( t \)-test was performed for continuous variables, and paired Student \( t \)-test was used to compare the intra-group differences in the MMSE scores at different assessment points with their baseline values. Categorical data were analyzed by chi-square test. A value of \( P < 0.05 \) was considered statistically significant.

**Results**

A total of 60 patients above 65 years of age who were undergoing elective surgical procedures under general anesthesia were included in the study. These patients were randomized to two groups of 30 each using a computer generated table.

The mean age in the sevoflurane and desflurane group were 69.47±4.42 years (range: 65-88 years) and 69.17±4.73 years (range: 65-84 years) respectively. The gender distribution is given in table 1. The various surgeries undergone by the study subjects in the two groups are given in table 2. Statistically, there was no significant difference with respect to age (\( p = .800 \)), gender (\( p = .071 \)), ASA grading (\( p = .371 \)), BMI (\( p = .098 \)), various surgeries undergone by the study subjects (\( p = .066 \)), propofol (\( p = .9 \)) and fentanyl (\( p = 1.0 \)) between the two groups.

The mean duration of anesthesia for sevoflurane and desflurane groups were 140.57±35.26 min and 145.33±40.77 min respectively (\( p = .63 \)). The average duration of surgery for sevoflurane and desflurane groups were 107.83±33.55 min and 119.17±36.34 min respectively (\( p = .21 \)). The various recovery indices between the two groups are given in table 3. The time to eye opening, time until extubation, time to follow commands and orientation to time was significantly better with desflurane (\( p < .001 \)).

**Table 1**

<table>
<thead>
<tr>
<th>Treatment Group</th>
<th>Sevoflurane</th>
<th>Desflurane</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male (%)</td>
<td>19 (63.3)</td>
<td>12 (40.0)</td>
<td>31 (51.7)</td>
</tr>
<tr>
<td>Female (%)</td>
<td>11 (36.7)</td>
<td>18 (60.0)</td>
<td>29 (48.3)</td>
</tr>
<tr>
<td>Total (%)</td>
<td>30 (100)</td>
<td>30 (100)</td>
<td>60 (100)</td>
</tr>
</tbody>
</table>

**Table 2**

<table>
<thead>
<tr>
<th>Group</th>
<th>ENT (%)</th>
<th>OBG (%)</th>
<th>Orthopedics (%)</th>
<th>Surgery (%)</th>
<th>Urology (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sevoflurane</td>
<td>0 (0.0)</td>
<td>1 (3.3)</td>
<td>11 (36.7)</td>
<td>11 (36.7)</td>
<td>7 (23.3)</td>
<td>30 (100.0)</td>
</tr>
<tr>
<td>Desflurane</td>
<td>2 (6.7)</td>
<td>6 (20.0)</td>
<td>5 (16.7)</td>
<td>13 (43.3)</td>
<td>4 (13.3)</td>
<td>30 (100.0)</td>
</tr>
<tr>
<td>Total</td>
<td>2 (3.3)</td>
<td>7 (11.7)</td>
<td>16 (26.7)</td>
<td>24 (40.0)</td>
<td>11 (18.3)</td>
<td>60 (100.0)</td>
</tr>
</tbody>
</table>

ENT- Ear, Nose and Throat
OBG- Obstetrics and Gynaecology

**Table 3**

<table>
<thead>
<tr>
<th>Index</th>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>Std. Dev</th>
<th>Minimum</th>
<th>Maximum</th>
<th>‘p’ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eye Opening (min)</td>
<td>Sevoflurane</td>
<td>30</td>
<td>7.93</td>
<td>1.530</td>
<td>5</td>
<td>12</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>Desflurane</td>
<td>30</td>
<td>5.37</td>
<td>.999</td>
<td>4</td>
<td>8</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Extubation (min)</td>
<td>Sevoflurane</td>
<td>30</td>
<td>10.10</td>
<td>1.583</td>
<td>7</td>
<td>14</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>Desflurane</td>
<td>30</td>
<td>7.17</td>
<td>.913</td>
<td>5</td>
<td>9</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Commands (min)</td>
<td>Sevoflurane</td>
<td>30</td>
<td>12.67</td>
<td>1.826</td>
<td>9</td>
<td>17</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>Desflurane</td>
<td>30</td>
<td>8.83</td>
<td>1.262</td>
<td>7</td>
<td>12</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Orientation (min)</td>
<td>Sevoflurane</td>
<td>30</td>
<td>13.80</td>
<td>1.789</td>
<td>9</td>
<td>17</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>Desflurane</td>
<td>30</td>
<td>9.63</td>
<td>1.377</td>
<td>8</td>
<td>13</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>
The trend of MMSE scores at 1, 3 and 6 h postoperatively show that MMSE scores at 1 hr were significantly low in both groups (Table 4), but returned to the baseline by 6h. The incidence of POCD in the two study groups at various time-lines is given in Table 5. There was statistically no difference between the two groups in the incidence of POCD. In addition, there were no significant differences in the amounts of postoperative analgesic and the incidence of side effects in the two study groups.

**Discussion**

Postoperative cognitive impairment is a condition characterized by impairment of memory and concentration, and the incidence has been reported to be extremely frequent in elderly patients. The aged brain is different from the younger brain in several important aspects, including size, distribution and type of neurotransmitters, metabolic function, and capacity for plasticity. For this reason, early POCD is more common in the elderly after major surgery, compared to middle-aged patients\(^1\). In the present study, we compared the speed of recovery in elderly patients undergoing general anesthesia with sevoflurane or desflurane and compared the incidence and duration of cognitive impairment in them.

The two anaesthetic groups were comparable with respect to age, gender, ASA grade, durations of anesthesia and surgery, BMI as well as doses of medications used for premedication, propofol induction dose and intra-operative analgesic requirement.

The emergence times from the end of anesthesia to eye opening, tracheal extubation, following verbal commands, and orientation were significantly shorter in the Desflurane (versus Sevoflurane) Group (p<.001) consistent with previous studies\(^16\). In the present study, there was no significant difference between desflurane and sevoflurane groups with respect to their MMSE score preoperatively and at 1h, 3h and 6h postoperatively. Chen et al and Rortgen et al also did not find any significant difference between desflurane and sevoflurane groups with respect to POCD, indicating that either of the agents are suitable for anesthetizing elderly patients without causing significant POCD\(^1,9\).

The early recovery profiles (e.g., 0-4h) of

---

**Table 4**

Comparison of mean Mini Mental Scale Examination (MMSE) scores between the two groups

<table>
<thead>
<tr>
<th>Groups</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Minimum</th>
<th>Maximum</th>
<th>'p' value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre op-MMSE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sevoflurane</td>
<td>30</td>
<td>28.97</td>
<td>0.964</td>
<td>27</td>
<td>30</td>
<td>0.214</td>
</tr>
<tr>
<td>Desflurane</td>
<td>30</td>
<td>28.60</td>
<td>1.276</td>
<td>25</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>MMSE- 1h</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sevoflurane</td>
<td>30</td>
<td>27.17</td>
<td>1.234</td>
<td>25</td>
<td>29</td>
<td>0.109</td>
</tr>
<tr>
<td>Desflurane</td>
<td>30</td>
<td>26.53</td>
<td>1.737</td>
<td>22</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>MMSE- 3h</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sevoflurane</td>
<td>30</td>
<td>27.97</td>
<td>1.066</td>
<td>26</td>
<td>30</td>
<td>0.403</td>
</tr>
<tr>
<td>Desflurane</td>
<td>30</td>
<td>27.70</td>
<td>1.368</td>
<td>24</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>MMSE- 6h</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sevoflurane</td>
<td>30</td>
<td>28.67</td>
<td>0.959</td>
<td>27</td>
<td>30</td>
<td>0.321</td>
</tr>
<tr>
<td>Desflurane</td>
<td>30</td>
<td>28.40</td>
<td>1.102</td>
<td>25</td>
<td>30</td>
<td></td>
</tr>
</tbody>
</table>

**Table 5**

Comparison of percentage of patients having Post-Operative Cognitive Dysfunction (POCD)

<table>
<thead>
<tr>
<th>Group</th>
<th>POCD at 1h</th>
<th>POCD at 3h</th>
<th>POCD at 6h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sevoflurane</td>
<td>15 (50%)</td>
<td>4(13%)</td>
<td>1(3.3%)</td>
</tr>
<tr>
<td>Desflurane</td>
<td>18(60%)</td>
<td>5(16.7%)</td>
<td>0</td>
</tr>
<tr>
<td>p-value</td>
<td>0.44</td>
<td>0.71</td>
<td>0.31</td>
</tr>
</tbody>
</table>
modern anaesthetics such as sevoflurane, desflurane and propofol have been well studied and recently reviewed. Most psychometric tests appear to show a return to baseline values between four and six hours after anesthesia. A meta-analysis on post-operative recovery after general anesthesia reported that patients receiving desflurane followed commands, were extubated, and were oriented 1.0-1.2 minutes earlier than patients receiving sevoflurane. However, Heavner and colleagues did not find any difference between desflurane and sevoflurane in the elderly after general anesthesia with respect to recovery time when they were assessed with the Digit–Symbol Substitution Test.

A smaller study group and use of single neurobehavioural assessment tool might have masked the subtle differences between the two compounds. A large scale study with multiple neurobehavioural assessment tools is needed to establish the present findings as facts.

References

ULTRASOUND GUIDED PERITUBAL INFILTRATION OF 0.25% ROPIVACAINE FOR POSTOPERATIVE PAIN RELIEF IN PERCUTANEOUS NEPHROLITHOTOMY

GEETA P. PARIKH*, VEENA R. SHAH**, KALPANA S. VORA***, BEENA K. PARIKH†, MANISHA P MODI† AND ARUN PANCHAL****

Abstract

Background: Percutaneous nephrolithotomy (PCNL) is a common endourologic procedure with less morbidity than open surgery. However, pain around the nephrostomy tube requires good post operative analgesia. So we hypothesize that infiltration of local anesthetic from the renal capsule to the skin around the nephrostomy tract would relieve the pain in the initial postoperative period.

Methods: 60 adult patients of either sex with ASA physical status I to III and undergoing percutaneous nephrolithotomy were randomized for a prospective double-blind controlled study. Patients were divided into control group (n=30) and ropivacaine group (n=30). Balanced general anesthesia was given. After completion of surgical procedure, 23 gauge spinal needle was inserted at 6 and 12 o’clock position under ultrasonic guidance up to the renal capsule along the nephrostomy tube. 10 ml of 0.25% ropivacaine or normal saline solution was infiltrated in each tract while withdrawing the needle from renal capsule to the skin. Post-operative pain was assessed using visual analogue scale (VAS) and dynamic visual analogue scale (D-VAS) during deep breathing and coughing on a scale of 0-10 during the initial postoperative 24 hours. Rescue analgesia was given in the form of injection tramadol 1.0 mg/kg intravenously when VAS > 4 and maximum up to 400mg in 24 hours. Time to first rescue analgesic, number of doses of tramadol and total amount of tramadol required in the initial postoperative 24 hours were noted. Patients were observed for any side effect and treated accordingly.
Results: VAS at rest (VAS) as well as during deep breathing and coughing (DVAS) were significantly lower in ropivacaine group during first 24 hours. Mean time to 1st rescue analgesic in ropivacaine group was longer (10.7±2.64 hours) as compared to control group (2.05±1.44 hours) (P=0.0001). Mean number of doses of tramadol in 24 hours in group-R were less (2.25±0.51) than group-C (4.4±0.68) (P= 0.0001). The mean total amount of tramadol in 24 hours in group-R was significantly lower than group-C. Side effects like nausea and vomiting and sedation were minimum and non-significant in both groups.

Conclusion: Local anesthetic infiltration of 0.25% ropivacaine along the nephrostomy tract is efficient in alleviating post-operative pain after percutaneous nephrolithotomy surgery. The number of doses and total consumption of rescue analgesic were also decreased in the initial postoperative 24 hours.

Conflict of interest: NIL.

Sources of financial support: NIL.

Key words: Percutaneous nephrolithotomy, Post-operative pain, Ropivacaine, Ultrasound.

Introduction

The efficacy, safety and superiority of percutaneous approach to manage large renal calculi have been well established over the past two decades. Placement of nephrostomy tube after percutaneous nephrolithotomy (PCNL) is still considered a standard practice since not all patients are candidates for a tubeless PCNL and thus several investigations have focused on the impact of reduced percutaneous catheter size on post-operative pain, analgesic requirements and duration of cutaneous drainage1. Even though analgesics such as NSAIDS and opioids have been used for postoperative analgesia, pain around nephrostomy tube can be distressing. Skin infiltration of local anesthetic drug at surgical site is not so effective. So we hypothesized that infiltration of local anesthetic from the renal capsule to the skin along the nephrostomy tract would relieve the postoperative pain during the initial postoperative period.

The aim of present study was to investigate the efficacy of peritubal infiltration of 20 ml of 0.25% ropivacaine under ultrasonic guidance for postoperative pain relief after PCNL and to assess the of number of doses as well as total requirement of rescue analgesic during the first postoperative 24 hours.

Methods

A prospective randomized double-blind controlled study was conducted in 60 ASA physical status I-III adult patients posted for PCNL surgery after obtaining institutional ethics committee’s approval and informed consent from each patient. Patients were randomly divided in two equal groups of 30 patients in each group. Group R is Ropivacaine group (0.25 % ropivacaine infiltration) and group C is Control group (normal saline infiltration). Patients’ inclusion criteria were 18 to 60 years of age, 35 to 85 kg of weight with BMI <30 kg/m², renal stone size less than 3.0 cm requiring a single nephrostomy tube (22 F) and a duration of surgery less than 3 hours. Patients having supracostal puncture, excessive bleeding and more than one puncture were excluded from the study. In all patients, balanced general anesthesia was given using fentanyl as a premedication in dose of 2 µg/Kg intravenously during induction. Anesthesia was induced with thiopentone sodium and succinylcholine. Trachea was intubated with appropriate sized endotracheal tube. Anesthesia was maintained with N2O, O2, Isoflurane and Atracurium. PCNL surgery was performed in the prone position. After insertion of nephrostomy tube and before the extubation of the patients, 23 gauge 90 mm spinal needle was inserted up to renal capsule under ultrasonographic guidance along the nephrostomy tube at 6and 12’ O clock positions. In group R, 20 ml of 0.25% ropivacaine and in group C, 20 ml of normal saline was infiltrated (10 ml in each tract) while gradually withdrawing the needle from renal capsule to the skin and infiltrating renal capsule, perinephric fat, muscles, subcutaneous tissue and skin. Patients were extubated and kept in post-anesthesia care unit under observation for 24 hours.

During follow up, patients were assessed for pain and side effects by an independent observer blinded to the infiltration immediately after extubation, and at 0.5, 1, 1.5, 2, 4, 6, 8, 12, 16, 20 and 24 hours postoperatively. The pain score was assessed using 0-10 point visual analogue scale (VAS) at rest and
ULTRASOUND GUIDED PERITUBAL INFILTRATION OF 0.25% ROPIVACAINE FOR POSTOPERATIVE PAIN RELIEF IN PERCUTANEOUS NEPHROLITHOTOMY

Table 1

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Ropivacine group</th>
<th>Control group</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (Yrs)</td>
<td>43.9 ± 14.55</td>
<td>41.2 ± 11.94</td>
<td>0.435</td>
</tr>
<tr>
<td>Sex (male: female)</td>
<td>21:09</td>
<td>20:10</td>
<td>0.781</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>54.4 ± 9.18</td>
<td>62.5 ± 12.56</td>
<td>0.008</td>
</tr>
<tr>
<td>Duration of Surgery (Hrs)</td>
<td>1.45 ± 0.25</td>
<td>1.61 ± 0.32</td>
<td>0.678</td>
</tr>
</tbody>
</table>

Dynamic visual analogue scale (DVAS) on deep breathing and coughing where 0 means no pain and 10 means unbearable pain.

When VAS score > 4, the patient was given 1 mg/kg intravenous tramadol slowly as a rescue analgesia and the patient was reassessed for pain. Maximum 400 mg of tramadol was allowed in the initial 24 hours. Intravenous ondansetron was given if there was nausea and vomiting. Nausea was scored as 0-3 where 0 means none and 3 means severe nausea while sedation was scored as 0-3 where 0 means patient is awake and alert and 3 means deep sleep. Time for 1st need of rescue analgesic and duration of analgesia was noted. Number of doses of tramadol and total consumption of tramadol required in 24 hours were noted.

Statistical Analysis

Sample size calculation was done on the basis of total consumption of tramadol in 24 hours to compare the effect of ropivacaine infiltrated along the nephrostomy tract with control group. Power analysis was performed. This analysis was based on two samples with statistical significance of 0.05 and 90% power. The sample size required to detect the standardized difference of 0.87 are approximately 56 (28 in each group). Considering rejection in the study, we decided to take 30 patients in each group.

Statistical Analysis was performed using Statistical package of social sciences i.e. SPSS version 12. Continuous data are described as mean +/- standard deviation and categorical variables are given as percentages. Continuous variables were compared using t-test for two independent samples. Percentages were compared using Chi-square analysis. P-values < 0.05 were considered to be statistically significant.

Results

Sixty adult patients scheduled for PCNL were enrolled in the study. There was no dropouts or exclusions in the study. The demographic data regarding age, sex and duration of surgery were comparable and non-significant (Table-1). VAS (at rest) and DVAS (during coughing and deep breathing) were significantly lower in ropivacaine group than control group (Fig. 1 and 2). The mean time for first demand of analgesia was 10.7±2.64 hours in ropivacaine group and 2.05 ± 1.44 hours in control group (P=0.0001). The mean number of analgesic demands during initial 24 hours was 2.25± 0.51 in R group and 4.4± 0.68 in group C. The mean total consumption of tramadol in 1st 24 hours was 123.2±30.16 mg in group R and 276.8±62.45 mg in group C. The side effects like nausea and vomiting and sedation were non-significant in both groups (Table-2).
Discussion

In PCNL surgery, the cause of post operative pain is mainly due to nephrostomy tube which produces local inflammatory reaction. So we designed to infiltrate the nephrostomy tract by local anaesthetic solution, ropivacaine because local anesthetic can inhibit inflammatory and local sensitising responses by directly suppressing some phases of inflammation like neutrophil priming and by blocking some of the neuronal pathways which are activated by inflammation that is protein kinase C and G protein-coupled receptors\(^8\). We compared this study with control group and data assessed were post-operative pain score, time to 1st demand analgesia, number of analgesic demand and total requirement of rescue analgesic, tramadol in first 24 hours. In our study, VAS and DVAS scores of pain in ropivacaine group were significantly lower as compared to saline group and correlates with the studies of Dalela et al\(^{10}\), Jornavithula et al\(^{11}\), Gokten et al\(^{12}\) and Ugras et al\(^{13}\) While Haleblian et al\(^9\) evaluated the use of subcutaneous infiltration of 1.5 mg/kg of 0.25% bupivacaine after PCNL in 25 patients. Their results did not showed significant difference in VAS score and pain relief around nephrostomy site area after PCNL surgery in the study group. It was postulated that the cause for pain after PCNL surgery which requires nephrostomy tube could result from structures beyond the skin puncture site like the renal capsule. Dalela et al\(^{10}\) performed PCNL under renal capsular block by infiltrating renal capsule with 2% lignocaine in 11 patients. They used a numeric pain rating scale (NRS) to quantitate the degree of pain. The NRS scores during the initial 1.5 hours were <3 in all patients. In two patients in whom the procedure extended beyond 1.5 hours, the NRS scores were 6 and 7. They confirmed that most of the pain during PCNL is felt at the time of dilatation of renal capsule and parenchyma that is heavily innervated by pain conducting neurons. Jornavithula et al\(^{11}\) evaluated post-operative pain relief using 0.25% bupivacaine infiltration along the nephrostomy tract after PCNL under fluoroscopic guidance. The mean VAS and DVAS scores for pain observed were IQR of 5-7 and IQR 6-8 in control group while IQR of 2-5 and IQR 2-6 in the block group. Gokten et al\(^{12}\) did the same study using 0.25% levobupivacaine infiltration followed by intravenous paracetamol infusion. They found lesser requirement of opioid, lower VAS score, shorter time to full mobilization and higher patient satisfaction score compared to the control group.

Ugras et al\(^{13}\) used 30 ml of either 0.02% ropivacaine or saline instillation into renal puncture site, nephrostomy tract and skin after PCNL. In 34

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Ropivacine group (mean [95% CI]) (mean ± SD)</th>
<th>Control group (mean [95% CI]) (mean ± SD)</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean time for 1st demand of tramadol (hrs)</td>
<td>10.7 ± 2.64</td>
<td>2.05 ± 1.44</td>
<td>0.0001</td>
</tr>
<tr>
<td>No. of doses of tramadol required in 24 hours</td>
<td>2.25 ± 0.51</td>
<td>4.4 ± 0.68</td>
<td>0.0001</td>
</tr>
<tr>
<td>Total consumption of tramadol in 24 hours (mg)</td>
<td>123.2 ± 30.16</td>
<td>276.8 ± 62.45</td>
<td>0.0001</td>
</tr>
<tr>
<td>Side effects</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vomiting – 1 (3.3%)</td>
<td></td>
<td>Vomiting-2 (6.6%)</td>
<td>0.554</td>
</tr>
<tr>
<td>Nausea – 1 (3.3%)</td>
<td></td>
<td>Nausea-2 (6.6%)</td>
<td>0.554</td>
</tr>
<tr>
<td>Sedation – 1 (3.3%)</td>
<td></td>
<td>Sedation-1 (3.3%)</td>
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</tbody>
</table>
patients. They assessed the effect of ropivacaine infiltration on post-operative pain status and pulmonary functions. Their results showed that VAS at 6 hours, time to first analgesic demand and total analgesic need were significantly lower in ropivacaine group. In our study, time to first rescue analgesia was prolonged and number of analgesic demand as well as total requirement of rescue analgesics in first 24 hours were decreased in ropivacaine group, which were comparable with studies by Haleblian et al, Dalela et al, Jornavithula et al, Gokten et al and Ugras et al. In our study, incidence of side effects like nausea vomiting or sedation were minimum and comparable in both groups since all patients had post-operative urinary catheter, urinary retention could not be evaluated.

The limitation of our study was that it was not performed in supracostal or multiple punctures or in patients having stone size >3.0 cm. We also excluded patients with BMI>30.

**Conclusion**

Local anesthetic infiltration with ropivacaine along the nephrostomy tract from renal capsule to the skin gives excellent postoperative analgesia and significantly reduced rescue analgesic requirement after percutaneous nephrolithotomy.
References


Abstract

**Background:** Management of postoperative pain and emergence agitation following adenotonsillectomy in pediatrics has been a major challenge for anesthesiologists. Although analgesic sparing effect of ketamine has been studied during tonsillectomy in pediatrics, there is a lot of controversy about its efficacy. Present study was designed to evaluate the effect of intravenous low dose ketamine (0.25mg/kg) during induction of anesthesia on postoperative pain and emergence agitation following adenotonsillectomy in children.

**Methods:** In this randomized clinical trial 66 children aged 5 to 15 years who underwent elective adenotonsillectomy were randomly allocated into two groups. Patients in the control group received 5ml of normal saline while patients in the ketamine group received 0.25 mg/kg of ketamine in 5 ml volume during induction of anesthesia. After termination of surgeries and transferring the patients to recovery, emergence agitation, pain score, paracetamol requirements and incidence of postoperative nausea & vomiting were assessed every hour for 6 hours.

**Results:** Emergence agitation score was significantly lower in the ketamine group (P =0.002). Pain score at all hours was lower in the ketamine group than the control group (P< 0.05). The requirements for intravenous paracetamol were significantly lower in the ketamine group (P=0.0036). There was no difference in the incidence of postoperative nausea and vomiting between the two groups (P=0.99).

**Conclusion:** Low-dose ketamine during induction of anesthesia improves emergence agitation and postoperative pain following adenotonsillectomy in children.

**Conflict of interest:** None.

**Key words:** Ketamine; Postoperative pain; Tonsillectomy; Children.
**Introduction**

Adenotonsillectomy is one of the most common surgeries in pediatric age group. This procedure is usually associated with immediate moderate to severe postoperative pain and agitation that causes bleeding, laryngospasm, and delays discharge from recovery. Traditionally opioids have been used for management of pain that have many complications such as respiratory depression specially in these patients with edema at the operative site that may cause airway obstruction and hypoxemia, nausea and vomiting and even central sensitization.

Other analgesics recommended for control of postoperative pain in adenotonsillectomy include local anesthetics, nonsteroidal anti-inflammatory drugs (NSAID) and N-methyl-D-aspartate receptor antagonist. Local anesthetics and NSAID are associated with vasoconstriction and increased risk of bleeding at site of operation respectively. Ketamine hydrochloride is a noncompetitive antagonist of NMDA receptors. In adult patients, it was found that ketamine has both analgesic-sparing and antisensitization effects. Although analgesic sparing effect of Ketamine has been studied both locally and systemic during tonsillectomy in pediatrics, there is a lot of controversy about its efficacy.

The aim of the present study is to determine the effect of intravenous low dose ketamine (0.25mg/kg) on postoperative pain score, needs to paracetamol as a rescue analgesic following adenotonsillectomy in pediatric patients.

**Methods:** In this double blind randomized control trial, seventy pediatric patients aged 5 -15 years old who underwent elective adenotonsillectomy were enrolled in this study. Patients with history of convulsion, high intracranial pressure, common cold, favism, congenital heart disease, hypersensitivity to paracetamol or ketamine and pediatrics with developmental or cognitive disorder were excluded from the study. After our institutional board approval, written informed consent was obtained from parents. Eligible pediatric patients were randomly allocated in two groups by computer base program, the ketamine group and the control group (Figure 1).

Upon arrival of patient to operating room, routine monitors including: blood pressure, electrocardiogram and pulse oximetry were applied to all children. Anesthesia was induced with intravenous sodium..

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**Fig. 1**
Flowchart of the patients according to the consort guidelines
KETAMINE IMPROVES POSTOPERATIVE PAIN AND EMERGENCE AGITATION FOLLOWING ADENOTONSILLECTOMY IN CHILDREN. A RANDOMIZED CLINICAL TRIAL

M.E.J. ANESTH 22 (2), 2013

thiopental 5-7mg/kg and 0.6mg/kg atracurium as muscle relaxant. In the ketamine group, patients received ketamine 0.25 mg/kg in 5 ml total volume and in the control group, patients received physiologic normal saline in 5 ml total volume. A nurse in anesthesia prepared the ketamine and placebo drugs in two identical 5 ml syringes. At induction of anesthesia, an anesthesiologist unaware of the prepared drug delivered the solution as per the allocation of the patients to the relevant groups. After oral endotracheal intubation, general anesthesia was maintained with 1.2% isoflurane, 50% N2O in oxygen and controlled ventilation to maintain end tidal about CO2 30-35 mmHg. Adenotonsillectomy was done by dissection by the same surgeon and upon the end of operation and discontinuation of general anesthesia the patients were transferred to recovery room and remained intubated till became fully awake. Emergence from anesthesia was recorded by same resident from anesthesia who was blinded to the groups of patients. Emergence agitation was assessed using a simple assessment scale as follows: 1: asleep; 2: awake but calm; 3: agitated but comfort; and 4: severely agitated and difficult to comfort. Then pain score of both groups was assessed ten minutes after extubation using the Baker-Wong faces pain rating scale every one hour till six hours after extubation. The Wong-Baker FACES Pain scale is often useful for assessing pain in patients who do not have ability to use language to describe pain. This scale uses faces: Face 0 is very happy because he doesn’t hurt at all. Face 2 hurts just a little bit. Face 4 hurts a little more. Face 6 hurts even more. Face 8 hurts a whole lot. Face 10 hurts as much as you can imagine (Figure 2).

If pain score was ≥ 4 then patients received 15mg/kg intravenous paracetamol as rescue analgesic. Postoperative nausea and vomiting (PONV) were recorded every one hour during these six hours. Vomiting was defined as the forceful expulsion of gastric contents from the mouth and was brought about by the powerful sustained contraction of the abdominal muscle; nausea was defined as a subjectively unpleasant sensation associated with awareness of the urge to vomit.

Statistical analysis

By using the power static software collection (SSC), sample size calculation was based on the assumption that the primary end point was the number of patients required paracetamol as a rescue analgesic in postoperative period. Power calculations indicated with a power of 80% and α level of 0.05, a sample size for each group of at least 33 patients (total of 66patients) would detect a 50% reduction in number of patients that required rescue analgesic drug during the first 6 hours post operation.

The data were prospectively transferred into a computer database for further analysis by SPSS for Windows; Version 19.0 (SPSS Inc., Chicago, IL, USA). Independent t-test and chi- square was used to compare sex, weight, age between two groups. For test hypothesis, chi-square, t test and Mann- Whitney U were used. Data were reported as means± SD. The statistical significance was considered at P<0.05.

Results

Sixty six pediatric patients undergoing elective adenotonsillectomy, were randomly allocated to the ketamine group (n=33) and the control group (n=33). There were no significant differences in the demographic variables in the two groups (Table 1).

Fig. 2

Wong-Baker FACES Pain Rating Scale
The pain scores during the first 6 postoperative hours were significantly lower in the ketamine group compared to the control group (Figure 3). The percentage of patients requiring paracetamol for postoperative pain control was significantly lower in the ketamine group compared to the control group (Table 2).

Furthermore emergence agitation was lower in the ketamine group than the control group and this differences were statistically significant between two groups (P=0.002) (Table 2).

There was no significant difference between two groups regarding incidence of the postoperative nausea and vomiting (P=0.996) (Table 2).

**Discussion**

The present study showed that intravenous low dose ketamine (0.25 mg/kg) at induction of anesthesia may reduce postoperative pain, reduce paracetamol need as a rescue analgesic, and reduce emergence agitation.

Abu-Shahwan showed that ketamine 0.25mg/kg at induction time did not decrease postoperative pain in pediatric patients undergoing tonsillectomy15. Batra et al in another study found that postoperative pain score after tonsillectomy in pediatric patients was not decreased by small dose ketamine16. However, all these studies used remifentanyl in the maintenance of anesthesia which could have made ketamine effective in reducing postoperative pain17. DA Conceição et al reported that a single small dose of ketamine (0.5mg/kg) in the pediatric patients undergoing tonsillectomy could reduce postoperative pain and use of rescue analgesia18. Likewise Murray et al concluded that ketamine (0.5 mg/kg) was effective in reducing postoperative pain in pediatric population undergoing tonsillectomy19. In our study a further decrease in the ketamine dose e (0.25mg/kg) was effective in reducing postoperative pain and in reducing rescue analgesic usage.
Emergence agitation in pediatric population undergoing adenotonsillectomy remains a major problem. Emergence agitation is reflected by self aggressive movement during emergence of anesthesia in recovery room. Yoon Sook Lee et al found that ketamine was effective in the prevention of emergence agitation without delay in awakening and both sub-hypnotic doses of ketamine 0.25 and 0.5 mg/kg were effective. Also Kararmaz et al concluded that oral ketamine was effective in reducing incidence of emergence agitation. Similarly in the present study we showed that low dose ketamine (0.25mg/kg) is effective in preventing of emergence agitation in pediatric patients following adenotonsillectomy.

The incidence of postoperative nausea and vomiting (PONV) after adenotonsillectomy is more than 70% and may cause serious complications such as pulmonary aspiration, hypoxemia, increase chance of bleeding and may cause unplanned hospitalization in 3-4.7% of patients. This complication may result from using opioids. Hasnain et al in their study that compared ketamine with morphine for management of postoperative pain following tonsillectomy in pediatrics reported that postoperative nausea and vomiting in the ketamine group was significantly less than the morphine group. The other studies that used low dose ketamine to decrease postoperative pain showed that low dose ketamine did not increase the incidence of PONV. Similarly, the current study showed that the incidence of PONV did not increase in the ketamine group as compared to the control group.

In conclusion intravenous low dose ketamine (0.25mg/kg) was effective in reducing postoperative pain following adenotonsillectomy in pediatric patients, in decreasing incidence of emergence agitation, and in decreasing the incidence of PONV in these patients.

Acknowledgment

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References


USE OF THE BILATERAL BIS MONITOR AS AN INDICATOR OF CEREBRAL VASOSPASM IN ICU PATIENTS

JESS W. BRALLIER* AND STACIE G. DEINER**

Abstract

Earlier diagnosis of cerebral vasospasm and delayed cerebral ischemia (DCI) and treatment has the potential to decrease post-bleed morbidity after subarachnoid hemorrhage (SAH). Previous studies have shown that electroencephalogram (EEG) can detect blood flow changes associated with DCI sooner than other modalities potentially leading to earlier diagnosis. However, continual monitoring with raw EEG requires significant expertise and effort, and may be difficult due to the intermittent need for MRI studies in these patients. Here we describe a series of patients with subarachnoid hemorrhage in the Neurosurgical ICU who underwent monitoring with the Bilateral Bispectral Index (BIS) monitor.

Conflict of interest: None.

Sources of financial support: None.

Introduction

Subarachnoid hemorrhage (SAH) affects 30,000 Americans each year. It is initially fatal in 33-50% of cases, with a large percentage of remaining patients suffering from late complications due to rebleeding or cerebral vasospasm. Twenty to 40 percent of patients who survive the initial hemorrhage will develop cerebral vasospasm which results in delayed cerebral ischemia (DCI). Early diagnosis and treatment of is critical in preventing infarction. Recognition of clinical neurologic deterioration in the absence of hydrocephalus or rebleeding is often the first clinical sign leading to a diagnosis of vasospasm.

Current modalities used to diagnose cerebral vasospasm include transcranial Doppler (TCDs), angiography, and several Computed Tomography (CT) and Magnetic Resonance Imaging (MRI) techniques. These diagnostic tools are invasive, require specially trained personnel to administer,
and are not continual. There is electroencephalographic (EEG) evidence that blood flow related changes associated with vasospasm precede clinical deterioration by as much as two days. However, the use of continuous standard EEG is difficult because it requires trained personnel, must be removed for follow up MRI, etc...

We thought that processed EEG with BIS had the potential to be very useful because uses a single sensor on the forehead which can be removed and reapplied, and the interpretation is simple. To this end we performed a small case series utilizing bedside monitoring with bilateral Bispectral Index (BIS) (Aspect Medical Systems Inc., Newton, MA) as a means to follow real time changes in processed EEG patterns in SAH patients.

Methods

After IRB approval, written informed consent was obtained from each subject or a legal surrogate. All patients received standard intensive care unit (ICU) monitoring with the addition of a bilateral BIS probe applied within 48 hours of SAH. Left and right BIS values were recorded every 12 hours until discharge from the Neurosurgical ICU. Additionally, Glasgow Coma Scale (GCS) scores and focal neurologic deficits were recorded every 12 hours. Modalities used to diagnose vasospasm included TCD, angiography, MRI and CT. The formal diagnosis was made by a neurointensivist using a combination of modalities and clinical criteria. Bilateral BIS data was analyzed for trends and correlated with clinical and radiographic evidence of vasospasm as determined by the neurointensivist.

Results

15 patients completed the protocol. The number of days in the ICU ranged from 2 to 15. Five patients had vasospasm diagnosed by a neurointensivist. In two of these individuals there was significant divergence between right and left BIS scores at the time of vasospasm. During angiography in these patients, selective injection of calcium channel blockers was associated with a resolution of the discrepancy in right and left BIS scores (Figure 1). Divergent BIS scores also correlated with elevated unilateral TCDs and cerebral infarction even when vasospasm was not diagnosed. However, similar discrepancy between left and right signals were episodically present at times when patients did not have vasospasm, elevated TCDs, or cerebral infarction (Figure 2).
Conclusions

Divergent BIS values between left and right side of the brain seems to be a nonspecific and insensitive indicator of cerebral vasospasm. Reasons for the mixed results include: depressed level of consciousness from the underlying condition or sedation may mask left and right sided differences in EEG, spontaneous muscle activity, electrical interference and patient movement.

In some cases it was likely that the spastic vessels did not supply the frontal lobes thus making it unlikely to detect a divergent BIS score.

The condition of DCI is more complex than just vasospasm or decreased cerebral blood flow; cerebral infarction correlates with the territory of angiographic vasospasm in only 25% to 81% of SAH patients. However, DCI correlates more closely with clinical outcomes than the presence of vasospasm. Interestingly even in the absence of significant vasospasm, one sided BIS score discordance may develop with infarction and increasing pulsatility indices on TCDs. This suggests that EEG is a sensitive indicator for blood flow but may not capture the complexity of this more inclusive definition of vasospasm for the reasons above.

There were some limitations in our observation of the patients; BIS scores can fluctuate significantly in a small time period, but for the purposes of this study we recorded the value at a single time point and not as error bars over a period of time. While it seems a minor issue, many patients had significant headache associated with their condition and did not wish to wear the probe for a significant period of time.

Bilateral BIS may be a good indicator of hemispheric changes in blood flow to the frontal lobes and may be better suited for situations or procedures where the frontal lobes are most likely to be affected e.g. carotid endarterectomy. Use of the BIS monitor in an ICU setting on awake patients is complicated by discomfort, muscle activity, and movement. The diagnosis of cerebral vasospasm after SAH continues to be made via clinical signs, bedside Doppler, and radiographic testing.


EFFECTS OF LIBERAL VS. CONVENTIONAL VOLUME REGIMEN ON PULMONARY FUNCTION IN POSTERIOR SCOLIOSIS SURGERY

JENNIFER NIESCERY*, NINA HUHMANN**, BURKHARD DACSH*, VIOLA BULLMANN***, THOMAS PETER WEBER****, MARTIN BELLGARDT* and HEIKE VOGELSAng*

Abstract

Background: We observed an increased rate of pulmonary complications (hypoxemia, pulmonary edema, re-intubation) in some patients after posterior spinal fusion, though standardized intraoperative volume regimens for major surgery were used. Therefore, we focused on the effects of two different standardized fluid regimens (liberal vs. conventional) as well as on two different types of postoperative pain management (thoracic epidural catheter vs. intravenous analgesia) concerning pulmonary function in patients undergoing posterior spinal fusion.

Methods: 23 patients received a conventional intraoperative fluid management (crystalloids ≈ 5.5ml/kg/h), whereas 22 patients obtained a liberal regimen (crystalloids ≈ 11ml/kg/h) during surgery. After surgery a thoracic epidural catheter was used in 29 patients, whereas 16 patients got a conventional intravenous analgesia. Regarding pulmonary outcome, the re-intubation rate, the postoperative oxygen saturations as well as delivery volumes and retention times of pleural drainages were evaluated.

Results: Patients with conventional intraoperative fluid management had a less frequent re-intubation rate (p= 0.015), better postoperative oxygen saturations (p= 0.043) and lower delivery volumes of pleural drainages (p= 0.027) compared to those patients with liberal volume regimen. Patients with thoracic epidural catheter had improved oxygen saturations on pulse oximetry at the first day after surgery (p<0.001) and lower delivery volumes of pleural drainages than patients with intravenous analgesia (p= 0.008).

Conclusions: The combination of a more restrictive fluid management (better pulmonary oxygen uptake and ventilation, less pulmonary edema) and a thoracic epidural catheter (sympatholysis, pain management) in posterior spinal fusion may be advantageous as both factors can improve pulmonary outcome.

Conflict of interest: No conflicts of interest are to be stated by the authors.

Sources of financial support: none declared.

* MD, Department of Anesthesiology, St. Josef-Hospital, Ruhr-University Bochum, Germany.
** MD, Department of Spine Surgery, St. Franziskus Hospital, Cologne, Germany.
*** MD, PhD, Professor; Department of Spine Surgery, St. Franziskus Hospital, Cologne, Germany.
**** MD, PhD, Professor; Department of Anesthesiology, St. Josef-Hospital, Ruhr-University Bochum, Germany.
Corresponding author: Mrs. Jennifer Niescery, Department of Anesthesiology, St. Josef-Hospital Bochum, Gudrunstr. 56, D-44791 Bochum, Germany. Tel.: +49-234-5093211, Fax: +49-234-5093209. E-mail: J.Niescery@gmx.de
Introduction

The adolescent idiopathic scoliosis is defined as a lateral curvature of the spine with simultaneous vertebral rotation that occurs in children aged 10 years to maturity. Children undergoing posterior spinal fusions are usually due to their young age in good health condition, though the long duration of surgery, the occasionally high blood loss and the considerable damage of soft tissue are often accompanied by a high peri- and postoperative morbidity. In particular, pulmonary complications are frequent problems. First, the patient’s prone position causes reduced lung compliance and rising airway pressures. Secondly, a heaped incidence of atelectasis can occur, leading to a ventilation-perfusion-mismatch with right-left-shunt and arterial hypoxia. Thirdly, pulmonary edema often occur as a result of arterial hypoxia and intraoperative fluid replacements. Therefore, a lung protective intraoperative volume regimen is of particular importance. Interestingly, at our institution we observed an increased rate of re-intubations in some patients after posterior spinal fusion, though standardized volume regimens for major surgery were used on a regular basis (restrictive-conventional ≈5ml.kg⁻¹/h or liberal ≈10ml.kg⁻¹/h). Hence, this study focused on the effects of two different intraoperative volume regimens concerning pulmonary outcome (oxygen saturation, re-intubation rate, delivery volume and retention time of pleural drainages) in patients undergoing posterior spinal fusion.

Methods

Ethical approval for this study was provided by the Ethical Committee (Registration: 2009-350-f-S, University of Muenster).

We analyzed retrospectively 45 patients after posterior spinal fusion in adolescent idiopathic scoliosis. Data collected included patients’ age, gender, body size and body weight, ASA physical status classification, Cobb-angle, number of operated segments, duration of surgery, duration of ventilation, intraoperative volume regimen, postoperative pain management (with or without thoracic epidural catheter), oxygen saturation on pulse oximetry at the first day after surgery (highest value throughout the day), re-intubation rate, delivery volume and retention time of pleural drainages as well as the length of ICU stay. Older patients (> 25 years), patients with severe scoliosis (Cobb angle > 100°) as well as patients with any kind of pre-existing pulmonary disease, renal disease or heart failure were excluded.

The posterior spinal fusions were performed by surgeons from the Department of Orthopedics and Tumor Orthopedics, Muenster University Hospital, during the period 2003-2009. Data were collected from the hospital information systems Medico/s (Siemens), Centricity Critical Care (GE Medical Systems) and Orbis (Agfa HealthCare), as well as from anesthesia protocols and documentation in ICU.

Intraoperative management

For induction of general anesthesia Sufentanil (Sufenta mite®, JANSSEN-CILAG GmbH, Neuss, Germany; 0.5-2µg.kg⁻¹) and Propofol (Propofol Fresenius 1%, Fresenius Kabi Austria, Graz, Austria; 1.5-2.5mg.kg⁻¹) were used. Muscle relaxation was performed with Cis-Atracurium (Nimbex®, GlaxoSmithKline Pharma, Vienna, Austria; 0.2mg/kg). During surgery, all 45 patients received a balanced anesthesia with Sufentanil (0.15-0.7µg.kg⁻¹/h) and the volatile anesthetic Sevoflurane (Sevorane®, Abbott, Vienna, Austria; MAC 2.2%-2.8%).

Ventilation was volume-controlled with a tidal volume of 7-8ml per kilogram body weight. The inspiratory oxygen concentration was adjusted to maintain the arterial oxygen partial pressure above 150 mmHg and the oxygen saturation per pulse oximetry reached values above 95%. Each patient was ventilated with a positive end-expiratory pressure of 5 cm H₂O.

During surgery all patients received crystalloids however with either restrictive-conventional approach (5ml.kg⁻¹/h) or liberal approach (10ml.kg⁻¹/h). The anesthesiologist’s decision for a more conventional or more liberal intraoperative volume regimen depended primarily on the clinical performance of the patient and on the anesthesiologist’s preference. The total volume of given crystalloids was heterogeneous, mainly influenced by the patient’s body weight, duration of surgery and intraoperative blood loss. Colloids, cell
saver blood, packed red blood cells (RBC) and fresh frozen plasma (FFP) were given if necessary (distinct hypovolemia, high blood loss and hemoglobin concentration < 7mg/dl, coagulopathy). To ensure that differences in pulmonary outcome didn’t appear as a result of a higher blood loss, the hemoglobin concentration was measured at least at the beginning and at the end of surgery.

Pleural drainages were fit by surgeons in every patient at the end of surgery. They were removed when the residual flows were less than 150ml per day.

**Postoperative management**

After completion of surgery patients were brought mechanically ventilated to the recovery room. The Train of Four testing was performed in every patient to measure the degree of neuromuscular blockade before weaning started. Shortly before extubation an arterial blood gas analysis was done to ensure an adequate gas exchange. Extubation criteria included an adequate respiratory rate (≥ 10/min) with a sufficient tidal volume (> 5ml.kg⁻¹), an adequate gas exchange ([PaO₂/FIO₂] ratio > 150-200) with a normal arterial partial pressure of carbon dioxide during spontaneous ventilation, an appropriate level of consciousness and sufficient airway protective reflexes (cough, swallow). Every patient received oxygen (2l / min) via a nasal cannula directly after extubation for two hours. Whenever oxygen saturation on pulse oximetry was < 95%, patients received oxygen again. Criteria for re-intubation included an inadequate respiratory rate (> 35/min), an impaired gas exchange ([PaO₂/FIO₂] ratio < 150) with an arterial oxygen partial pressure < 55mmHg and a PaCO₂ > 60mmHg or rising levels of PaCO₂ > 10mmHg / h, as well as clinical signs of dyspnea and increased work for breathing.

A thoracic epidural catheter (TEC) for postoperative pain management and sympatholysis was offered to every patient and fixed by the surgeons before the wound was closed, so that its correct position could be ensured. Patients obtained a mixture of 5ml Bupivacaine and Sufentanil (Bucain®, Actavis Group, Hafnarfjördur, Island; 0.175% and Sufentanilmite®, 1µg.ml⁻¹) per hour as soon as they left the recovery room. Those patients who had to be reintubated or rejected the TEC received a conventional intravenous analgesia with Sufentanil (Sufentanilmite®, 0.1-0.5µg. kg⁻¹/h) or Piritramid (Dipidolor®, Janssen - Cilag Pharma, Vienna, Austria; 0.04-0.15mg.kg⁻¹/h) and Paracetamol (Perfalgan®, Bristol-Myers Squibb, Vienna, Austria; 15mg.kg⁻¹, 4x/day) for postoperative pain management. Pain nurses ensured that no patient had a pain score of ≥4 (out of 10) using a numerical rating scale during their stay in hospital.

**Statistical analysis**

All statistical evaluations were performed using the program IBM SPSS version 20. Categorical patient characteristics were presented in frequencies or percentages and continuous variables as mean ± standard deviation. Categorical traits were checked for independence from each other by using the chi-square test according to Pearson or Fisher’s exact test (cell size less than 5). Continuous variables were prior to statistical analysis tested for normal distribution by using the Kolmogorov - Smirnov - Test. Group differences were either performed with the parametric t test for independent samples or with the non-parametric Mann-Whitney-Wilcoxon-test. The significance level was set as a two-sided test with an error probability less than 5% (p - value <0.05).

**Results**

1. **Patient characteristics**

Among the analyzed 45 patients were 12 men and 33 women. They were 16.5 ± 2.9 years old, had a body size of 168 ± 23 cm and a body weight of 58.5 ± 9.69kg. All patients were of ASA-class I or II. The preoperative average measured Cobb angle was 66 ± 13°. The posterior fusion covered ordinary 8.7 ± 2.5 vertebrae with duration of surgery of 317 ± 119 minutes (Table 1).

2. **Pulmonary function outcome**

Patients who received a conventional intraoperative volume regimen had a less frequent re-intubation rate than those patients with a liberal
volume management (conventional: 0% vs. liberal: 22.7%; p= 0.015).

The postoperative oxygen saturation at the first day after surgery was higher in the patients with a conventional regimen compared to patients in the liberal regimen (Table 2).

The need for oxygen therapy two hours after extubation was higher in the liberal group, although the difference was not statistically significant (Table 2).

The volumes of pleural drainages were lower in patients with a more conventional regimen than in those patients with a liberal volume management (Table 2).

The patients’ stay in the ICU was not statistically significant between the two groups (Table 2).

Patients with a TEC had improved oxygen saturations at the first day after surgery compared to those patients with a conventional analgesia, statistically smaller volumes of pleural drainages, but similar duration of ICU stay (Table 3).

### Table 1

<table>
<thead>
<tr>
<th>Patient characteristics</th>
<th>Conventional fluid regimen</th>
<th>Liberal fluid regimen</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>16.9 ± 3.53</td>
<td>16.1 ± 2.84</td>
<td>p= 0.438</td>
</tr>
<tr>
<td>Gender ♂:♀ (n)</td>
<td>6:17 (n = 23)</td>
<td>6:16 (n = 22)</td>
<td>p= 0.632</td>
</tr>
<tr>
<td>Body size (m)</td>
<td>1.66 ± 0.39</td>
<td>1.70 ± 0.07</td>
<td>p= 0.514</td>
</tr>
<tr>
<td>Body weight (kg)</td>
<td>57.5 ± 9.77</td>
<td>59.4 ± 9.61</td>
<td>p= 0.796</td>
</tr>
<tr>
<td>ASA (Score)</td>
<td>1.45 ± 0.51</td>
<td>1.41 ± 0.51</td>
<td>p= 0.632</td>
</tr>
<tr>
<td>Surgery</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cobb-angle (°)</td>
<td>66.8 ± 15.7</td>
<td>65.5 ± 10.2</td>
<td>p= 0.083</td>
</tr>
<tr>
<td>Operated segments</td>
<td>9.1 ± 3.28</td>
<td>8.4 ± 1.64</td>
<td>p= 0.37</td>
</tr>
<tr>
<td>Duration of surgery (min)</td>
<td>306 ± 111</td>
<td>327 ± 127</td>
<td>p= 0.559</td>
</tr>
</tbody>
</table>

### Table 2

<table>
<thead>
<tr>
<th>Intraoperative volume regimen and outcome</th>
<th>Conventional fluid regimen</th>
<th>Liberal fluid regimen</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 23 (5.5 ± 1.3ml.kg⁻¹/h)</td>
<td>n = 22 (11 ± 2.6ml.kg⁻¹/h)</td>
<td></td>
</tr>
<tr>
<td>Re-intubated patients (n)</td>
<td>0</td>
<td>5</td>
<td>p= 0.015</td>
</tr>
<tr>
<td>Need for oxygen therapy 2h after extubation (%)</td>
<td>39.1</td>
<td>50</td>
<td>p= 0.463</td>
</tr>
<tr>
<td>Oxygen sat. 1st day after surgery (%)</td>
<td>98.96 ± 1.19</td>
<td>97.59 ± 2.9</td>
<td>p= 0.043</td>
</tr>
<tr>
<td>Volume pleural drainage (ml)</td>
<td>661 ± 295</td>
<td>946 ± 514</td>
<td>p= 0.027</td>
</tr>
<tr>
<td>Length of ICU stay (days)</td>
<td>4.78 ± 1.45</td>
<td>5.45 ± 1.26</td>
<td>p= 0.104</td>
</tr>
</tbody>
</table>
3. Intraoperative volume regime

The amounts of given colloids (conventional: 3.6 ± 9.5 ml/kg/h vs. liberal: 4.6 ± 11.5 ml/kg/h; p = 0.75), RBC units (conventional: 1.1 ± 0.5 ml/kg/h vs. liberal: 0.8 ± 0.6 ml/kg/h; p = 0.08) and FFP (conventional: 0.7 ± 0.7 ml/kg/h vs. liberal: 0.5 ± 0.7 ml/kg/h; p = 0.34) were similar in both groups. Accordingly, observed blood losses were nearly identical (conventional: 1258 ± 310 ml vs. liberal: 1236 ± 295 ml; p = 0.215). None of the patients had a hemoglobin concentration of less than 7.5 g/dl or a hemoglobin difference of >4 g/dl (pre- vs. postoperatively) after completion of surgery.

4. Postoperative management

Time till extubation (period between completion of surgery and extubation) was slightly longer in the conventional group, though the difference did not reach statistical significance (conventional: 154 ± 54 min vs. liberal: 114 ± 68 min; p = 0.06). Five patients who had obtained a liberal intraoperative fluid management developed some kind of respiratory failure (mainly pulmonary edema) and had to be reintubated. Those patients received diuretics and were transferred to the ICU.

Discussion

Our data show that pulmonary outcome in young patients undergoing spinal fusion can be improved by using a conventional (5.5 ml/kg/h) versus a liberal (11 ml/kg/h) crystalloids infusion regimen.

The intraoperative volume management has because of its diverse effects on the patients’ overall morbidity a particular priority. Unfortunately, an ideal volume management is difficult to achieve.

On the one hand, a high volume fluid management (> 4-6 liters of crystalloids during surgery apart from replacement of blood losses) in major surgery is generally less advantageous as it may lead to overhydration, including reduced pulmonary functions and decreased cardiac output. Reduced pulmonary functions after isotonic saline infusions occur even in healthy volunteers, as infusions of 1 liter crystalloids decrease functional residual capacity, reduce diffusing capacity and can lead to an increase in pulmonary blood-flow. This higher blood flow through pulmonary capillaries increases pulmonary vascular pressure and is associated with increasing fluid transudation, resulting finally in impaired gas exchange. Furthermore, rapid crystalloid infusions can cause mild airflow obstruction, thus resulting probably from airway wall edema on the bronchial lumen. Therefore, it is not surprising that patients undergoing major posterior scoliosis surgery are at high risk for developing pulmonary complications such as pulmonary edema or hypoxemia. Additionally, impaired cardiac output can occur, as high fluid regimens may generate a shift to the right on the Starling myocardial performance curve, resulting in a depression of ventricular function, leading secondary to fluid accumulation in the lungs.

On the other hand, restrictive fluid regimens are...
often equally complicated. Again, the Frank-Starling mechanism is of importance, as hypovolemia results in a shift to the left on the Starling performance curve, caused by decreased ventricular filling (preload), which impairs the cardiac output. This reduced cardiac output is accompanied by increased plasma norepinephrine (stress response) and declined mean arterial pressure (clinical signs of hypovolemia). Additionally, dehydration from preoperative fasting and intraoperative blood losses have to be corrected.

Summarized, there are still no data concerning a pulmonary protective intraoperative volume regimen in adolescent idiopathic scoliosis surgery.

In this study patients in the conventional group received significantly less crystalloids than those in the liberal group. We assume that the better pulmonary outcome of patients in the conventional group (less frequent re-intubation rate, better postoperative oxygen saturation at the first day after surgery, lower delivery volumes of pleural drainages) can be primarily explained by avoidance of fluid overload and less pulmonary edema. We furthermore suppose that the tendency of prolonged mechanical ventilation after surgery in the conventional group (conventional: 154 ± 54 min. vs. liberal: 114 ± 68 min.) might have additional lung protective effects by faster elimination of intraoperatively formed atelectasis (ventilation with PEEP).

Several studies reported improvement in pulmonary function in patients receiving TEC after surgery compared to patients with intravenous analgesia. Movafegh and Tenenbein showed that patients with TEC had significantly better lung functions reflected by forced expiratory volume in 1 second (FEV1) and FEV1/FCV (FEV 1/forced vital capacity) compared to patients receiving conventional analgesia within the first two days after surgery and less atelectasis already four hours after surgery. Our data show that other pulmonary functions such as SpO2 and rate of re-intubation can also be improved with the use of TEC while maintaining adequate analgesia.

Effects of TEC include sympatholysis and reduced activations of physiological stress responses. It was previously shown that epinephrine and cortisol concentrations under combined anesthesia (patients with TEC) were considerably lower during surgery compared to general anesthesia without TEC. These higher concentrations of catecholamines, glucocorticoids as well as proinflammatory cytokines may potentially lead to an upregulation of sodium channels, which are involved in the pathogenesis of pulmonary edema. Therefore, the smaller volume of pleural drainages with TEC could also be explained by lower stress responses and less inflammatory reaction.

Most likely, the intraoperative volume regimen is the most important factor for pulmonary function outcome after posterior scoliosis surgery. Nevertheless, a TEC should be seen as “gold standard” for postoperative pain management in posterior spinal fusion as it might have additional lung protective effects.

There are two limitations that need to be acknowledged and addressed regarding the present study. One limitation was the relatively small sample size (n = 45). Although posterior spinal fusions were performed regularly, we had to exclude all patients with structural pulmonal or cardiac disorders, with severe scoliosis (Cobb angle > 100°), those patients with an ASA Score ≥3 as well as all patients whose scoliosis didn’t result from adolescent idiopathic scoliosis in order to ensure comparability. Nevertheless, significant differences between the groups could be detected although the sample size of this study is small.

The second limitation concerns the selectivity of observed lung protective effects, since 20 patients with a TEC received a more restrictive volume regimen, whereas 9 patients obtained a liberal volume management. Additionally only 5 out of 16 patients with a conventional analgesia got a restrictive intraoperative volume regimen. It must be considered that high volume fluid regimens do not always cause pulmonary complications, though they can probably make them worse.

In summary, our results indicate that the combination of a more restrictive fluid management and a TEC in posterior spinal fusions may be advantageous as both factors can improve pulmonary outcome even in young and generally healthy patients.
EFFECTS OF LIBERAL VS. CONVENTIONAL VOLUME REGIMEN ON PULMONARY FUNCTION IN POSTERIOR SCOLIOSIS SURGERY

References

EFFECT OF PREOPERATIVE LICORICE LOZENGES ON INCIDENCE OF POSTEXTUBATION COUGH AND SORE THROAT IN SMOKERS UNDERGOING GENERAL ANESTHESIA AND ENDOTRACHEAL INTUBATION

DIYVA GUPTA*, SANJAY AGRAWAL**, AND JAGDISH P. SHARMA***

Abstract

Introduction: Post-Operative Sore Throat (POST) is an undesirable side effect of endotracheal intubation. Pharmacological and non-pharmacological measures have been utilized for minimizing the morbidity caused by POST. We have tested whether medicated lozenges of Licorice provides efficacy in decreasing POST in smokers presenting for surgery under general anesthesia with endotracheal intubation.

Methods: 100 patients, 20 - 65 years, American Society of Anaesthesiologists (ASA) physical status Grade I & II, of either sex, with history of smoking, and posted for elective surgical procedure lasting more than one hour and requiring general anesthesia with endotracheal intubation were included and randomly divided into two groups (n= 50) to receive Licorice lozenges (Group A) and Sugar Candy (Group B). The patients were assessed for cough, sore throat and hoarseness of voice immediately after extubation and then at 30 min, 12 hrs and 24 hrs after extubation utilizing scoring system of Harding and McVey.

Results: Overall incidence of postextubation cough was less in Group A (12 patients, 24%) compared to Group B (26 patients, 52%) (p= 0.002). Magnitude of sore throat (Grades 0/1/2/3) was seen in 48/2/0/0 patients (Group A) and 46/4/0/0 (Group B) at extubation (p= 0.40) and 34/16/0/0 (Group A) and 28/20/2/0 (Group B) at 30 min (p= 0.17). At 12 and 24 hours, the magnitudes of sore throats were 24/25/1/0 (Group A) & 12/38/0/0 (Group B) (p=0.02) and 26/23/1/0 (Group A) & 15/35/0/0 (Group B) (p= 0.03) respectively.

Conclusion: Use of licorice lozenges is efficacious for reducing the distressing complaint of POST in postoperative period among smokers.

Key words: POST, lozenges, Licorice.

* Assistant Professor.
** Associate Professor.
*** Professor.
Department of Anaesthesia, Himalayan Institute of Medical Sciences, Dehradun, India.
Corresponding author: Dr. Sanjay Agrawal, Associate Professor, Department of Anesthesia, Himalayan Institute of Medical Sciences, Swami Ram Nagar, Dehradun, India. E-mail: docagrawal72@yahoo.co.in
Introduction

The symptoms of postoperative pharyngeal dryness, throat pain, uncoordinated / inability / pain on swallowing associated with cough and hoarseness of voice is commonly termed as Postoperative Sore Throat (POST)\(^1\). Tracheal intubation has been found to be the foremost cause of POST\(^2\) with an incidence of 21- 65%\(^3,4\). Chronic smoking is associated with inflammation of tracheal mucosa secondary to effects of substances in cigarette smoke, leading to increased respiratory problems in perioperative period. These patients have an increased incidence of POST\(^5\). Various techniques have been utilized to decrease the incidence of POST. Use of licorice gargles 5 minutes before induction of anaesthesia are effective in decreasing the incidence of POST by 50%\(^6\). Lozenges of licorice are available for management of sore throat associated with pharyngitis due to varied causes in traditional Indian medicine. Such lozenge contains a lower dosage of licorice and has been found efficacious for management of pharyngitis.

In this study, we evaluated the effectiveness of low dose licorice lozenges for decreasing the incidence of POST in smokers undergoing surgery under general anesthesia and endotracheal intubation.

Methods

This randomized placebo controlled study was conducted between March 2012 and August 2012 at Himalayan Institute of Medical Sciences. Institution Ethical Committee review was obtained and written informed consent of patients were taken. 100 patients, of either sex, 20-65 years of age, American Society of Anesthesiologists(ASA) physical grade I and II, posted for elective surgical procedures lasting more than one hour, and requiring general anesthesia and endotracheal intubation were included. Exclusion criteria included surgeries lasting less than one hour, anticipated difficult intubation, Mallampatti Grade III and IV, pregnancy, Body Mass Index > 30 kg/m\(^2\), surgeries requiring insertion of Ryles’ tube, throat packing or rapid sequence intubation, history of upper respiratory tract infection, gastroesophageal reflux disease, asthma and significant cardiovascular disease.

The patients were divided into 2 groups by sealed envelope technique to receive Licorice lozenges (Sualin; Hamdard Pharma, India) (Group A) and Sugar Candy (Dabur India Limited) (Group B). All patients were asked to refrain from smoking for 48 hrs prior to surgery and were asked to suck (and not chew) the lozenges as per group allotment, 30 minutes prior to expected induction of anesthesia. Before shifting to operating room (OR), it was ensured that any leftover lozenges was not present in oral cavity. In the OR after establishing intravenous (i.v.) access, standard monitoring electrocardiogram (ECG), non - invasive blood pressure (NIBP) and pulse oximetry (SpO\(_2\)) were attached. Induction of anaesthesia was achieved with injection (inj.) fentanyl 2 mcg/kg and inj. propofol 2 mg/kg till loss of verbal contact. Ease of mask ventilation was confirmed and neuromuscular blockade was achieved with inj. vecuronium 0.1mg/kg. Patients were ventilated with 66% nitrous oxide in oxygen and isoflurane for 3 minutes. Endotracheal intubation was completed using size 3 Macintosh curved blade and a high volume low pressure cuffed endotracheal tube (Portex, Smiths Medical International Limited, UK ) of size 7-7.5 for females and 8-8.5 for males. The tube size selection was at the discretion of single anaesthesiologist with an experience of > 5 years. Duration of laryngoscopy and number of attempts for intubation was noted. The cuff of endotracheal tube was filled with air to maintain cuff pressure ≤ 25 mm of Hg as assessed periodically in the intraoperative period utilizing Portex Cuff Manometer (Smiths Medical International Limited, Germany).

Anesthesia was maintained with 66% nitrous oxide in oxygen, isoflurane, intermittent boluses of inj. vecuronium and inj. fentanyl. Last dose of opioids was administered at least 30 minutes prior to expected extubation and inj. Diclofenac Sodium 75 mg (Dynapar AQ, Troikka Limited, India) in 100 ml normal saline was administered 20 min prior to expected extubation. Isoflurane was switched off 10 minutes prior to extubation. Neuromuscular paralysis was reversed with inj. Neostigmine(0.05 mg/kg) and inj. Glycopyrrolate(0.01 mg/kg). With resumption of spontaneous respiration, nitrous oxide was switched off and patients were made to breath spontaneously with 100 % oxygen. Gentle oral suction was done once and patients were extubated. Care was taken to avoid bucking on endotracheal tube and too harsh or repeated suctioning was not allowed. The patients
were assessed for cough, sore throat and hoarseness of voice at extubation, 30 min, 12 hrs and 24 hrs post-anesthesia by framing the questions in the local dialect and language of the patients, utilizing the scoring system of Harding and McVey (Table 1).7

<table>
<thead>
<tr>
<th>Sore throat</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>No sore throat at any time since the operation</td>
<td>0</td>
</tr>
<tr>
<td>Minimal sore throat (Complains of sore throat only on asking)</td>
<td>1</td>
</tr>
<tr>
<td>Moderate sore throat (Complains of sore throat on his / her own)</td>
<td>2</td>
</tr>
<tr>
<td>Severe sore throat (Complains of throat pain)</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 1
Score system of Harding and McVey

<table>
<thead>
<tr>
<th>Cough</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>No cough at any time since the operation</td>
<td>0</td>
</tr>
<tr>
<td>Minimal cough or scratchy throat (Light or single episode of cough)</td>
<td>1</td>
</tr>
<tr>
<td>Moderate cough (more than one episode of non-sustained cough)</td>
<td>2</td>
</tr>
<tr>
<td>Severe cough (Sustained and repetitive cough with head lift)</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hoarseness</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>No evidence of hoarseness at any time since the operation</td>
<td>0</td>
</tr>
<tr>
<td>No evidence of hoarseness at the time of interview</td>
<td>1</td>
</tr>
<tr>
<td>Hoarseness at the time of interview noted by patient only</td>
<td>2</td>
</tr>
<tr>
<td>Hoarseness that is easily noted at the time of interview</td>
<td>3</td>
</tr>
</tbody>
</table>

Sample size was calculated on the basis of previous studies5. Presuming the reduction in incidence of POST by 50%, α error of 5% and power of 80%, 46 patients were needed in each group. So, 50 patients were selected in each group. Statistical analysis was performed using SPSS version 19 (SPSS Software, IBM Corporation Amrock, New York). Results are presented as mean ± standard deviation (SD) for parametric data and as percentage (%) for non-parametric data. Analysis of variance (ANOVA) was used to analyze the continuous data while non-parametric data was compared by using Chi-square test (χ²). Mann - Whitney test was applied to compare the independent groups considering mean of sum of ranks. p value of < 0.05 was considered significant.

Results
The patients in both groups were comparable in their demographic profile (Table 2). Intubation characteristics such as duration of laryngoscopy (DOL), number of intubation attempts, duration of surgery (DOS) and duration of anesthesia (DOA) were also comparable (Table 3).

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Group A</th>
<th>Group B</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number (n)</td>
<td>50</td>
<td>50</td>
<td>--</td>
</tr>
<tr>
<td>Male: Female</td>
<td>45:5</td>
<td>46:4</td>
<td>0.12</td>
</tr>
<tr>
<td>ASA I/II</td>
<td>46 / 4</td>
<td>41 / 9</td>
<td>0.46</td>
</tr>
<tr>
<td>Age (yr) (Mean±SD)</td>
<td>39.48±11.15</td>
<td>41.60±14.63</td>
<td>0.87</td>
</tr>
<tr>
<td>Range of Age (yr)</td>
<td>20 – 65</td>
<td>20 - 65</td>
<td>--</td>
</tr>
<tr>
<td>Weight (kg) (Mean±SD)</td>
<td>57.20±11.65</td>
<td>61.08±9.86</td>
<td>0.12</td>
</tr>
<tr>
<td>Range of Weight (kg)</td>
<td>40 – 80</td>
<td>45 - 85</td>
<td>--</td>
</tr>
</tbody>
</table>

12 patients (24%) in Group A and 26 patients (52%) in Group B had cough of grade 1 at extubation (p=0.002). Only 1 patient in Group B complained of cough at 12 hrs and 24 hrs postoperatively (p > 0.05) (Table 4).

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Group A</th>
<th>Group B</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOL (sec) (Mean±SD)</td>
<td>11.00±3.64</td>
<td>10.56±3.11</td>
<td>0.68</td>
</tr>
<tr>
<td>No. of Attempts (1 / 2)</td>
<td>44 / 6</td>
<td>45 / 5</td>
<td>0.44</td>
</tr>
<tr>
<td>DOA (min) (Mean±SD)</td>
<td>149.00±51.67</td>
<td>156.00±62.825</td>
<td>0.70</td>
</tr>
<tr>
<td>DOS (min) (Mean±SD)</td>
<td>125.60±50.24</td>
<td>131.80±61.60</td>
<td>0.69</td>
</tr>
</tbody>
</table>

DOL: duration of laryngoscopy; DOA: duration of anesthesia; DOS: duration of surgery
Complaint of sore throat was present at all times with the lowest incidence being at extubation and at 30 min postoperatively (p>0.05). At 12 hrs, scores of 0/1/2 were present in 24 (48%), 25 (50%), 1 (2%) (Group A) and in 12 (24%), 38 (76%), 0 (0%) (Group B) (p=0.02). Scores at 24 hrs were 26 (52%), 23 (46%), 1 (2%) (Group A) and 15 (30%), 35(70%), 0 (0%) (Group B) (p=0.03). There was an overall reduction in severity of sore throat in group A except for 1 patient who complained of persistent sore throat of Score 2 up to 24 hours (Table 5).

None of the patients complained of hoarseness of voice at any time of observation.

Discussion

Our study demonstrated that preoperative use of licorice lozenges is effective in decreasing the incidence of postextubation cough and sore throat. This study differs from previous reports of effectiveness of licorice gargle for attenuation of POST in the following ways: dosage, formulation and time of administration.

Agrawal et al in their study have utilized a dosage of 0.5 g as gargle 5 minutes prior to intubation. Similarly, Sessler et al have also demonstrated effectiveness of licorice gargle for decreasing the incidence of POST. In contrast, we have utilized lozenges of licorice which contained only 97 mg of licorice. Second, the time of administration was 30 minutes prior to intubation compared to 5 minutes in other studies. Only two studies are available in literature showing the effectiveness of lozenges for decreasing the incidence of POST: one utilizing Strepsils lozenges and other being magnesium lozenges. To our knowledge, our study is probably the only study where effectiveness of lozenges of licorice is evaluated for decreasing the incidence of POST. We evaluated the incidence of sore throat utilizing the scale as derived by Harding and McVey which is a more subjective assessment of the symptomology while the majority of the other studies have utilized VAS as the tool for measuring POST. The etiology of POST is multifactorial with incidences ranging from 0-50% to as high as 100%. The method and type of airway instrumentation is the single most influential factor in development of pharyngeal complication. Patient related factors such as female

Table 4

<table>
<thead>
<tr>
<th>Cough</th>
<th>At Extubation</th>
<th>At 30 Min</th>
<th>At 12 Hrs</th>
<th>At 24 Hrs</th>
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<td></td>
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<td>Scores</td>
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<td>50 0 0 0</td>
<td>50 0 0 0</td>
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<tr>
<td></td>
<td>% 76 24 0 0</td>
<td>100 0 0 0</td>
<td>100 0 0 0</td>
<td>100 0 0 0</td>
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<tr>
<td>Group B</td>
<td>n 23 26 1 0</td>
<td>50 0 0 0</td>
<td>49 1 0 0</td>
<td>49 1 0 0</td>
</tr>
<tr>
<td></td>
<td>% 46 52 2 0</td>
<td>100 0 0 0</td>
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<td>98 2 0 0</td>
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<tr>
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<td>1.00</td>
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* Mann-Whitney test

Table 5

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<tr>
<th>Sore Throat</th>
<th>At Extubation</th>
<th>At 30 Min</th>
<th>At 12 Hrs</th>
<th>At 24 Hrs</th>
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<tr>
<td></td>
<td>Scores</td>
<td>Scores</td>
<td>Scores</td>
<td>Scores</td>
</tr>
<tr>
<td>Group A</td>
<td>n 48 2 0 0</td>
<td>34 16 0 0</td>
<td>24 25 1 0</td>
<td>26 23 1 0</td>
</tr>
<tr>
<td></td>
<td>% 96 4 0 0</td>
<td>68 32 0 0</td>
<td>48 50 2 0</td>
<td>52 46 2 0</td>
</tr>
<tr>
<td>Group B</td>
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<td>0.17</td>
<td>0.02</td>
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EFFECT OF PREOPERATIVE LICORICE LOZENGES ON INCIDENCE OF POSTEXTUBATION COUGH AND SORE THROAT IN SMOKERS UNDERGOING GENERAL ANESTHESIA AND ENDOTRACHEAL INTUBATION

sex, younger age groups, gynecological surgeries, use of succinylcholine for intubation, history of smoking or lung disease all predispose to POST\textsuperscript{2,14}.

Smokers develop laryngeal epithelial inflammation, metaplasia and dysplasia due to chronic irritation by substances in cigarette smoke. This impairs laryngeal integrity and function causing greater exposure of subepithelial airway receptors to stimuli\textsuperscript{22}. Erskine et al evaluated airway reflexivity to chemical and mechanical stimulations. Tracheal intubation results in stretch stimulation of trachea leading to respiratory complications\textsuperscript{23}.

Various pharmacological and non – pharmacological modalities are utilized to decrease the incidence of POST. Use of smaller size tube, avoidance of nitrous oxide, maintaining intracuff pressure <25 mm of Hg, careful instrumentation and intubation after full neuromuscular blockade have all been found to prevent POST\textsuperscript{24}. Similarly use of lubricants, gargles or medications in preoperative period have also been found to decrease the incidence of POST.

Licorice is extracted from the plant Glycyrrhiza glabra Linn and has been used in traditional medicine worldwide for the treatment of ailments of respiratory tract, digestive tract, hepatitis and cancer. Licorice consists of a number of active ingredients such as glycyrrhizin, glycyrrhizic acid, liquiritin, liquiritigenin, glabridin, and hispaglabridins\textsuperscript{25}. Anti-inflammatory and antiallergic properties are due to glycyrrhizin\textsuperscript{26} while glycyrrhizic acid decreases the inflammatory process by inhibiting cyclooxygenase activity, prostaglandin formation, and inhibition of platelet aggregation\textsuperscript{27}. Liquiritin and liquiritigenin have peripheral and central antitiussive properties\textsuperscript{28}. Glabridin has significant antioxidant and ulcer-healing properties which might be helpful in minimizing the extent of ischemic injury to the pharyngeal and tracheal mucosa and expedite their healing\textsuperscript{29}.

Side effects of the use of licorice have been reported. Prolonged use is associated with pseudoaldosteronism\textsuperscript{10,31} hypertension\textsuperscript{12,33} and hyperkalemia\textsuperscript{34,35}. Liquorice extract and glycyrrhizin have also been reported to induce changes in Cytochrome P450 linked activities resulting in accelerated metabolism of co-administered drugs and adverse effects due to change in cytochrome profiles such as toxicity/ cytotoxicity\textsuperscript{36}. In the current study, no side effects were reported as a once and low dose of licorice was used in the study group.

Shortcomings of our study were the absence of patients’ blinding as patients were able to recognize the taste of these commonly available lozenges. Also, we didn’t assess the incidence of POST at other shorter times post operatively (e.g. 4-8 hours) Another shortcoming was not categorizing the patients according to the number of pack years of smoking. Does this influence the incidence and severity of POST needs to be further studied? Moreover relation between type of surgery and intraoperative position of patient with the incidence of POST was also not taken into consideration.

A further study investigating use of licorice lozenges for prevention of POST in surgeries requiring Ryles tube insertion, pharyngeal packing, surgeries in positions other than supine, LMA insertion, intubation by anesthesiology residents could give an idea of its further effectiveness in different clinical situations and conditions.

Conclusion

Incidence of post intubation cough and sore throat can be decreased with the preoperative use of one licorice lozenge. This low dose serves as an effective, cost limited and ready to use method for decreasing the distressing symptoms of POST.
References

SUCCESS OF ULTRASOUND GUIDED POPLITEAL SCIATIC NERVE CATHETERS IS NOT INFLUENCED BY NERVE STIMULATION

Christopher B. Robards*, Steven B. Porter*, Ilana Logvinov** and Steven R. Clendennen*

Abstract

Background: There is debate as to whether nerve stimulation (NS) is required to place peripheral nerve catheters when using ultrasound (US) guidance. There is conflicting evidence for whether stimulating catheters improve postoperative analgesia compared to non-stimulating catheters. The use of US in combination with NS has been shown to be superior to NS alone in terms of popliteal nerve blockade. Given the previously published reports, we hypothesized that there is improvement in sensory and motor blockade for stimulating popliteal perineural catheters placed under US guidance when NS is used.

Methods: Following IRB approval, 21 patients undergoing elective foot and ankle surgery were randomly assigned to either a US or US+NS-guided continuous popliteal sciatic nerve block using a lateral approach. The primary end-point of the study was successful nerve blockade at 20 minutes. Secondary end-points included: block performance time, minimum stimulating current, pain scores on postoperative day 1 and day 2, and patient satisfaction.

Results: There was no significant difference in successful nerve blockade at 20 minutes in the US versus US+NS groups (73% vs. 80%, p=1). Procedure time was significantly shorter in the US only group (median 62 seconds vs. 130.5 seconds, p<0.01). Postoperative pain scores and overall patient satisfaction were not significantly different between the two groups.

Conclusion: We have found that the addition of NS provides no benefit over US alone. US alone was associated with a significantly shorter block performance time. US+NS showed no significant difference in pain control, patient satisfaction, or block success.

Conflict of interest: The authors have no conflicts of interest to declare.

Sources of financial support: This project received no internal or external funding.

Key words: postoperative analgesia; popliteal sciatic nerve block; ultrasound; nerve stimulation; foot and ankle surgery.

* MD.
** RN.

Department of Anesthesiology, Mayo Clinic, Jacksonville, FL.

Corresponding author: Christopher B. Robards, MD, Assistant Professor, Mayo Clinic, 4500 San Pablo Road, Jacksonville, FL 32224, USA. Tel: 904-956-3327, Fax: 904-956-3332. Robards.christopher@mayo.edu
There is debate as to whether nerve stimulation (NS) is required to place peripheral nerve catheters when using ultrasound (US) guidance. US guidance has been shown to improve the onset, decrease the amount of local anesthetic required, and improve the quality of peripheral nerve blockade. There is also information that indicates nerve block needles can have an intimate relationship with a nerve (including intraneural needle tip location) and fail to elicit an appropriate motor response. Furthermore, there is conflicting evidence as to whether stimulating catheters improve postoperative analgesia when compared to non-stimulating catheters. There is also evidence that US in combination with NS is superior to NS alone when performing popliteal nerve blockade. In a recent study, when combined with NS, US was shown to increase block success compared to NS alone during popliteal sciatic nerve blockade. Given the previously published data, we hypothesized that there is improvement in sensory and motor blockade for the placement of stimulating catheters for popliteal sciatic nerve block when NS is combined with US guidance.

Methods

Following institutional board review approval, full description of the study, and informed consent, 21 volunteers (male or female, age greater than 18 years) scheduled for foot or ankle surgery were assigned to receive a US-guided continuous popliteal sciatic nerve block using a lateral approach. Randomization of the two arms of the study was performed via sealed envelopes. Based on previous studies and the experience of the research team, it was felt that a reasonable estimate for the rate of complete blockage for catheters placed without nerve stimulation would be approximately 70%. An absolute increase of 15% in the successful block rate is considered clinically significant. The detection of this increase with 80% power, using a chi-square test at the at the α=0.05 level, will require 58 participants per group. Thus, we proposed to enroll a total of 120 participants. All volunteers received an intravenous catheter and an infusion of Lactated Ringer’s solution. Patients were sedated using a combination of midazolam (2-5 milligrams) and fentanyl (50-250 micrograms). Under US guidance, the sciatic nerve was identified at the point where the nerve divides into its two components, the tibial (TN) and common peroneal nerves (CPN). That point was marked on the skin and measured from the popliteal crease and documented. Following thorough chlorhexadine prep and sterile drape placement, the skin was infiltrated using a solution of 1% lidocaine.

In one arm of the study (US/NS), a nerve stimulator was connected (initial current setting of 1.0 mA, pulse duration 100 µs, frequency 2 Hz) to a 17 gauge 4 inch Tuohy needle (Arrow International, Reading, PA) and advanced towards the bifurcation of the sciatic nerve under US guidance (Logiq-e General Electric, 12 L probe, Milwaukee, WI). The needle was advanced and repositioned until a dorsiflexion (indicating CPN stimulation) or plantar flexion motor response (indicating TN stimulation) was obtained. After eliciting a motor response, a stimulating catheter (19 gauge X 60 cm Stimucath, Arrow International, Reading, PA) was advanced to 5 cm past the tip of the needle. Dorsi- or plantar flexion through stimulation of the catheter was confirmed at a current of less than 1.0 mA and documented. After securing the catheter in place, 30 mL of plain mepivacaine 1.5% was injected incrementally with aspiration every 5 mL.

In the second arm of the study (US), the same stimulating catheter and needle system was used. However, the nerve stimulator was not turned on during the placement of the catheter. The end point for needle advancement was ultrasonographic appearance of the Tuohy needle being beneath the thick epineurial sheath of the sciatic nerve at the level of the bifurcation of the sciatic nerve proximal to the popliteal fossa. After advancing the needle to that point, the catheter was advanced 5 cm past the tip of the needle. Dorsi- or plantar flexion through stimulation of the catheter was confirmed at a current of less than 1.0 mA and documented. After securing the catheter in place, 30 mL of plain mepivacaine 1.5% was injected incrementally with aspiration every 5 mL. The anesthesiologist performing the block was aware of the randomization of each patient so that he or she knew how to perform the nerve block procedure. A separate
anesthesiologist assessing motor and sensory blockade was blinded to the randomization. The time from Touhy needle insertion into the skin, after attainment of a US image of the nerve, to final catheter positioning at 5 cm past the needle tip was documented for each patient. After injection of local anesthetic, sensory and motor distribution of anesthesia was assessed by a blinded observer at 5, 10, and 20 minutes using pin-prick test. Sensory distributions assessed included the superficial peroneal, deep peroneal, sural, and tibial nerves. Assessment was based on a three point scale: no sensation (0), dull sensation (1), and sharp sensation (2). Motor strength was assessed in the distribution of the CPN and the TN by testing the patient’s strength with respect to dorsiflexion (CPN) and plantar flexion (TN) using a 3 point scale: no visible contraction (0), able to dorsiflex/plantarflex against gravity (1), and able to dorsiflex/plantar flex against resistance (2). A successful nerve block was defined as a score of <2 in all four sensory nerve distributions at 20 minutes. A follow up visit (if the patient was an inpatient) or a telephone call (if the patient was an outpatient) was made every 24 hours for the duration of catheter use (approximately 48-72 hours) to assess for patient satisfaction and numeric pain score on an 11 point scale (no pain [0], worst pain imaginable [10]). Descriptive statistics, Fisher’s exact test, and the Mann-Whitney U test were performed using http://www.vassarstats.net.

**Results**

Patient characteristics for both groups are presented in Table 1. The overall success of catheter placement as defined by a sensory deficit in both the TN and CPN components of the sciatic nerve at 20 minutes following injection of local anesthetic was 72.73% in the nonstimulating group and 80% in the stimulating group, and was not statistically significant (p = 1) (Table 2). Pain score assessment was not significantly different at any point assessed during the postoperative period, and overall patient satisfaction was similar between the two groups. The time required

<table>
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<tr>
<th>Table 1</th>
<th>Patient Characteristics</th>
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<tr>
<td>Variable</td>
<td>Nerve stimulator technique (n = 10)</td>
</tr>
<tr>
<td>Age (years)</td>
<td>52 (15)</td>
</tr>
<tr>
<td>Gender (Male)</td>
<td>5 (50%)</td>
</tr>
<tr>
<td>Gender (Female)</td>
<td>5 (50%)</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>172 (12)</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>97 (20)</td>
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</tbody>
</table>

Categorical variables are summarized by n (%). Continuous variables are summarized by mean (standard deviation).

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Block Characteristics and Results</th>
</tr>
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<tbody>
<tr>
<td>Block Time (seconds)</td>
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<tr>
<td>MIN</td>
<td>MEDIAN</td>
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<tr>
<td>Current (mA)</td>
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<tr>
<td>Patient Satisfaction (0-3)</td>
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<td>Pain Score 1 (0-10)</td>
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<tr>
<td>Pain Score 2 (0-10)</td>
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<tr>
<td>Success of Block</td>
<td>72.3%</td>
</tr>
<tr>
<td>Distance of Sciatic Nerve Bifurcation from Popliteal Crease (cm)</td>
<td>5.8</td>
</tr>
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</table>
to place the catheters was significantly longer in the stimulating group (130.5 seconds vs. 62 seconds, p=0.01). The average distance from the bifurcation of the sciatic nerve above the popliteal crease was 5.8 cm (US/NS) and 6.0 cm (US) in the two groups and similar to previous data.

Discussion

The results of this data set suggest that the use of NS during placement of a stimulating catheter at the popliteal sciatic nerve under US guidance does not significantly add to the success rate as measured by sensory deficit at 20 minutes, postoperative pain scores, or overall patient satisfaction. By adding nerve stimulation there is a significant increase in the time it takes to place the catheter. Recent studies on popliteal sciatic nerve blockade have shown that US guidance can reduce local anesthetic consumption, as well as improve the success rate of sensory block, number of needle passes, patient satisfaction during catheter placement, and morphine consumption when compared to NS alone. Whether a stimulating catheter improves continuous catheter placement depends on which block is being performed and the data are mixed. It appears from our limited data set that there is no benefit to using NS when placing a stimulating catheter under US guidance at the popliteal fossa. Therefore, it would seem that using a stimulating catheter is not necessary when performing this block and that a multiorificed flexible catheter (for example, an epidural catheter) may be similarly effective, faster, and less costly to place.

While seemingly low, the 72.3% and 80% success rate in the the US and US/NS groups respectively is comparable to recently published data at 20 minutes following popliteal sciatic nerve blockade. It is known that the sciatic nerve has a slow onset of nerve blockade, and the fact that postoperative pain scores were low and satisfaction was high in our patients suggests successful blockade. We suspect that if time had permitted and we would have continued to assess both sensory and motor blockade for 30 minutes post-block we would have been able to demonstrate a higher success rate. Furthermore, our definition of successful blockade was strict in that it was sensory deficit in all four terminal branches of the sciatic nerve.

We made the decision to stop our study prior to enrollment of the initially planned 120 patients because of a series of complications we experienced with stimulating catheters at our institution. We did not feel it appropriate to continue enrolling patients in a study that used stimulating catheters following these incidents. Of note, the complications we experienced with stimulating catheters did not involve any of the study patients, and all involved upper extremity blocks. Despite stopping enrollment early, our data agrees with previous studies that US is superior to NS for popliteal sciatic nerve blockade. Anecdotally, a patient in the US group had a successful nerve block with a minimum stimulating current of 3.77 mA. This underscores the fact that there is still a gap in understanding when it comes to the relationship between minimum stimulating current, elicited motor response, and successful nerve blockade. In conclusion, in this limited data set, it appears that there is no benefit to adding NS when placing a stimulating catheter under US guidance when performing a continuous popliteal sciatic nerve block. The addition of NS only adds time to the procedure without offering an increase in successful nerve blockade.
SUCCESS OF ULTRASOUND GUIDED POPLITEAL SCIATIC NERVE CATHETERS IS NOT INFLUENCED BY NERVE STIMULATION

Reference

MONITORED ANESTHESIA CARE FOR A PATIENT WITH ADVANCED HUNTINGTON’S CHOREA

TAYLOR WHITE* and STEVEN NEUSTEIN**

Introduction

Huntington’s disease (HD), a rare, autosomal dominant disorder of the central nervous system, has been associated at times with unusual responses to anesthetic agents such as thiopental, midazolam, succinylcholine, and nondepolarizing neuromuscular blocking drugs. We describe the anesthetic management of a 50 year-old female with advanced HD, complicated by chorea, dementia, dysphagia, and dysarthria, undergoing percutaneous endoscopic gastrostomy (PEG) placement. To the best of our knowledge, there have not been any prior reports describing the use of propofol for sedation in a patient with Huntington’s disease.

Case

A 50 year-old, 50 kilogram female with Huntington’s disease (HD) complicated by chorea, dementia, dysphagia, and dysarthria, with no history of cardiopulmonary disease, presented for percutaneous endoscopic gastrostomy (PEG) placement. Despite redirection by the patient’s sister at bedside, the patient was agitated in the endoscopy holding area and suffering from violent choreoathetoid movements. Although she was unable to follow commands, she spontaneously demonstrated a Mallampati Class 1 airway, with adequate mouth opening, thyromental distance, and neck range of motion.

Given her agitation, intramuscular sedation with a benzodiazepine and/or an antipsychotic was considered; however, with the aid of the nursing team and the patient’s sister, a 20-gauge intravenous catheter was placed in the left forearm and well secured. Midazolam was administered in one-milligram increments over the span of approximately 20 minutes, to a total dose of four milligrams, with little decrease in the patient’s movements or level of agitation. The decision was made to proceed to the endoscopy suite to continue with further sedation.

Standard ASA monitors and a nasal cannula were placed with difficulty, and an initial 30-milligram bolus of propofol was administered. Within 60 seconds, the patient’s choreoathetoid movements ceased, and she closed her eyes. With intermittent propofol boluses to a total dose of 200 milligrams, and local anesthesia administered by the proceduralist, PEG placement...
proceeded without incident, with adequate respiratory and cardiovascular parameters throughout the fifteen-minute procedure. The patient’s recovery room course was uneventful, and she was able to return to her skilled nursing facility without any undue delay.

Discussion

Huntington’s disease was first fully described by 22-year old New York family physician George Huntington in 1872. It is a devastating disease of the human central nervous system, now known to be caused by a toxic gain-of-function mutation of the Huntingtin gene. This mutation, an increase in the number of cytosine-adenine-guanine trinucleotide repeats present in the gene’s coding portion, creates a polyglutamine region in the Huntingtonin protein which alters its function and leads to neuronal degeneration, particularly affecting the basal ganglia. Greater than 40 CAG repeats produces fully penetrant disease, which is inherited in an anticipatory autosomal dominant pattern.

Through the latter portion of the 20th century, case reports have at times associated HD with prolonged recovery from benzodiazepines and barbiturates, as well as with increased duration of paralysis after administration of both depolarizing and nondepolarizing neuromuscular blocking drugs (NMBDs). In addition, at least one genetic study has found an increased incidence of atypical pseudocholinesterase in patients with HD.

A recent review of eleven patients with HD who underwent seventeen general anesthetics, by Kivela et al of the Mayo Clinic, did not find any atypical reactions to midazolam, sodium thiopental, succinylcholine, nor nondepolarizing NMBDs. Prolonged sedation observed after benzodiazepines and barbiturates in prior reports was attributed by these authors to relative overdosing of these drugs, not abnormal patient response. While no abnormal response to NMBDs was observed, the authors still recommended caution with succinylcholine given the association with atypical pseudocholinesterase. Succinylcholine may still be needed, however, due to the possible increased risk of aspiration in these patients.

The administration of propofol to individuals with HD has been previously described. However, in those two case reports, the tracheas of both patients were intubated, and the anesthetics were general anesthetics with mechanical ventilation. There was no report on any effect that propofol had on the chorea. The use of sedation has been reported previously in a patient with Huntington’s disease, but the sedation was achieved solely with midazolam, which in that case did have a beneficial effect on the choreiform movements.

With regards to our case, midazolam did not control the patient’s motor symptoms or agitation. In addition, we note that the recovery course was not prolonged despite this 50-kilogram patient’s receiving four milligrams of midazolam prior to her brief procedure. A small dose of propofol quickly and effectively ceased her choreoathetoid movements and established a plane of anesthesia appropriate for beginning the PEG placement. Propofol has been associated with involuntary movements including athetosis, seizures, and dystonia, likely due to inhibition of inhibitory pathways in the basal ganglia, leading to a net increase in excitatory cholinergic outflow. In that case report, the movements were lessened by benztropin. The use of propofol in our case was effective in quieting the debilitating motor symptoms of Huntington’s disease.

References

USE OF AIRWAY EXCHANGE CATHETER FOR BRONCHOSCOPY OF A PATIENT WITH DOWN’S SYNDROME

AYŞE KARCI*, SEDEN DURU**, ELVAN ÖÇMEN** and VOLKAN KARAÇAM***

Tracheobronchial injuries (TBI) are highly fatal, and early diagnosis and repair are crucial for survival.1-3 The anesthesiologist and the surgeon must secure the integrity and patency of the airway for these cases. These injuries remain infrequent, and are becoming less fatal due to the availability of the resources necessary to achieve a secure airway, and thus some of them can be managed conservatively.4 We report an unusual case of upper airway compromise and extensive subcutaneous emphysema due to traumatic bronchial rupture and its conservative repair in a patient with Down’s syndrome.

Conflict of interest: The authors declare that they have no conflicts of interest to disclose.

Case Presentation

A 33-year-old, 120 kg man with Down’s syndrome presented to the Emergency Department with dyspnoea and cough which began while he was having his meal. Radiography and computed tomography of the chest showed a foreign body present in the left lung. On examination he was tachypneic with severe suprasternal retractions and subcutaneous emphysema of face, chest wall, axillae, and back which was thought to be caused by the massive air leak due to the foreign body. Upon development of severe respiratory distress and subcutaneous emphysema, he was intubated and mechanically ventilated while taken to the operating room for bronchoscopy. (Fig. 1)
In addition to massive subcutaneous emphysema in the face, neck and anterior chest, the tongue was severely swollen and laryngoscopic view (as far as it could be performed) revealed that the edema was not limited to the tongue and the lips, but the oral cavity was also involved. Therefore, extubation of the patient was deemed potentially hazardous (Fig. 2). Since emphysema had progressed rapidly following endotracheal intubation and mechanical ventilation, the patient was suspected of having sustained a tracheal injury due to the foreign body. Bronchoscopy was required for removal of the foreign body and also for the diagnosis and treatment of the suspected rupture. The only surgical indication for repairing the laceration was the reluctance to extubate the patient and the surgeon’s first choice was conservative treatment. The decision was to use an airway exchange catheter, which has a high success rate when used as a guide for re-intubation, but has not been reported for extubation before bronchoscopy.

An 14-F airway exchange catheter (AEC) 83-cm long, with an outer diameter of 6.5-mm was introduced through the endotracheal tube before the tube was removed, and was left in situ during bronchoscopy. Using a rigid bronchoscope, a chicken bone about 4 cm long was extracted from the distal part of the left main bronchus. The bronchoscopic view showed a tear just above the level where the chicken bones was located. The bronchial rupture was endoscopically treated using fibrin glue.

On the second postoperative day, the patient was extubated without any complications when the standard extubation criteria were met, and when the patient was conscious, hemodynamically stable, and could protect and clear the airway. Furthermore, the subcutaneous edema had disappeared. (Fig 3)

**Fig. 2**
*Extensive swelling of the tongue and subcutaneous emphysema of the neck and the anterior chest*

**Fig. 3**
*Posteroanterior chest radiograph of the patient soon after extubation*

**Discussion**

Tracheal injuries are rare events and their management requires a fast and straightforward diagnostic evaluation. They are not diagnosed immediately in 25-68% of the cases but tachypnoea and subcutaneous emphysema are frequent physical findings and can alert the physician to diagnosis. Although it is commonly agreed that posttraumatic injuries require surgical intervention the management of iatrogenic injuries is presently shifting towards a more conservative treatment. For both urgent bronchoscopy and re-intubation, maintaining a continuous access to the airway following extubation was mandatory in our case, presented above. A compromised airway such as this presents an uncommon diagnostic and surgical challenge to the anesthesiologist and the surgeon.

Cassada et al.\(^1\) reported that independent of mechanism or anatomic location of injury, delay in the diagnosis of injuries to the trachea and major bronchi was the most important prognostic factor for postoperative morbidity in foreign body aspirations causing rupture in respiratory tract. Since the patient was intubated when he was brought to the operating room, extubation should be performed as soon as
possible to enable bronchoscopy for diagnosis.

The American Society of Anesthesiologists Task Force on the Management of the Difficult Airway recommends consideration of placement of a stylet prior extubating the difficult airway, to facilitate reintubation if necessary, and also to allow ventilation. Airway exchange catheters (AEC) are long, thin hollow tubes which have distal terminal and side holes for ventilating the patient and are supplied with removable 15-mm connectors that are compatible with the anesthetic circuit. Continuous access to the airway via an AEC seemed to be the only safe extubation strategy for this patient with Down’s syndrome. Maintaining a conduit within the trachea that affords the ability to resecure the airway and ventilate the patient was the planned extubation strategy.

A prospective analysis by Mort supports the concept of an AEC- facilitated extubation strategy. In the analysis, the benefit of airway exchange catheters was demonstrated in selected patients, but its use in patients with Down’s syndrome and airway deterioration has not been mentioned.

Previous investigators who incorporated an airway 11F (3.7 mm ED) catheter for securing the airway in difficult extubation patients, have reported that it is well tolerated. The larger sized AEC, the 14F (4.7 mm ED) which has not been previously reported for difficult extubation patient, have been found to be useful for maintaining access to the airway and re-intubating the trachea. The larger sized AEC was preferred for this case because, first, it can be used as a stylet for tracheal reintubation; second, we wanted a larger diameter, in case we would use the ventilator port of the airway exchanger catheter to ventilate the patient.

The presence of the AEC to assist in reintubating the trachea is a major step toward improving safety in patients whose reintubation was considered a risk. In addition to the use of an AEC for a difficult extubation and bronchoscopy in a patient with Down’s syndrome, this case presents a conservative approach to tracheobronchial injuries. When Lampl et al. presented their experience for the first time in 1994, hardly anyone appeared to be convinced about the advantages of this procedure. Later on, the effects of conservative treatment of tracheal lacerations were confirmed by Ross and Molins. Non-operative management of TBIs should be reserved for patients with small laceration of the membranous tracheal wall (<2 cm) and in severely injured patients with a high operative risk. However recently, Gómez-Caro et al. have stated that conservative treatment for tracheobronchial injuries is effective regardless of the mechanism of production, length, or site of injury. Conservative treatment should be carefully assessed in patients who meet strict selection criteria.

This case reconfirms that the AEC is an efficient method of maintaining continuous access to the airway after extubation, as it potentially offers a clinically valuable conduit for both bronchoscopy and reintubation in difficult airways.
References


INCIDENTAL FINDING OF FOREIGN BODIES DURING NASAL INTUBATION IN A MENTALLY CHALLENGED PATIENT

ABDUL KADER MAHFOUZ* AND MOHAMMAD SULEIMAN KHAN**

Abstract

Nasal foreign bodies are frequently encountered among children and mentally challenged patients. They are often asymptomatic and may remain undetected for years. We are presenting a case of an incidental finding of foreign bodies during nasal intubation in a mentally challenged patient.

Key words: Intubation, nasal, foreign body.

Conflict of interest: There is no conflict of interest.

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Introduction

Nasal foreign bodies are frequently reported among children and mentally challenged patients. This could be explained by accidents, trauma or curiosity of children and mentally retarded patients which leads them to explore their body orifices1,2. The foreign bodies may be inert and can remain in the nose for years without mucosal damage3. We are presenting a case of an incidental finding of foreign bodies during nasal intubation of a mentally challenged patient posted for dental restoration and extractions under general anesthesia. Written consent from relatives was obtained for publication of this report.

Case report

A 21 year old female was posted for dental restoration and extractions under general anesthesia. Since the patient was mentally challenged and violent, the dentist was unable to do this procedure at the dental clinic. The patient had a history of epilepsy but was not on any medication. The clinical examination was unremarkable, except that the patient was highly uncooperative. Routine laboratory investigations were within normal limits but dental ortho-pan-tomogram showed badly decayed teeth. The patient’s body weight was 45 Kg, heart rate 82/min and noninvasive arterial blood pressure (NIBP) was 108/74 mmHg. She was kept fasting overnight at the hospital. The patient was premedicated with midazolam 7.5 mg tablet orally given half an hour before the expected time of surgery.

* MSc, PhD, Sr. Consultant Anesthesiologist, Al Nahda Hospital, Muscat- Sultanate of Oman.
** MD, Registrar Anesthesiologist, Al Nahda Hospital, Muscat- Sultanate of Oman.

Corresponding author: Abdul Kader Mahfouz, MSc, PhD; Sr. Consultant Anesthesiologist, Al Nahda Hospital, Muscat- Sultanate of Oman. PO: 937, PC: 112 Ruwi. Tel: +96899360867. E-mail: abdulkaderm2000@hotmail.com
On arrival at the operating theatre the patient was sedated and she was talking to the medical staff in a friendly but incoherent manner. She did not allow the insertion of an intravenous cannula or attachment of routine monitoring. Therefore inhalational induction was started with 8% sevoflurane in a mixture of oxygen and N₂O in a ratio of 1:1. After loss of consciousness, routine monitoring of ECG, NIBP and pulse oximetry was started. An IV cannula was inserted, fentanyl 50 µg and atracurium 25 mg were given and sevoflurane was reduced to 1%. A nasal vasoconstrictor (Xylometazoline hydrochloride 0.1%) was instilled in both nostrils. After adequate lubrication, the anesthesiologist tried to insert a preformed north-pole, 6.5 endotracheal tube nasally into the left nostril but failed to do so. With gentle manipulation, he was able to pass it through the right nostril with the sensation of a sudden give. Once the anesthesiologist felt that the tip of the tube was in the oro-pharynx, a Macintosh laryngoscope was inserted orally to direct the tip of the tube to the larynx. He noticed some blood in the oro-pharynx, and after aspirating it, he was able to see two shining metallic objects on the posterior pharyngeal wall. After the two objects were removed using Magill forceps, the tip of the endotracheal tube was directed into the larynx. When the correct position of the tube was confirmed with equal bilateral air entry on auscultation, mechanical ventilation was started. The metallic objects were found to be “pop can openers”.

At that time it was decided to start the dental surgery and to call an ENT surgeon for nasal endoscopy to check the nasal cavities for any unrecognized foreign bodies.

At the end of the dental procedure, the ENT surgeon examined the nasal cavities with an endoscope. He was able to remove six more pop can openers from the left nostril and wanted to examine the right nostril where the endotracheal tube was inserted. After adequate oral suction the nasal tube was removed and replaced with same size oral tube. Three more pop can openers were extracted from the right nostril. The nasopharynx and oro-pharynx were thoroughly checked for any possible missed foreign bodies, but nothing more could be detected. Esophagoscopy and examination of both ears were carried out and the findings were negative. The total number of pop can openers removed from the patient was 11 (Fig. 1). Reversal of muscle relaxant was done by neostigmine 2.5 mg and atropine 0.9 mg, and extubation was carried out in the recovery position after return of reflexes. Paracetamol 0.75 gm IV was given for postoperative analgesia. The relatives were informed about the foreign bodies and were counseled to take a better care of the patient. They denied any history of epistaxis, nasal discharge or foul odour coming from the patient’s nose. Patient was kept under observation for 2 hours at the recovery area, and then discharged to the ward.

Fig. 1
All foreign bodies removed from the patient’s nose after endoscopic examination.

Discussion

Nasal Foreign bodies are uncommon in adults. Some foreign bodies are inert and may remain for years without clinical manifestations. Patients may present to outpatient clinics or accident and emergency department complaining of nasal occlusion, headache, unilateral mucopurulent nasal discharge with foul odour, or epistaxis. If a nasal foreign body is suspected, removal can be attempted in the clinic in cooperative patients. General anesthesia will be an alternative in the case of children, mentally challenged patients or failure of attempted removal in the clinic.

In the present case, the patient was mentally challenged, violent and difficult to approach. There was no previous complaint of any nasal problem. The physical examination did not reveal any nasal discharge or foul odour which might give rise to suspicion of the presence of a foreign body. The dental ortho-pan-tomogram did not show any clues of the presence of a foreign body. However, the X-ray was
done one week before the scheduled time of surgery which is enough time for the patient to insert these foreign bodies in her nose. The hazards of nasal intubation in a patient having an unrecognized nasal foreign body include the unnoticed displacement of the foreign body to the posterior part of the naso-pharynx with the risk of inhalation and choking at the time of recovery. The foreign body might be pushed down the airway with the tube with the risk of partial or total airway obstruction. This would greatly endanger the patient’s life especially if bronchoscopic facilities are not available in the place. If the foreign body is small, it might be impacted in one of the small bronchioles. This would carry the risk of distal emphysema and super-added infection which would need time postoperatively to manifest and diagnose.

The incidental finding of foreign bodies in this case on the posterior pharyngeal wall raised the doubt about other unrecognized foreign bodies. An ENT surgeon was consulted to check the nasal cavities and was able to remove more foreign bodies from both nostrils. Examinations of both ears and esophagoscopy were done and were negative.

This case suggests that special attention should be paid during nasal intubation of children or mentally challenged patients for the possibility of foreign bodies even if the patient is free of symptoms. Another alternative would be to request an X-ray of the paranasal sinuses in children and mentally challenged patients in whom nasal intubation is planned to exclude the presence of foreign bodies. However, not all patients have foreign bodies and it would be unjustified to expose patients to the X-ray hazards. In addition, not all foreign bodies are radiopaque. Anesthesiologists’ vigilance should remain the cornerstone during management of these cases.
References


CARDIORESPIRATORY CRISIS AT THE END OF PREGNANCY: A CASE OF PHEOCHROMOCYTOMA

SAMIR HADDAD*, BASEL AL-RAIY**, AZZA MADKHALI***, SAAD AL-QAHTANI****, MOHAMMAD AL-SULTAN***** AND YASEEN ARABI******

Abstract

Pheochromocytoma during pregnancy is extremely rare. Its clinical manifestation includes hypertension with various clinical presentations, possibly resembling those of pregnancy-induced hypertension. The real challenge for clinicians is differentiating pheochromocytoma from other causes of hypertension (preeclampsia, gestational hypertension, and pre-existing or essential hypertension), from other cause of pulmonary edema (preeclampsia, peripartum cardiomyopathy, stress or Takotsubo cardiomyopathy, pre-existing cardiac disease [mitral stenosis], and high doses betamimetics), and from other causes of cardiovascular collapse (pulmonary embolism, and amniotic fluid embolism). Although, several cases of pheochromocytoma during pregnancy have been published, fetal and maternal mortalities due to undiagnosed cases are still reported. We report a case of a patient whose delivery by cesarean section was complicated by severe hemodynamic instability resulting in a cardiac arrest. Later on, pheochromocytoma was suspected based on computed tomography (CT) scan findings. Diagnosis was confirmed with special biochemical investigations that showed markedly elevated catecholamines in urine and metanephrines in serum, and later by histopathology of the excised left adrenal mass. This case illustrates the difficulty of diagnosing pheochromocytoma in pregnancy and raises the awareness to when this rare disease should be suspected.

* MD, CES, Intensive Care Department, MC 1425, Director, Surgical Intensive Care Unit, King Abdulaziz Medical City, Riyadh, Kingdom of Saudi Arabia.
** MD, Intensive Care Department, MC 1425, Assistant Professor, College of Medicine, King Saud Bin Abdulaziz University for Health Sciences, King Abdulaziz Medical City, Riyadh, Kingdom of Saudi Arabia.
*** MD, Obstetrics-Gynecology Department, Assistant Professor, College of Medicine, King Saud Bin Abdulaziz University for Health Sciences, King Abdulaziz Medical City, Riyadh, Kingdom of Saudi Arabia.
**** MD, FCCP, FRCP (C), Intensive Care Department, MC 1425, Associate Professor, College of Medicine, King Saud Bin Abdulaziz University for Health Sciences, King Abdulaziz Medical City, Riyadh, Kingdom of Saudi Arabia.
***** MD, FCCP, FRCP (C), Intensive Care Department, Emergency Medicine Department, Associate Professor, Dean of Admission and Registration, College of Medicine, King Saud Bin Abdulaziz University for Health Sciences, King Abdulaziz Medical City, Riyadh, Kingdom of Saudi Arabia.
****** MD, FCCP, FCCM, Chairman, Intensive Care Department, Associate Professor, King Saud Bin Abdulaziz University for Health Sciences Medical Director, Respiratory Services, King Abdulaziz Medical City, Riyadh, Kingdom of Saudi Arabia.

Corresponding author: Samir Haddad, MD, CES, Intensive Care Department, MC 1425 Director, Surgical ICU, King Abdulaziz Medical City, PO Box 22490, Riyadh 11426, Kingdom of Saudi Arabia. Tel: ++966-1-8011111 x18855 / x18877, Fax: ++ 966-1-8011111 x18880. E-mail: haddad55@yahoo.com; icu1@ngha.med.sa
Introduction

Pheochromocytoma is a rare catecholamine-secreting tumor and extremely rare in pregnancy. The clinical manifestations of a pheochromocytoma result from excessive catecholamine secretion by the tumor that may precipitate life-threatening cardiovascular complications. Diagnosis is often difficult and can be easily missed, as pheochromocytoma may present a broad spectrum of clinical manifestations, particularly mimicking pre-eclampsia.

Case presentation

A 31-year-old gravida-8, para-6 + 1 woman at 42 weeks gestation presented to the emergency department with abdominal pain. At 16:30, she was admitted to the delivery ward as being in labor. All her previous pregnancies ended in a normal spontaneous vaginal delivery except the last one that ended in a cesarean section (CS). Her past medical, family and social histories were unremarkable. She was not on any medication, or known to have any allergy. On physical examination, she was afebrile. Her heart rate (HR) was 112 beats per minute (BPM), blood pressure (BP) was 107/80 mm Hg, respiratory rate (RR) was 20 breaths per minute, and her oxygen saturation (SpO2) was 98-100% while she was breathing room air. Her abdomen was gravid and not tender to palpation. Mild uterine contractions were noted (3 to 4 in 10 minutes) with mild to moderate pain (pain score 2 to 4). No edema was found on her lower extremities. On pelvic examination, her cervix was 4 to 5 cm dilated and 80% effaced, with the head at -3 station. Her initial blood analysis revealed a hemoglobin of 110 g/L, a white cell count of 8.8 × 10^9/L, and a platelet count of 281 × 10^9/L. All electrolyte levels were unremarkable, her serum creatinine was 46 µmol/L and uric acid 195 µmol/L. An intravenous cannula was inserted and infusion of a crystalloid solution at the rate of 125 mL/hours was commenced. Two doses of 100 mg of meperidine and 25 mg of promethazine, with 6 hours interval, were administered intramuscularly for pain control. Continuous cardiotocograph (CTG) monitoring showed normal fetal HR with acceleration and normal variability, and uterine hyperstimulation for which 2 doses of 0.25 mg of terbutaline, with 4 hours interval, were administered subcutaneously.

At 21:50 hours, she became moderately distressed, her BP was recorded at 152/119 mm Hg and her HR at 155 BPM. Distress, hypertension and tachycardia were attributed to anxiety, pain and the use of terbutalin. On obstetrician request and patient agreement for analgesia, an epidural catheter was sited at the L3-4 interspace. A bolus of 1 liter Lactated Ringer (LR) was administered as preparation for the epidural analgesia. A test dose (3 ml of lidocaine 1.5% with 1:200,000 epinephrine), followed by a 5-ml dose of 0.125 % bupivacaine were injected and provided adequate analgesia. During the following hour, her BP ranged 125-150/76-111 mm Hg, HR 80-163 BPM; however, both RR and SpO2 remained stable (20-22 and 98-100%, respectively).

At 22:55, the patient was transferred to the operating theatre for an emergency CS for failure to progress and persistent fetal tachycardia. Epidural anesthesia was extended using 11 ml of 2% lidocaine and 100 µg of fentanyl preceded by a bolus of 1 liter LR to prevent secondary hypotension. A male infant in poor condition was delivered with Apgar scores of 3 and 8 (at one and five minutes, respectively) and an umbilical arterial pH of 6.90. Oxytocin (10-units) was administered as a slow intravenous (IV) bolus on delivery of the baby. CS was uneventful and blood loss was estimated at 500 ml. However, her BP remained elevated ranging from 140 to 160/90 to 100 mm Hg with persistent sinus tachycardia at 130 to 163 BPM. Two 10-mg increments of esmolol were administered intravenously to control the HR; however, there was no significant response.

Suddenly, at the end of the CS and while she was breathing through a face mask with an FiO2 of 0.4, the SpO2 fell to 89% and sero-sanguinous fluid emerged from her mouth. Urgent intubation of the trachea was performed without administering any additional drug, and positive pressure ventilation was started. A large amount of pink frothy secretions were suctioned from the endotracheal tube, diagnosed as frank pulmonary edema. She remained hypoxemic (SpO2 80-90%), tachycardic (150-170 BPM) and hypertensive (150-160/90-100 mm Hg). Labetalol 10 mg and amiodarone
150 mg were administered as slow IV bolus to control HR for a suspected atrial fibrillation (AF) with rapid ventricular response (irregular tachyarrhythmia). Shortly, the HR dropped to 30 BPM, the BP fell to 40/25 mm Hg and she became pulseless. Cardiopulmonary resuscitation (CPR), as per the Advanced Cardiac Life Support (ACLS) recommendations, was performed for 3 minutes and restored the BP to 130/80 mm Hg and the HR to 150 BPM. Pulmonary edema, secondary to the use of terbutaline and fluid shift, was considered to be the most likely etiology of the event. Sixty mg of furosemide was administered as IV bolus. The patient was transferred to the intensive care unit (ICU) at 00:10 of the next day.

On admission to the ICU, she was sedated, intubated and mechanically ventilated with an FiO2 of 1.0 and a lung protective strategy (respiratory rate 30 breaths/min, tidal volume 300 ml [6 mL/kg of predicted body weight], and PEEP of 16 cm H2O). She was severely hypoxemic with SpO2 around 60%. Arterial blood gas (ABG) analysis was pH 7.15, PaCO2 57.2 mm Hg, PaO2 41.1 mm Hg, HCO3- 19.8 mmol/L, base excess -9.1 mmol/L and SaO2 63%. Chest X-ray showed pulmonary edema (Fig. 1). She was hemodynamically unstable with labile and rapidly fluctuating blood pressures. The systolic blood pressure (SBP) varied from 200 to 60 mm Hg and the HR from 140 to 170 BPM. Vasopressor infusions (norepinephrine, dopamine, phenylephrine, vasopressin and epinephrine) were used on and off according to the BP. Central and arterial cannula were inserted. Routine chest X-ray, following the central line insertion, confirmed the presence of pulmonary edema. The central venous pressure (CVP) was 20 mm Hg. A bolus of furosemide 60 mg IV was given followed by a continuous infusion at 10 mg per hour with poor response so a dialysis catheter was inserted for fluid removal. One hour after admission to the ICU, an episode of severe hypotension and bradycardia was followed by a pulseless electrical activity cardiac arrest. CPR for 42 minutes, epinephrine 5 mg (total), atropine 2 mg (total), vasopressin 40 units, 10% calcium chloride (20 ml) and 8.4% NaHCO3 (250 mmol) resulted in restoration of cardiac activity and hemodynamic stability.

As diagnosis was uncertain, a pulmonary artery catheter (PAC) was inserted, 3 hours after ICU admission, for hemodynamic assessment and monitoring. Cardiac index was at 2.2 to 2.8 L·min⁻¹·m⁻² and the pulmonary capillary wedge pressure (PCWP) ranged from 6 mmHg to 9 mmHg. Transesophageal echocardiography (TEE) showed global hypokinesia of the left ventricle (LV) with ejection fraction (EF) of 25 to 30%. Supportive therapy was continued with full neurological, respiratory and hemodynamic recovery. However, her stay in the ICU was complicated with the development of fever and leukocytosis. A septic screen was performed and included a computerized tomography (CT) scan of the abdomen which showed a large (44 × 39 mm), heterogeneous, enhancing, left adrenal mass. A presumptive diagnosis of pheochromocytoma was confirmed with biochemical investigations that showed markedly elevated catecholamines in urine (Table 1) and metanephrines in serum (Table 2). The patient was treated with alpha-adrenergic blockade (phenoxybenzamine), with additional beta-blockade (metoprolol), and discharged home with the above medications. Two months after discharge, she underwent uneventful elective laparoscopic excision of the left adrenal mass. The histopathology described a nodular, encapsulated mass arising from the adrenal medulla measuring 2.5 × 2.3 × 1.5 cm, and confirmed the diagnosis of pheochromocytoma.

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**Fig. 1**

Chest radiography showing pulmonary edema.
Fig. 2
Abdominal computed tomography (CT) scan showing a large (44 × 39 mm), heterogeneous, enhancing, left adrenal mass.

Fig. 3
Photomicrograph of the lesion, showing a well demarcated mass (left) with a residual normal adrenal gland (right).

Fig. 4
The tumor cells are arranged in nests surrounded by a thin fibrovascular stroma, so called “Zellballen”. There is slight pleomorphism, but no atypia.
CARDIORESPIRATORY CRISIS AT THE END OF PREGNANCY: A CASE OF PHEOCHROMOCYTOMA

Table 1

<table>
<thead>
<tr>
<th>Twenty-four hour urinary analysis (catecholamines: HPLC) (u)</th>
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<tr>
<td>Epinephrine</td>
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<tr>
<td>Epinephrine / Creatinine</td>
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<tr>
<td>Norepinephrine</td>
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<td>Norepinephrine / Creatinine</td>
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<tr>
<td>Dopamine</td>
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<td>Dopamine / Creatinine</td>
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<td>Creatinine</td>
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N: normal

Table 2

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<th>Serum catecholamines (HPLC)</th>
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<tr>
<td>Epinephrine</td>
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<td>Norepinephrine</td>
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<td>Dopamine</td>
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N: normal

**Discussion**

Pheochromocytomas are rare neuroendocrine, catecholamine-secreting tumors derived from the chromaffin cells of the adrenal medulla or extraadrenal paraganglia. Their incidence during pregnancy is even more infrequent with an estimated prevalence of 1 in 50,000 to 54,000 in full-term pregnancies. The maternal mortality rate is 2 to 4% if the tumor is diagnosed in the antenatal period, compared to 14 to 25% if it is diagnosed intra- or postpartum.

Bullough et al. reported a case of pheochromocytoma as an unusual cause of hypertension in pregnancy. Intravenous magnesium sulfate infusion proved successful in controlling hypertension in the postpartum period. Magnesium sulfate has also been used as the sole drug for control of hemodynamic disturbances during pheochromocytoma excision surgery. Dugas et al. described a patient who was diagnosed with pheochromocytoma in the third trimester of pregnancy and discussed the perioperative and anesthetic management. A fatal, undiagnosed pheochromocytoma mimicking severe preeclampsia in a pregnant woman at term was reported by Hudsmith et al. Postmortem examination of the patient revealed a 5.5-cm tumor of the right adrenal gland confirmed histologically as a pheochromocytoma. Pearson et al. reported a case of pheochromocytoma in an 18-year-old woman. She presented with aproteinuric hypertension and intermittent panic attacks. Ultrasonography showed a structure obscuring the left adrenal gland. In the postpartum period, the tumor was resected and histologically arose from the sympathetic paraganglion cells; the left adrenal gland itself was normal. A pheochromocytoma was diagnosed following a crisis in late pregnancy (sudden onset of bitemporal headache and shortness of breath) in a 31-year-old woman in the 37th week of pregnancy. In 2010, a case report and literature review was published by George et al. The authors recommended evaluating for pheochromocytoma all patients with the typical triad of headache, sweating and palpitation in the presence of resistant or labile hypertension. Oliva et al. reviewed six cases of pheochromocytoma in pregnancy and concluded that pheochromocytoma was a rare but important cause of hypertension in pregnant women because of its high morbidity and mortality to both mother and fetus.

The excess release of catecholamines (norepinephrine, epinephrine and dopamine) accounts for the typical presentation of pheochromocytoma. Clinical manifestations can differ greatly, resembling several clinical conditions. Consequently, pheochromocytoma has often been referred to as the great mimic. However, the most common clinical feature is hypertension, associated with tachycardia and paroxysmal symptoms such as headache, sweating, nausea, tremor, palpitations and feelings of anxiety or panic. Although, hypertension is common and may be insidious or severe with hypertensive crises, there is growing number of normotensive and asymptomatic patients who are diagnosed with the disease.

Consequent to an increased use of advanced imaging technology, nearly 25% of all pheochromocytomas are now diagnosed incidentally during imaging studies for distinct disorders.

Pheochromocytoma-related signs and symptoms may occur for the first time during or in late pregnancy. Furthermore, the earliest clinical presentation may
develop at the end of pregnancy during vaginal delivery or cesarean section. Increased vascularity of the tumor, hemorrhage into the tumor, mechanical effects such as enlarging gravid uterus or vigorous fetal movements which can stimulate catecholamine secretion, vaginal delivery, anesthesia and cesarean section (CS) are precipitating factors for crisis or worsened condition. Our patient was completely asymptomatic before and during pregnancy; her first presentation was as a sudden cardiorespiratory crisis. One or more of the above mentioned factors may have contributed to her deterioration.

In pregnant patients, the diagnosis of pheochromocytoma is often missed since the classical signs and symptoms may mimic pre-existing essential hypertension and other forms of pregnancy-related hypertensive syndromes including gestational hypertension and preeclampsia. Usually, pre-existing essential hypertension is diagnosed and treated prior to pregnancy while pre-eclampsia develops after 20 weeks gestation and includes proteinuria. Conversely, pheochromocytoma is rarely associated with proteinuria, and the hypertension may occur throughout the entire pregnancy. A differential diagnosis of pheochromocytoma in pregnancy includes beta-mimetic-induced pulmonary edema, cardiomyopathy (preeclampsia, peripartum, stress or Takotsubo), pre-existing cardiac diseases such as mitral stenosis, pulmonary embolism (PE), aspiration pneumonitis (Acute Respiratory Distress Syndrome: ARDS), sepsis-related acute lung injury (ALI), and amniotic fluid embolism. Thus, a high index of suspicion is required for early diagnosis.

A combination of alpha- and beta-adrenergic receptor blockers for the treatment of pheochromocytoma-induced hypertension must directed by their pharmacodynamic effects and should follow a certain sequence. Commencement of nonselective beta blocker treatment without prior alpha blockade in a patient with pheochromocytoma may precipitate a hemodynamic crisis. Premature initiation of a nonselective beta blocker results in a loss of beta-2 receptor-mediated vasodilatation and the unopposed alpha-adrenergic receptor stimulation. This causes vasoconstriction, arterial hypertension and increased afterload, leading to myocardial dysfunction and pulmonary edema. Sibal et al. reported that the initiation of beta blockers in four patients with pheochromocytoma was associated with further deterioration in hemodynamic status, labile blood pressure and cardiac arrhythmias. They concluded that "unexplained cardiopulmonary dysfunction, particularly after the institution of beta blockers, should alert clinicians to the possibility of pheochromocytoma". Our patient suffered exactly the same consequences following the administration of emolol (a beta1-cardioselective adrenergic receptor blocking agent) and later labetalol (both selective alpha1-adrenergic and nonselective beta-adrenergic receptor blocking agent) and amiodarone. Nonselective beta blockers should be initially avoided in patients with a suspected pheochromocytoma, but can be used only after adequate alpha blockade.

Although, patients with pheochromocytoma are hypertensive, their intravascular volume may be reduced. Initiation of fluid removal, by administering diuretics or instituting hemofiltration, may precipitate cardiovascular collapse, and should be avoided. This might explain why our patient deteriorated further (PEA cardiac arrest) after administration of furosemide and fluid removal by hemofiltration. Invasive hemodynamic monitoring with a PAC suggested a low intravascular volume (PCWP 6 to 9 mmHg) and excluded other possible diagnosis such as pregnancy induced cardiomyopathy, fluid overload, beta-mimetic-induced pulmonary edema. Moreover, most reported cases of beta-mimetic-induced pulmonary edema occurred with higher doses (more than 30 mg) of these drugs especially when administered intravenously (our patient received only 0.5 mg SC), making this diagnosis to be unlikely.

In our patient, pheochromocytoma was suspected by the finding of an adrenal mass on CT scan of the abdomen as a work up for septic shock in ICU. It was confirmed by high level of catecholamine in serum and urine and by biopsy after surgical resection. Our case report represents an atypical presentation of pheochromocytoma, including acute respiratory failure followed by PEA arrest, in a pregnant patient.
Conclusions

Pregnant women with pheochromocytoma may remain asymptomatic until the end of pregnancy. The first clinical presentation may develop during vaginal delivery or cesarean section and may manifest as a severe cardiorespiratory crisis.

Pheochromocytoma should be considered in the differential diagnosis of hemodynamic crisis occurring during or at the end of pregnancy.

Cardiovascular collapse following the administration of a beta blocker should alert one to the possibility of pheochromocytoma.

In patients who are suspected to have pheochromocytoma, beta blockers should be avoided until adequate alpha blockade is established.

Careful fluid management is also essential.
References

ECHOCARDIOGRAPHY GUIDED THERAPY FOR MASSIVE INTRA-OPERATIVE PULMONARY EMBOLI DURING ARTERIO-VENOUS FISTULA/GRAFT THROMBECTOMY

JAHAN PORHOMAYON* AND NADER D. NADER**

Abstract

Various techniques’ are currently employed for thrombectomies of the arterio-venous (AV) fistula/ graft to restore flow. Sub massive or massive pulmonary emboli’s have been reported following such procedures both intra-operatively and post-operatively. The hemodynamic responses depend not only on the size of the emboli’s but also on the pre existing cardiac or pulmonary reserve of the patient. Rapid intra-operative echocardiography by anesthesiologist not only will help the clinicians with diagnosis but also can guide treatment plan as well as prognosis.

Conflicts of interest: None

Key words: Pulmonary Emboli, Echocardiography, Hypotension, Intra-operative, Hemodialysis, Fistula

Introduction

Hemodialysis graft or fistula occlusion is a common event that occurs frequently in patient with end stage renal disease. As a result, the vast majority of dialysis patients with AV graft/ fistula thrombosis undergo surgery for thrombectomy1-3. Surgical approach and techniques include, thrombolysis4, suction thrombectomy5, balloon thrombectomy6, mechanical thrombectomy with surgical devices7 or combinations of these methods. Restoration of flow can be achieved with balloon angioplasty and in some instances endovascular stents8-9. Embolization could occur during extraction process and result in mild to severe cardio-respiratory complications10.

Intra-operative echocardiography is not only a valuable tool for the anesthesiologist to diagnose pulmonary emboli (PE) but also help the surgical team to make appropriate treatment plan.

* MD, FCCP, Associate Professor of Anesthesiology and Critical Care Medicine, Division of Critical Care.
** M.D., PH.D., FCCP, Professor of Anesthesiology, Surgery and Pathology, Division of Cardiovascular Anesthesia VA Western New York Healthcare System, Department of Anesthesiology, State University of New York at Buffalo School of Medicine and Biomedical Sciences, Buffalo, New York.
Corresponding author: Jahan Porhomayon MD, FCCP, FABHP, VA Medical Center, Rm 203C, 3495 Bailey Ave, Buffalo, NY 14215. Tel 716 862-8707, Fax 716 862-8707. E-mail: jahanpor@buffalo.edu
Case Report

We report a case of a 58 year old male with past medical history significant for end stage renal disease (ESRD), hypertension and liver disease secondary to hepatitis C infection. Surgical history was significant for multiple hemodialysis and AV graft/fistula thrombectomies. He was admitted to the hospital with the chief complain of non functioning AV fistula. Vascular team evaluations revealed AV fistula thrombosis and patient was scheduled for thrombectomy of AV fistula. Prior to surgery, bilateral lower extremities venous doppler ultrasound did not detect deep venous thromboses. He was brought to the operating room for attempted thrombectomy of the AV fistula. Vital signs on arrival to the operating room were blood pressure of 100/60 mm/Hg, heart rate of 110 beat/min, oxygen saturation of 97% and axillary temperature of 36.5 centigrade. On arrival to the operating room, he was placed on 100% oxygen via face mask. He was induced with propofol/fentanyl/oxygen/air and trachea was intubated without difficulty. He was maintained on desflurane/air and 50% oxygen. He was placed on controlled mechanical ventilation with respiratory rate of 14 beat/minute, tidal volume of 600 ml, positive end expiratory pressure of 5 cmH2O and end tidal CO2 of 25 mm/Hg with pulse oximetry reading of 97% saturation. Arterial blood gas analysis showed pH = 7.32, PaCO2 = 35 mm/Hg, PaO2 = 120 mm/Hg. Operation begun with a longitudinal incision above the antecubital crease and dissection was carried down until fistula was identified. The basilic vein appeared to be pulsatile. An attempt was made to puncture the fistula and passed the wire in a retrograde fashion but unsuccessful. The fistula was then opened with a #11 blade and manually large amount of thrombus was evacuated from the basilic vein. A fogarty catheters was also passed through the basilic vein with return of brisk bleeding. A left brachio-basilic fistulogram was performed. The basilic vein appeared to be widely patent. A short period after thrombectomy patient vital signs became unstable with a drop in arterial oxygen saturation to low 60% with low end tidal CO2 below 10 mm/Hg. Systolic blood pressure dropped below 40 mm/Hg. Patient was immediately placed on 100% oxygen and vasopressors and rapid infusion of crystalloids were started. Vasopressin infusion was started at 0.1 units per minute and norepinephrine at 10 mcg/min to maintain a mean arterial pressure of 65 mm/Hg. Transesophageal echocardiography was performed intra-operatively and confirmed the presence of large pulmonary emboli in pulmonary artery [Fig. 1, 3] and superior vena cava [Fig. 2]. It was decided to start thrombolytic therapy with the tissue plasminogen activator (tPA) 100 mg IV over 2 hours. Patient was immediately transferred to MICU and his post operative course was complicated with respiratory failure with mechanical ventilation and hypotension requiring vasopressor therapy. He gradually recovered with supportive care and was transferred to floor a week later.

Fig. 1

TEE demonstrates several large emboli are observed in the superior vena cava. Arrows point to emboli.

TEE = Transesophageal echocardiography, RA = Right atrium, IVC = Inferior vena cava, LA = Left atrium, SVC = Superior Vena Cava

Fig. 2

TEE features of an acute PE includes: Right ventricular dilation, Tricuspid regurgitation, Ventricular septal wall bulging (arrow), Right atrial dilation

TEE = Trans-esophageal echocardiography, RA = Right atrium, LA = Left atrium, LV = Left ventricle, IVS = Intra-ventricular septum
ECHOCARDIOGRAPHY GUIDED THERAPY FOR MASSIVE INTRA-OPERATIVE PULMONARY EMBOLI DURING ARTERIO-VENOUS FISTULA/GRAFT THROMBECTOMY

Fig. 3

TEE = Transesophageal echocardiography indicate large emboli in the pulmonary artery (arrow)
AO = Aorta, RPA = Right pulmonary artery, LPA = Left pulmonary artery, MPA=Main pulmonary artery

Discussion

The United States annual renal report in 2008 indicated that a total of 112,476 patients started ESRD therapy, and the ESRD population reached 547,982 including 382,343 dialysis patients. The vast majority of patients had interventional procedures for thrombosis of hemodialysis fistula/graft in the USA. To restore flow, catheter intervention techniques have become the primary mode of restoring flow in about 80% of cases. Complications arising from such interventions include bleeding, PE, vein rupture, cerebral embolism and arterial embolism.

The true incidence and rate of successful lysis and outcome of massive intra-operative PE following such procedures remains largely unknown. Massive pulmonary embolism remains the most feared complication intra-operatively. Thrombolytic therapy remains the treatment of choice and surgical management is reserved for high risk patient. Catheter embolectomies have also been reported and are currently limited to centers with specialized training and dedicated staff.

In general, standard diagnostic modalities utilized for evaluation of PE includes ventilation perfusion scan of lung, contrast enhanced computed tomography of lung with PE protocol and echocardiography. Transesophageal (TEE) or transthoracic echocardiography remains the most valuable tools in the operating room and can be useful in providing therapeutic and prognostic information. Echocardiographic finding useful in diagnosis of PE include: Right ventricular dysfunction and dilation, dilated pulmonary artery, and reduced left ventricular size. A recent study by Aymard et al suggested that right ventricule (RV) to left ventricule (LV) ratio of > 1.5 should be considered as the cut off value for allocating patients to surgical embolectomy. TEE in our patient not only confirmed the presence of a saddle embolus in pulmonary artery [Fig. 3] and several smaller PE’s in the superior vena cava (SVC) but also an RV/LV ratio of 0.9 favoring thrombolytic therapy. Thrombolysis with tPA in combination with heparin were initiated at the end of the operation after surgical homeostasis was achieved.

Other clues for supporting diagnosis of PE, includes the presence of a wide arterial to end tidal CO2 gradient as well as hemodynamic instability. Echocardiography can play a valuable role and is a useful diagnostic test for early diagnosis, risk stratification, and management of patient with large PE.
References

HIGH DOSE STREPTOKINASE FOR THROMBOLYSIS IN THE IMMEDIATE POSTOPERATIVE PERIOD: A CASE REPORT

RAKESH V SONDEKOPPAM*, MANJEET KANWAR**, LATHA Y S*** AND BANASHREE MANDAL***

Abstract

Venous thrombo-embolism is a life threatening condition with often non specific presentation. The detection of massive pulmonary embolism in the intra and immediate post-operative period is not only difficult due to the variety of conditions with similar presentation, but the therapy for the same is complicated with concerns of surgical and intracranial bleeding precluding various options. We present a case of massive pulmonary embolism presenting as intraoperative hypotension with an increased alveolar to arterial CO2 gradient which was subsequently managed with an accelerated regimen of streptokinase without increased postoperative bleeding. Accelerated regimen of streptokinase may be used as a safe low cost alternative modality in selected cases of massive pulmonary embolism in the immediate postoperative period.

Conflict of interest: None

Sources of financial support: None

Key words: Alveolar-arterial gradient, Intraoperative, major abdominal surgery, Pulmonary embolism, Streptokinase.

Venous thromboembolism (VTE) and Pulmonary embolism (PE) are one of the commonest preventable life threatening emergency of surgical patients having nonspecific presentation but, thrombolysis in the immediate post-operative period is contraindicated due to increased concerns of surgical and intracranial bleeding. The improvement in hemodynamics and gas exchange in massive PE is greatest in the first 48 hours of diagnosis\(^1\). Although there is an overall decrease in the incidence of life threatening bleeding complications probably owing to an increased use of non-invasive modalities for the diagnosis of PE\(^2\); there is little evidence on the use of thrombolysis in the immediate postoperative period. We present a case of pulmonary embolism with shock recognised in the immediate postoperative period successfully managed with accelerated dose of streptokinase after obtaining ethical committee approval and patient consent for publication.
Case report

A 65 year old ASA-1 female (52 Kg weight), a follow up case of antrectomy, gastrojejunostomy and vagotomy for benign stricture of pylorus presented with symptoms of small gastric volume and dumping syndrome for which an operative exploration and adhesiolysis followed by total gastrectomy and feeding jejunostomy was planned. Patient did not have any underlying co-morbidity and was apparently healthy on the preoperative examination without any functional limitation but complained of weight loss and weakness due to the dumping syndrome. After ensuring overnight fasting, the patient was shifted to the operating room and large bore intravenous access obtained. The patient complained of anxiety during shifting on to the operating table. After attachment of ECG, NIBP and pulse oximeter, baseline tachycardia (HR 136 beats/min) was noted but presumed to be due to anxiety and possible dehydration. Her other vital parameters (BP of 126/84 and SPO2 of 97%) were normal. A thoracic epidural was put for analgesia and right internal jugular vein cannulated for central venous pressure monitoring and fluid resuscitation. Initial CVP was low. After volume expansion with 500 ml of crystalloid patient was induced with IV morphine 6 mg, titrated dose of propofol 80 mg and vecuronium 6 mg to facilitate endotracheal intubation. A sudden hypotension was noted (72/40 mm Hg) soon after induction and was presumed to be due to exaggerated response to propofol and hence IV phenylephrine (100 µg) bolus was injected but did not improve the BP to normal levels and hence patient was immediately intubated and fluid bolus of 500 ml rapidly infused following which, the blood pressure came up to 116/72 mm Hg and HR settled. An invasive arterial blood pressure was transduced and an arterial blood gas analysis done which showed blood gas parameters with a Ph of 7.23, PO2 of 130 (50% FIO2), PaCO2 of 46 mm Hg, HCO3 of 20 Base deficit of -6 and an SAO2 of 98% revealing an increased (A-a) O2 and CO2 gradient. The patient had stable intraoperative haemodynamics except increasing tachycardia which did not respond to fluid boluses or increasing depth of anesthesia and analgesia. End tidal CO2 did not respond to changes in ventilatory strategies. Intermittent ABGs revealed increased (A-a) CO2 gradient but oxygenation was maintained. Anesthesia was maintained by oxygen and nitrous (50:50) with isoflurane titrated to 1 MAC and intermittent boluses of vecuronium titrated to train of four count < 2. The surgical course was uneventful. The total duration of surgery was about 3 hours following which patient was reversed for residual neuromuscular blockade at the end of anesthesia but the patient did not respond to verbal commands or painful stimuli even after about 45 minutes of stopping anesthetic agents and complete recovery of train of four counts. Pupils were normal and reactive to light. Suspecting possible intraoperative pulmonary thromboembolism the patient was transferred to PACU for postoperative ventilation and further management. Patient had persistent and increasing tachycardia and alveolar to arterial gradient of CO2 and became hemodynamically unstable for which dopamine 5 µg/kg/min was started post-operatively. The cardiac markers were negative and twelve lead ECG was normal except for tachycardia and chest X-ray was unremarkable. Echocardiography revealed dilatation of right sided chambers with RV hypokinesia and hence suspecting pulmonary embolism, a pulmonary CT-angiography was performed which confirmed RV dilatation (Fig. 1) with bilateral pulmonary embolism extending from segmental branches of upper, middle & lower lobes (Fig. 2). After arranging blood products and informing the blood bank, patient was thrombolysed with 1.5 million units of streptokinase over half an hour without any bleeding episodes in the subsequent postoperative period. The patient was extubated after overnight ventilation. A search for the source of embolus revealed a DVT of left calf region on compression ultrasound without any physical evidence like swelling or warmth on examination. The patient sustained paroxysmal supraventricular tachycardia (HR of 230/min & hypotension of 60/40mmHg) in the next post-operative day which responded to carotid massage. The cause of PSVT was found to be hypokalemia which was subsequently corrected. Second day repeat ECHO showed improvement in RV hypokinesia although dilatation of RA and RV was still present. The rest of the hospital course was uneventful and the patient was subsequently discharged after 14 days of hospital stay.
Fig. 1
CT angiogram showing dilated right ventricle

Fig. 2
pulmonary CT angiogram demonstrating bilateral pulmonary emboli starting from the lobar division.


**Discussion**

Our case represents a typical presentation of massive pulmonary embolism with high alveolar-arterial CO2 gradient, increased pressures in the right heart chambers, delayed awakening probably due to systemic embolization from opening of foramen ovale with the condition further progressing to hemodynamic instability following right heart failure. Pulmonary thromboembolism (PE) is a frequent life threatening disorder presenting diagnostic difficulties. It is often unrecognised in up to 75% of cases and cadaveric studies have shown approximately 3% to 5% of the necropsies harbouring emboli in the pulmonary vessels. The problem in early detection of VTE is the insensitivity of physical examination to detect it with even the most sensitive screening methods missing up to 30% of patients with PE. Hence, a fairly high percentage of undetected DVT might have an associated asymptomatic pulmonary embolism. Around 30-50% blockade of pulmonary vasculature is necessary to produce hemodynamic instability and shock the prognosis of which depends on the time to diagnosis and institution of appropriate management. Although immediate postoperative period is a relative contraindication for the performance of thrombolysis in acute PE, it might be a last resort in life threatening cases with severe right ventricular failure and shock. Usual doses of streptokinase recommended for pulmonary embolism (loading dose of 250 000 IU over 30 min, followed by 100 000 IU/h over 12–24 h) might take a longer duration for complete thrombolysis and hence accelerated regimens (1.5 million IU over 2 h) have been studied for utility. A study by MENEVEAU ET AL showed the safety and efficacy of a 2-h regimen of high dose streptokinase in improving cardiac output similar to high dose therapy with alteplase. With an increasing evidence of inefficient thrombolysis in worsening early outcomes, goal of the thrombolytic regimens are to achieve complete thrombolysis as soon as possible which might be possible with accelerated regimens. One of the major concerns after thrombolysis is the occurrence of intracranial or surgical site bleeding which can range from 14% with older studies to around 4 % with the use of noninvasive methods used for diagnosis. Hence a high dose streptokinase might be a life-saving option in massive pulmonary embolism. Although patients having major surgery were excluded in the study by Meneveau et al, massive pulmonary embolism in immediate postoperative period may require thrombolytic therapy with considerations to the type of surgery, intraoperative course and pre-existing co-morbidity.

A major vascular, spine or neurosurgery, injury to a major vessel during the intraoperative course, or a preexisting cerebrovascular disease or previous stroke can preclude thrombolysis. These patients and others with contraindications to thrombolysis or those patients failing thrombolytic therapy might be better candidates for surgical thrombo-embolectomy. Although recent evidence suggests a decreasing bleeding complications and better survival rates with surgical embolectomy, intracranial bleeds and neurological events were similar with surgical or pharmacological therapies.

**Conclusion**

To conclude, accelerated regimen of thrombolysis can be selectively utilized in massive pulmonary embolism associated with hemodynamic instability in the immediate postoperative period. Considerations to preoperative patient condition and type of surgery should aid in the decision making between surgical and pharmacological therapies.
References


PATHOLOGY QUIZ: ONCOCYTIC CYST OF THE VENTRICULAR FOLD

HAMDAN AL*, MARIE-THERESE HOMSI**, ZAAHIR TURFE*** AND FOUAD BOULOS****

Case Presentation

A 56 year old woman presented to the Voice Clinic with recent history of change in voice quality associated with foreign body sensation in the throat and globus pharyngeus. Patient denied any symptoms of gastro-esophageal reflux, namely heartburn and or regurgitation. She had history of smoking but no history of phonotraumatic behavior. Medical history was negative for any systemic illness. On perceptual evaluation, she had a rough voice with mild straining. Laryngeal video-endostroboscopy revealed a 0.5 cm × 0.5 cm polypoidal smooth mass arising from the anterior aspect of the right false vocal fold (see Fig. 1). The true vocal folds were intact and mobile. The patient underwent suspension microlaryngoscopy under general anesthesia with resection of the mass using Carbon Dioxide Laser. The pathology revealed the following: (see Fig. 2).

Fig. 1
Laryngeal video-endostroboscopy showing a polypoidal smooth mass arising from the right false vocal fold measuring 0.5cm x 0.5.

* MD, EMBA, FACS, Department of Otolaryngology-Head & Neck Surgery, American University of Beirut Medical Center-Beirut-Lebanon.
** BS, Faculty of Medicine, American University of Beirut, Beirut-Lebanon.
*** BS, Michigan State University College of Human Medicine.
**** MD, Department of Pathology & Laboratory Medicine, American University of Beirut Medical Center, Beirut-Lebanon.
Corresponding author: Abdul-Latif Hamdan, MD, EMBA, FACS, Professor, Vice-Chairman, Director of Hamdan Voice Unit, Department of Otolaryngology-Head & Neck Surgery, American University of Beirut Medical Center, P.O. Box: 110236 Beirut-Lebanon. Tel/Fax: 961-1-350000. E-mail: ah77@aub.edu.lb
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Pathology Quiz: Oncocytic cyst of the ventricular fold

Oncocytic cysts are benign lesions lined by oncocytes. Many names have been attributed to these cysts such as oncocytic papillary cystadenoma, oncocytoma, cystic adenoma, eosinophilic granular cell cystadenoma, eosinophilic papillary cystadenoma and oncocytic hyperplasia. Oncocytic cysts rarely occur in the larynx despite the fact that oncocytes can be found in the normal epithelium of the thyroid and parathyroid glands, salivary glands, tongue, lacrimal system, uvula, respiratory tract, esophagus, pharynx and larynx. In this later the prevalence of oncocytes increases with aging and smoking. When present, oncocytic cysts account for 0.5-1% of laryngeal biopsies and represent 7% of all laryngeal cysts and one third of cysts of the ventricular folds. The distribution of these lesions is highest in supraglottic sites and lowest in subglottic region. In the supraglottic region, the ventricles and the false vocal cords are the two most common sites due to the abundance of seromucinous glands in their epithelium. Invariably, the lesion appears as a single polypoidal mass or as a submucosal enlargement measuring less than 1cm in dimension. Multiple lesions are rarely reported. In our case the mass was isolated, polypoid in shape with a cystic appearance. The differential diagnosis included laryngocele, hemangioma, amyloidal deposition, among other lesions. The patient may be asymptomatic or reports hoarseness of several months duration, less often with pain, stridor or respiratory obstruction. Our patient presented with a foreign body sensation, globus pharyngeus and mild change in voice quality. The treatment of choice is endoscopic excision with cold steel instruments or laser. Close follow up is recommended due to the risk of recurrence especially in cases of multiple cysts.

There several theories behind the origin of oncocytic cysts. These include occlusion of the ducts, inflammatory and degenerative changes as well as aging. The long exposure to the oxidants can lead to inflammation of the mucosal lining which in turn results in metaplastic changes of acinar and ductal cells of the salivary glands and respiratory mucosal lining. The altered metabolism is associated with compensatory hyperplasia of mitochondria and the subsequent appearance of oncocytic cells. The metaplasia of the distal segment of the duct leads to cystic dilatation with resultant cyst formation. Oncocytes are energetic cells because of their ability to divide and the abundance of mitochondria in their cytoplasm. With aging and degeneration, oncocytes may undergo mitochondrial alterations which render the cells unable to produce energy. Metaplastic changes are rare but have been reported in patients above the age of 50 with a female predominance (F/M = 2:1).
References

ANESTHESIA CONSIDERATIONS
IN STIFF PERSON SYNDROME

MOISES A. SIDRANSKY*, NEILSON V. TRAN**
AND ALAN DAVID KAYE***

Abstract

A 34 year old morbidly obese stiff person syndrome (SPS) patient was scheduled for a permanent catheter placement. SPS is a rare neurologic condition with a suspected autoimmune etiology. SPS most common manifestations are progressive, including severe muscle rigidity or stiffness affecting the spine and lower extremities more than other muscle groups. SPS have superimposed episodic muscle spasms that may resemble myotonic-like contractions and are precipitated by unexpected noises, tactile stimuli, or emotional stress. This case report describes a patient with SPS and morbid obesity, and his subsequent management perioperatively for a permanent catheter placement under monitored anesthesia care. Careful and methodical management of patients with SPS is strongly suggested given their sensitivity to inhalational anesthetics and neuromuscular blockers.

Key words: stiff person syndrome, inhalational anesthetics, monitored anesthesia care, neuromuscular blockers

Introduction

Stiff Person Syndrome (SPS) is a rare neurologic condition with a suspected autoimmune etiology. It is estimated to occur in less than one in a million people, is caused by involuntary action of the motor unit, and was first described by Moersch and Woltman in 1956. Patients commonly present with progressive, severe muscle rigidity or stiffness, which tends to affect the spine and lower extremities more than other muscle groups. In addition to rigidity, patients with SPS have superimposed episodic muscle spasms that occasionally may resemble myotonic-like contractions and are precipitated by unexpected noises, tactile stimuli, or emotional stress. These manifestations occur in the absence of any other neurologic disease or underlying chronic pain syndrome that might produce prolonged muscle rigidity and spasms.

Although the cause of this disease has not been discovered, it has been postulated that the pathophysiology of SPS is created by antibodies against the 65kD isoform of glutamic acid decarboxylase (anti-GAD 65), the enzyme essential for the creation of gamma aminobutyric acid (GABA). High levels of anti-GAD 65 are found in the serum and/or cerebral spinal fluid of 85% of patients. It is also associated with autoimmune diseases, particularly diabetes mellitus. By decreasing GABAergic input from inhibitory spinal interneurons and causing malfunction in GABAergic...
cortical neurons, this leads to the hyperexcitability of motor neurons and consequently progressive muscle rigidity and spasms\textsuperscript{4,5}. SPS can be treated with one or a combination of several medications including diazepam, baclofen, gabapentin, clonazepam, dantrolene, and vigabatrin. Their beneficial effects are likely mediated by their action on the gamma-aminobutyric acid (GABA\textsubscript{A}) receptor\textsuperscript{6,7}. The use of these medications with certain general anesthetics causes concern amongst anesthesiology providers because it has been shown that the combination causes delayed awakening and neuromuscular weakness in some SPS patients\textsuperscript{8,9}. Though Lorish et al.\textsuperscript{10} established criteria for diagnosis of SPS over two decades ago (Table 1), subsequent patients have demonstrated numerous other abnormalities not associated with the neuromuscular system. The case report presented involves a morbidly obese patient with SPS who underwent surgery for permanent catheter placement.

**Table 1**

<table>
<thead>
<tr>
<th>Criteria for Diagnosis of Stiff Person Syndrome</th>
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<tbody>
<tr>
<td>1. Prodromes centered on swelling and stiffness of the axial musculature.</td>
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<tr>
<td>2. Slow progression to the point of affecting the musculature near the extremities, making voluntary movements and walking difficult.</td>
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<tr>
<td>3. Demonstrated deformity of the spinal column.</td>
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<tr>
<td>4. Intercurrent episodes of episodic spasms, precipitated by brusque movements, sudden noises, stress, or emotional events.</td>
</tr>
<tr>
<td>5. No deficits in either motor and sensory examination.</td>
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<tr>
<td>6. No deficits in intellect.</td>
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</tbody>
</table>


**Case Report**

A 34 years old patient weighing 300 lbs. (136 Kg) and 157 cm in height (BMI= 55 kg/m\textsuperscript{2}) was scheduled for a permanent catheter placement. He was diagnosed with SPS based on his symptoms and was relatively asymptomatic in regards to his morbid obesity. He denied dyspnea, angina, or any other cardiopulmonary manifestations. Six months prior to the surgery, symptoms presented as muscle stiffness in his back and painful spasms in his lower extremities. A plasma anti-GAD antibody level was found to be 5,000 times higher than normal limits. The patient reported that when going through stressful situations, such as losing his job, he would develop symptoms. He was being treated with carisoprodol 250 mg daily, diazepam 10 mg BID, gabapentin 600 mg TID, and baclofen 30 mg daily. His symptoms were poorly controlled requiring IVIG therapy, one of the newer therapies in treating SPS. A monitored anesthesia care (MAC) anesthetic was planned for the procedure.

Carisoprodol, diazepam, gabapentin, and baclofen were given on the day of surgery. Electrolytes were within normal limits, and no other premedication was prescribed. Standard American Society of Anesthesiology monitors were used which included: temperature, blood pressure, heart rate, electrocardiogram, and end tidal CO2 assessment. Monitored anesthesia care was started by administering to the patient 60 mg of lidocaine, and a propofol drip at 200 mcg/kg/hr. Vital signs all stayed within a normal range, and there was no significant pulmonary ventilator depression noted. There were no surgical complications. The patient had mild discomfort during part of the procedure and was given 50 mcg of fentanyl in a bolus dose, twice. After completion of the procedure, the patient was followed closely in Post Anesthesia Care Unit for approximately one and a half hours without any events. His vital signs remained stable and then he was transferred back to a regular hospital floor and returned to the floor on continuous pulse oximetry to start IVIG therapy.

**Discussion**

Treating a patient with SPS involves certain challenges for anesthesiologists. To date, there are a number of different anesthetics that have been performed on patients with SPS (Table 2). Our literature has reported that some patients undergoing general anesthesia with muscle relaxation have had weakness despite appropriate reversal of muscle relaxation and the need for postoperative mechanical ventilation for up to 48 hours\textsuperscript{8}. It has also been postulated that prolonged neuromuscular blockade could be explained by the synergistic effects of baclofen preoperatively and volatile anesthetics via a GABA\textsubscript{A} receptor mediation or modulation. Though successful
<table>
<thead>
<tr>
<th>Patient</th>
<th>Surgery</th>
<th>Drugs</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female, 46 years old</td>
<td>Repair of intrathecal baclofen pump</td>
<td>Sufentanil, Thiopental, Vecuronium, Neostigmine, and Glycopyrrolate</td>
<td>Muscle weakness (hypotonia) in the presence of a vigorous response to ulnar nerve stimulation</td>
</tr>
<tr>
<td></td>
<td>5 months later</td>
<td>Midazolam, Halothane, and no relaxant</td>
<td>Need of mechanical ventilation overnight</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Recovery of strength on postoperative day 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Uneventful</td>
</tr>
<tr>
<td>Male, 58 years old</td>
<td>Thymectomy</td>
<td>Midazolam, Propofol, Remifentanil, Rocuronium, and Isoflurane (0.2%-0.4%)</td>
<td>Uneventful</td>
</tr>
<tr>
<td>Male, 76 years old</td>
<td>Thymectomy</td>
<td>Fentanyl, Propofol, Sevoflurane (0.5%-1.7%), and Ropivicaine (0.25%, epidural)</td>
<td>Uneventful</td>
</tr>
<tr>
<td>Male, 74 years old</td>
<td>ENT surgery</td>
<td>Propofol and Remifentanil</td>
<td>Uneventful</td>
</tr>
<tr>
<td>Female, 44 years old</td>
<td>Double heart-valve replacement</td>
<td>Midazolam, Diazepam, Fentanyl, Etomidate, Pancuronium, Propofol, Remifentanil</td>
<td>Pain in arms and legs, and mild contractions in a forearm and lower limbs without spasms (7 hours after admission into critical care unit)</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Moderate pain and mild stiffness in legs (11 hours after admission into critical care unit)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>No further reference to muscular discomfort or contractions</td>
</tr>
<tr>
<td>Female, 40 years old</td>
<td>Thymectomy</td>
<td>Fentanyl, Thiopental, Vecuronium, Isoflurane, and Diazepam, Fentanyl, Thiopental, Vecuronium, Isoflurane, and Nitrous Oxide</td>
<td>Neuromuscular blocking recovery within normal range</td>
</tr>
<tr>
<td></td>
<td>Appendectomy (6 weeks after)</td>
<td>Fentanyl, Propofol, and Vecuronium</td>
<td>Temporary clinical improvement</td>
</tr>
<tr>
<td></td>
<td>Endoscopic nasal sinus surgery (1 year after)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female, 60 years old</td>
<td>Respiratory failure, no surgery required</td>
<td>Midazolam, Propofol, and Atracurium</td>
<td>Uneventful</td>
</tr>
</tbody>
</table>

anesthetics have been reported with both inhalational anesthetics and neuromuscular blockers, reduced doses and conservative postoperative management appears to be prudent for the clinical anesthesiologist managing patients with SPS\textsuperscript{11,12}.

Cases have been performed successfully using total intravenous anesthesia (TIVA) with no muscle blockade alone or in combination with epidural anesthesia, and using a paravertebral block with conscious sedation for an inguinal hernia repair\textsuperscript{12-14}. In the case presented, the patient was receiving a permanent catheter for treatment of his SPS with IVIG. By utilizing a propofol drip with fentanyl for sedation and breakthrough pain, a safe MAC anesthetic was provided without complications and a rapid recovery.

In recent years, patients with other co-morbidities have been identified with SPS whom underwent procedures requiring anesthetics in some capacity. A review of the literature indicates other co-morbidities found in patients with SPS including: cardiac valvular disease, breast cancer, colon adenocarcinoma, appendicitis, lymphoma, and thymoma\textsuperscript{15-20}. There is even documentation of a patient who became pregnant two months after her diagnosis of SPS and was administered an epidural with a smooth delivery\textsuperscript{21}. In the case presented, the patient presented with the potential challenge of being morbidly obesity, which can dramatically affect cardiopulmonary status, rate of desaturation, and potentially increase morbidity and mortality. However, by using monitored anesthesia care with avoidance of inhalational anesthetics, the patient was able to receive permanent catheter placement without any exacerbation of his SPS.

In summary, MAC with IV anesthetics can be used successfully in patients with SPS for minor procedures. For more complex cases, TIVA without muscle relaxants, or TIVA without muscle relaxants and regional anesthesia, or regional anesthesia with conscious sedation should be considered\textsuperscript{12-14}. The use of these techniques avoids exposure of SPS patients to the risk of hypotonia and mechanical ventilation, which may result from the use of volatile anesthetics and neuromuscular blocking agents\textsuperscript{8,9}. Because this is an extremely rare disease, a conservative approach with a careful laid out plan is warranted.
ANESTHESIA CONSIDERATIONS IN STIFF PERSON SYNDROME

References


ROLE OF LARYNGEAL MASK AIRWAY IN INTERVENTIONAL BRONCHOSCOPY PROCEDURES FOR UPPER TRACHEAL STENOSIS: CASE SERIES

LIDA FADAIZADEH*, MAHSA SADAT HOSSEINI**, SHIDEH DABIR***

Abstract

**Background:** Bronchoscopic interventional procedures are novel means of treating airway lesions which are less invasive and well tolerated for patients with endo-luminal lesions, but managing the airway and oxygenating the patient in a field that is shared by both anesthesiologist and bronchoscopist is a major concern. Also in cases with subglottic and upper tracheal stenotic lesions an airway device placed inside the lumen interferes with the procedure and occasionally bears the hazard of ignition. Therefore, an airway device placing above the glottis with effective oxygenation is required. Laryngeal mask airway is a supra-glottic device which facilitates assisted or spontaneous positive pressure ventilation.

**Methods:** In this study, eight patients with subglottic stenoses due to different etiologies are presented who underwent fiberoptic bronchoscopy and therapeutic interventions through laryngeal mask.

**Results:** In all these patients, we experienced simple access to the vocal cord, glottis and trachea and also the lesion, besides effective oxygenation of the patient. Furthermore, bronchoscopist and patients were both comfortable with the procedures.

**Conclusion:** Laryngeal mask airway could be regarded as a reliable alternative for airway management during interventional bronchoscopic procedures, especially when they are located near the glottis or in the upper third of the trachea.

**Conflict of interest:** All authors explicitly state that there is no conflict of interest in this manuscript.

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**Keywords:** Fiberoptic bronchoscopy; Laryngeal mask airway; Tracheal stenosis

*Assistant Prof. of Anesthesiology.
Affiliation: Telemedicine Research Center, National Research Institute of Tuberculosis and Lung Diseases (NRITLD), Shahid Beheshti University of medical Sciences, Tehran, Iran.

**General Practitioner.
Affiliation: Telemedicine Research Center, National Research Institute of Tuberculosis and Lung Diseases (NRITLD), Shahid Beheshti University of medical Sciences, Tehran, Iran.

***Associate Prof. of Anesthesiology
Affiliation: Tracheal Diseases Research Center, National Research Institute of Tuberculosis and Lung Diseases (NRITLD), Shahid Beheshti University of medical Sciences, Tehran, Iran.

**Corresponding Author:** Shideh Dabir, Tracheal Diseases Research Center, National Research Institute of Tuberculosis and Lung Diseases (NRITLD), Daar-Abad, Niavaran, Tehran, Iran, Zip Code: 19569-44413, P.O. Box: 19575-154, Tel: +98 9122171609, Fax: +98 (21) 26105385, E-mail: lfadaizadeh@yahoo.com
Introduction

Upper airway lesions, especially in the subglottic region, can cause serious conditions that are hardly tolerated by the patients and occasionally may be life threatening. These lesions have several etiologies with the most common of them being prolonged tracheal intubation or tracheostomy in the Intensive Care Unit (ICU). Other causes include: trauma, infection, burn, tumors, connective tissue diseases such as systemic lupus erythematosus and Wegener's granulomatosis; and even idiopathic subglottic stenosis1-3.

Treatment of tracheal stenosis is categorized to two main fields: surgical resection and reconstruction; and endoscopic therapies. Interventional bronchoscopic techniques, including: electrocautery, Argon Plasma Coagulation (APC), cryotherapy, laser, balloon bronchoplasty, and stent placement are novel means of treatment that have opened new horizons in upper airway management4,5.

All these procedures require a secure method for airway management besides endotracheal tube, since it might either bypass the lesion or if introduced into stenotic trachea, might cause edema, bleeding and laceration and is also associated with the risk of ignition during bronchoscopic thermal therapies6-7.

Laryngeal mask airway (LMA) is a supraglottic airway device which can be utilized for bronchoscopic procedures and has the benefit of being placed above the glottis with excellent visibility of glottis and subglottis and thus, feasibility for treating subglottic and upper tracheal lesions7-9.

In this study, we present 8 patients with upper tracheal stenosis who underwent therapeutic bronchoscopy through the laryngeal mask airway under general anesthesia.

Methods

In this study, we present 8 patients with upper airway lesions who were referred to Interventional Bronchoscopy Unit of Masih Daneshvari Hospital.

Patients were initially evaluated by the anesthesiologist for their underlying condition and then they signed an informed written consent regarding the procedure.

Method of anesthesia was almost similar in all patients. Initially, Lidocaine in the form of 10% spray with a maximum dosage of 1 mg/kg was used to anesthetize the pharynx and then Midazolam (1 mg) and Sufentanyl (5 microgram/kg) were injected intravenously as premedication. After 3 minutes, standard doses of Thiopental as hypnoic and Atracurium were injected to induce general anesthesia. Titrated propofol (up to a total dose of 1-2 mg/kg) was also used as hypnotic agent.

Bispectral index (BIS) was used to evaluate the level of anesthesia, Therefore; After reaching a BIS level of 60, LMA (LMA company, sizes 4-5 depending on patient) was inserted and mechanical ventilation was started using a standard anesthesia machine with following setting: tidal volume: 10cc/kg, respiratory rate: 12/min, O2 flow: 5lit/min (PEEP = 0). To ensure adequate level of anesthesia, BIS was monitored throughout the procedure and was kept around 60 using propofol infusion (100-150 microgram/kg/min).

Thereafter, FOB was introduced into LMA to perform the interventional procedures. During the procedure, vital signs and blood O2 saturation (SpO2) were monitored.

The incidence of post bronchoscopy sore throat was assessed in all patients. Also, the bronchoscopist’s satisfaction with the use of LMA was determined by asking about the ease of bronchoscope insertion and procedure performance and a score resembling their satisfaction given between 1-10.

Ethical approval for this study was provided by the Medical Research Ethics Committee of National Research Institute of Tuberculosis and Lung Diseases (NRITLD).

Case 1

A 32 year-old female who had been intubated for 1 week because of suicide attempt resulting in loss of consciousness, presented with cough, dyspnea, and wheezing 10 days after. She was referred to this center with primary diagnosis of post intubation tracheal stenosis. FOB through LMA (size 4) showed a nodule at the posterior commissure of right vocal cord and
also multiple granulation tissue formation at upper and middle parts of the trachea. The nodule was removed by cryotherapy and then APC was performed to ablate the granulation tissue. Throughout the procedure which lasted 40 minutes, patient’s hemodynamics were stable and no complication occurred. SpO2 was always above 96% except for two episodes of drop (87% and 72%, respectively). After the procedure, patient reported just a mild sore throat and the bronchoscopist’s satisfaction score was 10.

Case 2

A 21 year-old male presented with dyspnea and hoarseness 1 month after ICU admission and intubation for 12 days, due to electric shock. FOB was performed for the patient after inserting LMA (size 5); and 2 nodular lesions at the posterior commissure of vocal cords, and 3 web-like stenoses were seen at the middle part of the trachea. Cryotherapy was done to ablate the nodules and the tracheal webs were removed using APC. While performing the procedure, no decrease in SpO2 or other complications occurred. Patient and Bronchoscopist satisfaction was optimum.

Case 3

A 77 year-old female who was a known case of metastatic lung adenocarcinoma originating from thyroid cancer was referred for dyspnea, hoarseness, hemoptysis and stridor. After inserting the LMA (size 4), FOB was performed and subglottic tracheal stenosis and some nodular lesions due to tumoral invasion were revealed. APC was done to remove the stenotic lesions. Throughout the 1 hour procedure, patient’s SPO2 varied from 85% to 98% and she was hemodynamically stable. Also, minimal bleeding occurred which was treated by APC and eventually she did not complain of sore throat after awakening. Bronchoscopist satisfaction score was 10.

Case 4

A 33 year-old female with a history of exertional dyspnea and hoarseness since 3 years ago which had been already diagnosed as Idiopathic subglottic stenosis, was referred for therapy. FOB was introduced and a stenosis of 20 mm length was seen at about 10 mm below the vocal cords. The diameter of the trachea at the site of stenosis was around 6 mm. Initially, the bronchoscopist tried to dilate the airway by rigid bronchoscope size 7.5, but during the procedure, severe oxygen desaturation happened and therefore, LMA (size 4) was used and APC was performed through the working channel of FOB to open the airway. The procedure lasted 30 minutes and was completed successfully with no complication. Patient’s vital signs were completely stable, and SPO2 remained around 90% throughout the procedure. Patient reported moderate sore throat after the procedure and the bronchoscopist was fully satisfied.

Case 5

A 29 year old female with post intubation tracheal stenosis was referred to our center for continuing her therapeutic interventions. Ten years ago, she had experienced a severe car accident resulting in coma state for 3 months. She had undergone bronchoscopic dilation and also stent placement before. In our center, she underwent flexible bronchoscopy via LMA (size 4) which showed severe stenosis at the upper part of the trachea and also granulation tissue inside the stent. APC was utilized to destruct the granulation tissue. Vital signs were within normal range during the procedure and SPO2 was always greater than 98%. A mild sore throat was reported by the patient after the bronchoscopy and the bronchoscopist satisfaction was 8 due to bronchoscope adhesion to shaft of LMA which hindered the procedure.

Case 6

A 22 year old female with subglottic stenosis secondary to Wegener granulomatosis, presented with cough and dyspnea. Fiberoptic bronchoscopy was performed through LMA (size 4) to resolve the stenosis by the means of APC. Throughout the 30-minute procedure, the lowest oxygen saturation was 96% and no instability in vital signs occurred. Patient reported a mild sore throat after recovery from anesthesia and bronchoscopist satisfaction was complete.
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Case 7

A 25 year old male patient was referred with subglottic stenosis due to prolonged intubation in ICU. He had experienced car accident about 2 months ago and had been unconscious and intubated for about 20 days. After recovery and discharge from hospital he had experienced dyspnea and during preliminary examination had been diagnosed with subglottic stenosis. After LMA (size 5) insertion Fiberoptic bronchoscopy was performed and the stenosis was managed with APC. Since the stenosis was placed exactly below the glottis severe edema was expected, therefore; corticosteroid was administered in advance. The procedure was well performed and the patient recovered from anesthesia uneventfully and with mild sore throat. Bronchoscopist satisfaction score was 9 due to adhesion of bronchoscope to LMA.

Case 8

A 32 male patient, a known case of Down syndrome, was emergently referred to our ward with cyanosis, dyspnea and hypoxia. He had experienced several similar episodes during the previous months and was repeatedly intubated and admitted to ICU, therefore; a severe subglottic stenosis had been developed gradually. In addition to typical Down syndrome features with large tongue and short neck, he was morbidly obese. After induction of anesthesia the patient turned out to be a non-ventilate, non-intubate patient. LMA was inserted and both ventilation and APC treatment were performed uneventfully. Therefore, in this special case LMA had a life saving role in addition to simply a route for ventilation and device insertion. The patient was sent to ICU for further management. Bronchoscopist satisfaction was optimum.

Discussion

In this case series, we described 8 patients with tracheal stenosis consisting of 5 post intubation tracheal stenoses, 1 idiopathic subglottic stenosis, 1 tracheal stenosis secondary to Wegener granulomatosis and 1 tumoral invasion. For all these patients interventional bronchoscopy procedure was performed through LMA and each procedure was completed with no important complication.

Since the introduction of Laryngeal mask airway in 1988, it has been utilized for routine and emergency anesthetic procedures, difficult airway cases, and cases of impossible intubation while resuscitation. It has been described to be an airway device which fills the gap between face mask and endotracheal tube and facilitates assisted or spontaneous positive pressure ventilation. Hemodynamic changes have been shown to be less, using LMA for airway management, compared to other invasive airway devices like endotracheal tube. Other advantages mentioned for LMA include rapid insertion without a laryngoscope, acceptable protection of airway and effective ventilation during general anesthesia and deep sedation, easy access to glottis and upper trachea, low frequency of cough and sore throat during recovery, and less involvement of anesthesiologist’s hands compared to mask ventilation.

We experienced LMA as a suitable device because of its supra-laryngeal placement and accessibility and visualization of vocal cords, glottis and trachea. Besides, it maintained effective gas exchange in all patients, especially the patient who developed hypoxia during rigid bronchoscopy and the patient with Down’s syndrome, for whom it was life saving. The bronchoscopist passed the FOB through the large bore of LMA with no inconvenience and in one patient with bleeding, he was able to control the hemorrhage quickly and effectively. Sore throat was one of our major concerns, but fortunately except for one patient with moderate degree of sore throat, all others reported none or just mild degree of discomfort.

Myers described use of an LMA along with a flexible fiberoptic bronchoscope as a safe and effective method to visualize and manage lesions of the laryngotracheal region, especially when combined with a fiberoptic laser. Jameson has stated the convenience of FOB placement, ease of access to subglottic region, and acceptable lung ventilation as advantages of LMA and Chhetri described LMA as a simple and safe alternative to other ventilating methods during endoscopic laser treatment of subglottic stenosis. Also, Park has described the valuable role of LMA
in insertion of T-tube in sub-glottic stenosis, which is yet another challenge for anesthesiologists, since ventilation is sometimes severely impaired during the procedure. In conclusion, laryngeal mask airway could be regarded as a reliable alternative for airway management during interventional bronchoscopic procedures, especially when they are located near the glottis or in the upper third of the trachea.

References

Abstract

Objective: To report a rare case of Transglottic Basaloid Squamous cell carcinoma of the larynx and review the pathologic features of these lesions.

Case report: A 64 year old male, heavy smoker and alcohol abuser, presented with a 6 month history of hoarseness. Laryngoscopy revealed a right transglottic lesion involving the epiglottis, aryepiglottic fold, ventricle and true vocal fold.

Microscopically, the tumor was characterized by infiltrating solid sheets of basaloid cells showing palisading pattern along the edges. In areas of solid growth, tumor cells displayed scant cytoplasm, and hyperchromatic nuclei. A portion of the tumor abutting the thyroid cartilage showed squamous differentiation. An island of tumor cells with comedonecrosis was also noted. Immunohistochemical staining for a number of markers was performed.

Conclusion: Basaloid squamous cell carcinoma displays a biphasic histology. The stage of the disease at presentation is invariably advanced with metastatic lymphadenopathy in two thirds of the patients.

Keywords: basaloid; squamous cell carcinoma; larynx.

Introduction

Basaloid squamous cell carcinoma is considered a high grade histological variation of squamous cell carcinoma in view of its tendency to spread regionally and distally. The advanced stage of presentation of this disease has proven its poor prognosis and local aggressiveness. It was first described by Wain et al in 1986 as an independent neoplasm believed to arise either from the totipotential primitive cell in the epithelial basal layer or the epithelial lining of the salivary duct.

Despite its rare occurrence in different sites of the body, it has a predilection for the head and neck region. Laryngeal involvement is rare with most of these tumors arising in the glottis or supraglottis with a preference to the later. We would like to report a case of transglottic Basaloid Squamous cell carcinoma of the larynx with emphasis on the clinico-pathological features.
Case Report

A 64 year old male, heavy smoker and alcohol abuser, presented with a 6 month history of hoarseness. He denied any history of hemoptysis, dysphagia, odynophagia or otalgia. Fiberoptic nasopharyngeal laryngoscopy revealed a right transglottic lesion involving the epiglottis, aryepiglottic fold, ventricle and true vocal fold.

Computerized Tomography of the neck after IV contrast showed a large soft tissue mass occupying the right side of the laryngeal vestibule, involving the right aspect of the epiglottis and extending to the level of the true vocal folds crossing the midline anteriorly and posteriorly. A single prominent lymph node was seen at level two on the left side of the neck. Direct laryngoscopy and biopsy from the lesion revealed poorly differentiated squamous cell carcinoma. Patient underwent total laryngectomy, right selective neck dissection for level II, III and IV with left lymph node biopsy.

Gross examination showed a right transglottic tumor measuring 3 cm in greatest dimension. Microscopically, the tumor was characterized by infiltrating solid sheets of basaloid cells showing palisading pattern along the edge and some cystic spaces. In areas of solid growth, tumor cells displayed scant cytoplasm, and hyperchromatic nuclei. A mitotic figure was also noted (Fig. 1). The material within the cystic spaces is periodic acid-Schiff and Alcian blue positive, however mucicarmine was negative. A portion of the tumor abutting the thyroid cartilage showed squamous differentiation. An island of tumor cells with comedonecrosis was also noted (Fig. 2).

Immunohistochemical staining for a number of markers was performed. The tumor showed strong positivity for cytokeratin 34BE12 and cytokeratin AE1/AE3 in areas of squamous differentiation, but only focal and weak positivity in basaloid cells.

Epithelial membrane antigen was distinctly focal and limited to areas of squamous differentiation. Carcinoembryonic antigen highlighted keratin pearls but was totally negative elsewhere in the tumor. There was diffuse moderately intense staining for neuron specific enolase (NSE). Cytokeratin 8/18 (CAM 5.2), S-100, and smooth muscle acting were negative. There was strong nuclear positivity for P53 in basaloid tumor cells and less intense positivity in the squamous component.
Discussion

Because of the biphasic histology of basaloid squamous cell carcinoma, there is a potential for misdiagnosis in biopsies that are not fully representative. When the basaloid component is noted, the tumor must be differentiated from adenoid cystic carcinoma or neuroendocrine carcinoma. The presence of a squamous component should suggest basaloid squamous cell carcinoma. Another differentiating point is the continuity of the infiltrating tumor with a dysplastic overlying epithelium in basaloid squamous cell carcinoma, which is not present in adenoid cystic carcinoma (NSE may be positive in both basaloid squamous cell carcinoma and neuroendocrine carcinoma, however only the latter expresses the more specific neuroendocrine markers synaptophysin and chromogranin).

Keratin and CEA staining is generally limited to the squamous component, and is weak to absent in the basaloid component.

Basaloid squamous cell carcinoma has been reported in sites such as the lungs, thymus, cervix, anus, and esophagus. In the head and neck, the regions most frequently involved are the larynx, hypopharynx, tonsils and base of tongue. Squamous cell carcinoma accounts for 85% of the epithelial malignancies of the larynx. Basaloid squamous cell carcinomas are sporadic cases affecting mainly the supraglottis. The typical case is that of a male elderly smoker with history of alcohol abuse, presenting with history of hoarseness and neck fullness. The role of the Epstein-Barr virus and human papilloma virus as contributory factors is still controversial. Laryngeal endoscopy usually reveals a large invasive, ulcerated, tan white lesion with ill defined borders. The sites involved are the aryepiglottic folds, epiglottis, true and false vocal cords, arytenoids and retro-cricoid region and ventricles. In our case the tumor was transglottic extending from the ventricle, involving the left false cord, ventricle, true vocal fold and crossing the midline. The stage of the disease at presentation is invariably advanced with regional lymph nodes involvement in two thirds of the patients. Distant metastasis is common in 40% to 80% of the cases which reflects an aggressive clinical behavior and a high mortality rate in the first year. Radical surgery be it total, vertical or supraglottic laryngectomy with selective or radical neck dissection is usually required. Radiation therapy is usually recommended and systemic chemotherapy is warranted in selective cases.
References

PREVENTION OF BLOOD RETURN INTO INTRAVENOUS INFUSION TUBING

MAHESH NAGAPPA*, SANDEEP KUMAR MISHRA** AND LENIN BABU ELAKKUMANAN***

Letter to the Editor

Different techniques have been described to prevent return flow of the blood into an intravenous line when both the intravenous infusion and blood pressure cuff have to be placed in the same arm especially during orthopedic surgeries of the upper limbs and with patients in lateral position. Some of these techniques involve placement of the part of the tubing under the blood pressure cuff, which would then occlude when the pressure in the cuff goes up. However, having tried this technique, we found it not fully effective in preventing the regurgitation of blood into infusion tubing. The events may distract the anesthesiologist from maintaining full intraoperative monitoring of anesthesia delivery and patients’ vital signs.

At our institution we use pressure bags to administer intravenous fluids at a faster rate. We decided to use these pressure bags in situations where the intravenous infusion is in the same arm as blood pressure cuff. Initially the pressure at which the return of blood into intravenous infusion tubing occurs is determined. The pressure in the pressure bag is subsequently raised 20-30mmHg above the pressure that results in no blood return. As such, the flow of the intravenous fluid can be controlled independently using the intravenous fluid controller. The counter pressure exerted by the pressure bag can be extremely useful in preventing return of blood and we suggest their use more widely as it is a very simple solution to a very old problem.

* MD, DNB, MNAMS, Assistant Professor SLIMS, Puducherry, India.
** MD, Assistant Professor.
*** MD, DNB, Assistant Professor.

Affiliation: Department of Anesthesiology and critical care JIPMER, Puducherry, India.

Corresponding author: Dr Mahesh Nagappa, No135, 4th Main 6th Block, 3rd Stage, 3rd Phase, BSK, Bangalore 560085, Karnataka, India. Tel: +91-9843631992. E-mail: drmaheshn78@yahoo.com
Extracorporeal shock wave lithotripsy (ESWL) is the gold standard treatment for ureteral calculosis. Radial neuropathy related to anesthetic or surgical procedures is a very rare complication and it is generally related to compression factors. To date and to our knowledge, there are no descriptions of radial nerve lesion after ESWL procedure. A 36 years old female patient (61 Kg) with ureter calculosis disease, presented to ambulatory ESWL on the left lumbar region. She had previous history of post-spinal anesthesia headache. Pre-operative examinations were normal.

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**Sources of financial support:** No financial support

**MeSH:** Radial Nerve Lesion, Extracorporeal Shockwave Lithotripsy, Anesthesia.

A peripheral venous catheter was inserted on the right hand and the patient was monitored with oximetry, cardioscopy and non-invasive blood pressure measurements on the right lower limb. The patient was positioned on the table with the left arm abducted, bent elbow and the left hand on the back of the head for a better calculus approach. The patient received midazolam (2.0 mg), sufentanil (10 mcg) and a continuous infusion of propofol (plasma target 1.2 mcg.ml⁻¹) in order to maintain sedation between level 4 and 5 on the Ramsay scale. Four thousand two hundred and twenty-five shock waves were administered until a partly fragmented calculus was shown on fluoroscopy during a 62-minute procedure. The patient was home discharged home after 95 minutes of the end of the procedure without complaints. The next day, the patient presented to the emergency service complaining of slight paresthesia on the lateral region of the left forearm with slight paresia on fingers’ extensors and paresia of the brachioradial muscle. She was referred to a neurologist who diagnosed radial neuropathy. Electroneuromyography presented moderate injury of sensitive and motor fibers compatible to radial neuropraxia. Six months later, the patient came for a new urological procedure with a discrete improvement of the clinical picture. The radial nerve is originated from fibers of C6, C7, C8 and T1. It traces along the spiral groove of the humerus, along with the deep radial artery, and exits through the lower 1/3 of the lateral side of the upper arm, penetrating the external fascia. The radial nerve is situated near the skin, and is
covered with a thin fat layer. In the lateral region of the arm, about 3 cm proximal to lateral epicondyle of the humerus, it is possible to compress the nerve against the bone, what may be a mechanism of nerve injury. Anesthetic causes of radial nerve lesion include automatic pressure monitors, contention brackets, venoclysis, radial artery puncture and malpositioning. A lesion of the ulnar nerve has been reported during the administration of ESWL for the treatment of ureteral calculus and was attributed to bad positioning. In our patient, the genesis of the lesion seems to involve an unfavorable positioning of the limb and/or contact of the limb with the lithotripter machine, exposing the radial nerve to shock waves, directly or indirectly. In a recent study, it was shown that extracorporeal shock waves have caused multiple microscopically damages on rats’ spinal cord structures, including degenerated mitochondria and destruction of myelin sheaths. These findings may imply that some types of shock waves are harmful for nervous tissue. Nevertheless, it is interesting to note that ESW therapy have been administered to treat some painful syndromes. This is the first case that reports radial nerve injury after ESWL associated with malposition and sedation by continuous target controlled infusion of propofol.

References

**TECHNICAL NOTE**

HIGH INSPIRED CARBON DIOXIDE LEVELS DUE TO MISPLACED CENTRAL TUBING OF THE ABSORBENT CANISTER

NIMISHA VERMA* AND PRATIBHA TOAL**

Abstract

The authors present a case of unusual rise in inspired carbon dioxide due to misplaced absorbent canister.

**Source of financial support:** Nil

**Key words:** high ICO2, sodalime, Fabius.

Technical Note

A thirty seven year old female was posted for left mastoidectomy. The procedure was initiated under general anesthesia using a Dragger Fabius Anesthesia machine. Pre use check of the machine was normal, however after induction and intubation, an increasing trend of the inspiratory carbon dioxide was noticed. This was followed by an increase in end tidal carbon dioxide after a few minutes. On inspection of the sodalime canister, we observed that the sodalime was filled till the base of the canister and the chain connected to the baffle system was inside the canister instead of being at the base (Fig. 1). Immediately the soda lime canister was replaced by another one. There was a quick return of the inspired carbon dioxide to 0 mmHg and the normalization of end tidal carbon dioxide level and the case conducted uneventfully thereafter.

* M.D, P.D.C.C, Department of Anesthesia *G.S. Memorial Hospital, Mahmoorganj, Varanasi, INDIA-221105.
** M.D, Department of Anesthesia # BARC Hospital, Anushakti Nagar, Trombay, Mumbai, INDIA

**Corresponding author:** Nimisha Verma, Department of Anesthesia *G.S. Memorial Hospital, Mahmoorganj, Varanasi, INDIA-221105. Tel: +91-9559955988. E-mail: verma.nimisha5@gmail.com

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Fig. 1
White arrow—chain up in the canister instead of being at the base
Grey arrow—absorber filled even in the base
Upon inspection of the removed canister, an inadvertent oblique tilt of the central tubing was noticed, with the screen being turned upside down and hence placed above the soda lime. This arrangement caused a part of expiratory gases to bypass the absorber and reach the inspiratory limb to induce carbon dioxide rebreathing. This misplacement occurred due to variations in the configuration of the screens in different types of canisters\(^1\). We have notified this to the manufacturers and suggested modifications. Any wrong position of the canister that will cause the exhaled gases to bypass the soda lime could lead to a high inspired CO\(_2\)\(^2\).

References


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