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Special Issue: Nursing and Healthcare: Current Scenario and Future Development

ISSN No: 2319-5886

International Journal of Medical Research & Health Sciences, 2016, 5, 7S:58-61

Relieving of Laryngospasm Induced during Isoflurane Maintenance for Examination under Anesthesia in an Infant with Sevoflurane

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ABSTRACT

Laryngospasm is a common and potentially life-threatening complication encountered during anesthetic care of children. In this manuscript, we present a case of laryngospasm in an infant who had undergone light anesthesia along with pitfalls and highlights of our management.

Key words: laryngospasm, isoflurane, sevoflurane

INTRODUCTION

Laryngospasm is the sustained closure of the vocal cords resulting in the partial or complete loss of the patient's airway. It is a common and potentially life-threatening complication encountered during anesthetic care of children. The overall incidence has been reported at just less than 1% in both adult and pediatric practice [1]. It is more prevalent in younger age group [2] with incidence ranging from 14% in less than 6 years old to 3.4% in more than 6 years old [3].

Laryngospasm can rapidly result in hypoxaemia and bradycardia. In order to re-establish oxygenation, a clear management plan is required to avoid significant morbidity and even mortality. Here we present a case of laryngospasm in an infant who had undergone light anesthesia along with pitfalls and highlights of our management.

Case Report

A seven-month baby boy with 8 kg weight was brought to the operating room for examination under anesthesia (EUA). He was a case of congenital cataract and aphakic glaucoma who had undergone three operations prior to the current admission. He had his first operation in June 2012 when he was one month. The second operation (Des, 2012) was Ahmad valve implantation, scleral patch graft, and anterior vitrectomy OS. During that operation he had an allergic reaction in the form of rash in trunk and extremities during anesthesia which was managed with hydrocortisone with no further events. The last operation was bilateral lens extraction and anterior vitrectomy due to bilateral mature cataract.

Finally he needed EUA for evaluating the results of the surgery and also suture removal (Feb 2013). Preoperative evaluation was unremarkable except of the allergy. In the operating room we found no visible vein in the extremities

of this obese neonate ; therefore, we choose inhalational induction with sevoflurane (Sojourn, Primal critical care, Bethlehem, USA) in a mixture of O2/N2o (50%-50%). After deepening the anesthesia, we changed to isoflurane (Terrell, Primal critical care, Bethlehem, USA) and tried to have a venous access but the attempt was not successful. So we used a light source in searching for veins. Two other attempts with this technique were unsuccessful too. Therefore the issue was discussed with the surgeon who checked the eyes and said there will be no operation procedures other than an examination and suture removal. At this time we made a 0.1 mg atropine injection in the submucosal area under the tongue, continued to deepen the anesthesia again with isoflurane, and let the surgeon start the operation. After a few minutes due to the surgeon's request to remove the mask and hand from the patients' face, we deepened the anesthesia with isoflurane inhalation (up to the 6%) under spontaneous ventilation, and allowed the surgeon to restart with a clear field. The child had a shallow breathing while holding jaw trust.

After about 5-6 minutes, the patient's respiration became irregular suggestive of light anesthesia. By interrupting the surgery, mask ventilation was restarted with high sevoflurane concentration. In just one minute, respiration was regularized. We shifted to isoflurane and continued till deep anesthesia sensed, and allowed the surgeon to continue again with no mask interruption (spontaneous ventilation and jaw trust maneuver).

This sequence was repeated for three other occasions before the last one which ended in laryngospasm. At this time after the occurrence of irregular breathing and few coughs, we interrupt the surgeon and start mask ventilation, but mistakenly we started isoflurane (4%) instead of sevoflurane. After a few breaths, irregularity turned to coughing and while still isoflurane was continuing, laryngospasm built up (no air exchange, no chest movement). So we encountered a laryngospasm in a 7 months obese neonate with no intravascular access.

We noticed and discontinued isoflurane, hoping that the spasm will resolve. But the spasm continued, interrupting with just a few coughs. Another attending anesthesiologist was called to search for IV access; meanwhile, everything was made available for endotracheal intubation and simultaneously sevoflurane 8% was delivered by mask. Attempts for gaining IV access were unsuccessful. During this 4-5 minutes period, spasm was accompanied with few coughs (about one in every 30 seconds), and Sao2 dropped from 97% to of 62%, but heart rate did not change significantly. Gradually before intubating the patient, number of coughs increased and turned into coughs with occasional normal shallow breathing. The Sao2 began to increase very soon, and there was a decrease in cough episode, and the picture finally turned to normal breathing pattern and normal sao2.

During this period, another attempt for IV access was made with the aid of a light source, which was successful. Sodium thiopental and succinylcholine were used to facilitate tracheal intubation. After securing the airway, surgeon started the operation which lasted about 10 minutes. The patient was transferred to the recovery room with tracheal tube in place and normal respiratory pattern. In the recovery room, the patient was observed for any respiratory complications before tracheal extubation was performed after an hour. The patient remained in the recovery room for additional two hours and feeding was started before he was discharged to ward. The next day, patient was visited and there were no complaints.

DISCUSSION

Laryngospasm is a frequent complication in pediatric anesthesia. It causes about 40% of post-extubation airway obstructions. The incidence of laryngospasm in pediatric population ranges from 0.04 to 14% [4-8]. It is an airway reflex stimulated by many conditions, one of which is inadequate anesthesia and presence of a stimulus (surgical or anesthetic). Risk factors for laryngospasm can be classified into three categories: patient-related, surgery-related, and anesthesia-related factors. Treatment success mainly depends on the experience of the anesthesia provider. Removal of the offending stimulus alone may be sufficient to treat laryngospasm [9]. During laryngospasm, deepening the anesthesia with intravenous agents, jaw trust with positive pressure mask ventilation, use of succinylcholine for muscle relaxation and spasm reliving, and tracheal intubation have been recommended [10]. In no intravenous line situation, laryngospasm can be treated with succinylcholine administration by intramuscular, intraosseous, or intralingual routes [9]. Left untreated; it will end in severe hypoxia, cardiac arrest, and death.

We had many problems in the management of this case. The first one was inability of providing intravenous access. After about 4 attempts we considered IV access impossible or very difficult and decided to perform EUA without IV line. The next pitfall was that we continued in 3 occasions from a stimulated child under insufficient anesthesia to a deeper level again with no IV access and continued the surgery. Not paying enough attention to surgical problems

was another pitfall. We forgot that any anesthesia need to be quiet safe, and regardless of what surgeon expects, the anesthesiologist should follow a safe path. The unsafe path that we chose was the ignorance of early warning signs of laryngospasm in this case, and continuing the procedure looking at the hands of surgeon to finish the case. The procedure took more time than expected due to unexpected surgical events; this could happen in any case. The last and biggest problem occurred when we mistakenly started high concentration of isoflurane during the last episode of excitation and irregular breathing, which ended in laryngospasm. Isoflurane is not recommended for inhalational anesthesia induction in children compared to halothane and sevoflurane, as it is associated with more complications such as laryngospasm [11]. Amongst the inhalational agents, isoflurane is associated with greater incidence of laryngospasm [12].

But there are some good points to mention too. First we relieved frequent episodes of light anesthesia, excitation, and irregular breathing with restarting high concentration of sevoflurane and turning to isoflurane when no further need to expensive sevoflurane was indicated. The next point was withholding from the use of an airway, as it is irritating during light anesthesia and could worsen laryngospasm in the pre spasm period. In case of laryngospasm, positive pressure of approximately 10 cmH2 O should be applied immediately to the airways associated with elevation of the mandible, which is enough in most cases [13]. The irritation caused by placing the airway during the early and maintenance phases of laryngospasm would strengthen the spasm and further attempts for reversing the spasm will fail.

The last thing we did was sevoflurane administration, which finally reversed the spasm. Although there were just few coughs, this small amount of oxygen mixed with high sevoflurane concentration, gradually deepened the level of anesthesia until spasm was relieved. The irregular absorption of the drug in the presence of a low cardiac output (pre-cardiac arrest situations) is another matter to be considered [13]. A very helping item in this case was sublingual submucossal atropine administration. When there was low sao2, the vagolytic effect of atropine prevented bradycardia, the occurrence of which could push us to intubate the neonate and not wait for laryngospasm revilement. Atropine also has vagolytic effects in the tracheobronchial tree which is effective against laryngospasm.

CONCLUSION

Sevoflurane administration by mask can be considered as the initial management of laryngospasm when there is still some tidal breathing in pediatric cases. Further experience in this regard is needed before concluding that sevoflurane could relive laryngospasm in this population.

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