

A Case of Cardiac Arrest after Topical Phenylephrine Administration in Adenoidectomy Surgery

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Abstract

Some otolaryngologists administer topical phenylephrine for bleeding control in adenoidectomy surgery. Absorption of this drug from surgical site can lead to increase in blood pressure due to vasoconstriction and then bradycardia related to baroreceptor reflex. Our case was an intraoperative arrest of a 9-year-old girl related to administration of topical phenylephrine during adenoidectomy however, bradycardia is a rare complication of topical phenylephrine in Otorhinolaryngology (Ear, Nose and Throat) (ENT) surgeries probably due to preoperative administration of atropine or glycopyrolate. Due to severe complications have been ever seen, avoidance of topical administration of phenylephrine or other vasoconstrictors with undetermined doses is reasonable.

Key Words: Adenoidectomy, Cardiac arrest, Phenylephrine.

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Introduction

Postoperative bleeding is a common complication in ear nose and throat surgery. Otolaryngologists in some centers to reduce bleeding topical vasoconstrictors used such as phenylephrine an Alpha-agonist drug caused peripheral vasoconstriction and increased blood pressure. The increase in blood pressure causes secondary baroreceptor reflex result in bradycardia (1). In the other hand we can say that bradycardia can be an unavoidable complication of the administration of phenylephrine. The best of our knowledge, bradycardia followed by topical administration of this drug is rare in ENT surgeries perhaps the main reason is the administration of atropine or glycopyrolate before operation(2).

Topical phenylephrine with undetermined dose that sometimes used in ENT surgeries can cause sever hypertention and secondary bradycardia also, there is a report from cardiac arrest in a 27 weeks infant after application of this drug during retinopathy of prematurity examination(3); otherwise, some studies has shown safety other applications of this drug for topical uses(4) . However, Alpha antagonists or vasodilators with decrease of blood pressure can prevent of bradycardia in this settings.

The New York State Department of Health has had four reports of cardiac arrest following administration of topical phenylephrine has been reported that in all cases labetalol was prescribed to control high blood pressure(2,5). Probably decreased cardiac output after treatment with this drug lead to arrest. Therefore, it is reasonable to avoid of treatment with this and other beta-blockers in hypertension induced by topical phenylephrine.

Case presentation

The case was an intraoperative arrest following topical phenylephrine administration during surgery in 25-kg, 9-year-old girl who had undergone adenoidectomy to the referrall hospital of Birjand University of Medical Sciences: Valie -asr Hospital in Birjand, the capital of Khorasan Jonoobi Province, Iran. In preoperative evaluation she did not have any history of systemic diseases and the physical examination was normal. In the operating theatre intravenous access was established, after routine monitoring, as in our hospital atropine or glycopyrolate administration before surgery is not routinely, general anesthesia was induced with midazolam 1 mg, fentanyl 50 µg thiopental 125 mg, and atracurium 12.5 mg. Anesthesia was maintained with isoflurane, nitrous oxide, and oxygen.

The adenoidectomy was performed, after completion of this procedure, the surgeon instilled by dropper an unmeasured amount of 0.5% phenylephrine on the surgical site to control bleeding. At this time, the patient's blood pressure was 200/110 and heart rate was 40 beats/min and multiple Premature Ventricular Complexes (PVCs) appeared in the Electrocardiogram (ECG) the concentration of isoflurane was increased, bigeminy and suddenly ventricular tachycardia was appeared. According to the observed arrhythmias a dose of 125 mg amiodarone was administered unfortunately inadequate response to drugs lead to pluse less Ventricular Thacyarrhythmia (VT), thus defibrillation was performed with 50 J Direct current (DC) shock and after chest compression and ventilation Cardiopulmonary Resuscitation (CPR) for 2 minutes another 50 J DC shock and infusion of magnesium sulfate were established. After 10 minutes CPR the rhythm was sinus and the pulse was palpable according to sinus bradycaria, a single dose of 1 mg atropine Intravenous (IV) was injected. At this time

heart rate and blood pressure was 120 beats/min and 100/80 mmHg respectively.

About 20 minutes later the patient had spontaneous breathing thus, the neuromuscular blocked was reversed. After returning to full consciousness the patient was extubated and transferred to Coronary Care Unit (CCU) for more taking care. Any systolic or diastolic dysfunction was not seen in Echocardiography at 1 hour and 24 hour after CPR.

Discussion

In our hospital otolaryngologists are commonly used topical phenylephrine with indeterminate dose to control bleeding during and after adenoidectomy. Documented dose of phenylephrine for topical use was not recorded in medical literatures(2,5). Administration of these drugs can produce some side effects such as bradycardia, hypertension, pulmonary edema, and arrest.

The main reason for bradycardia induced by phenylephrine is stimulation of baroreceptors due to hypertension. According to studies, radycardia is a rare complication of topical phenylephrine in ENT surgeries probably due to preoperative administration of atropine or glycopyrolate thus, in our case the patient's bradycardia and multifocal ventricular ectopics was probably related to unadministration of atropine or glycopyrrolate for premedication.

According to New York State Guidelines on the topical use of Phenylephrine in the Operating Room, when phenylephrin induced hypertension occurs, a wait-and-watch policy (for 10–15 min) is recommended for mild to moderate hypertension, that for severe hypertension they recommended the use of vasodilators and α -blockers. In our case, we used from increasing doses of isoflurane as an antihypertensive drug, however it was ineffective. Due nitroglycerin had been

administered for hypertension; it would has prevented from secondary bradycardia and cardiac arrest.

It seems that the best way for prevention of severe complications of topical phenylephrine is to be used with minimal effective dose only for topical vasoconstriction. This was discussed in detail by the New York State Phenylephrine Advisory Committee in its report. The report recommends a 0.25% solution of phenylephrine as the one of choice, and doses not exceeding $20 \mu\text{g}/\text{kg}^{-1}$ in children. The role of alternative vasoconstrictors like oxymetazoline, as safer alternatives, is also mentioned although there is a report about bradycardia due to it's administration (6).

Since the most cases of cardiac arrest after treatment of phenylephrine induced hypertension related to administration of Labetalol or esmolol, New York State Phenylephrine Advisory Committee (NYS) recommended α antagonists or direct vasodilators in this condition. According to guidelins of NYS the following points are considerable:

1. The initial dose of phenylephrin for adults should not exceed 0.5mg (four drops of a 0.25 % solution) in children (up to 25kg), the initial dose should not exceed $20 \mu\text{g}/\text{kg}$.
2. The minimal amount of phenylephrine needed to achieve vasoconstriction should be administered. Blood Pressure (BP) and pulse should be closely monitored after phenylephrine is given.
3. The dose of phenylephrine should be administered in a calibrated syringe and should be verified by a physician.
4. The anesthesiologist should be aware of all medications that are administered to the patient perioperatively.
5. Mild-to-moderate hypertension resulting from phenylephrine use, in a healthy individual, should be closely monitored

for 10 –15 min before antihypertensive medications are given. Severe hypertension, as well as its adverse effects such as electrocardiographic changes or pulmonary edema, must be treated immediately. Antihypertensive agents that are direct vasodilators or α -receptor antagonists are appropriate treatments.

6. The use of β blockers and calcium-channel blockers should be avoided when vasoconstrictive agents such as phenylephrine are used in the operating room. Case reviews, as well as a review of the medical literature, suggest that the use of β blockers, and potentially calcium-channel blockers, as treatment of hypertension secondary to a vasoconstrictor may worsen cardiac output and result in pulmonary edema (7-8).

7. If a β blocker is used for the treatment of resulting hypertension, glucagon may be considered to counteract the loss of cardiac contractility as well as other standard therapies.

Conclusion

As a general consideration, for prevention of common complications of topical phenylephrine, there are three recommendations: first is to avoid from administration of undetermined doses of phenylephrine for topical uses; second is to treat complicated hypertension due to topical phenylephrine as soon as possible with vasodilator drugs and preferentially not with beta or calcium channel blockers; third is to administer atropine or glycopyrolate before pediatric surgeries in which probably will be used from topical vasoconstrictors.

Conflict of interests: None.

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