Introduction: Topical vasoconstrictors are routinely used in pediatric surgical and anesthesia procedures involving the airway to decrease operative site bleeding, decrease mucosal swelling, and facilitate techniques in nasal or fiberoptic intubations. Agents that have been used include cocaine, phenylephrine, and oxymetazoline. Documented toxicities with the topical use of cocaine and phenylephrine have lead to the increased use of oxymetazoline (Afrin). Although considered to have a safer hemodynamic profile, oxymetazoline is a vasoactive amine that can have serious systemic adverse effects. Pediatric patients are especially at risk for acute oxymetazoline toxicity even with pediatric concentrations of 0.025%. The manufacture recommends the delivery of oxymetazoline via nasal spray in an upright position. Its application is commonly via other methods due to the supine position of the patient. This includes squeezing the bottle upside down into the nasopharynx. The dosing of oxymetazoline in this manner delivers a significantly larger amount of drug to the patient. There is no literature on the therapeutic doses or toxic doses of oxymetazoline. We report a case of oxymetazoline toxicity and will discuss appropriate treatment and safer methods or application.

Case: A twelve year old, 44 kilogram female presented for extensive dental restoration. Past medical history is significant only for a previous cleft palate and lip repair. The dental team was aware that although nasal intubation is preferred for an unobstructed oral field, nasal intubation would only be attempted once and otherwise oral intubation with intermittent endotracheal tube adjustment would be performed. Inhalation induction with intravenous placement was unremarkable. The oxymetazoline bottle was squeezed in an upside down position twice into each nares. One attempt at passing a lubricated 5.0 endotracheal tube in each nares was made with care not to exert excessive pressure on the anatomy. Moderate bleeding resulted in one nares. On oral intubation, the oral cavity was noted to be dry. The patient was orally intubated without difficulty. Upon securing the endotracheal tube and positioning the patient, progressively rising blood pressures were noted. Increasing the sevoflurane concentration to seven percent was attempted to decrease the hypertension. Despite the increase in gas concentration, the patient’s blood pressure reached systolics up to one seventy, diastolics in the upper nineties to a hundred, and displayed bradycardia to a heart rate in the lower fifties. Oxymetazoline toxicity was recognized and treated with hydralazine 0.1mg/kg and a nitroglycerine infusion was titrated to normopressure. Normal blood pressures were obtained after fifteen minutes. Nitroglycerine infusion was discontinued in the following fifteen minutes. Patient was awakened without cardiopulmonary consequences. No complications or hemodynamic instability was noted in overnight observation.

Discussion: Oxymetazoline’s therapeutic action is secondary to stimulation of peripheral post-synaptic alpha 2 adrenergic receptors of the mucosa, causing local vasoconstriction. Direct stimulation of alpha 1 receptors and central alpha 2 adrenergic receptors also can occur. Because no beta adrenergic receptor agonism is present, systemic and high doses of oxymetazoline will produce hypertension with reflexive bradycardia instead of tachycardia.

With the increasing use of oxymetazoline, we predict that more adverse events will occur. A Cardiac arrest after oxymetazoline nasal spray application in a 2 year old was reported by Trush DN in the Journal of Clinical Anesthesiology 1994. It is possible that the anatomy of this child contributed to the rapid systemic absorption. The nares were blind pouches that retained the solution of oxymetazoline in an area of high vascularity. The method of application contributed to the amount of drug delivered.

Unlike other vasoactive agents, oxymetazoline is not precisely dosed in its delivery or according to weight. According to pharmaceutical manufacture’s directions, children over six years of age should require 2-3 sprays or drops per nostril twice daily for up to three days. This is a mere 0.1 to 0.3 cc ( 25 to 75 mcg ) dose if drops are measured by a syringe. Two to three mist sprays into a syringe collected also results in less than 1 cc. It is a common practice among surgeons and anesthesiologists to delivery the oxymetazoline from an upside down bottle or by syringe droppers secondary to the patient’s supine position. This results in a 1-3 cc dose for each stream or 250 to 750 mcg. This is ten times the amount given in a misted spray.

There is no literature on the treatment of oxymetazoline toxicity beyond antidotal reports. Beta blockers may precipitate a lethal event and should not be used to treat the hypertension from oxymetazoline. There is no literature of therapeutic or toxic dosage of oxymetazoline. Anesthesiologists and surgeons should be aware of the dangers of the increased amount of oxymetazoline delivered by squeezing the bottle upside down or by syringe droppers.