

# Epinephrine toxicity: an avoidable fatal complication due to iatrogenic overdose

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Epinephrine is used as an additive to local anaesthetic solutions. Large doses of epinephrine used in local anaesthesia can cause toxic manifestations as in our case in a young patient posted for Tympanoplasty.

**Keywords:** epinephrine, epinephrine toxicity, local anaesthesia

## Introduction

Epinephrine (Adrenaline) is the prototype drug amongst the sympathomimetics. It is a potent activator of  $\alpha$  adrenergic receptors and also activates  $\beta_1$  and  $\beta_2$  receptors. It is added to local anaesthetic solutions to decrease systemic absorption and prolong the duration of action of the anaesthetic.  $\alpha_1$  receptor mediated vasoconstriction decreases bleeding at the surgical site.<sup>1</sup>

We report a case with epinephrine toxicity in a patient posted for Tympanoplasty under local anaesthesia and would like to discuss the issues regarding the use of epinephrine as an additive to local anaesthetic mixtures.

## Case report

A 25 year old female, ASA grade one, weighing 60kg was posted for Tympanoplasty under local anaesthesia. All routine investigations were within normal limits. Preoperative pulse rate and blood pressure were 78 per minute and 118/70mmHg respectively. Patient was premedicated with glycopyrrolate 0.2 mg, pentazocine 30mg and promethazine 25mg by intramuscular route. The surgeon infiltrated surgical site with 20 ml of 2% lignocaine and 1mg of epinephrine. After a few minutes patient became restless and developed tachycardia (150-160 per minute), blood pressure had risen to 190/110mmHg along with complaints of headache and chest pain. ECG tracing showed ST depression and T wave inversion. Anaesthesiologist was then called upon.

Nitroglycerine spray 0.4mg via sublingual route was given and the same dose was repeated after 5 minutes. Blood pressure fell down to 140/90mmHg. Headache and chest pain were relieved and the tachycardia settled after half an hour. ST depression was corrected in the 12 lead ECG taken subsequently. Blood sample was sent for Troponin I levels. The surgery was abandoned and patient was shifted to ICU for further management.

## Discussion

Epinephrine toxicity presents as restlessness, throbbing headache, tremor, and palpitations. More serious reactions include cerebral haemorrhage and cardiac arrhythmias.<sup>2</sup> Angina may be induced in patients with coronary artery disease. Pulmonary oedema is known to be caused by excess adrenaline.<sup>3</sup> Significantly elevated Troponin T, CPK, CPK (MB) levels are noted. Long term side effects include tremors, muscle weakness, easy fatigability and shortness of breath on exertion.

It has been recommended in neck surgery that epinephrine in a concentration of 1:200,000 or 1:400,000 provide optimal initial haemostasis with minimal side effects, however, epinephrine 1:800,000 provided significantly less vasoconstriction.<sup>4</sup> A dose of 3mcg/kg up to a maximum of 200mcg has been considered as a safe dose in healthy individuals.<sup>5</sup> In our case five times of this safe dose was used. Malamed

recommended a maximum dose of 40µg epinephrine for a dental procedure per appointment in patients with cardiac disease.<sup>6</sup>

The duration of action of epinephrine is brief and hypertension may resolve spontaneously. Severe hypertension as in our case, require treatment with vasodilators such as nitroprusside or nitroglycerine. Treatment of systemic side effects with β adrenergic blocking drugs may be followed by pulmonary oedema and irreversible cardiovascular collapse on account of the decreased ability of stressed myocardium to increase contractility and heart rate.<sup>7</sup>

### Conclusion

1. Monitored Anaesthesia Care will ensure better safety of the patient especially when a drug like epinephrine is added to the local anaesthetics.<sup>8</sup>
2. Risk to benefit ratio should be assessed before using epinephrine in cardiac patients.
3. Patient safety might be improved by expressing drug concentrations exclusively as mass concentration.<sup>9</sup>
4. Adding undiluted epinephrine ampoules in local anaesthetics in large doses is a major cause of such mishaps. Local anaesthetic solutions containing epinephrine in safer dilutions should be used. For example: 30ml Lignocaine 2% with Epinephrine in 1:200000 dilution.<sup>10</sup>

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