

## Ventricular Dysrhythmia Caused By Inadvertent IV Epinephrine Administration

### *Yanlışlıkla IV Epinefrin Uygulamasına Bağlı Ventriküler Disritmi*

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#### ABSTRACT

This case describes a 38-year-old man who presented with an acute anaphylactic reaction occurred after intramuscular penicillin injection. He was erroneously given 0.5 mg (1:1000) intravenous (IV) epinephrine and revealed severe chest pain with a wide complex tachycardia seen on ECG. This case is an example of ventricular dysrhythmia occurred following inadvertent IV administration of epinephrine and illustrates a potential danger when the medication dosed incorrectly for anaphylaxis.

**Key words:** Anaphylaxis, intravenous epinephrine, ventricular dysrhythmia

#### ÖZET

Bu olgu sunumunda, intramuskuler penisilin enjeksiyonu sonrası akut anafilaktik reaksiyon gelişen 38 yaşında bir erkek hasta sunulmuştur. Hastaya yanlışlıkla 0.5 mg (1:1000) epinefrin intravenöz olarak uygulanmış , sonrasında akut gelişen ciddi göğüs ağrısı ve EKG' de geniş kompleks taşikardi gözlenmiştir. Bu olgu ile, epinefrin İV yanlış doz uygulanmasının ortaya çıkardığı ventriküler disritmi örneği ile anafilaksi için epinefrin uygulamasının potansiyel tehlikelerine dikkat çekmek amaçlanmaktadır.

**Anahtar Kelimeler:** Anafilaksi, intravenöz epinefrin, ventriküler disritmi

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## Introduction

Anaphylaxis has been defined clinically as reactions that range from mild simple urticaria to life-threatening hypotensive shock (1). The initial clinical presentation may be simple; however anaphylaxis occurs as a continuum, so that there is significant potential for rapid progression to a severe fatal reaction (1,2). It is often impossible to predict the ultimate severity of an anaphylactic episode at the time of onset (1). Early administration of intramuscular (IM) epinephrine reduce the severity of the acute episode (1). Epinephrine is available in different doses and concentrations for delivery by different routes, and for different indications. The differences can lead to life-threatening medication errors (3).

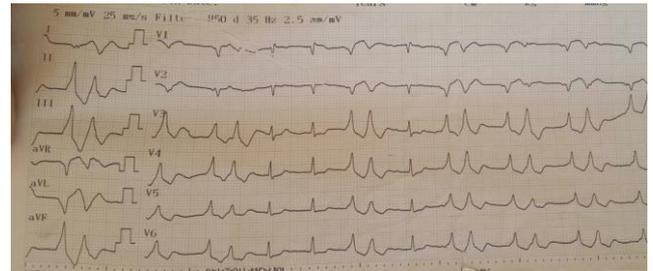
We present a patient in whom ventricular dysrhythmia occurred following inadvertent IV administration of epinephrine for an anaphylactic reaction.

## Case

A 38-year-old man with sore throat was diagnosed to have streptococcal pharyngitis and was ordered IM penicillin for treatment in a primary care clinic. After injecting penicillin intramuscularly, he had complained of lightheadedness and dyspnea. The blood pressure was decreased at 80/40 mmHg. The treating physician had considered 'possible anaphylaxis' for these symptoms and decided to give epinephrine to the patient. In addition to other medications administered, he was erroneously given 0.5 mg (1:1000) intravenous (IV) epinephrine. The drug administration order was given only verbally and the nurse had understood the order wrong, and had given epinephrine IV instead of the requested IM injection. Few seconds after IV epinephrine administration; the patient immediately developed severe chest pain, palpitations, high blood pressure. The electrocardiogram (ECG) revealed wide complex tachycardia (Fig. 1). The symptoms and wide complex tachycardia were resolved spontaneously after few minutes except chest pain. He was referred to our emergency department for further investigation and observation.

At the arrival, there was still ongoing chest pain, however the vital signs and the physical examination was within normal ranges. The ECG revealing normal sinus rhythm without any ischemic changes. The troponin I level was found high (0.3 ng/ml, upper limit of normal testing was 0.06 ng/ml) for this reason he was consulted with cardiology clinic and hospitalized for observation. Transthoracic echocardiogram showed normal cardiac contractility and normal wall motion. The troponin levels were not elevated so much and no recurrent dysrhythmia was occurred. The

patient refused coronary angiography, and he was discharged from the hospital without any sequela.



**Figure 1:** Electrocardiographic rhythm strip showing ventricular tachycardia after intravenous administration of adrenaline

## Discussion

Anaphylaxis are usually sudden in onset and can progress in severity over minutes to hours and become life threatening (4). All current guidelines recommend that the first-line use of IM epinephrine for the standard care of anaphylaxis (1,3). Delaying administration of epinephrine has been associated with increased risk of fatality (1).

Epinephrine reverses the symptoms of anaphylaxis by its effects on alpha and beta adrenoreceptors. The alpha adrenergic effects reverse peripheral vasodilation, hypotension and also reduces mucosal edema. The beta adrenergic properties of epinephrine cause bronchodilation, increase myocardial output and contractility, and suppresses the release of inflammatory mediators (2).

There are no absolute contraindications to the use of epinephrine for anaphylaxis (5).

and serious adverse effects are very rare when it is administered at the appropriate IM doses (1). IM injection into the anterolateral thigh is the preferred route of administration and attains higher plasma levels more quickly than subcutaneous administration (2). The dose is 0.01 mg/kg of a 1:1000 (1 mg/mL) solution to a maximum of 0.5 mg in adults or 0.3 mg in children (1). The transient anxiety, pallor, palpitations, and tremor experienced after administration of adrenaline. These symptoms are uncommon after an intramuscular injection (6).

IV epinephrine can also be used for anaphylaxis, however this route should only be administered in profoundly hypotensive patients or patients in cardiac or respiratory arrest who have failed to respond to IV volume replacement and IM doses of epinephrine (2,3). Intravenous epinephrine in patients with adequate circulation may cause life-threatening hypertension, myocardial ischemia, and arrhythmias (5). However, most adverse events with epinephrine use occur when it is given in i.v. high doses or rapid infusion rates (1). Elderly patients and patients with

known ischemic heart disease or hypertension are those particularly at risk (7).

Because of the potential for cardiovascular adverse events, IV epinephrine should be considered in the use of a highly diluted solution (1 in 10 000) and is infused at a rate of 1µg/min, with monitoring of heart rate, blood pressures, pulse oximetry and electrocardiography (3, 7).

The causes of these errors were attributed to inadequate physician knowledge about the appropriate dose and/or route, complicated dose calculations involving ratios, stressful working environment especially in ED, multiple patients to care for simultaneously and miscommunication between physicians and nurses (3). Errors can also occur with infusion pump malfunction in the setting of continuous infusion (8). A retrospective review of patients admitted with anaphylaxis over a 5-year period identified a 2.4% incidence of potentially life-threatening complications from inappropriate epinephrine administration (9). The high frequency of medication error usually occurs in children (10).

The miscommunication error between the physician and nurse caused the adverse events in our patient. Fortunately, the wide complex tachycardia and the symptoms were resolved spontaneously after few minutes and the patient was discharged from the hospital without any sequel.

### Conclusion

All guidelines recommend IM injection of epinephrine as the first-line medication of choice in anaphylaxis and there are no absolute contraindications for its usage. Epinephrine can be associated serious cardiac side effects, if administered in an incorrect route or dose. Serious adverse effects are very rare when it is administered at the appropriate IM doses. Because of epinephrine is a 'high-alert' medication, therefore physicians should verify the order, dose, concentrations prior the administration and adequate communication between physicians and nurses especially stressful working environment.

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