

# Efficiency of Gastric Tubing and Activated Charcoal Treatment in Beta Blocker (Metoprolol) Poisoning; A Case Report

## Beta Bloker (Metoprolol) Zehirlenmesinde Mide Dekontaminasyonu ve Aktif Kömürün Etkinliği; Bir Olgu Sunumu

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### Abstract

Beta blockers negatively impact the inotropy and cronotropy of myocardial activity and are widely prescribed for various clinical conditions. Beta blocker overdose may occur accidentally or with suicidal intent, leading to fatal clinical conditions requiring intensive treatment. Moreover, these drugs can affect cardiovascular functions as well as mental conditions. Here, we present the case of a 33 year-old-woman who ingested 100 mg of metoprolol (2 blisters of a pocket) an hour prior with suicidal intent. She presented with nausea, vomiting and dizziness. When vital signs were considered: her blood pressure was 120/70 mmHg, heart rate was 85 beats/min, respiratory rate and saturation were normal. Electrocardiogram showed sinus rhythm without ST segment deviation. In the observation unit, prompt gastric decontamination was administered. Additionally, a liter saline and antiemetic medication were administered for the management of nausea. Due to her bradycardia and vomiting, glucagon and atropin injections were applied and she was admitted to the intensive care unit. After 2 hours, she completely recovered and had no more any clinical symptoms. She was monitored for a day and was discharged from the hospital after full recovery. This case highlights the importance of early interventions such as gastric decontamination and activated charcoal administration in managing drug overdoses. Since we know that the ingestion of high doses of beta blockers is mortal and has poor clinical outcome, we think that the patient in this case underwent early and succesfully gastric decontamination and active charcoal administration, so she was discharged from the hospital with good clinical outcome. As a result, we think that emergent gastric decontamination and also active charcoal administrations are useful and lifesaving in cases of drug overdoses in early presentations.

### Keywords

Beta blockers, toxicology, overdose, gastric decontamination, case report

### Özet

Beta blokerler miyokardiyal aktivitede negatif inotrop ve kronotrop etkilere sahiptir. Birçok klinik durum için kullanılır ve bazı durumlarda hastalarda beta bloker doz aşımı ortaya çıkabilir. Bu ilaçlar kardiyovasküler fonksiyonlara ek olarak mental durumu da etkileyebilmektedir. Doz aşımı olan hastalarda klinik olaak ölümcül durumlar ortaya çıkmakta ve bu klinik tablolar yoğun bir tedavi gerektirmektedir. Tanımlayacağımız olgumuz 33 yaşında, suisid amacıyla 1 saat önce 100 mg metoprolol (toplam 2 blister) almış olan bir kadın hastadır. Hastanın başvuru sırasında mide bulantısı, kusması ve baş dönmesi vardı. Vital bulguları; tansiyonu 120/70 mmHg, nabızı 85 atım/dk, solunum sayısı ve oksijen saturasyonu normaldi. Hastanın elektrokardiyografisi sinüs ritmindeydi ve ST segment değişikliği yoktu. Hasta gözlem altına alındı ve monitorize takip edildi. Bir saat önce aldığı ilaçların erken dönemde emilmesini engellemek için gastrik dekontaminasyon yapıldı ve parçalanmış ilaç tabletlerinden çok miktarda geri aspire edildiği görüldü. Bulantı için salin infüzyonu ve antiemetik ilaç verildi. Takiplerinde bradikardi ve kusması başlayan hastaya glukagon ve atropin enjeksiyonu yapıldı ve yoğun bakım ünitesine yatırıldı. Yoğun bakım ünitesi takiplerinde tamamen iyileşen ve herhangi bir klinik semptomu olmayan hasta, gözlem sonrası hastaneden taburcu edildi. Yüksek dozda beta bloker kullanımının mortal seyrettiğini ve klinik sonuçlarının kötü olduğunu bilmekteyiz. Bu olgudaki hastaya erken ve başarılı bir şekilde gastrik dekontaminasyon ve aktif kömür uygulandığı için hastanın iyi bir klinik sonlanımla taburcu olabildiğini düşünüyoruz. Sonuç olarak toksik doz ilaç alımlarında, erken dönem mide dekontaminasyonu ve aktif kömür uygulamasının faydalı ve hayat kurtarıcı olduğunu düşünmekteyiz.

### Anahtar

### Kelimeler

Beta bloker, toksikoloji, overdoz, gastrik dekontaminasyon, olgu sunumu

## INTRODUCTION

Beta blocker poisonings and related fatalities have been extensively studied (1). These drugs act on individual receptors in the body and can lead to fatal clinical conditions. Among the 3 types of beta receptors, Type 1 is found in myocardial tissue and is responsible for increasing the chronocity and inotropy (2). Since the patient uses beta blocking agent which is targeting this receptor, we may see the the drug effects such as negative inotropy and chronotropy. Some beta blockers, such as Metoprolol, possess membrane stabilizing activity (MSA) that make them more lethal than other beta blocking agents (3). These types of drugs may also affect QTc interval, cause QRS widening and some more electrocardiographic changes (4). Furthermore, beta-blocking drugs competitively antagonize catecholamine receptors.

Various factors influence the clinical course of beta blocker poisoning, including receptor selectivity, lipid solubility, partial agonistic effects, and dosage. Main symptoms of beta-blocking agents' poisonings are hypotension and bradycardia. However, if the beta-blocking agent has partial agonistic effect, hypotension and tachycardia may occur (5). Differential diagnosis of hemodynamic disorders should consider other potential causes. Cardiac ultrasound, monitoring, blood gas analysis and other specific blood tests are helpful tools in diagnosis. The modalities in treating the poisoned patients with beta-blocking agents are glucagon, calcium, lipid emulsion, cardiac pacing, catecholamine and hemodialysis (6). When considering the cumulative poisoning literature, there is not sufficient evidence that gastrointestinal decontamination improves overall outcome. For this reason, airway, ventilation, and cardiovascular resuscitation take priority over gastrointestinal decontamination following overdoses. However, if the patient is stable and there is a suspicion of the overdoses of mentioned medication, decontamination may be appropriate because of the potential mortality from these cardiovascular drugs (7). It is reasonable to administer 1 g/kg activated charcoal within 1 to 2 hours of ingestion to decrease systemic drug absorption (8).

## CASE REPORT

A 33-year-old-woman was brought to the emergency department (ED) by the ambulance system. Emergency medical service found empty metoprolol pocket in her house and the patient admitted taking 20 tablets of 50 mg of metoprolol. In the ambulance, as well as in the emergency department, her vital signs and Glasgow Coma Scale were

normal. The patient was on a cardiac monitor and an intravenous line was established in the right antecubital region by the medical team. The patient's vital signs were within normal limits: her blood pressure was 120/70 mmHg, heart rate was 87 beats/min, her oxygen saturation and respiratory rate were normal. She exhibited symptoms of nausea, vomiting, and stomachache. She had been using these beta blocker agents for 1 year due to her tachycardia as well as was receiving treatment for depression, with no history of suicide. The careful and detailed examination of the ED physician led to the administration of the second vascular line. Electrocardiogram was in sinus rhythm and there were no ST segment deviations.

The blood tests (complete blood count, creatinine, hepatic enzymes, pregnancy test) were ordered and nasogastric tubing for gastric decontamination was performed. Additionally, a liter of intravenous saline and 8 mg of ondansetron were administered to manage the nausea and vomiting. Gastric decontamination revealed many pills of beta blockers in the decontamination fluid. 60 g of activated charcoal was administered after decontamination.

Shortly after admission, the patient developed nausea and bradycardia. Her heart rate was 48 beats/min, and had bradycardia symptoms such as nausea and fatigue. Her physician administered 1 mg atropine and 5 mg of glucagon injections. After the treatment, her heart rate increased to 56 beats/min and blood pressure was 130/80 mmHg again. An hour later, she was admitted to the intensive care unit for close observation of her clinic and vital signs. The patient, who did not develop any clinical symptoms in the intensive care unit, was discharged the day after with the recommendation of outpatient follow-up of psychiatry and cardiology clinics.

## DISCUSSION

Although there are many complications and contraindications of gastric decontamination, prompt use of gastric decontamination and charcoal administration were critical in saving the patient's life.

The patient ingested a significant amount of metoprolol (950 mg versus the normal dosage of 100 – 400 mg), which could have resulted in severe symptoms and fatal outcomes. Metoprolol is used for various clinical conditions, and all indications of metoprolol are part of cardiovascular diseases (9). Reported cases about metoprolol toxicity include hepatic failure; however, in our case blood tests and their controls were all normal (9). Reducing the drug dosage by early gastric decontamination could be the reason for this.

Using other medications while taking drugs causes drug-

drug interactions and may lead to undesirable effects. In our case, the patient had been using antidepressant agent for a long time and this may have affected her symptoms.

The toxicokinetics varies among individuals as the estimated lethal dose (LD<sub>50</sub>) of metoprolol is between 100 to 400 mg per day (9). Dizziness, confusion, arrhythmias and sleep disorders are often observed, many of which were also present in our case. Bradycardia and hypotension are common in beta blocker poisoning due to antagonizing beta 1 adrenergic receptor activity, also it has shown that in some cases bradycardia may be resistant to the treatments (REF) (5). In our case, we were able to manage the bradycardia and get a complete relief from the symptoms of the drug poisoning. We used atropin and glucagon promptly. In addition, gastric decontamination and activated charcoal were effectively used to remove the drug before being absorbed from the gastrointestinal system. Activated charcoal is recommended within 60 min of arrival to the emergency department and this effective with high adsorption if a drug has hepatic circulation (10). Considering the dose of medication the patient takes, we think that removing the medication is more effective for the treatment to go well.

In this case we expected more serious and fatal symptoms and outcomes. So, we can argue that early treatment with decontamination and activated charcoal gave the patient a chance of recover quickly. Overall, this case underscores the importance of early intervention and supportive care in managing beta blocker overdose.

#### **Ethical Declarations**

Not applicable, this article does not contain any studies include human or animal subjects. An informed consent was obtained from the patient for this case report.

#### **Conflict of Interest Statement:**

There is no conflict of interest between the authors and / or family members, or working conditions and similar situations in any firm.

#### **Financial Disclosure:**

In this study, there is no financial or spiritual support was received from any company.

#### **Author Contribution**

Treatment and Medical Practices: G.O.O. O.E. H.E.O, Concept: G.O.O., Design: G.O.O. O.E., Data collection or Processing: G.O.O H.E.O. F.O., Analysis or interpretation: F.O., G.O.O., Literatur Search and Writing: G.O.O. Manuscript drafting, revising and final approval were carried out by all authors.

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