

**RHYTHM DISRUPTION: DISCLOSING ATENOLOL'S IMPACT ON THE HEART"- A
REPORT ON ATENOLOL INDUCED AV BLOCK***¹Akhila Ann Cherian, ²Dr. Sara Kurien K. and ³Dr. Prakash Krishnan¹Pharm D Intern, Nazareth College of Pharmacy, Othara, Thiruvalla.²Assistant Professor, Department of Pharmacology.³Professor, Department of Pharmacology.

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ABSTRACT

Atenolol is a second-generation β -blocker that reduces heart rate and blood pressure and decreases myocardial contractility. It is an FDA-approved drug indicated in management of hypertension, angina pectoris, and acute myocardial infarction. The most common side effect associated with Atenolol is fatigue followed by hypotension, bradycardia, cold extremities, depression, diarrhea, vertigo, dizziness and rarely, second/third degree AV block. So far only 45 cases of Atenolol induced AV block have been reported. Here we present the case of a 79-year-old male with Second-degree Atrio-Ventricular block while on treatment with Atenolol for therapeutic management of hypertension.

KEYWORDS: Atenolol, AV block, Ambulatory ECG, Mobitz type II block.**INTRODUCTION**

The traditional indications of Atenolol include long-term management of angina, myocardial infarction and hypertension. Atenolol also has off-label indications such as treatment of arrhythmias, migraine prophylaxis, paroxysmal supraventricular tachycardia, alcohol withdrawal, thyrotoxicosis, and prophylaxis against secondary myocardial infarction.^[1,2] Atenolol is commonly known to have adverse reactions like nausea, diarrhea, bradycardia, tachycardia, hypotension, atrial fibrillation, pulmonary embolism and even heart block.

Atrio-ventricular block is a less common adverse effect of Atenolol. Atrio-Ventricular conduction block is caused by a delay in the conduction of electrical impulses between the ventricles and atria. It is indicated by a prolonged PR interval in an electrocardiogram. First-degree, second-degree, and third degree are the different types of conduction blocks. Wenckebach or Mobitz type I and Mobitz type II are the two sub-varieties of second-degree atrioventricular blockages.^[3,4] In general, individuals with second degree AV block may exhibit no symptoms at all or symptoms such as syncope and dizziness. Based on the degree of conduction system impairment, the second-degree heart block can be either permanent or transitory. If left untreated, the Mobitz type II block can cause mortality as it has the potential to develop into a total heart block.^[5] According to a study conducted by T.M.M

Dragos et.al., in 2022, around 0.9% patients on β -blockers developed a second-degree AV block.^[6]

β -blockers, therefore, are now gaining attention as a cause of acquired complete atrioventricular (AV) block in clinical practice. This is often stated logically in reviews published in highly esteemed journals^[7,8] and in cardiology textbooks.^[9,10] However, it is unclear if AV block discovered in patients treated with beta-blockers merely unmasks the presence of serious underlying AV conduction disease. Moreover, there is little evidence about the natural history and prognosis of patients with drug-related AV block. This is of clinical importance, as pacemaker implantation is generally considered unnecessary in patients with drug-induced AV block. Therefore, we discuss the particular case of Atenolol induced AV block.

CASE PRESENTATION

A 79-year-old male came to hospital with complaints of frequent episodes of syncope. He is a known case of Hypertension and Type II Diabetes Mellitus for 30 years. For hypertension and diabetic control, he was on Tab Atenolol 100 mg once daily (since 2020) and Metformin 500 mg once daily respectively. He was doing very well until October 2021, during which he had his first episode of syncope and the patient concurrently experienced dizziness. He experienced an epileptic kind of episode. After a couple of days, the patient had similar episodes

and was managed symptomatically. His blood sugar tests came back normal. Since the patient had a history of facial palsy 2 years back, he was taken to the Neurology department and after initial assessments, was referred to the Cardiology department for further examination. Since all other causes of an AV block that included ischemia, myocarditis and status post-cardiac surgery were ruled out, the patient was advised to have an ambulatory ECG done. The initial report showed a Second degree AV block, which in turn was suspected to be Atenolol. Hence, it was planned to taper the dose of Atenolol from 100 mg to 50 mg, 25 mg and then 12.5 mg once daily over a period of time, after which it was stopped. Furthermore, ambulatory ECG was repeated after 1 month and this time, it was found to be normal.

DISCUSSION

Atenolol is a second-generation beta-1-blocker indicated in the treatment of hypertension, angina pectoris, and acute myocardial infarction. Cardio selective beta-1-adrenergic antagonists, like Atenolol, inhibit sympathetic stimulation by blocking endogenous catecholamine's positive effects by binding to beta-1 adrenergic receptors in the vascular smooth muscle and the heart.^[11] Myocardial contractility is reduced as a result of this activity, along with blood pressure and heart rate reduction. On the other hand, Atenolol may extend left ventricular fiber lengths and increase end-diastolic pressure in patients with heart failure, which would raise oxygen demand.

β-adrenergic antagonists also lengthen the AV node's refractory period. As a result, it can also be used off-license to treat supra ventricular tachycardia and stop atrial fibrillation paroxysmal episodes.^[12] The duration of action is dosage-dependent. After administration of a single dose, the effects start to show up within an hour and reach their peak between two and four hours later, lasting for at least twenty-four hours.

This case depicts a scenario where AV block occurs due to the prolonged use of Atenolol, which is confirmed by taking ambulatory ECG before and after the discontinuation of the drug. Since the patient did not have any cardiac history, the sudden onset of block is assumed to be due to the medications that he was taking during the past years. Also, after discontinuation of Atenolol, the patient has no longer experienced syncope and other symptoms. The suspected adverse effect is probably due to Atenolol. Also, only 45 cases have been reported worldwide. This reinforces the need for proper follow-up and treatment as well as education in such patients.

CONCLUSION

Beta-blockers are commonly used to treat hypertension. However, it has the potential to cause Atrio-Ventricular blockade and bradycardia. Thus, physicians should be aware about this side effect in-order to suspect an AV block, if it arises on treatment with Atenolol. Also early

discontinuation and substitution of the suspected drug can reduce the complications associated herein.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

ABBREVIATIONS

- AV : Atrioventricular
- ECG : Electrocardiogram
- β-blockers : Beta-blockers

REFERENCE

1. Wadworth AN, Murdoch D, Brogden RN. Atenolol. A reappraisal of its pharmacological properties and therapeutic use in cardiovascular disorders. *Drugs*, 1991 Sep; 42(3): 468-510.
2. Ailani J, Burch RC, Robbins MS., Board of Directors of the American Headache Society. The American Headache Society Consensus Statement: Update on integrating new migraine treatments into clinical practice. *Headache*, 2021 Jul; 61(7): 1021-1039.
3. Fu Md J, Bhatta L. Lyme carditis: Early occurrence and prolonged recovery. *J Electrocardiol*, 2018 May-Jun; 51(3): 516-518. [PubMed]
4. Tuohy S, Saliba W, Pai M, Tchou P. Catheter ablation as a treatment of atrioventricular block. *HeartRhythm*. 2018 Jan; 15(1): 90-96. [PubMed]
5. Muhammad Asif Mangi; Wesley M. Jones; Mohamed K. Mansour; Laura Napier. Second-Degree Atrioventricular Block StatPearls [Internet]. August 14, 2023.
6. Dragoş Traian Marius Marcu, Cristina Andreea Adam, Dan-Mihai Dorobanţu, Delia Lidia Şalaru, Radu Andy Sascău, Mircea Ovanez Balasanian, Liviu Macovei, Cătălina Arsenescu-Georgescu, and Cristian Stătescu. Beta-Blocker-Related Atrioventricular Conduction Disorders—A Single Tertiary Referral Center Experience, 2022 Feb 20. doi: 10.3390/medicina58020320
7. Mangrum JM, DiMarco JP. The evaluation and management of bradycardia. *N Engl J Med*, 2000; 342: 703–9.
8. Garg J, Messereli AM, Bakris GL. Evaluation and treatment of patients with systemic hypertension. *Circulation*, 2002; 105: 2458–61.
9. Miller JM, Zipes DP. Management of the patient with cardiac arrhythmias. In: Braunwald E, Zipes DP, Libby P, editors. *Heart Disease. A Textbook of Cardiovascular Medicine*. 6th ed. Philadelphia, PA: W.B. Saunders Co., 2001: 711–39.
10. Olgin JE, Zipes DP. Heart block. In: Braunwald E, Zipes DP, Libby P, editors. *Heart Disease. A*

- Textbook of Cardiovascular Medicine. 6th ed. Philadelphia, PA: W.B. Saunders Company, 2001: 871–9. 5. Wolbrette DL, Naccarelli GV. AV nodal dysfunction. In: Topol EJ, editor. Comprehensive Cardiovascular Medicine. Philadelphia, PA: Lippincott-Raven, 1998: 1812–26.
11. Helfand M, Peterson K, Christensen V, Dana T, Thakurta S. Drug Class Review: Beta Adrenergic Blockers: Final Report Update 4 [Internet]. Oregon Health & Science University; Portland (OR): Jul, 2009. [PubMed]
 12. Kanno M, Nakaya H, Hattori Y, Izumi T, Nishimura T, Sakai K, Abiko Y. [Atenolol, its cardioselective property for adrenergic beta-receptor blocking action and effect on the cardiac function (author's transl)]. *Nihon Yakurigaku Zasshi*, 1980 Oct; 76(7): 621-32. [PubMed]