

Atenolol – Interaction with Other Drugs



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Introduction

Atenolol is a useful antihypertensive and its effects and interactions are in line with other Beta Blockers. However, Atenolol has a few peculiarities and some of the interactions with others discussed may not be applicable to Beta blockers in general.

Drug Interactions can be of two types

A. Pharmacodynamic Interactions: When effects of two drugs are similar, their simultaneous use can lead to additive if not synergistic effect. For example when Atenolol is used along with a non-hydropyridine calcium blocker, profound bradycardia can occur. Similarly, if two drugs with opposing effects are used together the effect of individual drug may be markedly reduced. If Dopamine or Dobutamine becomes necessary in a patient already on Atenolol, positive inotropic effects of these drugs may be significantly blunted by Atenolol.

B. Pharmacokinetic interactions:

These can occur due to variety of reasons:

- i. If gastrointestinal absorption of a drug is reduced it is recommended to try the concomitant use of another drug,
- ii. Change in the action of metabolizing enzymes,
- iii. Presence of one drug changing the degree of protein binding of another drug,
- iv. One drug affecting renal excretion (enhancing or reducing) of another drug,

Most of the interactions of Atenolol are due to its beta adrenergic blocking property and therefore are group specific rather than molecule specific. Following are the commonly seen interactions with Atenolol:

1. Antiarrhythmics: Concurrent administration of amiodarone¹ and atenolol causes pharmacodynamic interaction in form of conduction defects or more profound negative inotropic effect. Similar interaction may be seen with flecainide² and phenytoin. Beta blockers can have pharmacokinetic interaction where by sharing the hepatic flow. Beta blockers can reduce metabolism of xylocaine³ by the liver, increasing its blood level leading to its toxicity. Plasma concentration of beta blocking drugs may be increased when used along with propafenon⁴. This effect may be less common with atenolol than other beta blocking agents since excretion of atenolol is mainly renal and not hepatic.
2. Calcium channel blockers like diltiazem^{5,6} and verapamil^{7,8} when used along with beta blockers, bradyarrhythmias may result. In particular sinus bradycardia/a-v block may be witnessed. Such combination can also result in marked negative inotropism and is better avoided. However if for any reason it becomes essential to use such combination,

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frequent monitoring of cardiac rhythm and cardiac contractility (by echocardiography) is advisable especially if baseline LV function is subnormal. With nifedipine and amlodipine antihypertensive effect may be exaggerated and may increase chances of CCF.⁹

3. Nitrates When used along with Nitroglycerine (NGT) and other oral nitrates, atenolol reduces reflex tachycardia of NTG. Antihypertensive effect of Atenolol may be potentiated by nitrates.
4. Anaesthetic Agents (e.g. chloroform, halothane, trichloroethylene)^{10,11} when used in patient already on beta blocker increase the risk of myocardial depression and hypotension. Similarly pre-operative use of beta blockers can increase changes of initial bradycardia following induction doses of Fentanyl or its derivatives.¹²
5. Other anti hypertensive drugs¹³ like diazoxide when given along with a beta blocker, reflex tachycardia of diazoxide may be prevented but hypotensive effect may be exaggerated. When reserpine is used along with beta blockers, additive excessive beta blocking effect is seen. Bradyarrhythmia and hypotension can be the clinical outcomes. Since use of reserpine is very uncommon in the present era, this drug interaction is now rarely witnessed. Rebound hypertension of clonidine withdrawal may be exacerbated in presence of atenolol.
6. Adrenergic Blockers¹³ Beta blockers cause profound hypotension and block reflex tachycardia with adrenergic blockers like phenoxybenzamine or phentolamine. This effect may be seen especially with vasodilator β blocker like carvedilol especially since it has alpha blocking properties. Atenolol is less likely to cause profound hypotension.
7. Sympathomimetics¹³ like dobutamine or dopamine when attempted in a patient already on atenolol, positive inotropic effect may be blunted. Bronchodilatory effect of orciprenaline may also be blocked by atenolol.
8. Digoxin when used along with betablockers can increase the risk of severe bradyarrhythmias.
9. Bronchodilators like aminophylline, theophylline¹⁴ when used along with beta blockers there is inhibition of effects of both the drugs. Additionally, beta blockers decrease clearance of these drugs leading to increase of their levels in blood.
10. Diabetes. When beta blockers are used in diabetics along with insulin or oral hypoglycaemic agents, sugar control may be impaired.¹⁵ Similarly, recovery from hypoglycaemia which is normally brought about by circulating catecholamines is blunted by beta blockers. It is also a well known fact that some manifestations of hypoglycaemia are masked by beta blockers delaying clinical recognition of hypoglycaemia.
11. Nonsteroidal anti inflammatory agents (NSAIDs) like indomethacin inhibit renal prostaglandin synthesis and also cause sodium and fluid retention. This decreases the hypotensive effect of beta blockers.¹⁶

12. Monoamine oxidase ([MAO] inhibitors) like furazolidone, procabazine, selegiline if used along with beta blocker, their withdrawal causes significant hypertension.¹³
13. Rifampicin. Metabolism of some beta blockers is accentuated by rifampicin, reducing plasma concentrations of the beta blocker thereby reducing efficacy of the drug as a hypotensive agent.
14. Cimetidine¹⁷ which is now not in common use reduces clearance of hepatically metabolized beta blockers leading to increase in their plasma concentrations. Since atenolol is mainly excreted by kidneys, this interaction is less common with atenolol.
15. Oestrogens cause fluid retention there by blunting the antihypertensive effect of betablockers.¹³
16. Neuromuscular Blocking Agents:¹³ Beta blockers can potentiate and prolong the effect of neuromuscular blocking agents used intra-operatively. Their effect therefore can be lost for several hours after surgery and therefore can take long time for recovery from the neuromuscular blockade.
17. Iodinated Contrast used media in patient on beta blockers, increase the risk of anaphylaxis and the anaphylactic reaction may be severe.¹⁸
18. Ampicillin when used along with atenolol, reduces beta blocking effect of atenolol.^{19,20} Thus, during their concomitant use, blood pressure should be closely monitored. Changing the time of administration of the two drugs and spacing them out during day can be helpful.
19. Allergen²¹ for skin testing or for allergen immune therapy in presence of atenolol (and other beta blockers) can result in serious anaphylactic reaction which can become resistant to conventional therapy of anaphylaxis.

Conclusion

Understanding the role of atenolol and its interaction with agents like Iodinated Contrast media and allergens and neuromuscular blocking agents they must be used with caution to avoid life threatening situation. Drugs like Ampicillin, Rifampicin and NSAIDS decreases the hypotensive effect of beta blockers. Atenolol should be used with caution in diabetic patient.

MAO inhibitors with atenolol can cause rebound hypertension on withdrawal of the drug. Bronchodilators increase the levels of the drug in the blood. Severe bradyarrhythmias should be avoided when used in conjunction with Atenolol by restricting the use of Calcium Channel blockers.

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