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Review Article

Beta blockers in HF, reduced EF And Increased HR

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Abstract

Care for cardiac patient has been revolutionized throughout the past decades. Despite its initiated safety concerns, beta blockers are now one of the most used and safer drugs for the ailment of heart failure. These have proved not only effective for heart failure but also for many other conditions such as migraine headaches, breast cancer to reduce the mortality etc.

Keywords: beta blockers, heart failure with reduced ejection fraction, heart rate

1. Introduction

Beta blocker, mainly used for cardiovascular treatment, works by antagonistic and competitive action on beta adrenergic receptors. They are discovered as antianginal drugs in 1960's and now, used for treating hypertension, arrhythmia, heart failure and ischemic heart disease[1].

They act on adrenergic nervous system and are divided into three generations; non selective beta blockers, selective beta blockers and beta blockers with vasodilator effects. Cardio selective beta blockers act on the cardiac cells in ratio of 70:30 compared with other cells. e.g. metoprolol, atenolol. Non selective acts equally on both cardiac and non-cardiac tissues. e.g. propranolol. Third generation shows effects on vasodilatory activity e.g. labetalol[2].

The main mechanism of beta blocker includes reduction of blood pressure by reducing the cardiac output and also reduce the production of renin in the renin angiotensin aldosterone system.[2]

2. Beta blockers in heart failure

Beta blockers are a group of drugs that are used as the standard therapeutic drugs for the management of cardiovascular condition. They are beneficial for many patients with heart failure and ventricular dysfunction also their anti-arrhythmic effects are clearly established.

They are the cornerstone in the treatment of heart failure and reduced left ventricular ejection. It is evidently proved that it reduces the morbidity and mortality of the, and for the treatment, the maximum or tolerated dose should be necessarily considered which is recommended by both the American HF guidelines and the European society of cardiology[3]. In some earlier studies it was found , most of the patients treated with beta blocker does not reaches to the target dose where the optimal dosage is absolutely essential[4].

They act by reducing the harmful effects of adrenergic activation of the heart and was found to be highly beneficial in the first year of therapy after myocardial infraction. Studies found that they are used in high proportion by the patients with AMI than angina[5]. Most commonly used drug was carvedilol and bisoprolol followed by nebivolol and these classes of drugs are considered to be the first line treatment for a patient with AMI, to improve their ischemic symptoms. They reduce the conditions such as stroke, CHD, HF, by 27%, 7% and 42%[2]. Some studies have shown to increase the incidence of diabetics associated with beta blockers usage. Third generation beta blocker increase the sensitivity of insulin whereas older generation have shown to reduce its sensitivity.

They may complicate the conditions of elderly who are having diabetes or heart failure and can increase the odds of acute coronary event. Propranolol acute toxicity leads to hypotension, loss of consciousness, seizures etc. Evidence based heart failure therapies are mainly used in the elderly.

3. Beta blockers in reduced Ejection Fraction

Studies shows that, beta blockers reduce the mortality rate in patients with reduced ejection fraction. They are one of the most important class of drugs used in the treatment of heart failure with reduced left ventricular ejection fraction[6]. They mainly helps in reducing the mortality rate in patient

particularly with < 40% left ventricular ejection fraction[5]. Ejection fraction during a heart failure can be classified into three; heart failure with preserved ejection fraction, heart failure with mid range ejection fraction and heart failure with reduced ejection fraction[7].

A myocardial insult which can be an acute or a chronic infraction, results in left ventricular dysfunction, hyper activation of both RAAS and SNS. This increases both epinephrine and nor epinephrine which leads to increase the catecholamines that continuously stimulate the beta receptors and makes harmful repercussions for the falling heart. Reduced ejection fraction is characterized by decrease in beta 1 receptor and the uncoupling of b1 and b2 receptors from the membrane G Protein, which is mediated by G Protein coupled receptors kinase activity.

Beta blockers acts by antagonising the radiotoxic effects of catecholamines , suppress the RAAS, regulation of myocardial beta receptors and increase in inotropic reserve of the heart. Increasing the dose of drugs should be restricted in patients who shows symptoms like peripheral congestion, asymptomatic hypotension and symptomatic bradycardia[1].

4. Beta blockers in increased heart rate

Heart rate is one of the risk factor associated with CAD. Beta blockers are given to reduce the heart rate in CAD patients. They help in preventing angina and reduce myocardial ischemia[3]. Patients with altered heart rate are most primarily treated with beta blockers followed by ACE or ARB in combination with beta blockers. It was proved that they reduces the heart rate by 11-12 beats/ min both sinus and AF[6].

5. Miscellaneous

The anti-arrhythmic effects of beta blockers are due to cardiac electrophysiology action, which are mediated by reducing heart rate, slowing down the conduction of electrical impulses or increasing the refractory periods of the atrioventricular nodes. Anti-arrhythmic properties are influenced by inhibition of sympathetic activity, decreased mechanical stress, reduction of myocardial ischemia. They are also useful in controlling ventricular arrythmia and also prevent sudden cardiac death mainly under the condition of acute ischemia, systolic dysfunction and channelopathy[1].

They have been used to manage ischemic heart disease during AMI or in patient with coronary disease without previous AMI. During the course of AMI, due to pain, decreased cardiac output and anxiety , catecholamine- mediated sympathetic activity occurs. Hence there is an increase in sympathetic tone which have negative consequences like elevated myocardial oxygen demand and decrease ventricular fibrillation threshold which may increase the risk of cardiac death[1].

Beta blockers have the anti anginal effect and are included in the clinical practice guidelines. They reduce anginal episodes when compared with CCBs. Systemic reviews and meta-analysis does not show such evidences[1].

Nebivolol is novel beta blockers which has a higher degree of b1 adrenergic selectivity and vasodilatory action with lower adverse effects. It also has higher antihypertensive effect when compared with agents such as ACE inhibitors, ARBs and CCBs[2]. They show both b1 selective and vasidialtor effect.

Propranolol is used to control tremor, migraine prophylaxis and for cluster or tension headache. It is shown to be effective in reducing the mortality of breast cancer patients[7].

Propranolol and trimolol are used as topical agents. In this timolol is widely used compared to propranolol beta blocker antagonize the effect of circulating catecholamine's on beta adreno receptors within the skin, these receptors are present on keratinocytes, fibroblast and melanocytes[8].

6. Conclusion

Beta blockers are the primary agents for the treatment of HFrEF, increased heart rate and chronic HF . They have shown to reduce the morbidity and mortality associated with cardiac problems. To be effective, these class of drugs should be titrated to the maximum target dose or tolerated dose during the treatment. They also play a major role in other heart related conditions such as CAD, angina, arrhythmia etc. Underuses of these drugs are still reported even if they are not contraindicated[4].

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