

Calcium channel blockers



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- B. Trimble

Calcium-channel blockers or calcium antagonist have several possible modes of action in hypertension. In general, these agents block the slow channel in the cell membrane and prevent calcium entry into the cell. This blocking action reduces the mechanical activity of vascular smooth muscle and leads to vasodilation. Another possible mode of action is that they block norepinephrine-mediated vasoconstriction. This may occur because alpha sympathetic vasoconstriction is produced by enhanced calcium influx into the cell. If calcium influx is decreased, then norepinephrine vasoconstriction is reduced. Another system regulated by intracellular calcium is the release of renin by the cells of the kidney. Because calcium-channel blockers inhibit renin release, the renin-angiotensin system may also be suppressed.

Calcium-channel blockers prove to be useful in hypertensive patients who also have stable angina and spastic angina (Brunton, Chabner, & Knollman, 2011). The vasodilation properties of calcium-channel blockers lead to a reduction in after-load, and their regional smooth muscle relaxant properties are useful in relieving coronary spasms. Calcium-channel blockers are also useful in treating patients who cannot take beta-blocking agents (Katzung, Mastes, & Trevor, 2012). African-American patients may benefit more from CCBs as a first line of hypertensive treatment than others. Grapefruit products should be avoided as they interfere with normal operation of the medication. CCBs can also cause low blood glucose particularly those whose dosage is more than 60 mg daily. CCBs are mainly intended to be used for isolated systolic hypertension, and may be used in combination with other

antihypertensive medications such as diuretics and ACE Inhibitors (Frank, 2008).

Verapamil hydrochloride- (Calan, Isoptin) is given in doses of 240-640 mg daily to control essential hypertension. The oral dose is almost completely absorbed from the gastrointestinal tract, and there is a large first-pass hepatic effect. Side effects include constipation, headache, flushing, peripheral edema, and AV nodal effects such as first- and second-degree heart blocks. Verapamil has significant negative inotropic effects and should not be used in patients with congestive heart failure. Verapamil applies antihypertensive results by decreasing systemic vascular resistance usually without orthostatic decreases in blood pressure or response tachycardia. Verapamil reduces arterial pressure at rest and at a given level of exercise by reducing the total peripheral resistance or afterload against which the heart works. The dosage should be titrated for the individual. The usual daily dose of sustained release verapamil, Verelan, is 240 mg daily, however, the initial dosage of 120 mg may be necessary for patients who may have an increased reaction (e. g. Elderly or small people). If adequate control is not obtained with 120 mg, the dose may be titrated in the following manner: 180-240-360-480 mg daily (Chen, et al., 2010).

Nifedipine- (Procardia) used for essential hypertension the dosage ranges between 10 and 20 mg given three times daily. Doses above 100 mg are not recommended (Chen, et al., 2010). The oral dose is rapidly and fully absorbed from the gastrointestinal tract, with the drug being metabolized in the liver, highly bound to plasma proteins with a half-life of approximately two hours. Nifedipine is more effective than verapamil in dilating peripheral

blood vessels. Side effects include reflex tachycardias, stimulation of SA node, flushing, peripheral edema, and headache. CNS symptoms include tremors, nervousness, and mood changes (Wisloff, et al., 2012).

Nifedipine and the other dihydropyridine agents (Norvasc, Caduet, Lotrel, Sular, Calan, Verelan, etc.) are more selective as vasodilators and have less cardiac depressant effect than verapamil and Diltiazem. It is recommended that short acting oral dihydropyridine not be used for hypertension due to the increased risk of myocardial infarction. Oral Nifedipine has been used in emergency treatment of severe hypertension (Chen, et al., 2010). Norvasc is a dihydropyridine; Norvasc usual dosage is 5 to 10 mg daily. Small, fragile, or elderly patients or patients with hepatic insufficiency may be started on 2.5 mg daily and titrated for response (Wisloff, et al., 2012).

Diltiazem- (Cardizem) dosage is between 30 and 90 mg three to four times daily. It is well absorbed by the gastrointestinal tract, with onset of action in less than 15 minutes, a peak effect in 30 minutes, and a half-life of approximately four hours. Vasodilation is limited almost exclusively to the coronary arteries. The most common side effects include AV block, dry mouth, headache, vertigo, rash, and edema (Chen, et al., 2010). Diltiazem SR is one of several preferred initial therapies for hypertensive patients with high risk of developing coronary artery disease including those with diabetes mellitus. It can be used as a monotherapy for initial management of uncomplicated hypertension with conventional tablets used three to four doses daily before meals and at bedtime. Again, elderly or smaller persons may require a lower dosage and titrate as needed for response (Frank, 2008).

The algorithm for hypertension management according to The National Institute for Health and Clinical Excellence is as follows: KEY: A= ACE Inhibitor or Angiotensin II (ARB); C= Calcium Channel blocker; D= thiazide-like diuretics

Step 1. Under age 55 years Over age 55 or Black person of African or

1. Caribbean family origin of any age

(C)

Step 2. ——— (<55yrs) ----- (A+ C) ----- (> 55 yrs.)

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Step 3. ——— (<55 yrs.)----- (A+C+D) ----- (> 55yrs)

—————Step 4. Resistant hypertension (A+C+D+ consider further diuretics OR Alpha blockers or Beta blocker) (The National Institute for Health and Clinical Excellence, 2011).

References

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