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CARDIOLOGY



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[#] PAD – Peripheral arterial disease

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Report of Evidence Based Guidelines of the Taiwan Society of Cardiology and the Taiwan Hypertension Society for the Management of Hypertension

Introduction

Hypertension is a leading risk factor for global disease burden. The mortality rates attributable to hypertension have risen from 7.2 million in 1990 to as high as 9.4 million in 2010. Hypertension is a common disorder with rapidly escalating prevalence rates. It is noteworthy that the number of individuals with hypertension is expected to surge and reach up to 1.56 billion by the year 2025. Interestingly, there is an alarming increase of nearly 60% in merely 25 years. It is important to note that prevalence of hypertension is increasing faster in the Asian subcontinent compared to the rest of the world. Moreover, stroke and cardiovascular complications of hypertension are causing premature mortality among patients. Therefore, a comprehensive management approach is deemed necessary to curtail the mounting burden and reduce the peril of surging complications. The following section encompasses recommendations for the management of hypertension. These evidence based recommendations have been derived from 2015 guidelines of the Taiwan Society of Cardiology and the Taiwan Hypertension Society for the Management of Hypertension and provide extensive information pertaining to all aspects of hypertension.

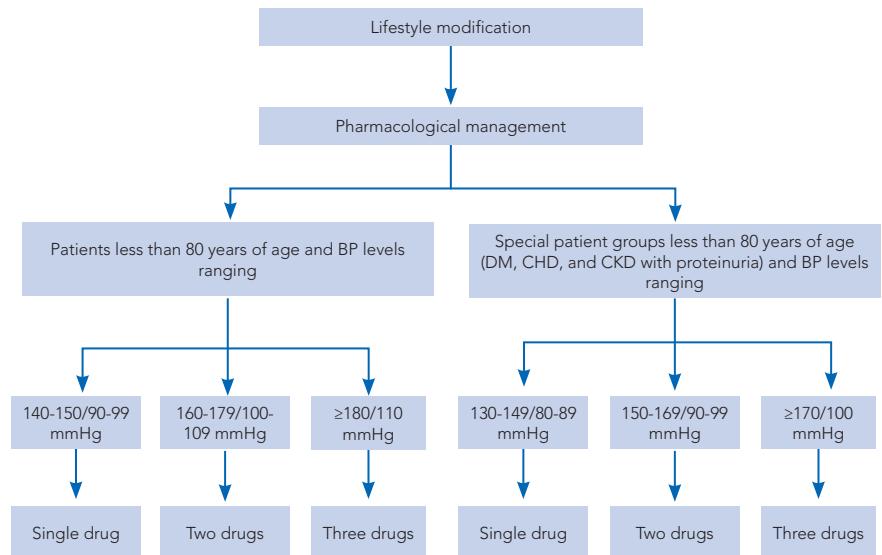
Treatment

In patients with hypertension, management strategy should encompass both non-pharmacological and pharmacological therapies. Lifestyle modification (LSM) is a vital part of non-pharmacological management. Lifestyle modification must be primarily initiated for a period of 3 months.

If blood pressure is persistently high, anti-hypertensive therapy must be initiated. While initiating drug therapy a strategy “PROCEED” may be adopted. “PROCEED” includes Previous experience, Risk factors, Organ damage, Contraindications or unfavorable conditions, Expert’s or doctor’s judgment, Expenses or cost, and Delivery and compliance issue. Moreover, in patients unable to attain target blood pressure levels “AT GOALS” must be considered. It includes parameters such as Adherence, Timing of administration, Greater doses, Other classes of drugs, Alternative combination or SPC, and LSM plus Laboratory tests.

Lifestyle modification and drug therapy must be combined for individuals with stage 2 hypertension and patients with blood pressure above 150/90 mmHg. A treatment algorithm for management of hypertension among patients under 80 years and patients with special conditions such as diabetes, coronary heart disease and chronic kidney disease is depicted in Figure 1.

Figure 1: Treatment algorithm for patients with hypertension



Abbreviations: DM- Diabetes mellitus, CHD- Coronary heart disease, CKD- Chronic kidney disease

Five major classes of anti-hypertensive agents are prescribed for the treatment of hypertension; these include beta-blockers, diuretics, calcium channel blockers, angiotensin converting enzyme (ACE) inhibitors and angiotensin receptor blockers (ARBs). These agents may be readily combined to target different anti-hypertensive mechanisms. Combination of low doses of drugs increases effectiveness and decreases adverse events.

Source: Chiang CE, Wang TD, Ueng KC, et al. 2015 guidelines of the Taiwan Society of Cardiology and the Taiwan Hypertension Society for the management of hypertension. *J Chin Med Assoc*. 2015 Jan;78(1):1-47.

Report of American College of Cardiology (ACC)/American Heart Association (AHA) Task Force on Practice Guidelines and the Heart Rhythm Society (HRS) for the Management of Patients with Atrial Fibrillation

Pharmacological therapy for the prevention of atrial fibrillation and the maintenance of sinus rhythm

Recommendations for anti-arrhythmic drug therapy to maintain sinus rhythm

- ⦿ Treatment of precipitating or reversible causes of atrial fibrillation is recommended as a pre-requisite to the initiation of an anti-arrhythmic drug therapy
- ⦿ Anti-arrhythmic drugs including amiodarone, dofetilide, dronedarone, flecainide, propafenone and sotalol are recommended in individuals with atrial fibrillation for maintaining sinus rhythm, depending upon underlying heart disease and comorbid conditions
- ⦿ Prior to the initiation of therapy with each drug, their risks including pro-arrhythmia should be considered
- ⦿ Use of amiodarone is not recommended after consideration of risks and failure or contradictions of other agents, owing to its potential toxicities
- ⦿ A rhythm control strategy with pharmacological interventions appears to be useful for the treatment of tachycardia induced cardiomyopathy in individuals with atrial fibrillation
- ⦿ Continuation of current treatment is recommended in the settings of infrequent, well-tolerated recurrences of atrial fibrillation as well as when the drug therapy resulted in reduced frequency and symptoms of the disease
- ⦿ Continuation of anti-arrhythmic drugs including dronedarone are not recommended when atrial fibrillation becomes permanent
- ⦿ Use of dronedarone is not recommended for the treatment of atrial fibrillation among individuals with New York Heart Association (NYHA) class III and IV heart

failure and those, who had an episode of decompensated heart failure in the past four weeks

Recommendations for specific drug therapy

- ⦿ **Amiodarone** is one of the most effective available anti-arrhythmic medications for maintaining sinus rhythm in individuals with paroxysmal or persistent atrial fibrillation
- ⦿ **Flecainide and Propafenone** medications can be considered for controlling rhythm among individuals with atrial fibrillation without structural heart disease
- ⦿ **Sotalol** can be used for the prevention of recurrent atrial fibrillation, but is not effective for conversion of atrial fibrillation to sinus rhythm
- ⦿ **Dofetilide** can be considered for controlling rhythm among individuals who are less vulnerable for torsades de pointes induced by QT interval prolongation and has minimal non cardiac adverse effects
- ⦿ **Dronedarone** can be considered for controlling rhythm among individuals without heart failure
- ⦿ **Disopyramide** can be considered for controlling rhythm among individuals with atrial fibrillation. It appears to be useful in atrial fibrillation that occurs in high vagal tone setting (vagally mediated atrial fibrillation) and in response to stimuli eliciting vagal response because of its prominent vagolytic pharmacological effects
- ⦿ **Quinidine** has sodium channel blocking effect at tachycardia, potassium channel blocking effect at bradycardia, and vagolytic and alpha-adrenergic receptor blocking effects
- ⦿ **Beta-blockers** can be considered as useful for the prevention of atrial fibrillation among individuals after cardiac surgery, during high-adrenergic state such as exercise and thyrotoxicosis-related atrial fibrillation.

Recommendations for the initiation of anti-arrhythmic drug therapy in outpatient settings

- ⦿ Pro-arrhythmia is common during the initial phase of anti-arrhythmic drug therapy. Serial electrocardiographs (ECGs) can be considered necessary for the detection of excessive QT prolongation (associated with dofetilide or sotalol drug therapy), appearance of “giant” U waves or QRS prolongation > 25% (associated with flecainide or propafenone drug therapy) and should be performed near time of peak drug concentration
- ⦿ Well established and widely supported databases exist for the initiation of anti-arrhythmic drug therapy with amiodarone and dronedarone in outpatient settings.

Recommendations for upstream therapy of atrial fibrillation

- ⌚ For the primary prevention of new onset atrial fibrillation among individuals with heart failure with reduced left ventricular ejection fraction (LEVF), an angiotensin-converting enzyme (ACE) inhibitor or angiotensin-receptor blocker (ARB) can be considered
- ⌚ For the primary prevention of new onset atrial fibrillation in the setting of hypertension, an ACE inhibitor or ARB therapy can be considered
- ⌚ For the primary prevention of new onset atrial fibrillation following coronary artery surgery, statin therapy can be considered
- ⌚ For the primary prevention of atrial fibrillation among individuals without cardiovascular diseases (CVD), neither an ACE inhibitor, ARB nor statin therapy appears to be beneficial.

Source: Wann L, Alpert J, Calkins H, et al. 2014 AHA/ACC/HRS Guideline for the Management of Patients With Atrial Fibrillation: A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines and the Heart Rhythm Society. *Circulation*. 2014;129:000-000.

Eighth Joint National Committee (JNC 8) Evidence-Based Guideline Report for the Management of Hypertension in Adults

Hypertension represents one of the major public health problems worldwide. Thereby, it necessitates prompt diagnosis and timely intervention to prevent further complications, such as myocardial infarction, stroke, end-stage renal disease and disease associated mortality. Individuals with hypertension want assurance that treatment will reduce the burden of their disease and physicians want guidance on the management of disease using best scientific evidence. Evidence based approach for recommending treatment thresholds, goals and medications in the management of individuals with hypertension are taken by this report; which is summarized below:

Recommendation 1

- ⦿ Pharmacological therapy should be initiated in individuals aged ≥ 60 years for lowering blood pressure at 150/90 mmHg or higher and achieving goal of blood pressure $< 150/90$ mmHg.

Corollary recommendation

- ⦿ There is no need for adjustments in therapeutic regimen, if pharmacological therapy for hypertension in individuals aged ≥ 60 years results in achievement of low systolic blood pressure (i.e. < 140 mmHg) and well tolerability with no adverse effects on health related quality of life of these individuals.

Recommendation 2

- ⦿ Pharmacological therapy should be initiated in individuals aged < 60 years for lowering blood pressure at diastolic blood pressure ≥ 90 mmHg and achieving a goal of diastolic blood pressure < 90 mmHg.

Recommendation 3

- ⦿ Pharmacological therapy should be initiated in individuals < 60 years for lowering blood pressure at systolic blood pressure ≥ 140 mmHg and achieving a goal of systolic blood pressure < 140 mmHg.

Recommendation 4

- ⦿ Pharmacological treatment should be initiated among individuals with chronic kidney disease (CKD) aged ≥ 18 years for lowering blood pressure at $\geq 140/90$ mmHg and achieving a goal of blood pressure $< 140/90$ mmHg.

Recommendation 5

- ⦿ Pharmacological therapy should be initiated among individuals with diabetes aged ≥ 18 years for lowering blood pressure at $\geq 140/90$ mmHg and achieving a goal of blood pressure $< 140/90$ mmHg.

Recommendation 6

- ⦿ Initial anti-hypertensive treatment among general non-black population, including those with diabetes should include a thiazide-type diuretic, calcium channel blocker (CCB), angiotensin-converting enzyme inhibitor (ACEI), or angiotensin receptor blocker (ARB).

Recommendation 7

- ⦿ Initial anti-hypertensive treatment among general black population, including those with diabetes should include a thiazide-type diuretic or calcium channel blocker (CCB).

Recommendation 8

- ⦿ Initial anti-hypertensive therapy among all CKD individuals with hypertension irrespective of race or diabetes status, aged > 18 years should include an ACEI or ARB for improvement in kidney outcomes.

Recommendation 9

- ⦿ Attainment and maintenance of goal blood pressure is the main objective of hypertension treatment
- ⦿ Dose of initial medication or a second medication from one of the classes recommended above including thiazide-type diuretic, CCB, ACEI, or ARB should be increased, if goal blood pressure cannot be achieved within a month of treatment
- ⦿ Continuous assessment of blood pressure and adjustment of therapeutic regimen should be done till achievement of goal blood pressure

- ⦿ Add and titrate a third medication from recommended classes of drugs (thiazide-type diuretic, CCB, ACEI, or ARB) which was not selected previously and avoid use of combination therapy of ACEI and ARB
- ⦿ Anti-hypertensive medications from other classes can be used, if goal blood pressure cannot be achieved by using above recommended medications including thiazide-type diuretic, CCB, ACEI, or ARB due to either contradictions or need to use more than three drugs
- ⦿ Individuals in whom goal blood pressure cannot be achieved by using above strategy and those complicated patients who require additional clinical consultation should refer to the specialist.

Source: James P, Oparil S, Carter B, et al. 2014 Evidence-Based Guideline for the Management of High Blood Pressure in Adults Report From the Panel Members Appointed to the Eighth Joint National Committee (JNC 8). JAMA. 2014;311(5):507-520.

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*Not approved in India.

x Contraindication ✓ Safe ! Caution

ANTIANGINALS

IVABRADINE



Selective sinus node inhibitor

INDICATIONS

Symptomatic treatment of chronic stable angina pectoris in coronary artery disease adults with normal sinus rhythm, chronic heart failure NYHA II to IV class with systolic dysfunction.

MECHANISM OF ACTION

Ivabradine is a selective sinus node inhibitor that slows the heart rate by inhibiting the I_f current. I_f current controls the spontaneous diastolic depolarization in the sinus node and regulates heart rate. Ivabradine closes the I_f current and delays the diastolic depolarization sinus node activation. The cardiac effects are specific to the sinus node with no effect on intra-atrial, atrioventricular or intra-ventricular conduction times, nor on myocardial contractility or ventricular repolarization

DOSAGE

The usual recommended initial dose is 5 mg twice a day and may be increased up to 7.5 mg after 3-4 weeks. In case of bradycardia persistent decrease in the heart rate of <60 beats/min, titrate the dose downward to 2.5 mg twice a day. *Elderly:* ≥75 yr old: Initiate the treatment with 2.5 mg twice a day. Titrate upwards if necessary.

Renal impairment: To be used with caution in patients with CrCl <15 ml/min.

CONTRAINDICATION

Hypersensitivity, pregnancy, lactation.

ONSET OF ACTION

15-120 seconds post bolus injection.

DRUG INTERACTION

Concomitant use of ivabradine and QT prolonging drugs (e.g., quinidine, disopyramide, bepridil, sotalol, ibutilide, amiodarone, pimozide, ziprasidone, sertindole, mefloquine, halofantrine, pentamidine, cisapride, erythromycin IV) is not recommended since QT prolongation may be exacerbated by heart rate reduction. Potassium sparing diuretics, thiazide diuretics and loop diuretics induce hypokalemia which ultimately increases the risk of arrhythmia and bradycardia. Co-administration of ivabradine with CYP3A4 inhibitors increases plasma concentration of ivabradine and the risk of excessive bradycardia. Imidazole antifungal drugs such as ketoconazole and itraconazole increases mean plasma exposure of ivabradine by 7 to 8 fold. Avoid the concurrent administration of nefazodone, sotalol and HIV protease inhibitors (nelfinavir, ritonavir). The intake of grapefruit juice should be restricted during the treatment since its increases ivabradine exposure by 2-fold following the co-administration.

ADVERSE EFFECTS

Ophthalmic problems such as luminous visual phenomena (people experiencing this effect

describe it as a brief moment of increased brightness in a limited area of their vision) and blurred vision and having brief moments of increased brightness. Other side effects are bradycardia, 1st degree AV-block, ventricular extrasystole, supraventricular extrasystoles, palpitations, headache, dizziness, nausea, constipation, diarrhea, vertigo, dyspnea, muscle cramps, hyperuricemia, eosinophilia, elevated blood-creatinine, gastrointestinal problems.

SPECIAL PRECAUTIONS

Use cautiously in patients with mild to moderate hypotension; Reduce dose if resting heart rate is persistently <50 beats/min or patient develops bradycardia; In case, heart rate reduces to <50 beats/min and symptoms persist discontinue the treatment. Ivabradine is contraindicated and not recommended for concomitant use with heart rate reducing calcium channel blockers (e.g. diltiazem or verapamil), immediate use after a stroke or in patients with 2nd degree AV-block, patients with retinitis pigmentosa and moderate hepatic insufficiency. Stop treatment if visual field deteriorates unexpectedly.

TRIMETAZIDINE



Piperazine calcium channel antagonist

INDICATIONS

i) Newly diagnosed CAD ii) conventionally incompletely controlled CAD iii) side effects with conventional CAD therapy iv) adjuvant in conventionally well controlled CAD v) ischemia of neurosensorial tissues as in Meniere's disease.

MECHANISM OF ACTION

It inhibits beta-oxidation of fatty acids by blocking long-chain 3-ketoacyl-CoA thiolase.

DOSAGE

PO: 20 mg TID after meals.

CONTRAINDICATIONS

Hypersensitivity to the drug, pregnancy, children, nursing mothers.

ONSET OF EFFECT

1 hr.

DURATION OF ACTION

Within 6-8 hrs.

DRUG INTERACTIONS

↓ dose required with other antianginals and antihypertensives.

ADVERSE EFFECTS

Headache, GI disturbances including nausea and vomiting.

SPECIAL PRECAUTIONS

Reduced dosage may be required in elderly. Renal/hepatic and vascular collapse can occur.

► NITRATES

GLYCERYL TRINITRATE



Nitrate vasodilator

INDICATIONS

- i) Unstable angina ii) angina pectoris iii) coronary vasospasm iv) LVF accompanying myocardial infarction v) hypertension during cardiac surgery vi) emergency treatment of pulmonary edema.

MECHANISM OF ACTION

It causes relaxation of vascular smooth muscles and reduces venous return (preload) and facilitates subendocardial blood flow with redistribution into ischemic areas, thereby relieving coronary vasospasm. By dilating the arterioles it reduces after load also thereby decreasing total peripheral resistance and blood pressure. This also reduces myocardial work and relieves angina.

DOSAGE

Prophylaxis or relief of anginal attacks: 0.5 mg every 3 minutes till pain subsides. For prevention give 0.5 mg sublingually before activity. Acute pulmonary edema- 0.8-2.4 mg sublingually every 5-10 minutes.

Anginal prophylaxis: 2.5-6.5 mg 8-12 hourly (SR tab) or 2%

transdermal ointment applied to chest, abdomen or thigh without rubbing. 5 mg or 10 mg /24 hr transdermal patch can also be used for the same indication. Replace every 24 hrs.

Max 2 patches/day. BP control peri-operatively, CHF associated with acute MI, unstable angina: 5 µg/min infusion increasing 5mcg/min every 3 to 5 minutes. If no response seen at 20 µg/min, increase the dose up to 10-20 µg/min. Depending on response, adjust dose later. For *angina treatment/prophylaxis:* 400 µg/metered dose aerosol spray also used. Spray 1-2 doses sublingually and close the mouth. Not more than 3 doses in 15 mins.

CONTRAINDICATIONS

HOCF, hypotension, glaucoma, raised intracranial pressure, low cardiac output secondary to hypovolemia, inferior MI with right ventricular involvement.

ONSET OF EFFECT

Sublingual and oral: Within minutes. SR Tab : 1-3 hrs.

DURATION OF ACTION

Sublingual : 20-30 mins.

PO and Oint. : 3-5 hrs.

SR Tab : 8-12 hrs.

DRUG INTERACTIONS

↓ dose required with calcium channel antagonists, antihypertensives, phenothiazines, TCAs, alcohol, ergot preparations.

ADVERSE EFFECTS

Flushing, headache, dizziness, tachycardia, nausea, vomiting, restlessness, tolerance, hypotension, syncope, weakness, vertigo, respiratory difficulty, urinary and fecal incontinence, contact dermatitis, localized burning sensation in mouth. Intravenous preparations contain alcohol and alcohol intoxication can occur during high dose IV infusion.

SPECIAL PRECAUTIONS

Use cautiously in blood disorders, cerebrovascular disease, lung disease, mitral valve prolapse, cor pulmonale, glaucoma, thyroid dysfunction. Side effects may be enhanced in geriatric patients. Drug passes in breast milk.

ISOSORBIDE 5-MONONITRATE



Nitrate vasodilator

INDICATIONS

- i) Prophylaxis of angina pectoris,
- ii) postmyocardial infarction.

MECHANISM OF ACTION

It is an active metabolite of isosorbide dinitrate. It causes dilatation of venous capacitance vessels. Preload and afterload are reduced and redistribution of coronary flow to ischemic regions occurs.

DOSAGE

20 mg 2-3 times daily or 40 mg BD up to 120 mg daily in divided doses if required tab: (40/60 mg) 1 tab in the morning, increased to 2 tabs if required.

CONTRAINDICATIONS

Hypotension, circulatory failure, HOCM, marked anemia, cerebral hemorrhage, increased intracranial tension, glaucoma, hypothyroidism, shock in acute MI, hypersensitivity.

ONSET OF EFFECT

Within 30-60 mins.

DURATION OF ACTION

4-6 hrs.

DRUG INTERACTIONS

↓ dose with: CCBs, anti-hypersensitivity, phenothiazines, tricyclic antidepressants, isosorbide ↑ the bioavailability of dihydro-ergotamine.

ADVERSE EFFECTS

Nausea, vomiting, headache, flushing, weakness, vertigo, throbbing, palpitations, skin rash, dizziness, sweating, syncope, false decreases in serum cholesterol.

SPECIAL PRECAUTIONS

Use cautiously in glaucoma, hypothyroidism, malnutrition, AMI, CCF. Initiate with low doses. Gradual withdrawal.



Rosuchol
Rosuvastatin 10mg / 20mg Tablets

ISOSORBIDE DINITRATE



Nitrate vasodilator

INDICATIONS

- i) Acute anginal attacks ii) prophylaxis of angina pectoris iii) coronary insufficiency iv) acute MI, v) acute LVF or CCF.

MECHANISM OF ACTION

It dilates venous capacitance vessels thereby reducing venous return (preload), conducting arteries and coronary collaterals. At higher doses arterioles are dilated reducing afterload.

DOSAGE

Adults: *Acute angina*: 5-10 mg sublingually. *Chronic prophylaxis*: 5-10 mg TID/QID. SR: 20-40 mg BD.
CHF: 30-60 mg QID.

CONTRAINDICATIONS

Acute MI when shock is present, marked anemia, cerebral hemorrhage, HOCM, low cardiac output, raised intracranial pressure (ICP), hypotension, hypersensitivity to the drug.

ONSET OF EFFECT

Within 2-3 minutes when chewed or held under the tongue or used as a spray (certain preparations only); 30 minutes when swallowed.

DURATION OF ACTION

Chewed: up to 2 hrs; swallowed: up to 5 hrs; slow release cap: up to 10 hrs.

DRUG INTERACTIONS

↓ dose required with: CCBs,

antihypertensives, phenothiazines, tricyclic antidepressants.

ADVERSE EFFECTS

Flushing, headache, fainting, weakness, dizziness, tachycardia, palpitation, nausea, vomiting, vertigo, hypotension, syncopal attack, localized burning with sublingual preparation, contact dermatitis with ointment.

SPECIAL PRECAUTIONS

Use cautiously in hepatic or renal disorders, mitral valve prolapse, arterial hypoxemia, anemia, glaucoma, malnutrition, pregnancy and lactation.

NITROGLYCERIN



Nitrate vasodilator

INDICATIONS

- (i) Angina (ii) hypertension (iii) acute myocardial infarction (iv) heart failure and low-output syndromes.

MECHANISM OF ACTION

The principal pharmacological action of nitroglycerin is relaxation of vascular smooth muscle, and consequent dilatation of peripheral arteries and veins, especially the latter. Dilatation of the veins promotes peripheral pooling of blood and decreases venous return to the heart, thereby reducing left ventricular end-diastolic pressure and pulmonary capillary wedge pressure (preload). Arteriolar relaxation reduces systemic vascular resistance, systolic arterial pressure, and mean arterial pressure (afterload).

DOSAGE

Angina pectoris: 5 mcg/minute, with increases of 5 mcg/minute every 3-5 minutes until a blood pressure response is obtained or until the infusion rate is 20 mcg/minute. *Hypertension*: Up to 100 mcg/minute may be required, with effective dosages ranging from 5-100 mcg/minute. *Acute myocardial infarction*: An initial 12.5- to 25-mcg dose can be given followed by continuous IV infusion at a rate of 10-20 mcg/minute, increasing the dosage further in 5- to 10-mcg/minute increments at 5- to 10-minute intervals.

CONTRAINDICATIONS

Allergy to nitroglycerin.

DRUG INTERACTIONS

Marked symptomatic orthostatic

hypotension when calcium channel blockers and organic nitrates were used in combination.

ADVERSE EFFECTS

Flushing, headache, nausea, nervousness, orthostatic hypotension, tachyarrhythmia, vomiting, allergic dermatitis, blurred vision, rash, xerostomia.

SPECIAL PRECAUTIONS

Use with caution in patients who may be volume depleted or who are already hypotensive. Nitrate therapy may aggravate the angina caused by hypertrophic cardiomyopathy. Nitroglycerin should be given to a pregnant woman only if clearly needed. Caution should be exercised when nitroglycerin is administered to a nursing woman.

► POTASSIUM CHANNEL ACTIVATORS

NICORANDIL



Potassium channel activator

INDICATIONS

Long term coronary artery disease (CAD) e.g., i) angina ii) MI iii) post percutaneous transluminal coronary angioplasty (PTCA) iv) post coronary artery bypass surgery (CABG).

MECHANISM OF ACTION

It relaxes vascular smooth muscles through membrane hyperpolarization via increased transmembrane potassium conductance and also through an increase in intracellular cGMP (like

nitrates). This causes increased coronary blood flow via vasodilation and reduced myocardial O₂ demand via decrease in preload and afterload. It has a cytoprotective effect also.

DOSAGE

10mg twice daily - may be given up to 60 mg/day.

CONTRAINDICATIONS

Hypotension, cardiogenic shock, left ventricular failure with a low filling pressure, hypersensitivity to nicorandil.

DRUG INTERACTIONS

↓ dose required with antihypertensives, vasodilators, TCAs.

ONSET OF EFFECTS

Within 30-60 mins.

ADVERSE EFFECTS

Headache, flushing, nausea, vomiting, hypotension, tachycardia, weakness.

SPECIAL PRECAUTIONS

Use cautiously in hypovolemia, hypotension, acute pulmonary edema, pregnancy and lactation.



Rosuchol

Rosuvastatin 10mg / 20mg Tablets

ANTIARRHYTHMICS

ADENOSINE



!



!



Purine nucleoside

INDICATIONS

- i) Paroxysmal supraventricular tachycardia (PSVT) including those associated with accessory bypass tracts (WPW syndrome)
- ii) diagnosis of tachycardias dependent on AV node iii) to induce brief coronary vasodilatation during certain diagnostic or interventional procedures iv) to produce controlled hypotension during surgery.

MECHANISM OF ACTION

It activates acetylcholine (Ach) sensitive K⁺ channels and causes membrane hyperpolarization through interaction with A-1 type of G protein coupled adenosine receptors on SA node, AV node, and atrium. It indirectly reduces Ca²⁺ current in AV node; depression of the re-entry circuit through AV node is responsible for termination of PSVT. It causes transient coronary dilatation.

DOSAGE

PSVT: Rapid IV bolus of 6 mg over 1-2 seconds into a large peripheral vein with close cardiac

monitoring. Second bolus of 12 mg after 1-2 mins. If needed, 12 mg dose may be repeated after 1-2 mins. *Diagnostic procedure:* 6 mg IV infusion. 140 mcg/kg/mins to induce coronary vasodilatation.

CONTRAINDICATIONS

Sick sinus syndrome, (except with a functional pacemaker), II/ III degree AV block (except with a functional pacemaker), asthma, hypersensitivity.

ONSET OF EFFECTS

Within mins.

DURATION OF ACTIONS

t½ in vitro: < 10s. In vivo: perhaps even shorter.

DRUG INTERACTIONS

↓ dose required with dipyridamol. ↑ dose required with theophylline and xanthines. There is increased risk of heart block if concomitantly carbamazepine is used.

ADVERSE EFFECTS

Usually a safe drug during conversion to sinus rhythm: atrial/ventricular ectopics, sinus

bradycardia/tachycardia, AV block, bradycardia induced ventricular excitation/arrhythmia/torsades de pointes, facial puffiness, sweating, palpitations, hyperventilation, blurred vision, tingling, numbness, burning sensation, chest pain, asystole, metallic taste, headache, heaviness head/chest/arm/neck/back, sensation, ECG changes suggestive of rhythm disturbances.

SPECIAL PRECAUTIONS

Cardiorespiratory monitoring must be available. Administer directly into a vein or closest to the vein if via an IV line, followed by a rapid saline flush. A high level AV block precludes further dose increments. Use cautiously in atrial flutter/fibrillation and an accessory path (conduction via the anomalous path), prolonged QT interval, heart transplant patients. Don't refrigerate.

AMIODARONE



x



x



Class III antiarrhythmic

INDICATIONS

- i) Effective in wide range of ventricular and supraventricular arrhythmias but due to toxic potential use is limited to resistant VT and recurrent VF ii) to maintain sinus rhythm in AF when other drugs have failed iii) WPW syndrome.

MECHANISM OF ACTION

It prolongs action potential duration and increases refractory period. Reduces sinus rate, PR and QT intervals. It also inhibits myocardial Ca²⁺ channels and has non-competitive β-blocking property.

DOSAGE

Oral: 400-600 mg/day followed by 200-200 mg/day for maintenance. IV- 5 mg/kg over 20-120 minutes via caval catheter with ECG monitoring.

CONTRAINDICATIONS

Hypersensitivity, 2°-3° AV block, cardiogenic shock, thyroid disease, sinus node dysfunction.

ONSET OF EFFECT

Oral: within 1-2 hrs., Inj IV: within 1-30 mins.

DURATION OF ACTION

Major effects last from 4-12 hrs. Some effects may last up to 1 month or more.

DRUG INTERACTIONS

Warfarin: potentiated by amiodarone. Digoxin: increased serum digoxin. Antiarrhythmic drugs: potentiated amiodarone. Beta blockers, calcium antagonists: Additive effects.

ADVERSE EFFECTS

Headache, weakness/fatigue, nausea/vomiting, light sensitive rash, ventricular arrhythmias, pulmonary alveolitis, shortness of breath, grey skin color, metallic taste, hypo/hyperthyroidism, alopecia, corneal microdeposits, sleep disturbances, bradycardia, hepatotoxicity, heart failure, peripheral neuropathy.

SPECIAL PRECAUTIONS

Use cautiously in chronic hepatic/renal/cardiac/ophthalmic/ thyroid or lung (e.g. asthma, bronchitis) disease. IV not recommended in NaCl solution.

DIGOXIN



Purine nucleoside

INDICATIONS

- i) Heart failure (more effective in 'low output' than in 'high output' failure)
- ii) atrial fibrillation
- iii) atrial flutter
- iv) paroxysmal supraventricular tachycardia (PSVT).

MECHANISM OF ACTION

It increases the force and speed of systolic myocardial contraction thereby reducing HR and conduction velocity through AV node.

DOSAGE

Oral: > 10 yrs and adults: 0.25-1.5 mg OD according to the desired speed of digitalization. 0.0625-0.75 mg/day for maintenance is used. < 10 yrs. Dose has to be carefully titrated for individual case. Usually 1-1.5 µg/kg is given as digitalizing dose and 25-30% of this dosage is used as maintenance dose in children.

Rapid IV digitalization (~ 80% PO):
Cardiac failure: 8-12; arrhythmia: 10-15; renal impairment : 6-10; age 5-10 yrs: 15-30; 2-5 yrs: 25-35; 1-24 months: 30-50; full term: 20-30; preterm: 15-25 (all in mg/kg & for patients not on digoxin the previous 2 weeks). Half of this loading dose is given STAT slowly and further fractions q 4-8 hrs (=distribution time), each fraction after assess-

ment. In a typical adults: 0.5-1 mg over ≥ 2 hrs infusion or divided q 10-20 mins. Pediatric Inj may be diluted ≥ 4 fold in sterile water/ NS/5% D. *Gradual IV digitalization* (esp in children): Start directly the IV maintenance dose. *IV maintenance:* 25-35 (20-30 in prem.)% of the IV loading dose.

CONTRAINDICATIONS

Hypersensitivity, ventricular fibrillation, hypertrophies, obstructive cardiomy (unless with heart failure), WPW syndrome (esp with AF).

ONSET OF EFFECT

Onset: IV: within 5-30 mins; IM/PO: 0.5-2 hrs Peak effect: IV: within 1-4 hrs; IM/PO: 2-6 hrs.

DURATION OF ACTION

Half-life: 1.5-2 hrs. Steady state levels: in 4-5 half-lives, with maintenance doses.

DRUG INTERACTIONS

↓ dose required with diuretics, steroids, CCBs, spironolactone. Cholestyramine, sulphasalazine, antacids, some antineoplastics: ↓ digoxin absorption. Macrolides, tetracyclines, omeprazole, diphenoxylate: ↑ digoxin absorption, Quinidine, verapamil, amiodarone, propafenone, captopril, nifedi-

pine, diltiazem, cyclosporin, alprazolam, itraconazole, indomethacin: ↑ plasma digoxin. Thyroid, salbutamol: ↓ plasma digoxin.

Corticosteroids, calcium, diuretics (esp. kaliuretics), sympathomimetics, succinylcholine: arrhythmias.

Cardiac depressants including verapamil, diltiazem, antiarrhythmics: conduction block.

ADVERSE EFFECTS

VPC (bigeminy/trigeminy), VT, AV dissociation, sinus bradycardia, nausea/vomiting/diarrhea, blurred/yellowed sight, headache, dizziness, psychosis, hyperventilation, rash, gynecomastia.

SPECIAL PRECAUTIONS

Use cautiously in renal impairment, AV block/sick sinus syndrome (worsening can occur), myocarditis (irritability, arrhythmogenic), chronic constrictive pericarditis, electrocardioversion (delay this or stop digoxin, leaving a 1-2 days interval; at least start with lowest voltages), dyselectrolytemia (↓K⁺, ↓Mg²⁺ increases and ↓Ca²⁺ decreases digoxin effects), hypoxia (digoxin effects). Digoxin is present in breast milk, cautious use in pregnancy is advocated. Renal failure may increase the adverse effects.

DISOPYRAMIDE



Antiarrhythmic class IA

INDICATIONS

- i) Atrial and ventricular arrhythmias not responding to lidocaine
- ii) atrial arrhythmias
- iii) arrhythmias associated with Wolf-Parkinson-white syndrome.

MECHANISM OF ACTION

It is a quinidine like drug and acts in a similar manner. It also has antimuscarinic and negative inotropic properties. It increases the effective refractory period of the atrium and prolongs conduction in the accessory pathways.

DOSAGE

100-200 mg orally 6 hourly. Max. daily dose is 800 mg. Dose to be reduced in paediatric and geriatric patient. IV- 2 mg/kg by slow IV injection.

CONTRAINDICATIONS

II or III degree heart block, LVF cardiogenic shock, hypotension, cardiomyopathy, glaucoma, prostate hypertrophy, congenital QT prolongation, hypersensitivity

ONSET OF EFFECT

Within 30-60 mins.

DURATION OF ACTION

8-16 hrs.

DRUG INTERACTION

Phenytoin: Reduced efficacy. Beta blockers, verapamil: potentiates negative chronotropic and inotropic effects. Digitalis: potentiates inhibitory effects on the conduction system. TCA, amiodarone: additive QT prolongation.

ADVERSE EFFECTS

Blurred vision, diarrhea/difficulty in urinating, colic, dry mouth, fainting, hypertension with heart failure, nausea/vomiting, blood dyscrasias, psychosis. There is an increased risk of recurrence of heart failure in patients with history of CHF.

SPECIAL PRECAUTIONS

Use cautiously in chronic hepatic or renal disorders, cardiac failure, low BP, diabetes, digitalis intoxication, hypokalemia, glaucoma, BPH, myasthenia gravis, avoid other antiarrhythmics except in life-threatening arrhythmias.

LIGNOCAINE (LIDOCAINE)



x



x



Class Ib antiarrhythmic
& local anaesthetic

INDICATIONS

- i) Ventricular arrhythmias especially those associated with acute MI
- ii) prevention and treatment of ventricular extrasystoles, digitalis and TCA induced arrhythmias.

MECHANISM OF ACTION

It stabilizes the neuronal membrane and inhibits the ion movement which is necessary for conduction of impulses. It reduces phase IV depolarization and decreases automaticity.

DOSAGE

Adults: 50-100 mg (1 mg/kg) IV under ECG monitoring. Give second injection after 5 minutes. Follow this by infusing 1-4 mg/min under close monitoring.

Children: Bolus dose of 1 mg/kg followed by infusion at 30 mgm/kg/min.

CONTRAINDICATIONS

Hypersensitivity, conduction disturbances, AV block, cardiac decompensation.

ONSET OF EFFECT

Within min.

DURATION OF ACTION

Depends on the type and method of administration.

DRUG INTERACTIONS

↓ dose required with cimetidine, propanolol.

Concurrent use with suxamethonium results in increased duration of suxamethonium activity.

Adrenaline given along with lignocaine prolongs its local action by reducing its absorption.

ADVERSE EFFECTS

Respiratory depression, cardiovascular collapse, cardiac arrest. These symptoms may occur quietly without any warning. Convulsions, tremors, dizziness, blurred vision, nervousness and nausea may occur.

SPECIAL PRECAUTIONS

Use cautiously in severe liver disease, epilepsy, bradycardia, neonates, impaired cardiac conduction, pregnancy and lactation.

PROPAFENONE



Class IC antiarrhythmic drug

INDICATIONS

Atrial fibrillation, arrhythmias.

MECHANISM OF ACTION

It blocks Na⁺ channel in cell of the heart.

DOSAGE

150 mg TID.

CONTRAINDICATIONS

Severe CCF, marked hypotension, severe bradycardia and heart block, conduction abnormalities,

cardiogenic shock, neonates, lactation.

DRUG INTERACTIONS

Raised serum levels with cimetidine. Increase absorption of cimetidine from GIT.

ADVERSE EFFECTS

Dizziness, headache, visual disturbances, vertigo, dry mouth, G.I. disturbances, alteration in taste, allergic skin rashes and leucopenia.

SPECIAL PRECAUTIONS

Use cautiously in severe pulmonary obstructive disease, impaired renal/hepatic function, cardiac pacemaker, pregnancy and in elderly.

QUINIDINE



Class IA antiarrhythmic drug

INDICATIONS

i) cardiac arrhythmias e.g., supraventricular tachycardia and ventricular arrhythmias ii) hiccups. Presently quinidine is used only for prophylaxis and maintenance purpose.

MECHANISM OF ACTION

It reduces rate of depolarization during the phase of action potential of cardiac muscle and prolongs refractory period. It has vagal blocking action and controls AF, PSVT and VT.

DOSAGE

100-300 mg OD orally. May be doubled if required.

CONTRAINDICATIONS

Complete/incomplete heart block, hypers. (including thrombocytopenia

purpura) to quinidine, myasthenia gravis, prolonged QT interval, digitalis intoxication.

ONSET OF EFFECT

Quinidine sulphate: within 1 hr. Quinidine gluconate: within 2-3 hrs.

DURATION OF ACTION

Adults : Effects may last up to 24 hrs. *Children* : From 12-18 hrs.

DRUG INTERACTIONS

↑ dose required with rifampicin, erythromycin, phenobarbitone and phenytoin. ↓ dose required with- beta blockers, amiodarone, digoxin, disopyramide, encainide, propafenone, imetidine. Concurrent use of digoxin may precipitate digoxin toxicity. ↑ effect of antihypertensives, vasodilators,

myocardial depressants, oral anti-coagulants and non-depolarizing muscle relaxants is seen.

ADVERSE EFFECTS

Lupus erythematosus, exfoliative dermatitis, granuloma, hepatitis, ventricular arrhythmias, CHF, heart block, nausea, vomiting, diarrhea, hypersensitivity, respiratory difficulties, muscle weakness, keratopathy, thrombocytopenia, cinchonism (impaired hearing, headache, blurred vision, dizziness and vomiting) urticaria and skin reactions.

SPECIAL PRECAUTIONS

Test dose recommended. Use cautiously in incomplete heart block, digitalized patients, renal/hepatic impairment, hypo/hyperkalemia.

► ANTI-CHOLINERGIC

ATROPINE SULPHATE



Parenteral anticholinergic agent and muscarinic

INDICATIONS

Preanesthetic medication, to restore cardiac rate and arterial pressure during anesthesia, lessens the degree of atrioventricular (A-V) heart block due to digitalis, to overcome severe bradycardia and syncope, as an antidote (with external cardiac massage) for cardiovascular collapse from the injudicious use of a choline ester (cholinergic) drug, in the treatment of anticholinesterase poisoning from organophosphorus insecticides, and as an antidote for the "rapid" type of mushroom poisoning.

MECHANISM OF ACTION

It is a competitive or surmountable antagonist which can be overcome

by increasing the concentration of acetylcholine at receptor sites of the effector organ (e.g., by using anticholinesterase agents which inhibit the enzymatic destruction of acetylcholine).

DOSAGE

The average adults dose is 0.5 mg (5 ml of a 0.1 mg/ml solution), range 0.4 to 0.6 mg (4 to 6 ml).

CONTRAINDICATIONS

Atropine generally is contraindicated in patients with glaucoma, pyloric stenosis or prostatic hypertrophy, except in doses ordinarily used for preanesthetic medication.

DRUG INTERACTIONS

With antihypertensives.

ADVERSE EFFECTS

Dryness of the mouth, blurred vision, photophobia and tachycardia, anhydrosis, heat intolerance or impair temperature regulation, constipation and difficulty in micturition may occur in elderly patients. Occasional hypersensitivity reactions, especially skin rashes which in some instances progressed to exfoliation.

SPECIAL PRECAUTIONS

Do not administer unless solution is clear and seal is intact. Discard unused portion.



R[®]
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ANTICOAGULANTS & ANTIPLATELETS, ANTITHROMBOTICS

► ANTIPLATELET DRUGS

ABCIXIMAB



Glycoprotein IIB/
IIIa Receptor Antagonist

INDICATIONS

Platelet aggregation inhibition as adjunct to percutaneous transluminal coronary angioplasty or atherectomy (PTCA).

MECHANISM OF ACTION

Abciximab is designed to block IIb/IIIa receptor and prevent platelet aggregation. It may markedly prolong the bleeding time, and while it has a half-life of only 10 minutes, low levels of glycoprotein IIb/IIIa receptor blockage may be present for up to 10 days after infusion.

DOSAGE

0.25mg/kg administered 10-60 minutes before the start of PTCA, followed by a continuous IV inj of 10 µg/min for 12 hours.

CONTRAINDICATIONS

Active internal bleeding (within 6 weeks), GI or GE bleeding of clinical significance, history of cerebrovascular accident (CVA) within 2 years or CVA with a significant neurological deficit, bleeding diathesis, administration of oral anticoagulants with 7 days unless prothrombin time is < 1.2 times control, thrombocytopenia, recent major surgery or trauma, intracranial neoplasm, severe uncontrolled hypertension, presumed or documented history of vasculitis.

DRUG INTERACTIONS

Patients with human anti-chimeric antibody (HAVA) titers may have allergic or hypersensitivity reactions

when treated with other diagnostic or therapeutic monoclonal antibodies.

ADVERSE EFFECTS

Constipation, ileus, bleeding, thrombocytopenia, atrial fibrillation/flutter, complete AV block, palpitation, SVT, abnormal thinking, dizziness, human antichimeric antibody development.

SPECIAL PRECAUTIONS

Free plasma concentration of the drug decreases rapidly with an initial half life of < 10 mins. and a second phase half-life of 30 minutes; platelet function recovers over the course of 48 hours.

ACENOCOUMAROL



Coumarin derivatives

INDICATIONS

As an anticoagulant agent used for many thromboembolic disorders.

MECHANISM OF ACTION

Acenocoumarol has an inhibitory effect on vitamin K reductase which ultimately inhibits the synthesis of vitamin-K-dependent coagulation factors II, VII, IX, and X and anticoagulant proteins C and S. It results in lower level of prothrombin and a decrease in the amount of thrombin generated and bound to fibrin. This is the main mechanism which reduces the thrombogenicity of clots.

DOSAGE

Adults: 4-12 mg on the 1st day and 4-8 mg on the 2nd day. Maintenance: 1-8 mg daily given in a single dose at the same time every day. Subsequent dosage should be based on prothrombin time measurements. Tapering of dosage is recommended prior to discontinuation.

CONTRAINDICATIONS

This medication is not advisable in patients with active bleeding or risk of serious bleeding, severe high blood pressure and pregnancy.

DRUG INTERACTIONS

Acetaminophen, acetylsalicylic acid, allopurinol, amprnavir, amiodarone, azithromycin, capecitabine, cefotetan, celecoxib, ciprofloxacin, cisapride, citalopram, clofibrate, levofloxacin, quinidine: ↑ the anticoagulant effect of acenocoumarol. aprepitant, aminoglutethimide, azathioprine, bosentan, carbamazepine, colestipol, dicloxacillin, glutethimide, griseofulvin, methimazole, nevirapine, phenobarbital: the anticoagulant effect of Acenocoumarol. ethinyl estradiol, phenytoin, tiaprofenic acid, tolmetin: ↓ the risk of bleeding. Bismuth carbonate and Mg reduce absorption.

ADVERSE EFFECTS

Hemorrhage is the most serious adverse effect of acenocoumarol. Others are alopecia, fever, nausea, vomiting, diarrhea, skin rash and cholestatic liver damage.

SPECIAL PRECAUTIONS

Bleeding, renal and hepatic diseases, peptic ulcers, severe wounds, cerebrovascular disorders and bacterial endocarditis.

Since the activation or gamma-carboxylation of the coagulation factors may be reduced in presence of hepatic congestion in severe heart failure. Therefore, a very cautious dosage schedule must be adopted. Special caution and monitoring of dose should be taken in elderly patients. Particular care should be taken where it is necessary to shorten the PT/INR for investigative or therapeutic interventions. Alcohol intake should be discontinued while taking the therapy.

BIVALIRUDIN



Direct thrombin inhibitor

INDICATION

As an anticoagulant in patients with unstable angina undergoing percutaneous transluminal coronary angioplasty (PTCA)

MECHANISM OF ACTION

Bivalirudin is a direct thrombin inhibitor which inhibits the thrombin by specifically binding both to the catalytic site and to the anion-binding exosite of circulating and clot-bound thrombin. This process is reversible as thrombin slowly cleaves the bivalirudin-Arg₃-Pro₄ bond, resulting in recovery of thrombin active site functions. Thrombin helps in fibrinogen conversion to fibrin during the coagulation cascade; inhibition of fibrinogen conversion to fibrin inhibits thrombus development.

DOSAGE

For patients who do not have HIT (heparin induced thrombocytopenia)/HITTS (heparin induced thrombotic

thrombocytopenia syndrome): started with intravenous (IV) bolus dose of 0.75 mg/kg, followed by an infusion of 1.75 mg/kg/hr for the duration of the PCI/PTCA procedure. An activated clotting time (ACT) should be performed after 5 minutes and administer additional 0.3 mg/kg bolus if necessary. For patients who have HIT (heparin induced thrombocytopenia)/HITTS (heparin induced thrombotic thrombocytopenia syndrome): IV bolus of 0.75 mg/kg. This should be followed by a continuous infusion at a rate of 1.75 mg/kg/hr for the duration of the procedure. May continue infusion following PCI beyond 4 hours (optional post PCI, at discretion of treating health care provider) initiated at a rate of 0.2 mg/kg/hr for up to 20 hours. Dosage should be adjusted in patients with renal impairment.

CONTRAINDICATIONS

Hypersensitivity to bivalirudin, vigorous bleeding.

DURATION OF ACTION

~ 1 hr after infusion discontinued.

DRUG INTERACTIONS

Adenosine diphosphate (ADP), antagonist, ticlopidine, and the glycoprotein IIb/IIIa inhibitor, abciximab, and with low molecular weight heparin.

ADVERSE EFFECTS

Bleeding is the most severe and fatal side-effect of bivalirudin therapy. Other treatment-emergent events are back, pain, nausea, headache and hypotension.

SPECIAL PRECAUTIONS

Use cautiously in patients with renal impairment. Bivalirudin should be administered with aspirin. Should be used during pregnancy only if clearly needed. Caution should be exercised when administered to a nursing woman. Not recommended in pediatrics.

CILOSTAZOL



Antiplatelet agent

INDICATIONS

Intermittent claudication.

MECHANISM OF ACTION

It reversibly inhibits platelet aggregation.

DOSAGE

100mg twice daily to be taken 30 minutes before or two hours after breakfast and dinner. Initiate therapy at a dose of 50 mg twice daily and with ketoconazole,

itraconazole, erythromycin, diltiazem.

CONTRAINDITION

Hypersensitivity, congestive heart failure.

DRUG INTERACTIONS

Macrolides, diltiazem

ADVERSE EFFECTS

Diarrhea, increased cough, rhinitis, headache, dizziness, vertigo,

palpitation, tachycardia, nausea, abnormal stool, flatulence.

SPECIAL PRECAUTIONS

Use cautiously in severe renal impairment.



Rosuchol
Rosuvastatin 10mg / 20mg Tablets

CLOPIDOGREL



Antiplatelet agent

INDICATIONS

Reduction of atherosclerotic events (MI, stroke, and vascular death) in patients with atherosclerosis documented by recent stroke, recent MI, or established peripheral arterial disease.

MECHANISM OF ACTION

It is a thienopyridine that irreversibly inhibits platelet aggregation.

DOSAGE

Adults: 75 mg once daily with or without food.

CONTRAINDICATIONS

Hypersensitivity, peptic ulcer or intracranial hemorrhage.

DRUG INTERACTIONS

Aspirin: Potentiates the effect of aspirin on collagen-induced platelet aggregation; *NSAIDs:* Risk of increased occult gastrointestinal blood loss. Phenytoin, tamoxifen, tolbutamide, warfarin, torsemide, fluvastatin: since clopidogrel inhibits CYP4502C9 it may interfere with the metabolism of these drugs.

ADVERSE EFFECTS

Hemorrhage, purpura, rash, diarrhea, dyspepsia, abdominal pain.

SPECIAL PRECAUTIONS

As with other antiplatelet agents, clopidogrel should be used with caution in patients who may be at risk of increase bleeding from trauma, surgery, or other pathological condition.

DIPYRIDAMOLE



Platelet inhibitor

INDICATIONS

i) CAD: primary and secondary prevention of unstable angina and MI ii) cerebrovascular disease iii) to improve potency of coronary bypass implants iv) to prevent embolism in prosthetic heart valves and arteriovenous shunts v) prophylaxis of venous thromboembolism vi) peripheral vascular disease.

MECHANISM OF ACTION

It inhibits platelet aggregation. By reducing coronary and peripheral resistance, it increases coronary

flow, but a steal phenomenon can occur (myocardial perfusion distal to occlusion may be worsened).

DOSAGE

Adults : 300-600 mg/day divided in 3-4 doses. Children : 5 mg /kg/day in divided doses.

CONTRAINDICATIONS

Hypersensitivity, peptic ulcer disease.

DRUG INTERACTIONS

↑ dose required with antacids.

ADVERSE EFFECTS

Rash, nausea, dizziness, fainting, headache, skin rash, diarrhea, flushing, worsening of angina, cardiac arrhythmias.

SPECIAL PRECAUTIONS

Use cautiously in hypotension, subvalvular aortic stenosis, migraine, angina, coagulation disorders. Not recommended in children <12 years. Reduced dose necessary. The drug passes into breastmilk.

DROTRECOGIN-ALFA



Recombinant human activated protein

INDICATIONS

Severe sepsis associated with acute organ dysfunction.

MECHANISM OF ACTION

In-vitro study suggested that drotrecogin-alfa inhibits factors Va and VIIIa for its antithrombotic activity and has indirect profibrinolytic activity by inhibiting plasminogen activator-inhibitor-1 (PAI-1). It possesses anti-inflammatory action by inhibiting the tumor necrosis factor production and restricting the thrombin-induced inflammatory responses within the microvascular endothelium through blocking leukocyte adhesion to selectins.

DOSAGE

Infusion rate: 24mcg/kg/hour intravenously for 96 hours as per the actual body weight. Bolus dose or dose escalation is not recommended.

Reconstitution process: Reconstitute 5 mg vials with 2.5 ml and 20 mg vials with 10 ml sterile water for injection (resultant solution 2 mg/ml). Further dilute

(within 3 hr of reconstitution) in 0.9% sodium chloride, typically to a concentration of 100-200 mcg/ml when using infusion pump or 100-1000 mcg/ml when infused via syringe pump.

CONTRAINDICATIONS

Contraindicated in patients with active internal bleeding, hemorrhagic stroke within last 3 months, recent intracranial/intraspinal surgery/severe head trauma in last 2 months, trauma patients with an increased risk of life threatening bleeding, epidural anesthesia, presence of epidural catheter, intracranial mass. Hypersensitivity to drotrecogin alpha-activated or any component.

DRUG INTERACTION

Anticoagulants, NSAIDs, antiplatelet agents, antithrombin III platelet inhibitors and thrombolytic agents may increase the risk of bleeding. Salicylates may increase the adverse effect of drotrecogin alfa.

ADVERSE EFFECTS

Bruising, GI bleeding. Skin/soft tissue bleeding, immune reaction, retroperitoneal bleeding, genitourinary bleeding, intracranial bleeding, intrathoracic hemorrhage, dizziness, fainting, palpitations, perianal itching, GI disturbances, weakness and flushing.

SPECIAL PRECAUTIONS

Use cautiously in patients with therapeutic heparin (>15 units/kg/hr), platelet count <30,000/mm³, recent (in last 6 months) gastrointestinal bleeding, thrombolytic therapy (in last 3 months), oral anticoagulants or GP IIb/IIIa inhibitors therapy (in last 7 days), ischemic stroke (in last 3 months). Platelet count <30,000 x 10⁶/l, even if platelet count is increased after transfusions. Concurrent heparin therapy to treat an active thrombotic or embolic event. Use cautiously in pregnancy and lactation.

EPTIFIBATIDE



Platelet inhibitor

INDICATIONS

(i) Unstable angina and non-ST-segment-elevation myocardial infarction (ii) Acute ischemic complications of percutaneous coronary intervention (iii) Adjunctive therapy during thrombolysis to prevent reocclusion.

MECHANISM OF ACTION

It reversibly inhibits platelet aggregation by preventing the binding of fibrinogen, von willebrand factor, and other adhesive ligands to GP IIb/IIIa.

DOSAGE

Unstable angina and non-ST-segment-elevation myocardial infarction: 180 mcg/kg IV loading dose over 1–2 minutes as soon as possible following diagnosis, followed by continuous IV infusion of 2 mcg/kg/min until hospital

discharge or initiation of coronary artery bypass grafting (CABG), or for up to 72 hours. **Percutaneous coronary intervention:** 180 mcg/kg immediately before the initiation of PCI followed by a continuous infusion of 2 mcg/kg/min and a second 180mcg/kg bolus 10 minutes after the first bolus.

CONTRAINDICATIONS

A history of bleeding diathesis, or evidence of active abnormal bleeding within the previous 30 days, severe hypertension not adequately controlled with antihypertensive therapy, major surgery within the preceding 6 weeks, history of stroke within 30 days or any history of hemorrhagic stroke, current or planned administration of another parenteral GP IIb/IIIa inhibitor, dependency on renal dialysis,

known hypersensitivity to any component of the product.

DRUG INTERACTIONS

Concomitant use of platelet-aggregation inhibitors and an anticoagulant may increase the risk of hemorrhage.

ADVERSE EFFECTS

Major and minor bleeding events, anaphylaxis, hypotension, stroke.

SPECIAL PRECAUTIONS

Caution should be employed when eptifibatide is used with other drugs that affect hemostasis, including thrombolytics, oral anticoagulants, nonsteroidal anti-inflammatory drugs, and dipyridamole. Arterial and venous punctures, intramuscular injections, and the use of urinary catheters, nasotracheal intubation, and nasogastric tubes should be minimized.



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Rosuvastatin 10mg / 20mg Tablets

TICLOPIDINE



X



X

Platelet aggregation inhibitor

INDICATIONS

Use restricted to patients intolerant of aspirin i) stroke prevention ii) transient ischemic attack iii) intermittent claudication iv) unstable angina v) coronary artery bypass surgery (CABG) vi) secondary prophylaxis of MI vii) percutaneous transluminal coronary angioplasty (PTCA).

MECHANISM OF ACTION

It directly interacts with platelet membrane; alters fibrinogen receptor so that fibrinogen is not able to bind to the activated platelets. Due to this, platelet aggregation and clot retraction are inhibited. No effect on platelet cAMP or TXA₂.

DOSAGE

Adults: 250 mg B.D. To be taken with meals.

CONTRAINDICATION

Hypersensitivity, severe hepatic disease, hemorrhagic disorders (hemophilia, Von willebrand's disease), peptic ulceration, epistaxis, menorrhagia, agranulocytosis, thrombocytopenia, neutropenia, cerebrovascular accident (CVA), active bleeding (peptic ulcer).

DURATION OF ACTION 12-16 hrs.

ONSET OF EFFECT

Within 1-2 hrs.

DRUG INTERACTIONS

↓ drug required with cimetidine.

↑ drug required with antacids.

Actions of aspirin, other NSAIDs and theophylline is potentiated. Plasma levels of digoxin are reduced on concomitant use with ticlopidine.

ADVERSE EFFECTS

Neutropenia, rash, diarrhea/vomiting, abdominal pain, cholestatic jaundice, anorexia, nausea, vomiting, headache, tinnitus, bleeding, urticarial and erythematous skin reactions.

SPECIAL PRECAUTIONS

Use cautiously in hepatic or renal impairment, risk of increased bleeding from surgery and trauma.

TIROFIBAN



Glycoprotein IIB/IIIA receptor inhibitor

INDICATIONS

Prevention of early myocardial infarction in patients with unstable angina or non-ST-segment-elevation myocardial infarction and with last episode of chest pain within 12 hours.

MECHANISM OF ACTION

It inhibits glycoprotein IIb/IIIa receptors.

DOSAGE

IV infusion: Initially 400 nano grams/kg/min. for at least 48 hours. Maximum duration 108 hours.

CONTRAINDICATION

History of abnormal bleeding/stroke (hemorrhagic stroke within last 30 days), intracranial disease, hemorrhagic diathesis, severe hypertension, thrombocytopenia, increased PT or INR, breast feeding.

ADVERSE EFFECTS

Bleeding manifestation; thrombocytopenia (reversible)

SPECIAL PRECAUTIONS

Renal or hepatic impairment, major surgery or trauma within 3 months.

Organ biopsy or lithotripsy within last 2 weeks, acute pericarditis, aortic dissection, hematuria, occult blood in stool, severe heart failure, cardiogenic shock, anemia, hemorrhagic retinopathy, co-administration of the drugs that increased the risk of bleeding.

LOCALLY ACTING

HEPARINOIDS



Heparinoids

INDICATIONS

Hematomas, contusions and crush injuries. Superficial phlebitis and thrombophlebitis, varicose veins, improvement of scars after injuries, operation and burns and loosening of hard scar tissue.

MECHANISM OF ACTION

It is a locally acting anticoagulant which causes healing of superficial and post infusion thrombophlebitis.

DOSAGE

Liberal application over the affected area is advocated. Cover the area with a sterile dressing. Massage in gently in case of hard scars and may be left open.

CONTRAINDICATIONS

No contraindications are known except hypersensitivity to the active ingredient or the excipients in the drug.

ADVERSE EFFECTS

Rarely reddening of the skin and blistering can occur in sensitive patients.

SPECIAL PRECAUTIONS

Use cautiously in facial injuries, e.g., hematomas caused by spectacles: The drug should not come in contact with the eyes.

► ORAL ANTI-COAGULANTS

NICOUMALONE		!		x		x	Coumarins
<p>INDICATIONS</p> <p>i) Deep venous thrombosis (DVT) and pulmonary embolism ii) acute MI iii) rheumatic heart disease iv) atrial fibrillation v) disseminated intravascular coagulation (DIC) vi) cerebrovascular thromboembolic accident vii) transient ischemic attack (TIA).</p> <p>MECHANISM OF ACTION</p> <p>As a competitive antagonist of Vit K, it reduces plasma levels of functional clotting factors. The g carboxylation of glutamate residues of prothrombin and factor VII, IX and X affects their binding to Ca^{++} and phospholipid surfaces.</p>	<p>DOSAGE</p> <p>Day 1: 8-12 mg - single dose. Day 2: 4-8 mg - single dose. Maintenance: 1-8 mg - single dose depending on the response.</p> <p>CONTRAINDICATIONS</p> <p>Bleeding disorder, thrombocytopenia, severe hypertension, threatened abortion, piles, GI ulcers, infective endocarditis, large malignancies, thrombolysis, ocular and neurosurgery, chronic alcoholics.</p> <p>DRUG INTERACTIONS</p> <p>\downarrow dose required with NSAIDs, amiodarone, antibiotics like</p>	<p>cotrimoxazole, cephalosporins, erythromycin, quinolones, chloramphenicol, doxycycline, INH, neomycin. \uparrow dose required with rifampicin, barbiturates, and griseofulvin.</p> <p>ADVERSE EFFECTS</p> <p>Alopecia, fever, nausea, vomiting, diarrhea.</p> <p>SPECIAL PRECAUTIONS</p> <p>Use cautiously in bleeding diathesis peptic ulcers, severe wounds, CVA, bacterial endocarditis, renal/hepatic impairment, pregnancy and lactation.</p>					

PHENINDIONE		!		x		x	Coumarin oral anticoagulant
<p>INDICATIONS</p> <p>i) Deep venous thrombosis (DVT) and pulmonary embolism ii) acute MI iii) rheumatic heart disease iv) atrial fibrillation to prevent embolic complications v) DIC vi) cerebrovascular thromboembolic accident vii) TIA.</p> <p>MECHANISM OF ACTION</p> <p>It inhibits synthesis of Vit. K-dependent coagulation factors causing decreased activity of factors VII, IX, X and II. It has no effect on established thrombus but further extension of the clot is prevented.</p> <p>DOSAGE</p> <p>Day 1: 200 mg, Day 2 : 100 mg, maint.: 50-150 mg as per coagulation test.</p>	<p>CONTRAINDICATIONS</p> <p>Bleeding disorder, thrombocytopenia, severe hypertension, threatened abortion, piles, GI ulcers, infective endocarditis, large malignancies, thrombolysis, ocular and neurosurgery, chronic alcoholism.</p> <p>DRUG INTERACTIONS</p> <p>\downarrow dose required with broad spectrum antibiotics (cefoperazone, moxalactam), aspirin, dipyridamole, phenylbutazone, sulphonamides, indo-methacin, phenytoin, probenecid, cimetidine, tolbutamide, phenformin, anabolic steroids, quinidine, clofibrate, liquid paraffin. \uparrow dose required with barbiturates, rifampicin, griseofulvin, OCP.</p>	<p>ADVERSE EFFECTS</p> <p>Bleeding, agranulocytosis, anemia, thrombocytopenia, leukemoid reaction, lymphadenopathy, cholestasis, skin reactions, fever, liver and kidney problems, myocarditis, blood dyscrasias and visual disturbances.</p> <p>SPECIAL PRECAUTIONS</p> <p>Use cautiously in chronic hepatic or renal disorders, hypertension, peptic ulcer, bleeding disorders, periodic determination of purple toes (PT), CHF patients. Advise against NSAIDs usage. IM injections to be confined to upper extremities only. Major diet changes (especially vegetables) and intercurrent illness affects anticoagulant control.</p>					

**INDICATIONS**

- i) DVT and pulmonary embolism,
- ii) In acute MI, to be followed by heparin
- iii) rheumatic heart disease,
- iv) atrial fibrillation to prevent embolic complications
- v) DIC
- vi) cerebrovascular thromboembolic accident
- vii) transient ischemic attack (TIA)

MECHANISM OF ACTION

It inhibits synthesis of Vit. K-dependent coagulation factors causing decreased activity of factors VII, IX, X and II. It has no effect on established thrombus but further extension of the clot is prevented.

DOSAGE

Initially 2-5 mg per day. If required increased up to 10 mg/day depending on patient requirement.

CONTRAINDICATIONS

Bleeding disorder, thrombocytopenia, severe hypertension,

threatened abortion, piles, GI ulcers, infective endocarditis, large malignancies, thrombolysis, ocular & neurosurgery, chronic alcoholics, lumbar puncture and lumbar block anaesthesia, hypersensitivity.

ONSET OF EFFECT

Effect develops gradually over 1-3 days.

DURATION OF ACTION

Within 3-6 days.

DRUG INTERACTIONS

↓ dose required with broad spectrum antibiotics (cefoperazone, moxalactam), aspirin, dipyridamole, phenylbutazone, sulphonamides, indomethacin, phenytoin, probenecid, cimetidine, tolbutamide, phenformin, anabolic steroids, quinidine, clofibrate, liquid paraffin.

↑ dose required with barbiturates, rifampicin, griseofulvin, OCP.

ADVERSE EFFECTS

Hypersensitivity, rash, bleeding/bruising, fever, abdominal pain/diarrhea, nausea/vomiting, hair loss, purple toes, necrosis, jaundice, hepatic dysfunction and pancreatitis and dermatitis.

SPECIAL PRECAUTIONS

Use cautiously in chronic hepatic or renal disorders, hypertension, peptic ulcer, bleeding disorders, periodic determination of purple toes, CHF patients, advise against NSAIDs usage, IM injections to be confined to upper extremities only, major diet changes (especially vegetables) and intercurrent illness affects anticoagulant control.

► PARENTERAL ANTICOAGULANTS

alteplase	 <2 yrs. x  >2 yrs. !	 !	NR	Tissue plasminogen activator
INDICATION				
i) Clearance of central venous lines ii) acute MI iii) acute massive pulmonary embolism iv) acute ischemic strokes.	100 mg should be given as soon as possible after the onset of symptoms; total dose should be ≤ 1.5 mg/kg in patients weighing <65 kg. For admin within 6 hr of MI: 15 mg as bolus, then 0.75 mg/kg (up to a max of 50 mg) to be infused over 30 minutes, followed by the remainder dose to be infused over subsequent 60 minutes. For admin >6 hr after MI: 10 mg as bolus, then 50 mg to be infused over 60 minutes, followed by remainder dose to be infused over subsequent 2 hr.			CONTRAINDICATION
MECHANISM OF ACTION				Recent surgery or trauma, susceptibility to internal bleeding, history of cerebrovascular accident, uncontrolled hypertension, esophageal varices, heavy vaginal bleeding, coagulation defects, aneurysm and poor glycemic control.
Alteplase initiates local fibrinolysis and dissolution of clots by binding to fibrin in a thrombus and the fibrin-bound plasminogen is converted to plasmin.				DRUG INTERACTIONS
Excretion: Cleared rapidly from the plasma mainly by hepatic metabolism. Half-life: 4-5 minutes (initial); about 40 minutes (terminal).				Warfarin, heparin, prostacyclin and nitrates, potentially fatal with NSAIDs.
DOSAGE (INJECTION)				ADVERSE EFFECT
Clearance of central venous lines: Adults: Using soln at a conc. of 1mg/ml. Usual dose: 2mg, may repeat after 2 hr if needed. Not to exceed a total dose of 4 mg; patients weighing <30kg: dose is 110% of the internal lumen vol of the catheter (not >2 mg), may repeat after 2 hr if needed.	Acute massive pulmonary embolism: Adults: Total dose: 100 mg but not >1.5 mg/kg for patients weighing <65 kg. First 10 mg as bolus, followed by infusion of the remainder dose over 2 hr.			Vomiting, bleeding from puncture sites, gingival tissues and urinary tract; potentially fatal: hemorrhage esp. with previous trauma or unsuspected underlying cause of bleeding, intracerebral bleeding.
Acute MI: Adults: A total dose of	Acute ischemic strokes: Adults: To be given within 3 hr of the onset of symptoms: Infuse 0.9 mg/kg (up to a max total dose of 90 mg) over 60 minutes with 10% of the dose given as a bolus over the first minute.			SPECIAL PRECAUTIONS
				Children, elderly, pregnancy. Monitor intracranial hemorrhage and BP in acute stroke. Renal impairment.

heparin	 x	 ✓	 ✓	Parenteral anticoagulant
INDICATIONS				
i) deep venous thrombosis (DVT) and pulmonary embolism ii) acute MI, iii) rheumatic heart disease iv) atrial fibrillation to prevent embolic complications v) disseminated intravascular coagulation (DIC), vi) Cerebrovascular accident, vii) transient ischemic attack (TIA).	inj. : 5000-10,000 units 4-6 hourly. Prevention : 5000 units S/C.: 8-12 hourly. or as required. Child.: 50-100 IU/kg every 4-6 hrs.			DRUG INTERACTIONS
MECHANISM OF ACTION				↓ dose required with NSAIDs, dipyridamole, oral anticoagulants, phenylbutazone, streptokinase and in combination with ergot preparations. Heparin is incompatible with aminoglycoside antibiotics.
It increases the inhibitory action of antithrombin III (AT III) on factors XIIa, Xla, IXa and Xa and thrombin, thus causing inhibition of conversion of prothrombin to thrombin. Heparin also inhibits conversion of fibrinogen to fibrin and platelet functions.	CONTRAINDICATIONS Bleeding disorder, cerebral and subarachnoid hemorrhage, abdominal and thoracic bleeding into closed space, thrombocytopenia, severe hypertension, threatened abortion, piles, GI ulcer, infective endocarditis, large malignancies, tuberculosis, ocular and neurosurgery, lumbar puncture and renal or liver biopsy, chronic alcoholics, severe traumatic bleed (arterial injury).			ADVERSE EFFECTS
DOSAGE	ONSET OF EFFECT Within 15 mins.			Rash, bleeding/bruising, epistaxis, aching bones, alopecia, thrombocytopenia, anaphylaxis, rigor, skin necrosis in S/C inj., osteoporosis, hematuria, hypersensitivity reactions like urticaria, conjunctivitis, rhinitis, asthma, angioedema and anaphylactic shock.
Treatment : IV infusion : loading dose 5000-10,000 units, followed by 1000-2000 units/hr or 15,000 units S/C every 12 hrs. Alternatively	DURATION OF ACTION 4-12 hrs. after treatment is stopped.			SPECIAL PRECAUTIONS Use cautiously in hepatic or renal disorders, hypertension, bleeding tendencies, any allergy, peptic ulcer and hypersensitivity.

LOW MOLECULAR WEIGHT HEPARINS



Fractionated low molecular weight heparins

INDICATIONS

- i) Prophylaxis of deep venous thrombosis (DVT) in general/orthopedic surgery.
- ii) Treatment of DVT,
- iii) Hemodialysis (clot prevention)
- iv) Unstable CAD,
- v) Thrombocytopenia (potential value).

MECHANISM OF ACTION

They are fractionated heparins which selectively inhibit factor Xa with little effect on factor II a. They act only by inducing conformational change in AT III and not by bringing together AT III and thrombin. This is why LMWH have smaller effect on aPTT and whole blood.

DOSAGE

See table.

CONTRAINdications

Hemorrhagic diathesis, lumbar puncture, sympathetic block, neurosurgery, eye/ENT surgery, severe hypertension, history of hypersensitivity, CVA, acute bacterial endocarditis and drug induced thrombocytopenia.

DRUG INTERACTIONS

↓ dose with oral anticoagulants, platelet inhibitors, NSAIDs.

ADVERSE EFFECTS

Dose independent bleeding (severe increased platelets, DIC, local skin necrosis), allergy (nausea/vomiting, headache, limb ache, fever,

urticaria, anaphylaxis), decreased aldosteronism/increased K⁺ metabolic acidosis (in renal failure, DM), local reaction (induration, discoloration, small hematoma: needn't stop DH), vasospasm/priapism, osteoporosis, increased SGOT/PT/LDH.

SPECIAL PRECAUTIONS

Monitor coagulation time during treatment. Use cautiously in hepatic/renal dysfunction, osteoporosis, AT III deficiency, in elderly, children, pregnancy, lactation, platelet count and fecal occult blood test to be done during treatment, GI ulceration.

HEPARINS			ANTI XA ACTIVITY				DOSAGE	
Type*	MW	Derivn from heparin	IU/mg	T _{max} (hr)	t _{1/2}	Durn (hr)	See Heparin	
Unfractionated heparin	12000		170	1-6	4-12			
Dalteparin	6100	Nitrous acid degradation of porcine intestinal mucosal heparin	142		SC: 3-4 IV:2		Thromboproph (Tpx): SC 2500IU 1-2hr preop, foll by 2500qd(morn)-5-7d/(till) ambuln. High risk/orthosurg (HrO) : 5000 IU preop evening (or 2500 IU 1-2 hr preop & 8-12hr postop), foll by 5000 IU qd(morn/even) 5-7d/ambln. Hemodial/infltrn(Hm): IV 35 IU/kg foll by 13 IU/kg/hr (or bolus 5000IU for 4hr session & 8IU/kg foll by 5IU/kg/hr in high risk of bleed). Antidote (Ad): protamine 1mg for D 100IU.	
Parnaparin	4500	H ₂ O ₂ & Cu (II) acetate degrdn of porcine / bovine int heparin	85	3	6	20	Tpx : SC 3200 IU (0.3ml) 2hr preop & qd postop. HrO : 4250-6400IU (0.4-0.6ml) 12hr pre & postop, later qd (≥) 10d. Ad : IV protamine 0.6ml for P 0.1ml.	
Enoxaparin	4170	Alkaline degrdn of heparin benzyl ester	96		3-5		Tpx : SC 20-40mg OD, 1 st Inj a few hr preop if relevant. Hm: intra-arterial 0.5-1mg/kg at the start. Unstable CAD: SC 1mg/kg BD (+aspirin) has been tried.	
Nadroparin	4470	Nitric acid degrdn of porc int heparin	95	4-6	3-4	≥18	Tpx : SC 3075IU (0.3ml) OD (≥) 7d/(till) ambln, 1 st dose 2-4 hr preop if reqd. HrO: 12 hr pre & postop, later OD (≥) 10d: body wt < 50kg: 0.2ml, 0.3ml (preop & till postop 3d, postop 4d onwards): 50-69kg: 0.3ml, 0.4ml; ≥ 70kg : 0.4ml, 0.6ml. Trx(Throm Rx): SC BD(≥) 10d: < 50kg: 0.4ml; 50-59kg: 0.5ml; 60-69kg: 0.6ml; 70-79kg: 0.7ml; 80-89kg: 0.8ml; ≥ 90kg: 0.9ml. Hm: Intraarterial line (half dose in high risk of bleed & addnl smaller doses if >4hr): <50kg: 0.3ml; 50-69kg: 0.4ml; ≥ 70kg: 0.6ml. Ad: protamine 0.6ml for N 0.1ml.	
Reviparin	3900	Nitric acid degrdn of porc int heparin	130	1.5-2.5	3.3		Tpx : SC 1432IU(0.25ml=13.8mg) OD (1 st dose 2hr preop where reqd)7d/(till)ambln. Ad:IV protamine 17.5mg for R 13.8mg.	
Tinzaparin	6100	Enzymatic degrdn of porc int heparin	87		2-4		Tpx : SC 3500IU 2hr preop & qd 7-10d. HrO: 50IU/kg. Trx: 175IU/kg OD (≥) 6d.	

LOW MOLECULAR WEIGHT HEPARINS

ARDEPARIN



Parenteral anticoagulant

INDICATIONS

Prevention of venous thromboembolism.

MECHANISM OF ACTION

It increases the inhibitory action of antithrombin III (AT III) on factors Xlla, Xla, IXa and Xa and thrombin, thus causing inhibition of conversion of prothrombin to thrombin. Heparin also inhibits conversion of fibrinogen to fibrin and platelet functions.

DOSAGE

Treatment: IV infusion: loading dose 5000-10,000 units, followed by 1000-2000 units/hr or 15,000 units S/C every 12 hrs. Alternatively IV inj.: 5000-10,000 units 4-6 hourly. Prevention: 5000 units S/C.: 8-12 hourly or as required. Children: 50-100 IU/kg every 4-6 hrs.

CONTRAINDICATIONS

Bleeding disorder, cerebral and subarachnoid hemorrhage, abdominal and thoracic bleeding into closed space, thrombocytopenia, severe hypertension, threatened abortion, piles, GI ulcer, infective endocarditis, large malignancies, tuberculosis, ocular and neurosurgery, lumbar puncture and renal or liver biopsy, chronic alcoholics, severe traumatic bleeding (arterial injury).

ONSET OF EFFECT

Within 15 mins.

DURATION OF ACTION

4-12 hrs. after treatment is stopped.

DRUG INTERACTIONS

↓ dose required with NSAIDs, dipyridamole, oral anticoagulants, phenylbutazone, streptokinase

and in combination with ergot preparations. Heparin is incompatible with aminoglycoside antibiotics.

ADVERSE EFFECTS

Rash, bleeding/bruising, epistaxis, aching bones, alopecia, thrombocytopenia, anaphylaxis, rigor, skin necrosis in S/C inj., osteoporosis, hematuria, hypersensitivity reactions like urticaria, conjunctivitis, rhinitis, asthma, angioedema and anaphylactic shock.

SPECIAL PRECAUTIONS

Use cautiously in hepatic or renal disorders, hypertension, bleeding tendencies, in any allergy, peptic ulcer and hypersensitivity.

BEMIPARIN SODIUM



Low molecular weight heparin

INDICATION

Deep vein thrombosis, with or without pulmonary embolism, during the acute phase, prevention of thromboembolic disease in patients undergoing orthopedic surgery, prevention of clotting in the extracorporeal circuit during hemodialysis

MECHANISM OF ACTIONS

This anticoagulant binds to antithrombin III, thereby enhancing the inactivation of activated Factor X (Factor Xa) and, to a lesser extent, activated factor II (Factor IIa). Bemiparin promotes a greater release of tissue factor pathway inhibitor than UFH or dalteparin

DOSAGE

Bemiparin sodium 2,500units/0.2ml solution for injection pre-filled syringes, 3,500 IU anti-Xa/0.2 ml

CONTRAINDICATIONS

Hypersensitivity, history of confirmed or suspected immunologically mediated heparin induced thrombocytopenia (HIT), active hemorrhage or increased risk of bleeding due to impairment of hemostasis, severe impairment of liver and pancreas function, injuries to and operations on the

central nervous system, eyes and ears, disseminated intravascular coagulation (DIC) attributable to heparin-induced thrombocytopenia, acute bacterial endocarditis and endocarditis lenta, organic lesion with high risk of bleeding (e.g., active peptic ulcer, hemorrhagic stroke, cerebral aneurysm or cerebral neoplasms).

DRUG INTERACTION

The following types of medicine may interact with bemiparin sodium:

- Anticoagulants
- Antiplatelets
- Glucocorticosteroids
- Medicines that affect blood clotting
- Medicines which increase potassium levels
- Non-steroidal anti-inflammatories
- Salicylates
- Vitamin K antagonists.

All these drugs increase the pharmacological effect of bemiparin by interfering with its action on coagulation and/or platelet function and increasing the risk of bleeding. If the combination cannot be avoided, it should be used with

careful clinical and laboratory monitoring.

ADVERSE EFFECTS

The most commonly reported adverse reaction is hematoma and/or ecchymosis at the injection site. Osteoporosis has been associated with long-term heparin treatment.

SPECIAL PRECAUTION

Do not administer by the intramuscular route. Caution should be exercised in patients with liver or renal failure, uncontrolled arterial hypertension, history of gastroduodenal ulcer disease, thrombocytopenia, nephrolithiasis and/or urethrolithiasis, choroid and retinal vascular disease, or any other organic lesion with an increased risk of bleeding complications, or in patients undergoing spinal or epidural anaesthesia and/or lumbar puncture.

Bemiparin, like other LMWHs, can suppress adrenal secretion of aldosterone leading to hyperkalemia, particularly in patients such as those with diabetes mellitus, chronic renal failure, pre-existing metabolic acidosis.

DALTEPARIN SODIUM



Anticoagulant; low molecular weight heparin

INDICATIONS

Unstable coronary artery disease, i.e. unstable angina and non Q-wave myocardial infarction. Treatment of acute deep venous thrombosis. Prevention of clotting in the extracorporeal system during hemodialysis and hemofiltration in connection with acute renal failure or chronic renal insufficiency.

MECHANISM OF ACTION

The antithrombotic effect of dalteparin sodium is dependent on its ability to potentiate the inhibition of Factor Xa and thrombin by antithrombin (AT). It has a relatively higher ability to potentiate Factor Xa inhibition than to prolong plasma clotting time (APTT). It has a smaller effect on platelet function and platelet adhesion than heparin, and thus has only a small effect on primary hemostasis.

DOSAGE

Unstable coronary artery disease: 120 IU/kg body weight is administered subcutaneously twice daily. Maximum dose is 10,000 IU/12 hrs. Treatment should be continued for at least 6 days or longer.

CONTRAINDICATIONS

Hypersensitivity. Acute gastroduodenal ulcer and cerebral hemorrhage. Severe coagulation disorders. Septic endocarditis injuries to and operations on the central nervous system, eyes and ears.

DRUG INTERACTIONS

Concomitant medication with effect on hemostasis, such as, NSAIDs, vitamin-K antagonists and dextran, may enhance the anticoagulant effect. However,

unless specifically contraindicated patients with unstable coronary artery disease, i.e. unstable angina and non Q-wave myocardial infarction, should receive oral low dose acetylsalicylic acid.

ADVERSE EFFECTS

Bleeding at high dosage. Subcutaneous hematomas at injection site. Thrombocytopenia, skin necrosis.

SPECIAL PRECAUTIONS

Use cautiously in thrombocytopenia and platelet defects, severe liver and kidney in sufficiency's, uncontrolled hypertension, hypertensive or diabetic retinopathy pregnancy.

ENOXAPARIN



Low molecular weight heparin

INDICATIONS

Unstable angina, deep vein thrombosis, non-Q wave myocardial infarction.

MECHANISM OF ACTION

Its main action is to increase the inhibitory action of antithrombin III (AT III) on factors XIIa, IXa, Xa and thrombin. Heparin also inhibits thrombin thus preventing the conversion of fibrinogen to fibrin. Heparin inhibits platelet function.

DOSAGE

30 mg OD to 1 mg/kg body weight.

CONTRAINDICATIONS

Hypersensitivity, acute bacterial endocarditis; major bleeding disorder, hemorrhagic stroke, drug-induced thrombocytopenia.

DRUG INTERACTIONS

Anticoagulants, Aspirin, NSAIDs.

ADVERSE EFFECTS

Thrombocytopenia, mild bleeding,

inj. site irritation, pain and ecchymosis, hypersensitivity and erythema.

SPECIAL PRECAUTIONS

Use cautiously in renal/hepatic impairment, history of GI ulceration, uncontrolled hypertension, spinal/epidural anaesthesia, pregnancy, lactation and elderly. Periodic blood counts, including platelet count, and stool occult blood test recommended.

NADROPARIN CALCIUM



Low molecular weight heparin

INDICATIONS

Prevention of deep vein thrombosis and risk reduction for pulmonary embolism, thrombus formation during hemodialysis.

MECHANISM OF ACTION

It is one of the low molecular weight fragments of heparin and acts in a way similar to heparin itself.

DOSAGE 20-40 mg once daily subcutaneously.

CONTRAINDICATIONS

Hypersensitivity, acute septic endocarditis, hemorrhagic stroke, peptic ulcer, history of thrombocytopenia.

DRUG INTERACTIONS

Oral anticoagulants, platelet aggregation inhibitors, NSAIDs, aspirin or dextran.

ADVERSE EFFECTS

Hemorrhage, thrombocytopenia, local reactions.

SPECIAL PRECAUTIONS

Use cautiously in hepatic insufficiency, peptic ulcer, arterial hypertension, diabetic nephropathy, spinal anaesthesia and epidural block, pregnancy and lactation. Do not administer IM.

PARNAPARIN



Low molecular weight heparin

INDICATIONS

Deep vein thrombosis, unstable angina, non-Q wave myocardial infarction.

MECHANISM OF ACTION

Its main action is to increase the inhibitory action of antithrombin III (AT III) on factors XIIa, IXa, Xa and thrombin. Heparin also inhibits thrombin thus preventing the conversion of fibrinogen to fibrin. Heparin inhibits platelet function.

DOSAGE

30 mg OD to 1 mg/kg body weight.

CONTRAINDICATIONS

Hypersensitivity, acute bacterial endocarditis; major bleeding disorder, hemorrhagic stroke, drug-induced thrombocytopenia.

DRUG INTERACTIONS

Anticoagulants, aspirin, NSAIDs.

ADVERSE EFFECTS

Thrombocytopenia, mild bleeding, inj. site irritation, pain and

ecchymosis, hypersensitivity and erythema.

SPECIAL PRECAUTIONS

Use cautiously in renal/hepatic impair., history of GI ulceration, uncontrolled hypertension., spinal/epidural anaesthesia, pregnancy, lactation and elderly. Periodic blood counts, including platelet count, and stool occult blood test recommended.

REVIPARIN SODIUM



Low molecular weight heparin

INDICATION

Intraoperative and postoperative prophylaxis of deep vein thrombosis in patients with a low to moderate thromboembolic risk.

MECHANISM OF ACTION

Reviparin sodium, like heparin, inhibits clotting of blood *in vitro* and *in vivo* by enhancing the action of antithrombin III. Antithrombin III inhibits the activity of activated clotting factors including thrombin (factor III) & activated factor X (Factor Xa)

DOSAGE

Once daily subcutaneous injection of one 0.25ml prefilled syringe. The first injection should be given 2 hours before surgery. The injection

should be administered to pinched-up skin in the abdominal wall between the naval and the iliac crest, or on the front of the thigh.

CONTRAINDICATION

Invasive procedures involving the CNS, lumbar puncture, spinal anaesthesia, including epidural anaesthesia, known allergy to reviparin sodium and/or heparin, including allergic thrombocytopenia, conditions associated with an elevated bleeding risk, such as hemorrhagic diathesis, coagulation factor deficit, severe liver, kidney or pancreatic disease. Pregnancy and lactation.

DRUG INTERACTIONS

Aspirin, coumarin derivatives,

dipyridamole, dextrans, cephalosporin-type antibiotics, high-dosed penicillin and NSAIDs, potentiate the effect of reviparin.

ADVERSE EFFECT

Raised incidence of bleeding, particularly from the skin, mucosa, wounds, GIT and urogenital tract. Increase in serum potassium levels. Allergic reactions, thrombocytopenia, osteoporosis on long-term use.

SPECIAL PRECAUTIONS

Not to be administered IM, in renal failure, diabetes mellitus, hypoaldosteronism with hyperkalemia. Use cautiously in children and elderly.



R_{osuchol}
Rosuvastatin 10mg / 20mg Tablets

► THROMBOLYTICS/FIBRINOLYTICS

STREPTOKINASE



Thrombolytic agent

INDICATIONS

- i) Acute evolving transmural myocardial infarction
- ii) deep vein thrombosis
- iii) pulmonary embolism
- iv) arterial thrombosis or embolism
- v) occlusion of arteriovenous cannulae.

MECHANISM OF ACTION

It is inactive as such, but combines with circulating plasminogen to form an activator complex which then causes limited proteolysis of other plasminogen molecules to plasmin. Plasmin breaks down clots as well as fibrinogen and other plasma proteins.

DOSAGE

MI: 7.5-15 lac UIV infused over 1 hrs. *DVT and pulmonary embolism:* 15 lac UIV infused over 6 hrs OR

2.5 lac UIV loading dose followed by 1 lac IV/hrs for 24 hrs.

CONTRAINDICATIONS

Active hemorrhage, hypo-fibrinogenemia, recent (within 2 months) CVA, intracranial or intraspinal surgery, intracranial neoplasm, severe uncontrolled hypertension, hypersensitivity.

ONSET OF EFFECT

Immediate.

DURATION OF ACTION

A few minutes after stopping the drug (half life : 30-60 mins).

DRUG INTERACTIONS

↓dose required with oral anti-coagulants, heparin, antiplatelet drugs, allopurinol, quinidine, hormones, sulphonamides, tetracyclines, valproic and some

essential oils. All of these carry increased risk of hemorrhage when used concomitantly with streptokinase.

ADVERSE EFFECTS

Anaphylaxis, fever, arrhythmias, hypotension, wheezing, excessive bleeding, rash/itching. Liver enzyme abnormalities and allergic reactions.

SPECIAL PRECAUTIONS

Antistreptococcal postinfection antibodies, if present, inactivate a considerable fraction of the initial dose of streptokinase. A loading dose is therefore necessary. Use cautiously in diabetic hemorrhagic retinopathy, CVA, subacute bacterial endocarditis.

TISSUE TYPE PLASMINOGEN ACTIVATOR



Anti-thrombotic

INDICATIONS

Lysis of suspected occlusive coronary artery thrombi associated with evolving transmural MI in adults.

MECHANISM OF ACTION

It has been obtained from cultured human melanoma cells and attempts are being made to synthesize it through biotechnology. It selectively activates gel phase plasminogen that is bound to fibrin. Its use can avoid bleeding which occurs with streptokinase and urokinase due to simultaneous activation of soluble plasminogen.

DOSAGE

100 mg IV over 3 hrs to be administered under close supervision in hospitals only.

CONTRAINDICATIONS

Hypertension with possible cerebrovascular hemorrhage, ulcerative colitis, subacute bacterial endocarditis, GI bleeding, recent hemorrhage, acute pancreatitis or hepatic disease, recent trauma. Safety and effectiveness not established in pregnancy and in children.

DRUG INTERACTIONS

Increased risk of GI bleeding with NSAIDs, heparin reduces risk of coronary reocclusion.

ADVERSE EFFECTS

Nausea, vomiting, headache, rash, pruritis, intra-cerebral hemorrhage, GI and genitourinary bleeding.

SPECIAL PRECAUTIONS

Use cautiously in diabetes mellitus, proliferative diabetic retinopathy, hepatic and renal impairment, recent surgery or invasive procedures. Use with caution in lactating women and in elderly.

INDICATIONS

i) Myocardial infarction ii) pulmonary embolism iii) acute ischemic stroke.

MECHANISM OF ACTION

It specifically activates gel phase plasminogen already bound to fibrin, and has little action on circulating plasminogen.

DOSAGE

Acute MI: 15 mg IV bolus followed by 50 mg over 30 mins., Further followed by 40 mg over the next 1 hrs. **Pulmonary embolism:** 10 mg IV followed by 90 mg over 2 hrs. Patients weighing less than 67 kg should receive a total of 1.5 mg/mg. Heparin is to be given concurrently or immediately following fibrinolysis.

CONTRAINDICATIONS

Recent or current bleeding, hemorrhagic disorders, severe liver disease, active peptic ulceration, hypersensitivity, acute pancreatitis, oesophageal varices, bleeding P/V, aneurysm, bacterial endocarditis, severe hypertension with history of recent CVA.

ONSET OF EFFECT

The clot starts to dissolve as soon as the drug reaches it.

DURATION OF ACTION

The effect stops within few min. of stopping the drug.

DRUG INTERACTIONS ↓ dose required with NSAIDs. Concomitant use of heparin decreases the risk of coronary reocclusion.

ADVERSE EFFECTS

Skin rash, localized bleeding, allergies, GI bleeding, nausea, vomiting, mild hypotension, arrhythmias, fever, headache, intracranial hemorrhage, bleeding from puncture site, gingival tissues & urinary tract.

SPECIAL PRECAUTIONS

Use cautiously in impaired hepatic or renal function, patients with weight less than 65 kgs, proliferative diabetic retinopathy, recent surgery, diabetes mellitus, cerebrovascular accident (CVA).

UROKINASE

Thrombolytic agent

INDICATIONS

i) Pulmonary embolism ii) acute myocardial infarction in patients in whom earlier streptokinase has been used iii) deep vein thrombosis iv) lysis of fibrin or blood deposits in the anterior chamber of the eye.

MECHANISM OF ACTION

It is obtained from cultured human kidney cells and directly converts plasminogen into plasmin which then degrades fibrin clots as well as fibrinogen and other plasma proteins.

DOSAGE

MI: 2.5 lac IU IV over 10 mins. Followed by 5 lac IU over next

60 mins. (stop in between if full re-canulation occurs). **Venous thrombosis and pulmonary embolism:** 50,000 IU over 10 mins. IV followed by 3 lac IU infused over 8-12 hrs, then 50,000 IU daily for 6-13 days.

CONTRAINDICATIONS

Severe hypertension, aneurysm, GI bleeding, hemorrhagic disorders, recent CVA, hypofibrinogenemia, recent history of trauma or surgery.

ONSET OF EFFECT

Within mins.

DURATION OF ACTION

The effect disappears within a few hours of stopping the drug.

DRUG INTERACTIONS

↓ dose required with anticoagulants, antiplatelet drugs and NSAIDs.

ADVERSE EFFECTS

Fever, chills, hypotension, palpitation, dyspnea, cyanosis and hypoxemia, allergy, bleeding at puncture site, internal hemorrhage.

SPECIAL PRECAUTIONS

Use cautiously in renal or hepatic impairment, cerebrovascular disease, coagulation defects, subacute bacterial endocarditis, CVA, diabetic hemorrhagic retinopathy, monitor for reperfusion arrhythmias. Aspirin should not be given for fever.



Rosuchol

Rosuvastatin 10mg / 20mg Tablets

► OTHERS

AMINOCAPROIC ACID



NR



Fibrinolytic inhibitor;
hemostatic/anti hemorrhagic

INDICATIONS

Acute bleeding.

MECHANISM OF ACTION

It inhibits plasminogen activators and also possesses a lesser degree of anti-plasmin activity.

DOSAGE

Acute bleeding: Oral: Adults: 10 tablets (5g) or 4 tsp syrup (5g) during first hour, followed by 2 tablets (1g) or tsp syrup (1.25g) per hr.

Intravenous: Adults: 16 to 20 ml (4 to 5g) in 250 ml diluent infused for the first hour followed by 4ml/hour in 50 ml of diluent.

CONTRAINDICATIONS

Bleeding caused due to disseminated intravascular coagulation.

DRUG INTERACTION

Prolongation of template bleeding time.

ADVERSE EFFECTS

Edema, headache, malaise, allergic and anaphylactic reactions, anaphylaxis, bradycardia, hypotension, peripheral ischemia, thrombosis, abdominal pain, diarrhea, nausea, vomiting, agranulocytosis, coagulation disorder, leukopenia, thrombocytopenia, increased creatine phosphokinase

(CPK), muscle weakness, myalgia, myopathy, myositis, rhabdomyolysis, confusion, convulsions, delirium, dizziness, hallucinations, intracranial hypertension, stroke, syncope, dyspnea, nasal congestion, pulmonary embolism, pruritus, rash tinnitus, decreased vision, watery eyes, increased blood urea nitrogen (BUN), dry ejaculation.

SPECIAL PRECAUTIONS

Use cautiously in urinary tract bleeding, hematuria, skeletal myopathy, new born. Monitor creatine phosphokinase (CPK), avoid administration with factor IX complex concentrates.

ANTIDIURETIC HORMONE/ANALOGUES

DESMOPRESSIN



Vasopressin Analogue

INDICATIONS

- (i) Diabetes insipidus
- ii) primary nocturnal enuresis
- iii) nocturia associated with multiple sclerosis
- iv) renal function testing, hemophilia a and Von Willebrand's disease (IV infusion).

MECHANISM OF ACTION

Antidiuresis is the principal action which is exerted via the V_2 receptor linked adenyl cyclase system in the collecting tubule. This action makes the peptide ideal for the treatment of central diabetes insipidus and nocturnal enuresis. At high doses, this peptide increases plasma concentrations of factor VIII & liberates factor VIII R Ag

and plasminogen activator from endothelial cells; successfully used in certain bleeding disorders.

DOSAGE

Intra-nasally: *Diabetes insipidus diagnosis:* Adults and child: 20 µg. *Diabetes insipidus treatment:* Adults 10-40 µg daily (in 1 or 2 divided doses) Child: 5-20 µg. Infants may require lower doses.

CONTRAINDICATIONS

Hypersensitivity, psychogenic or habitual polydipsia, decompensated cardiac failure with ongoing diuretic treatment.

DRUG INTERACTIONS

Use other vasopressors in large

doses should be done under careful monitoring.

ADVERSE EFFECTS

Fluid retention, hyponatremia on administration without restricting fluid intake, stomach ache, headache, nausea, vomiting, epistaxis. Allergic reactions ranging from urticaria to anaphylaxis may occur.

SPECIAL PRECAUTIONS

Use cautiously in renal impairment, cardiovascular disease and hypertension (not indicated for nocturnal enuresis and nocturia in those over 65 years), cystic fibrosis.

TERLIPRESSIN



Vasopressin Analogue

INDICATIONS

Vasoconstrictive action on bleeding varices, water retention, pituitary diabetes insipidus and oesophageal varices.

MECHANISM OF ACTION

It has antidiuretic activity, also has activities of blood vessel contraction and blood clotting stimulation.

DOSAGE

According to manufacturers instructions.

CONTRAINDICATIONS

Vascular disease; pregnancy.

ADVERSE EFFECTS

Though the following adverse reactions are produced with lysin vasopressin, the severity will be less with terlipressin. Adverse effects produced include bradycardia, cardiac failure, MI, respiratory distress, abdominal cramps, angina, cardiac arrhythmias, skin pallor, sensation of facial warmth,

nausea, feelings of weakness and headache.

SPECIAL PRECAUTIONS

Use cautiously in patients with hypertension, cardiac disorders, renal insufficiency; elderly; lactation and impaired hepatic function.

VASOPRESSIN



Antidiuretic hormone

INDICATIONS

- i) Pituitary diabetes insipidus
- ii) bleeding from oesophageal varices.

MECHANISM OF ACTION

Antidiuresis is the main action exerted through V_2 receptors. At high doses plasma concentration of factor VIII is increased.

DOSAGE

DI S/C or IM: 5-20 units every 4 hrs. *Bleeding oesophagus varies:* 20 units over 15 mins. to control bleeding.

CONTRAINDICATIONS

Vascular disease, chronic nephritis (unless reasonable blood nitrogen concentration achieved).

DRUG INTERACTIONS

↓ dose required with carbamazepine, chlorpropamide, clofibrate, urea, fludrocortisone, TCAs and ganglion blockers. ↑ dose required with demeclocycline, noradrenaline, lithium, heparin.

ADVERSE EFFECTS

Pallor, nausea, bleeding, abdominal cramps, desire to defecate,

hypersensitivity. Constriction of coronary arteries may cause anginal attacks, myocardial ischemia.

SPECIAL PRECAUTIONS

Administered in low doses with extreme caution, especially in vascular diseases.

ANTIHYPERTENSIVES

► ACE INHIBITORS

BENAZEPRIL



ACE Inhibitor

INDICATIONS

Hypertension, CHF.

MECHANISM OF ACTION

It inhibits ACE and causes reduced level of angiotensin (AT) II and reduced aldosterone levels. Blood pressure is reduced and CHF signs and symptoms are reduced as salt and water retention is corrected. It increases renal blood flow.

DOSAGE

Adults: 10-40 mg OD as single or in divided dosage. Max. 80 mg. if creatinine clearance \leq 30 ml/min, then start with 5 mg/day with cautiously increasing the dose. Children (> 6 yrs.): 0.2mg/kg OD as monotherapy.

CONTRAINDICATIONS

Hypersensitivity to benazepril. History of angioedema, pregnancy.

DRUG INTERACTIONS

\downarrow dose with β -blockers, calcium blockers and diuretics.

\downarrow anticoagulant effect of warfarin. K⁺sparing diuretics used concomitantly cause hyperkalemia.

ONSET OF EFFECT

Anti hypertensive effect onset 30 min and max 2-4 hrs. ACE blockade: max 1-2 hrs.

DURATION OF ACTION 24 hrs.**ADVERSE EFFECTS**

Headache, upper respiratory tract

symptoms like cough, flushing, edema, palpitation, chest pain, fatigue, dizziness, headache, myalgia, back pain, somnolence, nausea, vomiting, abdominal pain, diarrhea, pancreatitis, anxiety, nervousness, angioedema, photosensitivity, SJ syndrome, impotence, azotemia, proteinuria.

SPECIAL PRECAUTIONS

Use cautiously in renal disease including renal artery stenosis, surgery/anaesthesia, Facial edema, hepatic dysfunction (the latter rarely progressing to hepatic failure): stop Rx. Monitor blood counts.

CAPTOPRIL



ACE Inhibitor

INDICATIONS

i) All grades of hypertension ii) scleroderma/crisis iii) diabetic nephropathy iv) congestive heart failure.

MECHANISM OF ACTION

It inhibits angiotensin converting enzyme (ACE) and causes reduced level of AT II and reduced aldosterone levels. Blood pressure is reduced and CHF signs and symptoms are reduced as salt and water retention is corrected. It increases renal blood flow.

DOSAGE

Adults: 25 mg TID increased gradually up to 100 mg TID. In CHF or patients on diuretics, start with 6.25 mg TID to avoid a sudden

fall in BP). Children: PO : 0.15 mg/kg/day in divided doses.

CONTRAINDICATIONS

Aortic stenosis, hypersensitivity, renal impairment, pregnancy.

DRUG INTERACTIONS

\downarrow dose with probenecid. \uparrow dose with NSAIDs. Concomitant immunosuppressive drug use causes bone marrow depression. Risk of hyperkalemia is there with concomitant use of K⁺ sparing diuretics.

ONSET OF EFFECTS

Within 1-2 hrs.

DURATION OF ACTION

It is dose dependent. From 6-12 hrs.

ADVERSE EFFECTS

Neutropenia is most serious side effect occurring within 3 months of starting therapy. Hyperkalemia in presence of effects.

SPECIAL PRECAUTIONS

Patients on diuretics or with sodium depletion should stop diuretics or increase sodium intake prior to start of therapy. Monitor 'WBC count and urinary protein in concomitant use in patients on immunosuppressants with renal impairment, systemic lupus erythematosus (SLE) or other autoimmune disorders. In CCF, diuretics and digoxin must be given concurrently when needed.

ENALAPRIL



ACE Inhibitor

INDICATIONS

- i) All grades of essential hypertension
- ii) renovascular hypertension
- iii) as an adjunct in the treatment of congestive cardiac failure.

MECHANISM OF ACTIONS

Enalapril gets converted to active metabolite enalapril. It inhibits angiotensin converting enzyme and causes reduced level of AT II and reduced aldosterone levels.

DOSAGE

Essential and renovascular hypertension: initially 5 mg OD (with diuretic 2.5 mg OD). *Maintenance dose :* 10-20 mg OD or in divided

doses. *CHF:* start with 2.5 mg OD and build up to 5-20 mg/day in one or two doses.

CONTRAINdications

Hypersensitivity, anuria, aortic stenosis, outflow obstruction, hepatic cirrhosis.

DRUG INTERACTIONS

Antihypertensives: enhanced hypotension. Lithium: increased blood levels and adverse effects of the lithium. K⁺ supplements & K⁺ sparing diuretics: increased K⁺ levels. NSAIDs : reduced enalapril effects.

ONSET OF EFFECT

Within 1 hr.

DURATION OF ACTION

24 hrs.

ADVERSE EFFECTS

Nausea, rash, persistent cough, muscle cramps, dizziness, headache, angioedema, renal failure.

SPECIAL PRECAUTIONS

Use cautiously in chronic renal disorder or failure. Reduce dose in elderly.

FOSINOPRIL



ACE Inhibitor

INDICATIONS

Mild to moderate hypertension, heart failure, acute myocardial infarction, nephropathy.

MECHANISM OF ACTION

Fosinopril is a prodrug which is de-esterified to fosinoprilat, a specific competitive inhibitor of angiotensin converting enzyme (ACE). In animal models, it has shown to lower BP without affecting the heart rate.

DOSAGE

In hypertension the usual dosage range is 20-40 mg. In heart failure

initial dose is 10 mg OD which may be increased to 40 mg. In moderate to severe renal failure 5mg is preferred.

In myocardial infarction initial dose is 5 mg which can be doubled up to 20 mg and in nephropathy the dose is 10mg.

CONTRAINDICATIONS

Hypersensitivity to the drug or any other angiotensin converting enzyme (ACE) inhibitor, history of angioedema, pregnancy, lactation.

DRUG INTERACTIONS

Diuretics, thiazides, potassium sparing diuretics, antacids.

ADVERSE EFFECTS

Usually well tolerated but side effects infrequently reported are chest pain, edema, hypertension crisis, rhythm disturbances, palpitations, hypotension, rashes, angioedema and dizziness.

SPECIAL PRECAUTIONS

Use cautiously in impaired renal and hepatic function, hyperkalemia. Impair absorption of fosinopril.

IMIDAPRIL



ACE Inhibitor

INDICATIONS

Essential hypertension.

MECHANISM OF ACTION

Imidapril is an angiotensin converting enzyme (ACE) inhibitor which inhibits the conversion of angiotensin I to II. This leads to marked peripheral vasodilation and blood pressure lowering effects.

DOSAGE

5 to 10 mg once daily.

CONTRAINDICATIONS

Hypersensitivity to imidapril or any other ACE inhibitors, history of angioneurotic edema, hereditary/idiopathic angioedema, renovascular hypertension, renal failure (creatinine clearance <10ml/min).

DRUG INTERACTIONS

Similar as of other ACE Inhibitors. Rafampicin: plasma concentration of active metabolites of imidapril

reduced by rifampicin (reduced antihypertensive effect).

SPECIAL PRECAUTIONS

As with other ACE inhibitors. Kidney transplantation, psoriasis, hypotension, renal insufficiency, hypersensitivity to insect toxins/bites, hyperkalemia, surgery/anaesthesia, aortic stenosis/hypertrophic cardiomyopathy, neutropenia\ agranulocytosis, proteinuria.

LISINOPRIL



ACE Inhibitor

INDICATIONS

i) Hypertension ii) congestive cardiac failure (CCF) iii) acute myocardial infarction.

MECHANISM OF ACTION

It causes inhibition of ACE to reduce levels of ATII and aldosterone. It also causes peripheral vasodilatation and reduces total peripheral resistance (TPR). Blood pressure reduction is increased by decreased salt and water retention. Reduces afterload in CHF and also decreases post capillary wedge pressure.

DOSAGE

Adults : Initially 2.5 mg OD to 5-20 mg OD. Max.: 40 mg. Reduced doses necessary in CCF and elderly.

CONTRAINDICATION

Hypersensitivity, Aortic stenosis, Outflow obstruction.

DRUG INTERACTIONS

↓ effect with Indomethacin, antacids.

ONSET OF EFFECT

Within 1-2 hrs.

DURATION OF ACTION

Up to 24hrs.

ADVERSE EFFECTS

Hypotension, renal failure, dizziness, headache, diarrhea, hyperkalemia and angioedema.

SPECIAL PRECAUTIONS

Use cautiously in renal dysfunction, major surgery or anaesthesia, in severe cardiac failure, sudden hypotension may lead to oliguria and acute renal failure. Reduce dose in elderly.

PERINDOPRIL



ACE Inhibitor

INDICATIONS

i) Hypertension ii) congestive cardiac failure.

MECHANISM OF ACTION

It inhibits angiotensin converting enzyme and causes reduced level of AT II and reduced aldosterone levels. BP is reduced and CHF signs and symptoms are reduced as salt and water retention is corrected. It increases renal blood flow.

DOSAGE

Hypertension: 4 mg OD. May be increased up to 8 mg OD after one month. Elderly: 2 mg OD to be increased to 4 mg OD after 1-2 wks.

CCF: 2 mg OD may be increased up to 4 mg OD after one month.

CONTRAINDICATIONS

Hypersensitivity to the drug, children, pregnancy, lactation.

ONSET OF EFFECT

Within 1 hr.

DURATION OF ACTION

Up to 24 hrs.

DRUG INTERACTIONS

↓ dose required with Allopurinol, ↑ dose required with Indomethacin, antacids. ↑ plasma digoxin levels, hyperkalemia.

ADVERSE EFFECTS

Headache, upper respiratory tract symptoms like cough, flushing,

edema, palpitation, chest pain, fatigue, dizziness, headache, myalgia, back pain, somnolence, nausea, vomiting, abdominal pain, diarrhea, pancreatitis, anxiety, nervousness, angioedema, photosensitivity, SJ syndrome, Impotence, ↑ serum creatinine, ↓Hb, ↓platelets, ↓neutrophils, ↑K⁺, azotemia and proteinuria.

SPECIAL PRECAUTIONS

Reduce dose in elderly. Use cautiously in renal disease, GIT infection, CCF, renal artery stenosis, severe diarrhea and vomiting, salt depletion (may cause hypotension).

QUINAPRIL



ACE Inhibitor

INDICATION

- i) Hypertension ii) heart failure.

MECHANISM OF ACTION

Quinapril inhibits the conversion of angiotensin I to angiotensin II resulting in lower levels of angiotensin II that further leads to decreased vasoconstriction, aldosterone secretion and increase in renin activity.

DOSAGE:

Hypertension: Adults: The recommended initial dose is 10 mg once daily. Maintenance: 20-40 mg daily

Elderly: The recommended initial dose is 2.5 mg daily.

Renal impairment: Initial dose of 2.5 mg once daily is recommended.

Heart failure: Adults: The recommended initial dose is 2.5 mg daily. Maintenance: 10-20 mg daily. Max dose: 40 mg daily.

DOSAGE ADJUSTMENT

Patients receiving diuretics or with

renal impairment in the treatment of hypertension: Initially, 2.5 mg daily.

ONSET OF ACTION

1 hour.

DURATION OF ACTION

24 hours.

CONTRAINDICATIONS

Hypersensitivity, aortic stenosis or outflow tract obstruction, renovascular disease. Pregnancy.

DRUG INTERACTION

Potassium-sparing diuretics, potassium supplements, NSAIDs, diuretics, other antihypertensives, alcohol, other agents that lower BP.

ADVERSE EFFECTS

Severe side effects are pronounced hypotension which could result in MI or stroke in patients with ischemic heart disease or cerebrovascular disease. Anaphylactic reactions including angioedema of the face, extremities, lips, tongue, glottis

and larynx. Dizziness, headache, fatigue, GI disturbances, taste disturbances, persistent dry cough and other upper respiratory tract symptoms, skin rashes, angioedema, hypersensitivity reactions, renal impairment, hyperkalemia, hyponatremia, blood disorders, proteinuria, chest pain, palpitations, tachycardia.

SPECIAL PRECAUTIONS

Symptomatic hypertension, peripheral vascular diseases, generalized atherosclerosis, idiopathic or hereditary angioedema, heart failure; patients likely to be salt or water depleted; monitor renal function before and during therapy; monitor WBC counts regularly; liver cirrhosis; surgery; anaesthesia. Lactation: Elderly.

RAMIPRIL



ACE Inhibitor

INDICATIONS

- i) Hypertension ii) heart failure.

MECHANISM OF ACTION

It causes inhibition of ACE to reduce levels of ATII and aldosterone. It also causes peripheral vasodilatation and reduced total peripheral resistance (TPR). Blood pressure reduction is increased by decreased salt and water retention. Reduces afterload in CHF and also decreases pulmonary capillary wedge pressure (PCWP). It is a longer acting agent. It reverses ventricular hypertrophy and cause reduced blood pressure without reflex tachycardia.

DOSAGE

Adults: Initially 1.25 mg increased to 2.5-5 mg OD. Max. 10 mg OD.

Creatinine clearance: Over 50 ml/min: No change, 20-50 ml/min: 1.25mg daily, < 20 ml/min: 1.25 every alternate day (Max 2.5 mg).

CONTRAINDICATIONS

Hypersensitivity, bilateral renal artery stenosis, or a single kidney with unilateral renal artery stenosis. Hepatic impairment - caution. Max daily dose 2.5 mg.

DRUG INTERACTIONS

↑K⁺ levels. ↓effects with NSAIDs.

ONSET OF EFFECT

Within 1-2 hr.

DURATION OF ACTION

Up to 24 hrs.

ADVERSE EFFECTS

Hypotension, nausea, vomiting, diarrhea, dizziness, fatigue, abdominal pain, hyperkalemia, angioedema, cough.

SPECIAL PRECAUTIONS

Use cautiously in renal/hepatic dysfunction, severe CHF, collagen vascular diseases, surgery, anaesthesia and while driving and operating heavy machinery. Reduce dose in elderly.

TRANDOLAPRIL



Angiotensin II
receptor antagonist

INDICATIONS

Hypertension.

MECHANISM OF ACTION

It is an ethyl ester prodrug of a non-sulphydryl angiotensin converting enzyme (ACE) inhibitor, trandolaprilat. The effect of trandolapril in hypertension appears to result primarily from the inhibition of circulating and tissue ACE activity thereby reducing angiotensin II formation, decreasing vasoconstriction, decreasing aldosterone secretion, and increasing plasma renin. Decreased aldosterone secretion leads to diuresis, natriuresis, and a small increase of serum potassium.

DOSAGE

2 to 4 mg once daily. Patients inadequately treated with once-daily dosing at 4 mg may be treated with twice-daily.

CONTRAINDICATIONS

Hypersensitive patients with a history of angioedema.

DRUG INTERACTIONS

Trandolapril component as with other ACE inhibitor patients on diuretics—especially those on recently instituted diuretic therapy, may occasionally experience an excessive reduction in BP after initiation of therapy.

ADVERSE EFFECTS

Cough, dizziness, diarrhea and hypotension. AV first degree block, bradycardia, edema, flushing, hypotension, palpitations, drowsiness, insomnia, paresthesia, vertigo, pruritus, rash, abdominal distention, abdominal pain/cramps, constipation, dyspepsia, diarrhea, vomiting, pancreatitis.

SPECIAL PRECAUTIONS

Use cautiously in impaired renal function, hyperkalemia and potassium-sparing diuretics, cough.

► ADRENERGIC NEURON BLOCKERS – ALPHA BLOCKERS

DOXAZOSIN



α_1 antagonist

INDICATIONS

- i) Benign prostatic hyperplasia
- ii) hypertension- as monotherapy and combination therapy with ACE inhibitors, β -blockers, calcium channel antagonists and diuretics.

MECHANISM OF ACTION

It is a quinazoline derivative with α_1 antagonistic property. It blocks α_1 receptors post synaptically in arterioles and venous vascular beds causing vasodilation and reduced BP.

DOSAGE

Hypertension: PO: Initially 1mg/

day, max 16 mg/day. 1mg/day (to minimise the risk of postural hypotension) and titrated upwards at 1-2 wk intervals.

BPH: Maximum 8 mg/day, started at 1 mg/day and titrated upwards at 1-to-2 week intervals.

CONTRAINDICATIONS

Hypersensitivity to doxazosin.

DURATION OF ACTION

Up to 36 hrs.

ADVERSE EFFECTS

Dizziness, fatigue/malaise, somnolence, edema, rhinitis,

nausea, postural effects (dose-related, most likely to occur within 2-6 hrs), hypotension, dizziness, dyspnea.

SPECIAL PRECAUTIONS

Use cautiously in peptic ulcer, dehydration, hepatic dysfunction, autonomic neuropathy. To start treatment on a low dose given at bedtime (to avoid first dose hypotension). Carcinoma prostate to be ruled out.

PHENOXYBENZAMINE



Sympatholytics

INDICATIONS

It is indicated in the management of hypertensive episodes associated with pheochromocytoma.

DOSAGE

Adults: In pheochromocytoma, the dosage generally required to achieve blood pressure control is 1-2 mg/kg body mass daily. Dosage range is usually 20 to 60 mg daily in two divided doses.

Concomitant beta-adrenergic blockade is required to control tachycardia and arrhythmias when pheochromocytomas are excreting an appreciable amount of adrenaline as well as noradrenaline. Children: There is little experience in children, but doses of 1 - 1.5 mg/kg body mass per day in pheochromocytoma have been used in divided dosages.

CONTRAINDICATION

Pregnancy.

ADVERSE EFFECTS

Sedation, fatigue, nasal congestion, miosis, postural hypotension with dizziness and compensatory tachycardia, inhibition of ejaculation may occur. Gastrointestinal irritation may be noticed in some cases.

PRAZOSIN



α_1 antagonist

INDICATIONS

- i) Mild to moderate hypertension
- ii) congestive heart failure (CHF)
- iii) hypertensive crisis iv)
- pheochromocytoma v)
- benign prostatic hypertrophy vi)
- bladder neck dysfunction iv)
- Raynaud's disease.

MECHANISM OF ACTION

It blocks α_1 adrenoceptors and reduces BP with minimal effect on heart rate. It reduces the vascular tone in prostate and increases urinary flow rates in patients with BPH.

DOSAGE

Prazosin 'plain': HT 0.5-1 mg BID/TID, increased up to 20 mg/day. Heart failure: 0.5 mg

2-4 times/day up to 4-20 mg/d.
BPH: 0.5 mg BID, max 2 mg/day
Beyond 1 mg TID unhelpful.
Prazosin gits: 2.5 mg OD, preferably HS. Max 20 mg/day after weekly increments.

CONTRAINDICATIONS

Cardiac failure due to mechanical obstruction. Hypersensitivity.

ONSET OF EFFECT:

Within 2 hrs.

DURATION OF ACTION:

6-8 hrs.,

long acting preparation 24 hrs.

DRUG INTERACTIONS: ↑ BP lowering effect with beta blockers, calcium channel blockers and diuretics : enhanced blood pressure lowering effect (postural hypotension).

DIURETICS

Aggravate sodium depletion.

ADVERSE EFFECTS: First dose hypotension, postural hypotension, syncope, palpitations, headache, lassitude, drowsiness, sudden loss of consciousness, dizziness, rash.

SPECIAL PRECAUTIONS

Pheochromocytoma, abrupt withdrawal to be avoided, impaired liver function, children under 17 years, concurrent use with other antihypertensive.

SILODOSIN



α_1 antagonist

INDICATIONS

To treat the symptoms of benign prostatic hyperplasia (BPH), including difficulty urinating (hesitation, dribbling, weak stream, and incomplete bladder emptying), painful urination, and urinary frequency and urgency.

MECHANISM OF ACTION

Blocks alpha-1A adreno-receptors in the prostate gland, the bladder and the urethra, and allows these muscles to relax, making it easier to pass urine and relieving the symptoms of BPH.

DOSAGE

Starting dose is 4 mg once a day for men with moderate kidney problems. Can be increased to 8 mg once a day after a week. Should be taken with food, preferably at the same time every day.

CONTRAINDICATIONS

- Severe renal impairment [Creatinine Clearance (CCr < 30 mL/min)].
- Severe hepatic impairment (Child-Pugh score > 10).
- Concomitant administration with strong CYP3A4 inhibitors (e.g., ketoconazole, clarithromycin, itraconazole, ritonavir).

DRUG INTERACTIONS

- Concomitant use of strong P-glycoprotein inhibitors (e.g., cyclosporine) and alpha blockers is not recommended.
- Concomitant use of PDE5 inhibitors can potentially cause symptomatic hypotension.

ADVERSE EFFECT

Most common adverse reactions (incidence $\geq 2\%$) are retrograde ejaculation, dizziness, diarrhea,

orthostatic hypotension, headache, nasopharyngitis, and nasal congestion.

SPECIAL PRECAUTIONS

- Postural hypotension, with or without symptoms (e.g., dizziness), may develop when beginning silodosin treatment.
- Dose should be reduced to 4 mg once daily in patients with moderate renal impairment.
- Patients should be examined thought to have BPH prior to starting therapy to rule out the presence of carcinoma of the prostate.
- Patients should be informed planning cataract surgery to notify their ophthalmologist that they are taking silodosin because of the possibility of intraoperative floppy iris syndrome (IFIS).

► ADRENERGIC NEURON BLOCKERS – BETA BLOCKERS

ACEBUTOLOL



Cardioselective β_1 blocker

INDICATIONS

Hypertension, Ventricular Arrhythmias, Angina.

MECHANISM OF ACTION

Acebutolol is a cardio selective β_1 receptor inhibitor. Epinephrine stimulates the activation of β_1 -receptors and increases the heart rate and the blood pressure. Acebutolol reverses the action of epinephrine and control heart rate and blood pressure. It also possesses some intrinsic sympathomimetic activity and membrane-stabilizing properties.

DOSAGE

200- 1200 mg, once or twice daily in divided doses

CONTRAINDICATIONS

Asthma/COPD, severe bradycardia, 2°/3° heart block, cardiogenic shock, overt heart failure, sinus bradycardia, sick sinus syndrome without permanent pacemaker.

ONSET OF ACTION

1.5-3 hr (initial response); 3-8 hr (peak response)

DURATION OF ACTION

12-24 hr.

DRUG INTERACTIONS

Exaggerated hypertensive responses have been reported from the combined use of beta-adrenergic antagonists and alpha-adrenergic stimulants, including those contained in proprietary cold remedies and vasoconstrictive nasal drops. Abrupt withdrawal of α_2 -agonist may lead to rebound hypertension. Increase the serum levels and bradycardic effect of acebutolol when co-administered with amiodarone. Co-administration of insulin and acebutolol may increase hypoglycemic effect of insulin. Caution may be advised for concomitant use of acebutolol and drugs like

acetohexamide, chlorpropamide, clonidine, dihydroergotamine, dihydroergotoxine, disopyramide, epinephrine, ergonovine, ergotamine, fenoterol, NSAIDs.

ADVERSE EFFECTS

Fatigue, dizziness, headache, constipation, diarrhea, dyspnea, nausea, flatulence, insomnia, abdominal pain, bradycardia, chest pain, dysuria, edema, heart failure, hypotension, impotence, myalgia, pharyngitis, pruritus, rhinitis, vomiting, wheezing.

SPECIAL PRECAUTIONS

Risk of anaphylactic reaction, impaired renal or hepatic function, Not recommended in pregnancy, lactation and children. It is in Category B: for 1st trimester and Category D in 2nd and 3rd trimester.

ATENOLOL



Cardioselective β_1 blocker

INDICATIONS

i) Hypertension ii) angina pectoris iii) myocardial infarction.

MECHANISM OF ACTION

It is a cardioselective β_1 blocker, reduces resting, exercise induced heart rate as also myocardial contractility. It reduces systolic and diastolic blood pressure. Anginal attacks are reduced in intensity and frequency and exercise tolerance is improved.

DOSAGE

HT: PO 25-50mg OD, max 100 mg OD after 1-2 week if required.

Angina: 25-50 mg OD, max 100 mg OD within 1 week if required,

Acute MI (with hemodynamic stability): IV (if within 12 hrs) 5-10 mg at 1 mg/mins in a CCU setting, follow

10-15 mins by PO 50 mg q 12 hrs for 24 hrs, follow by PO 100 mg (1 or 2 div doses)/d.

Arrhythmia: If urgent, IV 2.5 mg at 1mg/mins, repeat if required 5 mins up to 10 mg or infusion 150 mg/kg over 20 mins. Repeat the above 12 hrs if required. Maintain 50-100 mg/day.

Dialysis: 25-50 mg foll every dialysis.

CONTRAINDICATIONS

Sinus bradycardia, 2nd or 3rd degree heart block, cardiogenic shock, overt cardiac failure, anemia, hypersensitivity reaction.

ONSET OF EFFECT

Within 2-4 hrs.

DURATION OF ACTION

20-30 hrs.

DRUG INTERACTIONS

Antacids : reduced atenolol absorption. Antiarrhythmics : increased cardiac adverse effects. Indomethacin : ↓ antihypertensive effect.

ADVERSE EFFECTS

Rash, breathing difficulty, headache, fatigue/ depression, myalgia, nightmares sleeplessness, cold hands & feet, bronchospasm, constipation & paresthesia.

SPECIAL PRECAUTIONS

Use cautiously in chronic renal or hepatic dysfunction, poor circulation, asthma or bronchitis. Atenolol may have to be stopped prior to any surgery with general anaesthesia.

BISOPROLOL

Cardioselective β_1 blocker**INDICATIONS:**

- i) Hypertension ii) coronary artery disease.

MECHANISM OF ACTION

It is a competitive antagonist of β_1 receptors and causes dose dependent reduction in exercise induced tachycardia. It is long acting and causes reduced blood pressure. It also causes marked reduction in plasma renin activity.

DOSAGE:

Adults: 5 mg OD.

Increased to 5 mg BD if required.
Max : 20mg/day.

CONTRAINDICATIONS

Low cardiac output, congestive cardiac failure, peripheral vascular disease, heart block, conduction effects, COPD, severe hemorrhage.

ONSET OF EFFECT

Within 1-3 hrs.

DURATION OF ACTION

18-24 hrs.

DRUG INTERACTIONS:

↑ effect of anaesthetic agents, clonidine, calcium antagonists, digitalis, hypoglycemic agents and NSAIDs, plasma concentration of

rifampicin, steroids. Hypotension: vasopressors. Bronchospasm : isoproterenol and aminophylline.

ADVERSE EFFECTS

Headache, dizziness, nausea, GI disturbances, giddiness, headache, fatigue, cold extremities, reduced libido, dyspnea, insomnia, hallucinations, bradycardia.

SPECIAL PRECAUTIONS

Avoid sudden withdrawal of the drug. Use cautiously in renal dysfunction, diabetes mellitus, pregnancy, thyrotoxicosis. Reduce dose in children.

CARVEDILOL

Non selective β blocker with α_1 blocking property**INDICATIONS**

- i) Hypertension ii) stable angina
- iii) unstable angina iv) acute myocardial infarction v) congestive heart failure.

MECHANISM OF ACTION

It exerts antihypertensive activity by partly reducing total peripheral resistance and vasodilation by blocking α receptors and partly by inhibiting β mediated compensatory mechanism.

DOSAGE

Hypertension: PO: 12.5 mg OD x 2nd, then 25 mg/day. After 2 wk: 50 mg OD. If required.

Stable angina: PO 25-50 mg BID.

Controlled CHF: PO 3.125 mg BID. Maintenance: 25 mg BID.

CONTRAINDICATIONS

III degree heart block, shock, severe bradycardia, bronchial asthma, decompensated heart failure, COPD, hepatic impairment.

DRUG INTERACTIONS

Clonidine: barbiturates, tricyclic antidepressants, phenothiazines, vasodilating drugs, alcohol: increased carvedilol antihypertensive effects; particularly, clonidine should be gradually withdrawn before carvedilol withdrawal. Nifedipine: probable sudden hypotension.

Hypoglycemic: intensified insulin/OHA effects. Anaesthetics: negative inotropism.

ADVERSE EFFECTS

(Usually in early Rx) Postural hypotension, dizziness, headache, dyspnea, bronchospasm, bradycardia, malaise, asthenia.

SPECIAL PRECAUTIONS

Avoid abrupt withdrawal, can precipitate thyroid storm or exacerbation of hyperthyroidism, liver injury, vascular diseases, renal failure, diabetes, pregnancy.

CELIPIROLOL

 β_1 blocker, β_2 agonist**INDICATIONS**

- i) Hypertension ii) angina pectoris.

MECHANISM OF ACTION

It is a selective β_1 blocker and β_2 agonist with a vasodilatory effect with promise in asthmatic hypertensive patients.

DOSAGE

PO 200-600 mg OD.

CONTRAINDICATIONS

Heart failure, bradycardia.

DURATION OF ACTION

15-24 hrs.

ADVERSE EFFECTS

Headache, upper respiratory tract infection (URTI), dizziness, fatigue, metabolic derangement, raynaud's phenomenon, ortho-

static hypotension, muscle cramps, impotence, bronchial obstruction, tremor and rash.

SPECIAL PRECAUTIONS

The dose needs to be reduced in renal failure.



Rosuchol
Rosuvastatin 10mg / 20mg Tablets

ESMOLOL



β_1 blocker

INDICATIONS

- i) Supraventricular tachycardia
- ii) perioperative tachycardia
- iii) perioperative hypertension
- iv) wherever ↓ in ventricular rate urgently required.

MECHANISM OF ACTION

Cardioselective β_1 blocker causes rapid decreases in ventricular rate and also has antihypertensive action.

DOSAGE

Loading dose of 500 $\mu\text{g}/\text{kg}/\text{min}$ as infusion for 1 minute followed by 50 $\mu\text{g}/\text{kg}/\text{min}$ infusion for 4 minutes as maintenance dose. If required, repeat the same loading dose

followed by infusion of 100 $\mu\text{g}/\text{kg}/\text{min}$ as maintenance dose.

CONTRAINDICATIONS

Sinus bradycardia, heart block, cardiogenic shock, overt heart failure.

ONSET OF EFFECT

Within 5 mins.

DURATION OF ACTION

Approx. 9 mins.

DRUG INTERACTIONS

↑ bradycardia with CCBs. ↑ hypertension risk with inotropes, adrenaline or noradrenaline. ↑ blood digoxin levels, prolong neuromuscular blockade of suxamethonium. ↑ serum

level with warfarin. Reserpine : additive effect.

ADVERSE EFFECTS

Profound bradycardia and hypotension, dizziness, headache, confusion, fatigue, paresthesia, asthenia, depression, anxiety, anorexia, bronchospasm, blurred vision, urinary retention, fever, rigor and muscular pain.

SPECIAL PRECAUTION

Use cautiously in hypotension, depressed cardiac contractility, diabetes mellitus (DM), bronchospastic disease, renal impairment, pregnancy, lactation and children.

METOPROLOL



β_1 blocker

INDICATIONS

- i) Hypertension
- ii) angina pectoris,
- iii) acute myocardial infarction
- iv) migraine prophylaxis
- v) thyrotoxicosis.

MECHANISM OF ACTIONS

It inhibits β_1 receptors & causes reduced heart rate & decreased blood pressure. Cardiac output is reduced. Renin release is inhibited.

DOSAGE

HT: Angina, hyperthyroidism: PO: 100 mg OD. Max 200 mg BD. IV dose: *For SVT:* 5mg initially at 1-2 mg/mins. may be repeated at 5 min. Usually a total dose of 10-15 mg is adequate. Continue with oral therapy starting 4-6 hrs after the last

injection at 50 mg TDS. *Acute MI:* 5 mg IV every 2 minutes up to max of 15 mg. Oral therapy 15 mins later 50 mg 6 hourly for 48 hrs.

CONTRAINDICATIONS

Hypersensitivity, congestive cardiac failure, patients on oral hypoglycemic agents, cardiogenic shock, chronic obstructive pulmonary disease (COPD), 2nd or 3rd degree heart block, sick sinus syndrome, peripheral arterial disorders.

ONSET OF EFFECT

Within 1 hrs.

DURATION OF ACTION

Dose dependent: The higher the dose, the longer the duration: 4 to 16 hrs.

DRUG INTERACTIONS

↑ effect with reserpine, diuretics, NSAIDs. ↑ myocardial depression with general anaesthetics.

ADVERSE EFFECTS

Nausea, vomiting, headache, dizziness, diarrhea, nightmares, bradycardia, hypotension.

SPECIAL PRECAUTIONS

Use cautiously in chronic obstructive pulmonary disease (COPD), congestive heart failure (CHF), atrio-ventricular (AV) conduction disorders, bradycardia, peripheral arterial disease, liver cirrhosis, pheochromocytoma, pregnancy, sudden withdrawal.

NEBIVOLOL



Cardioselective β blocker

INDICATIONS

Treatment of essential hypertension with endothelial dysfunction e.g., with diabetes mellitus or hypercholesterolemia and in patients with ischemic heart disease.

MECHANISM OF ACTION

Nebivolol is the racemic mixture of the enantiomers L-nebivolol and D-nebivolol. It is a competitive and highly selective beta-1 receptor antagonist with mild vasodilating properties, possibly due to an interaction with the L-arginine/nitric oxide pathway.

DOSAGE

Adults: 5 mg once daily preferably at the same time of day.

CONTRAINDICATIONS

Cardiogenic shock, Sinus bradycardia, 2nd or 3rd degree heart block, bronchial asthma, uncontrolled congestive heart failure, severe hypoglycemia. It is contraindicated in pregnancy and lactation and in liver disease due to lack of data.

ONSET OF EFFECT

Within 1-3 hrs.

DURATION OF ACTION

18-24 hrs.

DRUG INTERACTIONS

Levels with cimetidine and chlorpromazine. Digitalis and anaesthetic agents: reduced heart rate, cardiac output.

ADVERSE EFFECTS

The most frequent adverse events (incidence between 1-10%) were headache, dizziness, tiredness & paresthesia. Other adverse events reported by at least 1% of patients were: diarrhea, constipation, nausea, dyspnea and edema. Other adverse events have been reported with a frequency of less than 1%.

SPECIAL PRECAUTIONS

Avoid sudden withdrawal of the drug. Use cautiously in renal dysfunction, diabetes mellitus, thyrotoxicosis, pregnancy. Reduce dose in children.

OXPRENOLOL



INDICATIONS

Hypertension, cardiac arrhythmia, functional sympathetic tonic cardiovascular disorders.

DOSAGE

Hypertension: 80-160mg daily in 2-3 divided doses, increase at 1-2 week intervals; max. 480mg daily.

Angina: 40-160 3 times daily. *Arrhythmias:* Initially 20-40mg 3 times daily, increased as necessary.

CONTRAINDICATIONS

Same as propranolol.

ONSET OF EFFECT

1-2 hours, full antihypertensive effects may take 2-3 weeks.

DURATION OF ACTION

6-12 hours.

DRUG INTERACTIONS

Corticosteroids: Efficacy of oxprenolol reduced.

Ergotamine: Increase adverse effects of ergotamine.

Insulin/oral diabetic drugs: Efficacy enhanced by oxprenolol.

ADVERSE EFFECTS

Nausea, epigastric discomfort, hypertension.

SPECIAL PRECAUTIONS

Patients with bronchial asthma, renal dysfunction diabetes.

PINDOLOL



Adrenergic blocker

INDICATIONS

Hypertension, angina pectoris.

MECHANISM OF ACTION

It is a non-selective adrenergic blocker with partial agonist activity.

CONTRAINDICATIONS

Cardiac failure, chronic obstructive pulmonary disease, bronchial

asthma, bradycardia, heart block (AV node).

ONSET OF EFFECT

< 1 hour.

DURATION OF ACTION

8-12 hours.

DRUG INTERACTIONS

Adrenaline: Marked increase in blood pressure.

ADVERSE EFFECTS

Dizziness, nausea, vomiting, headache, sleep disturbances.

SPECIAL PRECAUTIONS

Diabetes, renal dysfunction, general anaesthesia, in patients of pheochromocytoma blood pressure can rise steeply.



Rosuchol
Rosuvastatin 10mg / 20mg Tablets

PROPRANOLOL



β blocker

INDICATIONS

- i) Hypertension ii) angina pectoris
- iii) cardiac arrhythmia iv) post myocardial infarction, tachycardia
- v) tachyarrhythmias vi) hypertrophic obstructive cardio myopathy (HOCM) vii) pheochromocytoma.

MECHANISM OF ACTION

It is a nonselective beta blocker and reduces heart rate and cardiac output. Also decreases peripheral resistance on long term use. Blood pressure is reduced. Myocardial work load is also reduced. Propranolol reduces plasma renin activity. It has a membrane stabilizing action and is useful in arrhythmias.

DOSAGE

Hypertension: 10-40 mg 3-4 times daily. Slow releasing (SR) tablet of 60-240 mg OD.

Post MI: 180-240 mg OD in divided doses. Essential tremors.-40 mg BD increasing up to 240 or 320 mg/day in divided doses.

Pheochromocytoma: Only in association with a blocker 60 mg OD in divided doses for 3 days before surgery.

CONTRAINDICATIONS

Cardiogenic shock, sinus bradycardia, 2nd or 3rd degree heart block, bronchial asthma, congestive heart failure, severe hypoglycemia.

ONSET OF EFFECT

About: 1-2 hrs. Slow-release capsules: after 4 hrs In hypertension and migraine, it may be several weeks before full benefits of this drug are felt.

DURATION OF ACTION :

About: 6-12 hrs. Slow-release

capsules: 24-30 hrs.

DRUG INTERACTIONS

Effects with indomethacin and other NSAIDs. levels with cimetidine and chlorpromazine. digitalis and anaesthetic agents : reduced heart rate (HR), cardiac output.

ADVERSE EFFECTS

Lethargy/fatigue, rash, cold hands and feet, nausea, fainting, breathlessness, nightmares/vivid dreams, bronchospasm.

SPECIAL PRECAUTIONS

Switch over from conventional to slow releasing (SR) preparations, abrupt dose reduction, pregnancy, lactation, elderly, ischemic heart disease (IHD), congestive cardiac failure (CCF). Use cautiously in renal/hepatic dysfunction.

SOTALOL



Class IInd-IIIrd β-adreno-receptor blocker

INDICATIONS

Maintenance of normal sinus rhythm [delay in time to recurrence of atrial fibrillation/atrial flutter (AFIB/AFL)] in patients with symptomatic AFIB/AFL who are currently in sinus rhythm. Treatment of documented life-threatening ventricular arrhythmias.

MECHANISM OF ACTION

It prolongs the plateau phase of the cardiac action potential in the isolated myocyte, as well as in isolated tissue preparations of ventricular or atrial muscle (class III activity), ↑ sinus cycle length (slowed heart rate), ↓ AV nodal conduction and increased AV nodal refractoriness and produces significant reductions in

both systolic and diastolic blood pressures.

DOSAGE

Initial dose is 80 mg twice daily, increased if necessary to 240 or 320 mg/day, or 480-640 mg/day in life threatening refractory arrhythmias. Dose should be modified when creatinine clearance is lower than 60 ml/min.

CONTRAINDICATIONS

Sinus bradycardia sick sinus syndrome or second and third degree AV block, congenital or acquired long QT syndromes, baseline QT interval >450 msec, cardiogenic shock, uncontrolled heart failure, hypokalemia (< 4 meq/l), creatinine clearance < 40ml/

min, bronchial asthma and previous evidence of hypersensitivity to sotalol.

DRUG INTERACTIONS

Concomitant general anaesthesia may impair myocardial contractility, polymorphic ventricular tachycardia with antidepressants and quinidine.

ADVERSE EFFECTS

Ventricular arrhythmia and non-allergic bronchospasms (e.g., chronic bronchitis and emphysema), nausea, insomnia, lassitude, diarrhea, mask early sign of hypoglycaemia.

SPECIAL PRECAUTIONS

Use cautiously in renal impairment, diabetics, pregnancy. Gradual withdrawal recommended.

► ADRENERGIC NEURON BLOCKERS – BOTH ALPHA & BETA BLOCKERS

LABETALOL	x	!
INDICATIONS i) Hypertension (all grades) ii) hypertensive emergencies iii) clonidine withdrawal hypertension iv) pheochromocytoma.	min, usually in range of 50-200 mg Pregnancy: 20mg/hr. doubled every 30 minutes. Max 160 mg/hr.	hypoglycemic action. Anaesthetic agents : myocardial depression. tri cyclic antidepressants (TCAs) : increased incidence of tremors
MECHANISM OF ACTION It combines selective α_1 receptor blockade with nonselective β blockade. Pressor affects are attenuated, heart rate reduced and reflex tachycardia abolished. Labetalol reduces BP and heart rate.	CONTRAINDICATIONS Hypersensitivity to drug, A V block (greater than the first degree), untreated heart failure or low cardiac output, bronchospasm, cardiogenic shock, RVF secondary to pulmonary hypertension.	ADVERSE EFFECTS Headache, angina, jaundice, dreams/nightmares, postural hypotension, failure of ejaculation in males, nausea/vomiting, dyspepsia, nightmares, worsening of intermittent claudication.
DOSAGE 100 mg BD with food, increased at 14 day intervals to usual dose of 200 mg BD up to 800mg/day in 2 divided doses. Max 2.4gm/day. <i>IV For hypertension:</i> 2mg/	ONSET OF EFFECT Oral: Within 1-3 hrs.	SPECIAL PRECAUTIONS Use cautiously in hypersensitivity, cardiac failure, diabetes mellitus, hyperthyroidism, liver dysfunction, postural hypotension, anaesthesia.
	DURATION OF ACTION Up to 18 hrs.	
	DRUG INTERACTIONS Cimetidine : increased labetalol bioavailability. oral hypoglycemic agents (OHAs): increased	

► ANGIOTENSIN II RECEPTOR BLOCKERS

CANDESARTAN	
	x
	x
	Angiotensin II receptor antagonist
INDICATIONS Treatment of hypertension either alone or in combination with other antihypertensive agents.	with total daily doses ranging from 8mg to 32 mg.
MECHANISM OF ACTION It is a angiotensin II receptor (type AT1) antagonist and it acts by blocking the vasoconstrictor and aldosterone secreting effects of angiotensin II by selectively blocking the binding of angiotensin II to the AT, receptor in many tissues such as vascular smooth muscle and the adrenal gland.	CONTRAINDICATIONS Hypersensitivity, pregnancy, patient with a history of angioedema, urticaria.
DOSAGE Initially 16 mg once daily in patients who are not volume depleted. It may be given once or twice daily	DRUG INTERACTIONS No significant drug interactions have been reported when candesartan cilexetil is given with other drugs such as nifedipine, digoxin, warfarin and oral contraceptives in healthy volunteers.
	ADVERSE EFFECTS Dizziness, nausea, diarrhea, peripheral edema, rhinitis, back pain, headache, urticaria, coughing, fatigue, vomiting, rarely nausea, arthralgia, myalgia, angioedema, rash have been observed.
	SPECIAL PRECAUTIONS Use cautiously in volume or sodium depletion, aortic or mitral valve stenosis, hypertrophic obstructive cardiomyopathy, renal artery stenosis, primary hyperaldosteronism, women who are likely to become pregnant.

IRBESARTAN



Angiotensin II
receptor antagonist

INDICATIONS

Mild to moderate hypertension, either alone or in combination with other anti hypertensive agents.

MECHANISM OF ACTION

Irbesartan blocks the vasoconstrictor and aldosterone secreting effects of angiotensin II by selectively blocking the binding of angiotensin II to the AT₁ receptors found in vascular smooth muscle, adrenal gland, etc.

DOSAGE

Adults: usually 150 mg od can be increased to 300 mg OD if

necessary. *Intravascular volume depletion:* 75 mg OD

CONTRAINDICATION

Hypersensitivity.

DRUG INTERACTIONS

Prior treatment with diuretics increases risk of excessive hypotension. Potassium sparing diuretics, cyclosporin may ↑ risk of hyperkalemia, monitor potassium. excretion of lithium may be reduced.

ADVERSE EFFECTS

Diarrhea, dyspepsia/heartburn and upper respiratory tract infection.

SPECIAL PRECAUTIONS

Use cautiously in vol. or sodium depletion and aortic or mitral valve stenosis, hypertrophic obstructive cardiomyopathy, renal artery stenosis, primary hyperaldosteronism, women planning for pregnancy.

LOSARTAN



AT II receptor antagonist

INDICATIONS

Mild to moderate hypertension.

MECHANISM OF ACTION

Angiotensin II receptor antagonist which competitively blocks the binding of AT II to its receptor, inhibits angiotensin induced vasoconstriction, sodium reabsorption and aldosterone release.

DOSAGE

Start PO: 50 (hepatic dysfunction: 25 mg OD, empty/full stomach. Increase the dose/dosing frequency if the antihypertensive effect at trough is inadequate. Some patients might need 100mg OD. *Old age, mild-moderate renal impairment:* No initial dose adjustment is needed, although some prefer a lower starting dose of 25 mg OD in patients over 75 years of age.

Moderate to severe renal impairment (creatinine clearance < 20ml/min): Start PO 25 mg OD.

CONTRAINDICATIONS

Losartan hypersensitivity, pregnancy and lactation.

DRUG INTERACTIONS

↓ dose required with- Diuretics, other antihypertensives drugs.

↑ dose required with - NSAIDs, Cimetidine. Risk of hyperkalemia is there with K⁺ sparing diuretics, ACEIs & K⁺ supplements. Ketocon. inhibits the conversion of losartan to its active metabolite.

ONSET OF EFFECT

Maximal antihypertensive effect: 3-6 weeks.

DURATION OF ACTION

Over 24 hrs.

ADVERSE EFFECTS

Most frequently headache, dizziness, diarrhea, asthenia or fatigue. Rarely edema, first dose hypotension, skin rash or angioneurotic edema, transient high liver transaminases/hyperkalemia (ACE inhibitor-induced cough is not there with AT-II receptor antagonist).

SPECIAL PRECAUTIONS

Use cautiously sinus nodum or volume depletion, aortic or mitral value stenosis, HOCM, renal artery stenosis, primary hyperaldosteronism, women who are likely to become pregnant elderly and patient with reduced renal function.

OLMESARTAN



Benzimidazole derivative Angiotensin II type 1 (AT₁) receptor antagonist

INDICATIONS

i) Hypertension, ii) diabetic nephropathy, iii) congestive heart failure.

MECHANISM OF ACTION

Olmesartan blocks the vasoconstrictor effects of angiotensin II by selectively blocking the binding of angiotensin II to the AT₁ receptor in vascular smooth muscle. Its action is, therefore, independent of the pathways for angiotensin II synthesis.

DOSAGE

Adults: Min/Max Dose: 5.0 mg/40.0 mg

CONTRAINDICATIONS

Known hypersensitivity to olmesartan.

DURATION OF ACTION

Steady-state levels of olmesartan are achieved within 3 to 5 days and no accumulation in plasma occurs with once-daily dosing. The absolute bioavailability of olmesartan is approximately 26%. After oral administration, the peak plasma concentration (Cmax) of olmesartan is reached after 1 to 2 hours.

DRUG INTERACTIONS

No significant drug interactions were reported in studies in which olmesartan was co-administered with digoxin or warfarin in healthy volunteers.

ADVERSE EFFECTS

Back pain, bronchitis, increased

creatinine phosphokinase, diarrhea, headache, hematuria, hyperglycemia, hypertriglyceridemia, influenza-like symptoms, pharyngitis, rhinitis and sinusitis.

SPECIAL PRECAUTIONS

Extreme caution in patients with history of angioedema associated with or unrelated to ACE inhibitor or angiotensin II receptor antagonist therapy. When pregnancy is detected, olmesartan should be discontinued as soon as possible. Safety and effectiveness in pediatric patients have not been established.

TELMISARTAN



Angiotensin I receptor blocker

INDICATIONS

Management of hypertension.

MECHANISM OF ACTION

It acts by blocking the vasoconstrictor and aldosterone secreting effects of angiotensin II by selectively blocking the binding of angiotensin II to the AT₁ receptor in many tissues such as vascular smooth muscle and the adrenal gland. Its action is, therefore, independent of the pathways for angiotensin II synthesis. It has more affinity for AT₁ receptor than for AT₂ receptor.

DOSAGE

40 mg once a day. Blood pressure response is dose related over the range of 20-80 mg.

CONTRAINDICATIONS

In patients with biliary obstructive disorders or hepatic insufficiency, pregnancy and lactation.

DRUG INTERACTIONS

Digoxin, warfarin.

ADVERSE EFFECTS

Upper respiratory tract infection, dizziness, back pain, sinusitis, diarrhea.

SPECIAL PRECAUTIONS

Use cautiously in renovascular hypertension, renal impairment and kidney transplant, primary aldosteronism, hyperkalemia, aortic and mitral valve stenosis, obstructive hypertrophic cardiomyopathy, active gastric or duodenal ulcer.



Rosuchol
Rosuvastatin 10mg / 20mg Tablets

VALSARTAN



Angiotensin I receptor blocker

INDICATIONS

Treatment of hypertension alone or in combination with other antihypertensive drugs.

MECHANISM OF ACTION

Valsartan produces its blood pressure lowering effects by antagonizing angiotensin I induced vasoconstriction, aldosterone release, catecholamine release, water intake and hypertrophic responses.

DOSAGE

80-160 mg once a day.

CONTRAINDICATIONS

Patients who are hypersensitive to the drug.

DRUG INTERACTIONS

Potassium-sparing diuretics, potassium supplements; cimetidine, monoxidine; co-trimoxazole;

ACE inhibitors; phenobarbital; ketoconazole; troleandomycin; sulfaphenazole inhibits CYP 2819.

ADVERSE EFFECTS

Headache, dizziness, fatigue, abdominal pain, nausea, allergic reactions.

SPECIAL PRECAUTIONS

Use cautiously in hepatic and renal impairment.

► CALCIUM CHANNEL BLOCKERS

AMLODIPINE



Calcium channel blocker

INDICATIONS

i) Hypertension ii) angina.

MECHANISM OF ACTION

It inhibits movement of calcium ions across the cell membrane into vascular smooth muscles and myocytes. It also causes relief of angina by decreasing myocardial oxygen requirement.

DOSAGE

Adults: 5 mg OD.

Max.: 10 mg per day.

CONTRAINDICATIONS

Known hypersensitivity to dihydropyridines. Pregnancy and lactation.

ONSET OF EFFECTS

Within 2-6 hrs.

DURATION OF ACTION

2-4 days.

DRUG INTERACTIONS

If possible avoid beta blockers especially in presence of marked LVF.

ADVERSE EFFECTS

Headache, edema, fatigue, somnolence, nausea, abdominal pain, flushing, palpitation, dizziness, pruritus and rash.

SPECIAL PRECAUTIONS

Use cautiously in renal or hepatic impairment, CHF, elderly and children.

BENIDIPINE



Calcium channel blocker

INDICATIONS

i) Essential hypertension ii) angina pectoris.

MECHANISM OF ACTION

It inhibits calcium entry into the vascular smooth muscles and relaxes them thereby causing decrease in blood pressures.

DOSAGE

Essential hypertension: Usual dose 4 mg OD after breakfast.

Max. dose: 8 mg OD.

Angina pectoris: Usual dose 4mg BD after food.

CONTRAINDICATIONS

Hypersensitivity to the dihydropyridine calcium channel blockers.

ONSET OF EFFECT

30-60 mins.

DURATION OF ACTION

12-16 hr.

DRUG INTERACTIONS

↓ dose required with cimetidine, diuretics and beta blockers.

↑ digoxin levels.

ADVERSE EFFECTS

Palpitations, hot facial flushes, dizziness, light headedness,

headache, constipation, stomach discomfort, malaise, edema, urticaria, rash, elevation of SGOT, SGPT, Alkaline phosphatase, blood urea nitrogen (BUN).

SPECIAL PRECAUTIONS

Patients should not handle heavy and dangerous machine or work on elevated spots. Taper the dose prior to withdrawal. Liver function tests to be done frequently. Decrease in dose required for elderly.

DILTIAZEM



Calcium channel blocker

INDICATIONS

- i) Vasoconstrictive angina ii) chronic stable angina iii) hypertension.
- iv) atrial fibrillation ii) atrial flutter
- vi) paroxysmal supraventricular tachycardia.

MECHANISM OF ACTION

It blocks calcium channels in heart and blood vessels thereby reducing heart rate and blood pressure without causing reflex tachycardia. It decreases TPR and afterload is reduced. It can also convert paroxysmal supra ventricular tachycardia (PSVT) to sinus rhythm.

DOSAGE

Hypertension: 180 mg/day in 3-4 divided doses. Max 240 mg/day;
Angina: 30 mg QID and increase as required at intervals of 1-2 days up to 240 mg/day in 3-4 divided doses. **PSVT prophylaxis:** up to 270 mg/day in 3 or 4 divided doses. **SR tablets:** 90-120 mg BD. Max 180 mg BD if required. **AF/AFL:** Initial IV bolus of 0.25 mg /kg over 2 minute.

If required, 2nd bolus after 15 minutes. Individualize subsequent injection. For continued reduction of heart rate after initial bolus give iv infusion at rate of 10 mg/hr (up to 24 hrs.)

CONTRAINDICATIONS

Pre-existing sick sinus, AV nodal or myocardial disease (esp. ac MI with LVF), Heart block greater than 1st degree, Bradycardia, Pregnancy.

ONSET OF EFFECT

Oral: within 2-4 hr. **Inj IV :** Within 2-5 mins.

DURATION OF ACTION

8-12 hrs.

DRUG INTERACTIONS

↓ dose required with digoxin, cyclosporin, propranolol, cimetidine. ↑ toxicity of lithium and carbamazepine on concurrent use.

ADVERSE EFFECTS

Rash, leg and ankle edema, tiredness, nausea, dry mouth, dizziness, headache, hypotension,

weight gain, vomiting, constipation/diarrhea, disturbed taste, gingival hyperplasia, hepatitis/elevated LDH, SGOT/PT/AP, high degree of AV block, congestive cardiac failure, ventricular extrasystole, acute hepatic injury, GI discomfort, gynaecomastia.

SPECIAL PRECAUTIONS

Use cautiously in chronic hepatic or renal disease, cardiac failure. Careful hemodynamic monitoring with the first dose is needed, gradual withdrawal to prevent anginal exacerbation. Left ventricular dysfunction. The SR/ER formulation to be swallowed whole and intact, without being opened, crushed or chewed. Caution in other medications.

FELODIPINE



Calcium channel blocker

INDICATIONS

Hypertension, angina.

MECHANISM OF ACTION

It antagonises the inflow of calcium ions into the cells, more potently in vascular smooth muscle cells than heart. It causes peripheral vasodilation and reduces total peripheral resistance and fall in blood pressure. Renal blood flow is increased. In CHF, it reduces pulmonary capillary wedge pressure pulmonary (PCWP) and improves symptoms. Improves exercise tolerance in angina.

DOSAGE

Adults: initially 5mg OD (adjusted to individual needs).

Maintain.: 5-10 mg OD. Max: 20 mg OD.

CONTRAINDICATIONS

Hypersensitivity, pregnancy and lactation.

ONSET OF EFFECT

Within 30-60 mins.

DURATION OF ACTION

>24hrs.

DRUG INTERACTIONS

↑ dose required with phenytoin carbamazepine, barbiturates.

↓ dose required with cimetidine. ↑ digoxin levels. Beta blockers, when used along with felodipine, reduces the side effects of the former.

ADVERSE EFFECTS

Headache, flushing, dizziness, ankle edema, hypotension, bradycardia, gingival hyperplasia.

SPECIAL PRECAUTIONS

It may rarely cause hypotension with tachycardia, resulting in myocardial ischemia in susceptible patients. Withdraw if ischemic pain occurs. Use cautiously in severe liver disease.



Rosuchol
Rosuvastatin 10mg / 20mg Tablets

LACIDIPINE



Calcium channel blocker

INDICATIONS

- i) Hypertension ii) isolated systolic hypertension in the elderly.

MECHANISM OF ACTION

It is a long acting calcium channel blocker with more of vascular selectivity. It reduces blood pressure and also has been shown to have anti-atherosclerotic, antioxidant and platelet anti-aggregation property.

DOSAGE

PO 2-8 mg OD. Usually start 4mg OD, increase as required to 6mg OD after 3-4 weeks.

Old age, hepatic impairment: 2 mg OD, increase up to 4 mg OD.

Renal disease: no dose alteration.

CONTRAINDICATIONS

Hypersensitivity, severe hypotension, acute MI, cardiogenic shock.

ONSET OF EFFECT

Vasodilatory effects: Up to 3-6 weeks

DURATION OF ACTION

12-15 hrs.

DRUG INTERACTIONS

↓ dose required with antihypertensives, cimetidine, otherwise drug interactions are rarely seen with lacidipine.

ADVERSE EFFECTS

Headache, hot flushes, asthenia, ankle edema, palpitations, constipation, polyuria, chest pain, gingival hyperplasia.

SPECIAL PRECAUTIONS

Use cautiously in hepatic impairment, hypotension, SA/AV node malfunction.

LERCANIDIPINE



Calcium channel blocker

INDICATIONS

Mild to moderate hypertension.

MECHANISM OF ACTION

It is a new long-acting dihydropyridine calcium channel blocker (CCB) which selectively inhibits the influx of extracellular calcium through voltage-gated calcium channels.

DOSAGE

Initially 10 mg once daily, increased, if necessary, after at least 2 weeks to 20mg daily.

CONTRAINDICATIONS

Aortic stenosis, unstable angina, uncontrolled heart failure, within 1 month of MI, pregnancy and breast-feeding.

DRUG INTERACTIONS

Hypotensive effect of propranolol and metoprolol enhanced. Itraconazole may alter pharmacokinetics of lercanidipine.

ADVERSE EFFECTS

Flushing, peripheral edema, palpitation, tachycardia, headache,

dizziness, asthenia, GI disturbance, hypotension, drowsiness, myalgia, polyuria and rash.

SPECIAL PRECAUTIONS

Use cautiously in hepatic and renal impairment, left ventricular dysfunction, sick sinus syndrome (if pacemaker not fitted), avoid grapefruit juice as it may affect metabolism.

NIFEDIPINE



Calcium channel blocker

INDICATIONS

- i) Hypertension ii) hypertensive emergencies iii) prinzmetal's angina iv) chronic stable angina.

MECHANISM OF ACTION

It antagonises the inflow of calcium ions into cells, more potently in vascular smooth muscle cells than heart. It also causes peripheral vasodilation and reduces total peripheral resistance (TPR) and fall in blood pressure. Renal blood flow is increased. In CHF, it reduces capillary wedge pressure (PCWP) and improved symptoms. Improves exercise tolerance in angina.

DOSAGE

Hypertension: 30-60 mg daily.
Angina: 10-20 mg every 6-8 hrs up to 80 mg max. Elderly: Start with 5 mg TDS & build up.

CONTRAINDICATIONS

Hypersensitivity, acute MI, hypotension, cardiogenic shock.

DRUG INTERACTIONS

↓ dose required with antihypertensive drugs. ↑ levels of phenytoin and digoxin, ↓ COP with b blockers.

ONSET OF EFFECTS

Within 30-60 mins. When capsules are bitten the effects may be felt within minutes.

DURATION OF ACTION

8-12 hrs.

ADVERSE EFFECTS

Ankle swelling, ↑ micturition frequency, headache, flushing, dizziness/fatigue, increased angina, light headedness, hypotension, palpitations, tachycardia, weakness, muscle cramps, nasal congestion and rash.

SPECIAL PRECAUTIONS

Use cautiously in chronic hepatic or renal disorder, cardiac failure and diabetes.

NITRENDIPINE



Calcium channel blocker

INDICATIONS

Mild to moderate hypertension.

MECHANISM OF ACTION

It acts predominantly in peripheral blood vessels causing vasodilation and reduction in blood pressure. It has less effect on coronary vasculature and acts longer than nifedipine.

DOSAGE

HT: Adults: 30-60 mg OD.

Angina: 10-20 mg every 6-8 hrs up to 80 mg max. Elderly: Start with 5

mg TDS & buildup.

CONTRAINDICATIONS

Hypotension, poor cardiac reserve, cardiogenic shock, severe aortic stenosis, hypersensitivity.

ONSET OF EFFECTS

Within 30-60 mins.

DURATION OF ACTION

24-48 hrs.

DRUG INTERACTIONS

↓ dose required with beta blockers, phenytoin, cimetidine.

↑ dose required with quinidine.

ADVERSE EFFECTS

Hypotension, flushing, dizziness, palpitations, paresthesia, headache, edema and GI upsets.

SPECIAL PRECAUTIONS

Use cautiously in hepatic dysfunction, diabetes mellitus, cardiac disease and elderly.

VERAPAMIL



Calcium channel blocker

INDICATIONS

- i) Tachycardias such as paroxysmal supraventricular tachycardia, atrial fibrillation or flutter ii) extrasystoles
- iii) hypertensive crises iv) angina pectoris v) acute coronary insufficiency.

MECHANISM OF ACTION

It blocks calcium entry into arterial smooth muscles as well as myocytes and conducting tissues. This causes reversal and prevention of coronary arterial spasm, decreased afterload through peripheral vasodilation and decreased ventricular rate in patients with chronic atrial flutter or fibrillation and decreased PSVT. Verapamil reduces BP and relieves angina.

DOSAGE

Adults: Oral : 40-80 mg TID/QID.
Max: 480 mg/day. *Inj.* IV: 5 mg

initially. If the desired effect not achieved, further 5 mg after 5-10 min. (over 2 min). On relapse : IV infusion 5-10 mg/hr up to 25-100 mg/day. Children: *Oral:* < 6 yrs. up to 40 mg BD/TID, 6-12 yrs: 40-120 mg BD/TID. (Max : 360 mg/day).

Inj. IV: 1-5 yrs: 2-3 mg, 6-14 yr: 2.5-5 mg (over 2 mins).

Max total dose: 1.5 mg/kg/day.

CONTRAINDICATIONS

Cardiogenic shock, 2nd and 3rd degree AV block, severe bradycardia, sick sinus syndrome, uncompensated heart failure, acute phase of MI, hypotension.

ONSET OF EFFECT

Oral: within 1-2 hrs. *Inj IV:* within 5 mins.

DURATION OF ACTION

8-16 hrs.

DRUG INTERACTIONS

↓ dose required with beta blockers, prazosin. Do not administer disopyramide or quinidine along with verapamil due to risk of severe bradycardia.

ADVERSE EFFECTS

Flushing, nausea/vomiting, headache, ankle swelling, dizziness and constipation.

SPECIAL PRECAUTIONS

Use cautiously in chronic hepatic or renal dysfunction and in concomitant use along with other medications. Atrial flutter or fibrillation can occur with an accessory pathway. Use cautiously in poor cardiac reserve with digoxin and diuretics.



Rosuchol
Rosuvastatin 10mg / 20mg Tablets

► CATECHOLAMINE DEPLETORS

RESERPINE



Rauwolfia alkaloid

INDICATIONS

Hypertension.

MECHANISM OF ACTION

It blocks the transport system of storage granule membrane and depletes catecholamines in peripheral nervous system.

DOSAGE

Initial dose : 0.25-0.5 mg up to max. 1.5 mg daily.

CONTRAINDICATIONS

Active peptic ulcer, ulcerative colitis, mental depression, suicidal

tendencies, thyrotoxicosis and epilepsy.

ONSET OF EFFECT

Within 24-48 hrs.

DURATION OF ACTION

2-3 weeks.

DRUG INTERACTIONS

↑ dose required with thiazide diuretics. Fatal arrhythmias can occur with concomitant use of digoxin and quinidine.

ADVERSE EFFECTS

Postural hypotension, pancreatitis, jaundice, nausea, vomiting, diarrhea, anorexia, anaphylactic reactions, muscle spasm, vertigo, renal failure, headache, impotence, depression, hyperglycemia, breast enlargement.

SPECIAL PRECAUTIONS

It should be avoided in gallstones, cardiac failure, myocardial infarction., pheochromocytoma.

► CENTRALLY ACTING

ALPHA-METHYLDOPA



Central α_2 agonist

INDICATIONS

Mild to moderate hypertension.

MECHANISM OF ACTION

It is a specific agonist for α_2 receptors. Sympathetic tone is reduced which leads to decrease in blood pressure.

DOSAGE

Adults: 0.5-2 gm/day in divided doses. Children: 10 mg/kg/day in 2-4 divided doses.

CONTRAINDICATIONS

Hypersensitivity, pheochromocytoma, depression, hepatic impairment including jaundice.

ONSET OF EFFECT

Within 3-6 hours. Full effect begins in 2-3 days.

DURATION OF ACTION

6-12 hrs. Some effects may last 1-2 days after stopping the drug.

DRUG INTERACTIONS

↑ dose required with tricyclic antidepressants. ↓ dose required with levodopa, salbutamol and phenothiazines. Concomitant use of lithium may result in increased lithium levels.

ADVERSE EFFECTS

Fever, rash, dizziness/fainting,

drowsiness, nausea/vomiting, jaundice, depression/ headache, stuffy nose, AV conduction disorders, edema, weight gain, postural hypotension, bradycardia, gynaecomastia, galactorrhea, arthralgia, myalgia, eczematous rash, leucopenia, hemolytic anemia, thrombocytopenia and granulocytopenia.

SPECIAL PRECAUTIONS

Use cautiously in chronic hepatic or renal disorders, cardiac disease, anemia, angina and depression.

CLONIDINE



α_2 -adrenergic agonist

INDICATIONS

i) All grades of hypertension (except pheochromocytoma) ii) migraine iii) glaucoma iv) dysmenorrhoea v) menopausal vi) opioid withdrawal.

MECHANISM OF ACTION

It leads to activation of α_2 adrenergic receptors in CNS, this suppresses the sympathetic nervous system activity from the brain.

DOSAGE

Adults: 75-225 μ g/day divided in 2-3 doses. Increase gradually every 2-3 days. In hydrochlorothiazide combinations the latter must not exceed 80 mg/day.

Migraine: 100-150 μ g/day.

CONTRAINDICATIONS

Hepatic coma, Sick sinus syndrome.

ONSET OF EFFECT

Within 1-3 hrs.

DURATION OF ACTION

Several days.

DRUG INTERACTIONS

↑ effect of Hypoglycemic.

Dose required with TCAs, diuretics and vasodilators, digoxin and lithium. Drowsiness may be caused with hypnotics, antihistamines and alcohol.

ADVERSE EFFECTS

Rash, drowsiness, dry mouth,

dizziness, myalgia, urticaria, insomnia, arrhythmias, agitation, constipation, ankle swelling, impotence, depression, paralytic ileus, Raynaud's phenomenon.

SPECIAL PRECAUTIONS

Use cautiously in depression, circulatory disorders, coronary artery disease, hepatic/renal dysfunction while driving or operating heavy machinery. Abrupt withdrawal is not advisable. Avoid if postural hypotension in elderly and if safety in children is not established. Sedative effect of alcohol is potentiated.

► VASODILATORS

HYDRALAZINE					Vasodilator
INDICATIONS					
i) Moderate to severe hypertension ii) pre-eclampsia iii) hypertensive emergencies.					
MECHANISM OF ACTION					
It is a directly acting vasodilator with little action on venous capacitance vessels. It reduces total peripheral resistance and causes greater reduction of diastolic than systolic BP.					
DOSAGE					
PO: 25-50 mg OD-TDS. IV or IM dosage: 10-20 mg slow.					
CONTRAINDICATION					
Hypersensitivity.					
ONSET OF EFFECT					
Within 1-2 hrs.					
DURATION OF ACTION					
Beyond 12 hours.					
DRUG INTERACTIONS					
Additive effect with other antihypertensives like minoxidil, diazoxide.					
ADVERSE EFFECTS :					
Facial flushing, conjunctival injection, throbbing headache, dizziness,					
SPECIAL PRECAUTIONS					
Avoid using in CAD patients as angina or MI may be precipitated. Lupus like syndrome is more common in women and slow acetylators. Large doses are not recommended for long term use.					

MINOXIDIL					Vasodilator
INDICATIONS					
i) Alopecia areata ii) Alopecia androgenetica (male pattern baldness).					
MECHANISM OF ACTION					
It is a directly acting vasodilator with activity promoting hair growth in male pattern baldness and alopecia areata. Benefit is short lived.					
DOSAGE					
Dry hair and scalp thoroughly, apply 1ml to the affected area of scalp					
2 times/day. Max: 2ml/dose.					
<i>Note:</i> Use rubber gloves for the application or if used directly wash hands thoroughly after the application. Treatment period - minimum 4 months.					
Children: Not applicable.					
CONTRAINDICATIONS					
Hypersensitivity, hypotension.					
DRUG INTERACTIONS					
Antidepressants cause in minoxidil hypotensive effects.					
ADVERSE EFFECTS					
Nausea, dizziness/light-headedness, palpitations, rash, increased hair growth, breast tenderness, fluid retention/ankle swelling.					
SPECIAL PRECAUTIONS					
Use cautiously in chronic hepatic/renal cardiac dysfunction and in other medications.					

SODIUM NITROPRUSSIDE					Peripheral vasodilator
INDICATIONS					
i) Heart failure ii) hypertension iii) myocardial infarction iv) neuroleptic malignant syndrome v) peripheral vascular disease.					
MECHANISM OF ACTION					
It is a direct vasodilator. It is metabolized by smooth muscle cells to its active metabolite nitric oxide.					
DOSAGE					
Initial dose: 0.3µg/kg per minute. Usual dose: 0.5 - 6µg/kg/min. Max. recommended dose: 8µg/kg/min. <i>Heart failure:</i> Initial dose 10-15µg/min. Increased by increments of					
10-15µg/min. every 5-10 mins until response. Max.: 280µg/min.					
CONTRAINDICATIONS					
Compensatory hypertension, severe hepatic dysfunction, vitamin B ₁₂ deficiency, leber's optic atrophy, tobacco amblyopia.					
ONSET OF EFFECT					
Within a few seconds.					
DURATION OF ACTION					
1-10 mins.					
DRUG INTERACTIONS					
Dose required with alteplase due to risk of prolonged fibrinolysis and enhanced bleeding tendency.					
ADVERSE EFFECTS					
Nausea, vomiting, diarrhea, thrombocytopenia, dizziness, restlessness, perspiration, retrosternal discomfort, palpitations, abdominal pain, muscle twitching, phlebitis, cyanosis and hypothyroidism.					
SPECIAL PRECAUTIONS					
Use cautiously in impaired hepatic function, hypothyroidism, cerebrovascular disease. Use hydroxy-cobalamin before and during the administration of sodium nitroprusside.					

COAGULANTS

ADRENOCHROME



Epinephrine oxidation product

INDICATIONS

i) Metrorrhagia ii) epistaxis iii) menorrhagia iv) retinal hemorrhage v) other bleeding disorders vi) hematuria vii) secondary hemorrhage from wounds.

MECHANISM OF ACTION

It is believed to reduce capillary fragility, control oozing from raw

surfaces and prevent microvessel bleeding. But its efficacy is uncertain.

DOSAGE

Dose as per the formulation.

CONTRAINDICATIONS

Hypersensitivity.

DRUG INTERACTION

↑ drug required with anti-histamines.

ADVERSE EFFECTS

Not known

APROTININ



Enzyme inhibitor

INDICATIONS

The treatment of adults patients at high risk of major blood loss during and following open heart surgery with extracorporeal circulation including previous median sternotomy and endocarditis.

MECHANISM OF ACTION

It is a proteinase inhibitor and it acts by forming reversible stoichiometric enzyme inhibitor-complexes, aprotinin acts as an inhibitor of human trypsin, plasmin, plasma kallikrein and tissue kallikrein.

DOSAGE

Loading Dose: 200 ml (2 million KIU) is given IV after induction of anaesthesia and prior to sternotomy. The initial 1 ml (10 000 KIU) should be administered slowly as a test dose. The remainder of the loading dose should then be given as a slow IV infusion or injection over a period

of 15-20 minutes. Maintenance dose: A continuous infusion of 50 ml (500 000 KIU) per hour until the end of the operation except in patients with infective endocarditis where it may be continued into the early post-operative period.

Pump prime dose: An additional 200 mL (2 million KIU) should be added to the priming volume of the extracorporeal circuit. In patients with infective endocarditis 300 ml (3 million KIU) should be added.

CONTRAINDICATIONS

Known hypersensitivity experience in children, and pancreatitis.

DRUG INTERACTIONS

Incompatible with other drugs like corticosteroids, heparin, nutrient solutions containing amino acids or fat emulsions and tetracyclines. It has a dose-dependent inhibitory effect on the action of thrombolytic

agents, e.g., streptokinase, urokinase, alteplase (r-tPA).

ADVERSE EFFECTS

Anaphylactic or anaphylactoid reactions, itching, rash, sweating, flush, urticaria, skin eruptions, pallor or cyanosis, dyspnea, nausea, drop in blood pressure, tachycardia or bradycardia and airway obstruction to severe hypotension and anaphylactic shock with fatal outcomes in rare cases.

SPECIAL PRECAUTIONS

The addition to heparinised blood will prolong the activated clotting time (ACT). Thus, the ACT should not be taken as a reliable indicator of the need to administer additional heparin during a prolonged period of cardiopulmonary bypass.

BOTROPASE



INDICATIONS

Primary, secondary and post-operative internal and external hemorrhages.

MECHANISM OF ACTION

It is believed to reduce capillary fragility, control oozing from raw surfaces and prevent microvessel

bleeding. But its efficacy is uncertain.

DOSAGE

Adults: 1ml IM sos up to 2-3 times a day.

Children: 0.5-0. 75cc according to the age of the child and seriousness of the hemorrhage.

CONTRAINDICATIONS

Arterial thrombosis, venous thrombosis.

ETHAMSYLATE



Hemostatic

INDICATIONS

Prevention treatment of small blood vessel bleeds:
i) haematemesis ii) melaena
iii) hemoptysis iv) hematuria v)
epistaxis vi) DUB vii) primary
menorrhagia viii) postabortion/
postpartum hemorrhages ix)
pre/postsurgical hemorrhagical
disorders x) peri/intraventricular
hemorrhage in low birth weight/
premature infants xi) prophylactically
all pre/postsurgical procedures.

MECHANISM OF ACTION

It stops small vessel hemorrhage by
stabilizing the capillary wall.

DOSAGE

Adults: 500 mg TID, children: 250
mg TID, for perioperative bleed:
250-500 mg IV/IM repeat every 4-6
hrs till bleeding stops.

CONTRAINDICATIONS

Hypersensitivity, history of
thrombocytopenic purpura, history of
hemophilia, pregnancy & lactation.

DURATION OF ACTION

> 3 days after stopping treatment.

DRUG INTERACTIONS

Not significant.

ADVERSE EFFECTS

Headache, rash, nausea, transient
hypotension with IV inj.

SPECIAL PRECAUTIONS

Use cautiously in acute porphyria,
vaginal surgery (\uparrow risk of DVT).

FERACRYLUM

INDICATIONS

Adjunct to conventional hemostatic
procedures in capillary and venule
oozing in varied surgical and
diagnostic procedures. Dental
extractions and oral surgeries.

MECHANISM OF ACTION

It is local hemostatic and antiseptic
agent. The hemostatic effect of
feracylum is based on the formation
of a synthetic complex consisting of
its adduct with plasma proteins
principally albumin. Feracylum-

albumin complex formed gets
broken down over a period of
time.

DOSAGE

Undiluted solution to be applied
directly or poured over the bleeding
surface in varied surgical and
diagnostic procedures.

CONTRAINDICATIONS

Concomitant use of feracylum
with epsilon aminocaproic acid
is contraindicated because it

interferes with the formation of
feracylum-albumin clot.

DRUG INTERACTIONS

No specific drug interaction is
documented.

ADVERSE EFFECTS

Burning sensation.

SPECIAL PRECAUTIONS

Feracylum is not for parenteral
use (IM or IV) and should be used
without dilution.

HEMOCOAGULASE



Coagulants

INDICATIONS

Hemorrhages of diverse etiology
of medical, surgical, gynecological
and dental origin.

MECHANISM OF ACTION

It is an enzyme obtained from the
venom of vipers—*Bothrops sp.*
It acts on fibrinogen to produce
a fibrin monomer which can be
converted by thrombin into fibrin
clot. The name hemocoagulase
is used when the preparation

contains a factor-x activator. But
not all products have the factor-x
activator.

DOSAGE

Adults: 1ml by IM/IV/SC; children:
0.3-0.5 ml.

CONTRAINDICATIONS

Thrombotic or embolic episodes.

DRUG INTERACTIONS

No specific drug interaction is
documented.

ADVERSE EFFECTS

Over dosage should be
avoided otherwise the action of
hemocoagulase is weakened. It is
advisable to await the effect of a
single dose before doubling it.

SPECIAL PRECAUTIONS

Overdosage should be avoided.



R
Rosuchol
Rosuvastatin 10mg / 20mg Tablets

PROTAMINE SULPHATE



Heparin antagonist/
weak anticoagulant

INDICATIONS

Heparin overdosage; Heparin neutralization during extracorporeal circulation; Enoxaparin or dalteparin overdosage.

MECHANISM OF ACTION

Protamine sulfate combines with heparin to form a stable inactive complex. For LMWH, protamine sulfate neutralizes the anti-thrombin activity but only partly neutralizes the anti-factor-Xa effect. When admin in the absence of heparin, protamine sulfate has an anticoagulant effect. Protamine is not useful for reversing the effects of oral anticoagulants.

DOSAGE (For adults IV-admin.)

Heparin overdosage: For heparin administered via IV inj: If only a few minutes have elapsed since admin, 1-1.5 mg for every 100 units of heparin administered; if 30 minutes have elapsed since admin, 0.5 mg for every 100 units of heparin and, if ≥2 hr have elapsed since admin, 0.25-0.375 mg for every 100 units of heparin; doses to be given via IV inj at rate ≤5 mg/minute.

For heparin administered via IV infusion: 25-50 mg via inj after stopping heparin infusion.

For heparin administered via SC inj: 1-1.5 mg via IV inj for each 100 units of heparin administered. Loading dose: 25-50 mg via slow IV inj and

the rest of the dose via continuous IV infusion over 8-16 hr or the expected duration of absorption of heparin.

Heparin neutralisation during extracorporeal circulation: 1.5 mg for each 100 units of heparin administered. Alternatively, dosage may be determined using sequential activated coagulation time and a dose-response curve which correlates results of the coagulation tests and the amount of heparin left in the body. Dose to be given via slow inj at a rate ≤5 mg/minute.

Enoxaparin or dalteparin overdosage: For enoxaparin: If ≤8 hr since admin, dose should be equal to that of the administered enoxaparin dose; if >8 hr has elapsed since admin, infuse 0.5 mg for each 1 mg of enoxaparin sodium administered; if >12 hr has elapsed since admin, protamine admin may not be needed.

For dalteparin: 1 mg for every 100 anti-Xa units of dalteparin administered. If aPTT remains prolonged 2-4 hr after the 1st infusion, a 2nd infusion may be given.

ONSET OF EFFECT

Within 5 minutes.

DURATION OF ACTION

2 hrs.

CONTRAINDICATIONS

Antibiotics (e.g., cephalosporins, penicillin).

ADVERSE EFFECTS

Hypotension, bradycardia, pulmonary and systemic hypertension, dyspnea, warm sensation, transitory flushing, nausea and vomiting, lassitude. Potentially Fatal: Severe hypersensitivity reactions e.g., CV collapse, fatal anaphylactic reaction; noncardiogenic pulmonary edema with prolonged hypotension (rare).

SPECIAL PRECAUTIONS

Avoid rapid admin as this may cause severe hypotension and anaphylactoid reactions. Patients at risk of developing hypersensitivity to protamine (e.g previous history of procedures such as coronary angioplasty or cardiopulmonary bypass which may include protamine, diabetics using protamine insulin, allergy to fish, vasectomized or infertile males who may have antibodies to protamine. Monitor aPTT or activated coagulation time, 5-15 minutes after protamine sulfate admin. Monitor clotting parameters closely especially in prolonged procedures as rebound bleeding may occur up to 18 hr after operation. Pregnancy, lactation, children.

RUTIN



Hemostatic

INDICATIONS

i) Capillary impairment/venous insufficiency of lower limbs ii) hemorrhoids iii) epistaxis.

MECHANISM OF ACTION

It reduces capillary bleeding and improves capillary function.

DOSAGE

60 mg BD or TID. Use along with vitamin C which is known to facilitate its action.

CONTRAINDICATIONS None.

DRUG INTERACTIONS

Vitamin C enhances its effects.

ADVERSE EFFECTS

Not known.

SPECIAL PRECAUTIONS

None.

TRANEXAMIC ACID



Antifibrinolytic agent

INDICATIONS

Treatment and prevention of various fibrinolytic conditions such as cardiac surgery with cardiopulmonary bypass, dental surgery, orthopedic surgery, menorrhagia, liver transplantation, transurethral surgery, prostatectomy, gynecological and obstetric surgery, dysfunctional uterine bleeding, IUCD insertion, acute gastrointestinal hemorrhage and cervical conization.

MECHANISM OF ACTIONS

It is an anti-fibrinolytic agent, acts by competitively inhibiting the activation of plasminogen to plasmin. It blocks the lysine-binding site of plasminogen and thus fibrinolysis cannot proceed.

DOSAGE

Tranexamic acid is given by mouth or by slow IV or infusion. Oral doses are 1-1.5 gm (15 to 25 mg/kg body weight) 2-3 times daily. When given by slow IV, doses are 0.5-1 gm (10-15 mg/kg body weight 2-3 times daily. It is administered by continuous infusion at a rate of 25-50 mg per kg daily.

CONTRAINDICATIONS

Severe renal insufficiency; hematuria; acquired disturbance of color vision; history of thromboembolic disease.

DRUG INTERACTIONS

Drugs which act on hemostasis should be given with caution.

ADVERSE EFFECTS

Gastrointestinal disturbances like nausea, abdominal pain, diarrhea may occur, but disappear once the therapy is discontinued. Hypotension has been observed when IV injection is too rapid. This reaction has not been reported with oral use.

SPECIAL PRECAUTIONS

Doses of tranexamic acid should be reduced in patients with mild to moderate renal impairment; avoid rapid IV administration. Do not inject more rapidly than 1ml/min; high risk groups include neonates, children and the elderly; pregnancy and lactation. Use only if clearly indicated.

VITAMIN K ANALOGUES



INDICATIONS

Uterine hemorrhages, menorrhagia, metorrhagia, post-partum bleeding. Treatment and prophylaxis of bleeding due to deficiency of clotting factors. Hypoprothrombinemia of premature infants, malabsorption syndrome, hemoptysis, epistaxis. Obstructive jaundice, haematemesis.

MECHANISM OF ACTIONS

It is necessary for final stage of

synthesis of coagulation factors: II, VII, IX and in liver. In synthesis of coagulant proteins Vit. K.

DOSAGE

Adults: 1-3 caps. Daily in divided doses with meals; may be increased up to 8 caps. Daily during hemorrhagic crisis. *Maint:* 1-2 caps. daily.

Children: Not recommended.

DRUG INTERACTIONS

Anticoagulants. It may be necessary to increase the anticoagulant dose.

SPECIAL PRECAUTIONS

Menadione can cause hemolysis in patients suffering from G-6PD deficiency and in neonates.



Rosuchol
Rosuvastatin 10mg / 20mg Tablets

DIURETICS

AMILORIDE



Potassium sparing diuretic

INDICATIONS

i) Adjunctive treatment in CCF and HT ii) to restore serum potassium in patients on kaliuretic drugs iii) cirrhosis with ascites.

MECHANISM OF ACTION

Potassium sparing diuretic with mild natriuretic and antihypertensive in activity inhibits $\text{Na}^+ \text{-K}^+$ exchange at the distal convoluted tubule, cortical collecting duct and collecting duct.

DOSAGE

Adults: 5-10 mg/day.

Max.: 20 mg/day.

CONTRAINDICATIONS

Potassium sparing agents, potassium supplements, impaired renal function, hyperkalemia, anuria and hypersensitivity

ONSET OF EFFECT

Within 2-4 hrs.

DURATION OF ACTION

12-24 hrs.

DRUG INTERACTIONS

↓ dose with OHAs, K⁺ sparing diuretics, K⁺ supplements, ACE inhibitors, chlorpropamide.

ADVERSE EFFECTS

Rash, confusion, dry mouth, muscle weakness/cramps, GI upsets, postural hypotension, hyperkalemia, hyponatremia, psychiatric/visual changes, paresthesias.

SPECIAL PRECAUTIONS

Use cautiously in chronic renal disorder, gout, diabetes mellitus and in other medications.

BUMETANIDE



High Ceiling diuretic

INDICATIONS

i) Edema: congestive cardiac failure, renal edema in chronic renal failure and resistant edema. ii) acute pulmonary edema (acute LVF following MI), iii) Cerebral edema iv) forced diuresis v) hypertensive emergencies vi) along with blood transfusion in anemia vii) hypercalcemia.

MECHANISM OF ACTION

Major site of action is thick ascending limb of loop of Henle where it inhibits $\text{Na}^+ \text{-K}^2 \text{Cl}^-$ co-transport. It abolishes the corticomedullary osmotic gradient and blocks positive as well as negative free water clearance. Weak carbonic anhydrase activity is also there and increased HCO_3^- secretion is also there.

DOSAGE

Edema: PO: 1-2 mg/day in single or divided doses; *Refractory edema*: 5 mg/day. Max. 10 mg/day; *Pulmonary edema* : 1-2 mg IV repeated 20 mins. later if required. *Hyper*: PO: 0.5-2 mg/day.

CONTRAINDICATIONS

Hypersensitivity, anuria, Addison's disease, hypercalcaemia, cirrhosis of liver, severe electrolyte depletion.

ONSET OF EFFECT

PO: within 30 mins. Inj : within a min.

DURATION OF ACTION

2-4 hrs.

DRUG INTERACTIONS

↓ dose required with antihypertensives. ↑ dose required with- NSAIDs, probenecid.

ADVERSE EFFECTS

Hyperkalemia, hyponatremia, glucose intolerance, ototoxicity, impaired hearing, pruritus, musculoskeletal pain, chest discomfort, thrombocytopenia, renal failure, premature ejaculation, hyperuricemia, acute saline depletion, myalgia, hypotension.

SPECIAL PRECAUTIONS

Use cautiously in renal and hepatic insufficiency, diabetes, prostate hypertrophy, gout, monitor serum electrolytes regularly, potassium loosing nephropathy, hepatic cirrhosis and ascites, diarrheal states and in other medications.

CHLORTHALIDONE



Thiazide related diuretic

INDICATIONS

- i) Edema: mild to moderate cases.
- ii) Acts best in cardiac edema
- iii) hypertension
- iv) diabetes insipidus
- v) hypercalciuria
- vi) effective diuretic in renal failure.

MECHANISM OF ACTION

The primary site of action is cortical diluting segment or the early DT. Here it inhibits Na^+ Cl^- symport at the luminal membrane. It decrease positive free water clearance (in the absence of ADH) but does not affect negative free water clearance (in the presence of ADH). It also inhibits carbonic anhydrase.

DOSAGE

Edema: Initially 40 mg/day. Increased according to response up to 80mg/day. **Hypertension :** 20 mg/day. Some may require only 10 mg/day.

ONSET OF EFFECT

Within 1-2 hrs.

DURATION OF ACTION

24 hrs.

DRUG INTERACTIONS

\downarrow dose required with anti-hypertensives. \uparrow dose required with NSAIDs, probenecid, cotrimoxazole given with diuretics causes increased incidence of

thrombocytopenia, \downarrow in uricosuric action of probenecid, \uparrow serum lithium levels. Hypokalemia induced by diuretics increases digitalis toxicity and potentiates competitive neuromuscular blockers and reduces sulfonylurea action.

ADVERSE EFFECTS

Hypokalaemia, paralysis, dizziness, leg cramps, GI upsets, lethargy.

SPECIAL PRECAUTIONS

Use cautiously in hepatic disease, diabetes, gout and SLE.

EPLERENONE



Aldosterone antagonist

INDICATIONS

High blood pressure, congestive heart failure, kidney problems.

MECHANISM OF ACTION

Eplerenone prevents aldosterone from entering the principal cells of collecting duct and late distal tubule of the nephron, preventing sodium reabsorption.

DOSAGE

Oral: Adults: Hypertension: Initial: 50 mg once daily; may increase to 50 mg twice daily if response is not adequate; may take up to 4 weeks for full therapeutic response. Doses >100 mg/day are associated with increased risk of hyperkalemia and no greater therapeutic effect. Concurrent use with moderate CYP3A4 inhibitors: Initial: 25 mg once daily. Heart failure (post-MI): Initial: 25 mg once daily; dosage

goal: Titrate to 50 mg once daily within 4 weeks, as tolerated.

CONTRAINDICATIONS

Hyperkalemia, renal impairment, severe hepatic impairment.

ONSET OF EFFECT

\sim 1.5 hours; may take up to 4 weeks for full antihypertensive effect.

DURATION OF ACTION

Maintained through 8-24 weeks.

DRUG INTERACTIONS

Concomitant use of ketoconazole and itraconazole is contraindicated. Other drugs including erythromycin, saquinavir, and verapamil used with caution. Other salt substitutes, potassium supplements and potassium-sparing diuretics that increase potassium concentrations may increase the risk of hyperkalemia.

ADVERSE EFFECTS

Hyperkalemia, hypotension, dizziness, diarrhea, vomiting, altered renal function, and increased creatinine concentration.

SPECIAL PRECAUTIONS

Its use is contraindicated with potassium containing drugs like potassium-sparing diuretics, potassium supplements. Cautiously use with erythromycin, saquinavir, and verapamil. Cautiously used in pregnancy. Cautiously used in pediatrics (age 4 to 17 years) and not recommended for less than 4 years old as no study has been carried out (Ref: Rx lists of drugs). Not recommended in nursing mother.



Rosuchol
Rosuvastatin 10mg / 20mg Tablets

FUROSEMIDE



Loop diuretic

INDICATIONS

- i) Edema : congestive cardiac failure, renal edema in chronic renal failure and resistant edema
- ii) acute pulmonary edema (acute LVF following MI)
- iii) cerebral edema
- iv) forced diuresis
- v) hypertensive emergencies
- vi) with blood transfusion in anemia to prevent fluid overload
- vii) hypercalcemia.

MECHANISM OF ACTION

It inhibits Na^+ and Cl^- reabsorption in medullary portion of ascending limb of loop of Henle. Uric acid excretion is reduced and excretion of K^+ and NH_3 is increased. Furosemide reduces blood pressure in hypertensive as well as in normotensives. It reduces pulmonary edema before the onset of diuresis.

DOSAGE

Hypertension: 40-80 mg OD/BD.
Edema: 20-80 mg as single dose. Children 1-2 mg/kg/day as single dose IV IM in edema -20-80 mg/day. IM or slow IV (1-2 mins). Children IV IM in edema- 20-80 mg/day IM or IV.

CONTRAINdications

Severe dehydration, hypersensitivity to furosemide, hypokalemia, hyponatremia, precoma associated with liver cirrhosis, Addison's disease.

ONSET OF EFFECT

Within 1 hrs. (tab). Within 5 mins. (Inj).

DURATION OF ACTION

6-8 hrs.

DRUG INTERACTIONS

↓ dose required with anti-hypertensives. ↑ dose required with- NSAIDs, probenecid.

Cotrimoxazole given with diuretics causes increased incidence of thrombocytopenia. ↓ uricosuric action of probenecid on concomitant use. ↑ Serum lithium levels. Hypokalemia induced by diuretics increases digitalis toxicity and potentiates competitive neuromuscular blockers and reduces sulfonylurea action.

ADVERSE EFFECTS

Hypokalaemia, acute saline depletion, dilutional hyponatremia, GI disturbance, magnesium depletion, dizziness, lethargy, noise in the ears (high dose), muscle cramps, rash, ototoxicity.

SPECIAL PRECAUTIONS

Use cautiously in chronic renal or hepatic dysfunction, prostatic hypertrophy, diabetes, gout, chronic diarrhea, dehydration, long-term purgatives.

HYDROCHLOROTHIAZIDE



Thiazide diuretic

INDICATIONS

- i) Edema: mild to moderate cases. acts best in cardiac edema ii) hypertension iii) diabetes insipidus iv) hypercalciuria.

MECHANISM OF ACTION

The primary site of action is cortical diluting segment or the early DT. Here it inhibits $\text{Na}^+ \text{Cl}^-$ symport at the luminal membrane. It decreases positive free water clearance (in the absence of anti diuretic hormone (ADH) but does not affect negative free water clearance (in the presence of ADH). It also inhibits carbonic anhydrase.

DOSAGE

Adults: 25-100 mg daily in morning.

CONTRAINDICATIONS

Anuria, Addison's disease, hypercalcemia.

ONSET OF EFFECT

Within 2 hrs.

DURATION OF ACTION

8-12 hrs.

DRUG INTERACTIONS

↓ dose required with anti-hypertensives. ↑ dose required with- NSAIDs, probenecid. Cotrimoxazole given with diuretics causes increased incidence of thrombocytopenia. Diuretics diminish the uricosuric action of probenecid. Serum lithium

levels rise with diuretic therapy. Hypokalemia induced by diuretics increase digitalis toxicity and potentiates competitive neuromuscular blockers and reduces sulfonylurea action.

ADVERSE EFFECTS

Hypokalaemia, postural hypotension, hypercalcemia, gout, hyperglycemia, paralysis, rash, dizziness, temporary impotence, lethargy, leg cramps, digestive disturbances.

SPECIAL PRECAUTIONS

Use cautiously in chronic hepatic/ renal disorder, gout, diabetes and in other medications.

INDAPAMIDE



Thiazide

INDICATIONS

Mild to moderate hypertension.

MECHANISM OF ACTIONIt exerts antihypertensive effect at dose lower than that for diuretic action. It may cause smooth muscle relaxation by blocking Ca^{2+} inflow.**DOSAGE***Hypertension:* 2.5 mg/day. May be increased to 5 mg/day after 4 weeks.**CONTRAINDICATIONS**

Severe renal failure, severe hepatic failure, anuria.

ONSET OF EFFECT

Within 2 hrs.

DURATION OF ACTION

App. 48-72 hrs.

DRUG INTERACTIONS \downarrow dose required with- K^+ loosing diuretics, antihypertensives.**ADVERSE EFFECTS**

Headache, dizziness, lassitude, mild hypokalaemia, nausea, fatigue, epigastric distress, hyperuricemia and reversible acute myopia.

SPECIAL PRECAUTIONS

Use cautiously in hepatic or renal impairment and in elderly. Its use is contraindicated in pregnancy and lactation.

MANNITOL



Thiazide related diuretic

INDICATIONS

- i) Oliguric phase of renal failure;
- ii) cerebral edema; iii) reduction of raised intracranial pressure; iv) renal function testing; (v) transurethral prostatic resection.

MECHANISM OF ACTION

Mannitol increases urinary output by inhibiting tubular reabsorption of water and electrolytes. It raises the osmotic pressure of the plasma allowing water to be drawn out of body tissues.

DOSAGE (INTRAVENOUS)*Oliguric phase of renal failure:* Adults: 50-100 g in a 24-hr period by IV infusion of a 5-25% solution. Adjust rate of administration to

maintain a urine flow of at least 30-50 mL/hr; *Child:* 0.25-2 g/kg; Cerebral edema: *Adults:* 0.25-2 g/kg by IV infusion of a 15-25% solution given over 30-60 minutes; Reduction of raised intracranial pressure: *Adults:* 0.25-2 g/kg by IV infusion of a 15-25% solution given over 30-60 minutes; Renal function testing: *Adults:* 0.2 g/kg infused over 3-5 min; Transurethral prostatic resection (irrigation): *Adults:* Use 2.5-5% solution for bladder irrigation.

Contraindications

Pulmonary congestion or edema; intracranial bleeding; CHF; metabolic edema with abnormal

capillary fragility; anuria due to severe renal disease; severe dehydration.

DRUG INTERACTION

With cyclosporin.

ADVERSE EFFECTS

GI disorders, convulsions, chills, fever, tachycardia, chest pain, blurred vision, urticaria and hypotension or hypertension, acute renal failure, skin necrosis, thrombophlebitis.

SPECIAL PRECAUTIONS

Hypervolemia; urinary tract obstruction; check for signs of fluid and electrolyte imbalance. Should not be administered with whole blood. Pregnancy, lactation.

METOLAZONE



Thiazide-like diuretic

INDICATIONS

- (i) Edema associated with congestive heart failure and renal diseases
- (ii) hypertension (iii) diabetes insipidus (iv) renal tubular acidosis

MECHANISM OF ACTION

It acts primarily to inhibit sodium reabsorption at the cortical diluting site and to a lesser extent in the proximal convoluted tubule. The antihypertensive mechanism of action of metolazone is not fully understood but is presumed to be related to its saluretic and diuretic properties.

DOSAGE*Adults Min/Max Dose:* 2.5mg/20.0mg *Pediatric Min/Max Dose:* 0.2mg/kg/0.4mg/kg. Edema associated with congestive heart failure or renal disease: 5-10

mg once daily in the morning. *Hypertension:* 1.25-2.5 mg once daily in the morning.

CONTRAINDICATIONS

Anuria, hepatic coma or precoma, known allergy or hypersensitivity to metolazone.

ONSET OF EFFECT

Diuresis: ~60 min.

DURATION OF ACTION

12-24 hrs.

DRUG INTERACTIONS

Furosemide and other loop diuretics given concomitantly with metolazone can cause unusually large or prolonged losses of fluid and electrolytes. The hypotensive effects of alcohol, barbiturates, and narcotics may be potentiated by the volume contraction that may be associated

with metolazone therapy. Diuretic-induced hypokalemia may enhance neuromuscular blocking effects of curariform drugs. Metolazone, as well as other thiazide-like diuretics, may affect the hypoprothrombinemic response to anticoagulants.

ADVERSE EFFECTS

Abdominal bloating, palpitation, chest pain, and chills, dizziness, headache.

SPECIAL PRECAUTIONS

Caution should be used when administering metolazone and furosemide together. Use caution when administering metolazone to patients with severely impaired renal function, nursing mothers. It is not recommended in pediatric population.

SPIRONOLACTONE



Potassium sparing diuretic

INDICATIONS

- i) Edema: cirrhotic and nephrotic edema, particularly refractory edema
- ii) to counteract the K⁺ loss due to thiazide and loop diuretics
- iii) essential hypertension
- iv) primary hyperaldosteronism.

MECHANISM OF ACTION

It is a steroid which acts from the interstitial side of the tubular cells and combines with mineralocorticoid receptor and inhibits the formation of aldosterone induced proteins. Thus, it acts as an aldosterone antagonist and blocks Na⁺ reabsorption. It has no action in the absence of aldosterone while under normal circumstances it increases Na⁺ and decreases K⁺ excretion.

DOSAGE

Edema: PO : initially 100 mg/day in divided doses. ↑ if required up to 200 mg/day.

Hyperaldosteronism: Up to 400 mg for diagnosis and 100-400 mg pre-operative as maintenance.

Children: 3 mg/kg/day in divided doses.

CONTRAINDICATIONS

Anuria, hyperkalemia, hypersensitivity, hyponatremia, Addison's disease.

ONSET OF EFFECT

Within 1-3 days. Full effect may take up to 2 weeks.

DURATION OF ACTION

2-3 days.

DRUG INTERACTIONS

↓ dose with K⁺ supplements. ↑ dose with aspirin, carbenoxolone sodium. ↑ plasma digoxin concentrations occur on concurrent use.

ADVERSE EFFECTS

Drowsiness, confusion, GI upset, hirsutism, gynaecomastia, impotence, menstrual irregularities, hyperkalemia (cardiotoxic), nausea, lethargy, rash, headache, hyponatremia, osteomalacia, electrolyte imbalance.

SPECIAL PRECAUTIONS

Use cautiously in chronic hepatic or renal dysfunction, Addison's disease and metabolic disorders.

TORSEMIDE



Pyridine-sulfonylurea

INDICATIONS

It is indicated for the treatment of edema associated with congestive heart failure, renal disease, or hepatic disease, edema associated with chronic renal failure and in the treatment of hypertension alone or in combination with other antihypertensive agents. Intravenous injection is indicated when a rapid onset of diuresis is desired or when oral administration is impractical.

MECHANISM OF ACTION

Torsemide acts from within the lumen of the thick ascending portion of the loop of Henle, where it inhibits the Na⁺/K⁺/2Cl⁻ carrier system.

DOSAGE

Intravenous: injection administered either slowly as a bolus over a

period of 2 minutes or administered as a continuous infusion.

Oral: Congestive heart failure: the usual initial dose is 10 mg or 20 mg of once-daily oral or intravenous.

Chronic renal failure: The usual initial dose is 20 mg of once-daily oral or intravenous.

Hepatic cirrhosis: The usual initial dose is 5 mg or 10 mg of once-daily oral or intravenous.

Hypertension: The usual initial dose is 5 mg OD. If the 5 mg dose does not provide adequate reduction in blood pressure within 4 to 6 weeks, the dose may be increased to 10 mg once daily.

CONTRAINDICATIONS

Known hypersensitivity to sulfonylureas and anuria.

DRUG INTERACTIONS

None of the combined uses with beta-blockers, ACE inhibitors, and calcium-channel blockers was associated with new or unexpected adverse events.

ADVERSE EFFECTS

Headache, excessive urination, dizziness, rhinitis, asthenia, diarrhea, ECG abnormality, constipation, nausea, arthralgia, dyspepsia, sore throat, myalgia, chest Pain, insomnia, edema, and nervousness.

SPECIAL PRECAUTIONS

Use cautiously in hepatic disease with cirrhosis and ascites and electrolyte depletion.

TRIAMTERENE



Potassium sparing diuretic

INDICATIONS

i) Edema associated with CCF, hepatic cirrhosis, nephrotic syndrome, steroid induced edema, idiopathic edema and secondary hyperaldosteronism ii) as an adjunct to other diuretics iii) hypertension: used in combination with thiazide diuretics due to its K⁺ sparing effect. iv) used in conjunction with thiazide or high ceiling diuretics to prevent hypokalaemia and slightly augment natriuretic response.

MECHANISM OF ACTION

Nonsteroidal base which decreases K⁺ excretion along with a small increase in Na⁺ excretion. The luminal surface of late distal tubule

and collecting duct cells express a distinct amiloride sensitive Na⁺ channel through which Na⁺ enters the cells. Triamterene blocks these Na⁺ channels and indirectly inhibits K⁺ excretion, while the net excess loss of Na⁺ is minor.

DOSAGE

50-100 mg daily.

CONTRAINdicATIONS

Anuria, hyperkalemia and hypersensitivity.

ONSET OF EFFECT

Within 2 hrs.

DURATION OF ACTION

6-8 hrs.

DRUG INTERACTIONS

↓ dose with K⁺ supplements, ACE inhibitors. ↑ plasma levels of digoxin on concurrent use.

ADVERSE EFFECTS

Nausea, dizziness, muscle cramps, rise in blood urea, hypotension, hyperkalemia impaired glucose tolerance.

SPECIAL PRECAUTIONS

Use cautiously in chronic hepatic or renal dysfunction, renal calculi, gout. Should not be given along with K⁺ supplements.

XIPAMIDE



Thiazide like diuretic

INDICATIONS

i) Edema: mild to moderate cases. Acts best in cardiac edema ii) hypertension iii) diabetes insipidus iv) hypercalciciuria v) effective diuretic in renal failure.

MECHANISM OF ACTION

The primary site of action is cortical diluting segment or the early DT. Here it inhibits Na⁺ Cl⁻ symport at the luminal membrane. It decrease positive free water clearance [in the absence of anti diuretic hormone (ADH)] but does not affect negative free water clearance (in the presence of ADH). It also inhibits carbonic anhydrase.

DOSAGE

Edema: Initially 40 mg/day. Increased according to response up to 80 mg/day.

Hypertension : 20 mg/day. Some may require only 10 mg/day.

ONSET OF EFFECT

Within 1-2 hrs.

DURATION OF ACTION

24 hrs.

DRUG INTERACTIONS

↓ dose required with antihypertensives. ↑ dose required with- NSAIDs, probenecid, cotrimoxazole given with diuretics causes ↑ incidence of

thrombocytopenia, ↓ in uricosuric action of probenecid, ↑ serum lithium levels. Hypokalemia induced by diuretics increases digitalis toxicity and potentiates competitive neuromuscular blockers and reduces sulfonylurea action.

ADVERSE EFFECTS

Hypokalaemia, paralysis, dizziness, leg cramps, GI upsets, lethargy.

SPECIAL PRECAUTIONS

Use cautiously in hepatic disease, diabetes, gout, systemic lupus erythematosus.



Rosuchol

Rosuvastatin 10mg / 20mg Tablets

DRUGS IN CARDIAC FAILURE AND SHOCK

► POSITIVE INOTROPIC DRUGS

AMRINONE	! !	3-pyridine phosphodiesterase inhibitor
INDICATIONS Congestive heart failure.	(may be repeated after 30 minutes if necessary). Maintenance: 5-10 mcg/kg/min by infusion.	DRUG INTERACTIONS Mixing of Furosemide or dextrose with amrinone should be avoided and not to be injected into intravenous lines carrying amrinone infusions due to Chemical interaction with precipitation occurs with amrinone and dextrose or furosemide. Exaggerated hypotension reported with co-administration of disopyramide and amrinone.
MECHANISM OF ACTION Amrinone is a phosphodiesterase inhibitor with both positive inotropic and direct vasodilating (decrease both preload and afterload) properties.	Total daily dose (including loading dose): Should not exceed 10 mg/kg/day. Therapeutic dosage range: 0.5-7 mcg/ml.	
Amrinone inhibits myocardial cAMP (cyclic adenosine monophosphate) phosphodiesterase and increases the cellular levels of cAMP which stimulate calcium ion influx in cardiac cells and ultimately increases cardiac output.	CONTRAINDICATION Hypersensitivity.	
DOSAGE <i>Intravenous, loading dose:</i> 750 mcg/kg by slow injection, over 2-3 min	ONSET OF ACTION 5-10 min (initial effect); within 10 min (max effect).	
	DURATION OF ACTION 0.5-2 hr, duration depends on dose, multiple doses: 8 hr.	

MILRINONE	x ! x	Vasodilator
INDICATIONS Short term management of CCF in patients unresponsive to digitalis, diuretics or vasodilators.	DOSAGE <i>Adults:</i> Administer by iv infusion over 10 mins., diluted before use. Initiate therapy with 0.50mg/kg followed by intravenous infusion at a rate of 375-750 nanograms/kg/min., usually for up to 12 hours following surgery or 48-72 hours in CHF. Max. daily dose 1.13 mg/kg.	hypotension nonsustained/sustained ventricular tachycardia, angina ventricular fibrillation.
MECHANISM OF ACTION It is a relatively selective inhibitor of peak III cyclic AMP phosphodiesterase isozyme in cardiac and vascular muscle. In patients with CHF, it produces dose related and plasma drug concentration related increases in the maximum rate of increases of left ventricular pressure. Milrinone has a direct inotropic and direct arterial vasodilator activity.	CONTRAINDICATIONS Hypersensitivity to the drug.	SPECIAL PRECAUTIONS Monitor fluid and electrolyte changes, blood pressure and heart rate. Do not use in patients with severe obstructive aortic or pulmonic valvular disease.
	ADVERSE EFFECTS Headache, hypokalemia, tremors, ventricular arrhythmias (including ventricular ectopic activity),	

► VASOPRESSORS USED IN SHOCK

DOBUTAMINE



Inotropic sympathomimetic

INDICATIONS

- i) Pump failure in MI ii) cardiac surgery iii) short term management of severe CCF which is refractory and not responsive to digitalis.

MECHANISM OF ACTION

It stimulates β_1 receptors in heart to ↑ stroke volume, cardiac output without marked increase in heart rate. It also causes decrease in systemic vascular resistance.

DOSAGE

Adults: 2.5-10 $\mu\text{g}/\text{kg}/\text{min}$. Slow IV infusion. It can be titrated up to

40 $\mu\text{g}/\text{kg}/\text{min}$ as per requirements.
(diluted in 5% dextrose)

CONTRAINDICATIONS

Hypersensitivity, cardiac arrhythmias, constrictive pericarditis, idiopathic hypertrophic subaortic stenosis and obstructive cardiomyopathies.

ONSET OF EFFECT

Immediate.

DURATION OF ACTION

$\frac{1}{2}$ life : 2 mins.

DRUG INTERACTIONS

Anaesthetics cause Cardiac arrhythmias. MAOIs cause in dobutamine effect.

ADVERSE EFFECTS

Nausea, vomiting, headache, palpitations, dyspnea, tissue necrosis at site of extravasation, ectopic beats and angina.

SPECIAL PRECAUTIONS

Use cautiously in occlusive vascular disease, hypovolemia, acute MI. Do not mix in alkaline medium.

DOPAMINE



Sympathomimetic catecholamine

INDICATIONS

- i) Cardiogenic and endotoxic shock
- ii) to improve the renal blood flow
- iii) severe CHF
- iv) septicemic shock.

MECHANISM OF ACTION

It increases heart rate and force of contraction by stimulating adrenergic and dopaminergic receptors. At low infusion rates vasodilatation occurs in renal, mesenteric, coronary and cerebral beds. At higher rates vasoconstriction in skeletal muscles and a rise in blood pressure is there. Vasoconstriction is also there in renal and mesenteric arteries.

DOSAGE

IV infusion at a dose of 2.5 $\mu\text{g}/\text{kg}/\text{min}$. In serious condition rate can

be increased with increments of 5-10 $\mu\text{g}/\text{kg}/\text{min}$ up to 20-50 $\mu\text{g}/\text{kg}/\text{min}$. At doses above 50 $\mu\text{g}/\text{kg}/\text{min}$, check urine output.

CONTRAINDICATIONS

Pheochromocytoma, hyperthyroidism, tachyarrhythmias.

ONSET OF EFFECT

Immediate.

DURATION OF ACTION

Half-life: 2 mins.

DRUG INTERACTIONS

↓ dose required with MAO inhibitors, ergots. General anaesthetics sensitize myocardium to dopamine and precipitate severe arrhythmias. α blockers unmask dopamine's β action.

ADVERSE EFFECTS

Nausea, vomiting, palpitations, ectopic beats, angina, dyspnea, sudden rise in BP, widened QRS, vasoconstriction, bradycardia, azotemia.

SPECIAL PRECAUTIONS

Use cautiously in occlusive vascular disease, diabetic entereritis, Raynaud's disease, berger's disease, hypovolemia, infusion of a large dose or for a long period (may cause ischemia and gangrene of limbs), patients on MAOIs. Geriatric, pediatric and nursing patients are to be given dopamine cautiously taking into account the potential benefit to risk ratio.



R_{osuchol}
Rosuvastatin 10mg / 20mg Tablets

MEPHENTERMINE



Adrenergic vasoconstrictor

INDICATIONS

Shock and hypotension, e.g.
i) accompanying myocardial infarction, ii) secondary to spinal anaesthesia.

MECHANISM OF ACTION

It causes release of noradrenaline at synapses causing increase in cardiac output and systolic and diastolic blood pressure. It also increases coronary blood flow.

DOSAGE

15-60 mg IV drip in 5% dextrose.

CONTRAINDICATIONS

Phenothiazine induced hypotension, hypertension.

DRUG INTERACTIONS

↓dose required with cardiac glycosides, quinidine, tricyclic antidepressants, MAOIs.

General anaesthetics increase risk of ventricular fibrillation in patient on mephentermine. Concomitant use with MAOIs causes severe hypertension. Concomitant use with antihypertensives reduces their effect.

ADVERSE EFFECT

Cerebral hemorrhage, pulmonary edema, VT/VF, anxiety, restlessness, tremors, insomnia, confusion, irritability and psychosis,

urinary retention, dyspnea, weakness, impaired glucose metabolism, sweating, hypersalivation and headache.

SPECIAL PRECAUTIONS

Use cautiously in hypovolemic shock, any fluid/blood loss should be corrected, CVS disease, hypertension, diabetes, glaucoma. Phenothiazine induced hypotension may be worsened. Patients on MAOIs may have severe hypertension.

NORADRENALINE



Catecholamine

INDICATIONS

i) Acute hypotension ii) cardiac arrest iii) upper GI and similar bleeding disorders (local application), iv) local anaesthetics (adjuvant).

MECHANISM OF ACTION

It stimulates adrenergic receptors to produce a pressor response.

DOSAGE

Acute hypotension: IV 4 µg base/ml in 5% D or 5% DNS infused initially at 2-3 ml (8-12 µg)/mins, titrating accurately to blood pressure (monitored initially q 2mins). IV maintain: 0.5-1ml (2-4 mg)/mins. Alternatively, a syringe pump is used to give IV 40 µg/ml initially at 0.16-0.33 ml/mins. Phentolamine 5-10 mg/l added to the infusion may prevent sloughing upon extravasation, without compromising the vasopressor effects. Other hypoten-

sive states are similarly managed. Cardiac arrest :100mcg/l given in aliquots of 0.5-0.75 ml (50-75 µg), rapid IV or intracardiac. Local anaesthesia: adjuvant use in ~ 1: 80,000 concentration.

CONTRAINDICATIONS

Hypertension, hyperthyroidism, angina, along with halothane.

ONSET OF EFFECT

Immediate.

DURATION OF ACTION

Few minutes.

DRUG INTERACTION

Anaesthetics e.g., cyclopropane and halothane cause ventricular fibrillation. MAOIs cause dangerous hypertension. Separate both by at least 2 weeks. Digitalis, quinidine, tricyclic antidepressants cause risk of arrhythmias.

ADVERSE EFFECTS

Local extravasation (phlebitis, necrosis, sloughing), arterial constriction (e.g., myocardial necrosis), hypertension (leading to cerebral hemorrhage, pulmonary edema), β_1 stimulation (tachycardia, tachyarrhythmia, cardiac arrest, worsened CAD), gangrene (esp digital), anorexia/nausea/vomiting, CNS toxicity (anxiety, insomnia, irritability, psychosis). Other effects are foetal anoxia, ↓placental perfusion, uterine contraction.

SPECIAL PRECAUTIONS

Use cautiously in cardiovascular disease, hyperthyroidism, closed angle glaucoma and in other medications. Best avoid in pregnancy. Avoid extravasation. Prefer a fine cannula placed well inside a large vein, an upper limb being the best.

TAURINE



Essential amino acid

INDICATION

Congestive heart failure, acute hepatitis, nutritional supplement.

MECHANISM OF ACTION

Chemically, taurine is 2-aminoethane sulfonic acid and an essential amino acid. Taurine is full of antioxidant, putative hypocholesterolemic, hypotensive, antiatherogenic & detoxifying activities. Human breast milk is found to be rich in taurine

and clinically use in CHF, cystic fibrosis, toxic exposure and liver disorders due to its steatorrhea-reducing activity.

DOSAGE

Congestive heart failure: The recommended adults dose is 2-6 g/day daily in divided dose, BID-TID

Acute hepatitis: The recommended adults dose is 4 g daily, TID for 6 weeks.

CONTRAINDICATIONS

Hypersensitivity for taurine or any component of its formulation.

SPECIAL PRECAUTION

Patient should avoid use in pregnancy and lactation. Use cautiously in renal failure and CHF patients.

PLASMA EXPANDERS

HUMAN ALBUMIN



Colloid oncotic pressors

INDICATIONS

Severe hypoalbuminemia associated with low plasma volume and generalized edema.
i) Acute or subacute loss of plasma (burns, pancreatitis, trauma, post-operative and plasma exchange).
ii) neonatal hyperbilirubinemia, where exchange transfusion has been done.

MECHANISM OF ACTION

Albumin is the major protein in plasma accounting for most of the colloid osmotic pressure of plasma and regulating circulating volume of blood.

DOSAGE

Shock: Adults started with 500-700 ml and dose changed as per

response - children started with 12-20 ml/kg and then changed as per response. **Hypoalbuminemia:** Adults started with 100-200 mg and then adjusted as per requirement. Children started with 2.5-5 ml/kg and then dose adjusted as per requirement. **Hyperb.** 2.5-5 ml/kg and then individualised according to response. Given without dilution or in combination without dilution or in combination with whole blood, plasma, saline, glucose, or RL.

CONTRAINdications

Volume overload, asystole, Circulatory failure and hypersensitivity.

DRUG INTERACTIONS

Albumin is not to be administered

along with protein hydrolysates or alcoholic solutions.

ADVERSE EFFECTS

Hypersensitivity, nausea, vomiting, salivation, fever and chills.

SPECIAL PRECAUTIONS

Use cautiously in previous history of vascular or cardiac disease (slow infusion advocated, monitor central venous pressure (CVP) and pulmonary function), correction of pre-existing dehydration, patients prone to circulatory overload (especially along with other diluting IV fluids) and pregnant females.



Rosuchol

Rosuvastatin 10mg / 20mg Tablets

VASODILATORS

ISOXSUPRINE



β agonist

INDICATIONS

- i) Peripheral vascular disorder ii) Intermittent claudication iii) Berger's disease iv) nocturnal leg cramps v) premature labour vi) habitual abortion vii) threatened abortion viii) cerebral vascular disease.

MECHANISM OF ACTION

It is a beta agonist and causes peripheral and cerebral vasodilation with greater effects on skeletal muscle and vessels. It also causes uterine relaxation.

DOSAGE

20 mg 3-4 daily after meals. Titrate the dose as per response. SR tab-

40 mg BD. *Premature labour:* 10-20 mg IM 3-4 times daily.

Same dose for treatment of abortion.

IV dose: 200-300 µg/min adjusted as per response and then maintained on IM or oral dosage.

CONTRAINDICATIONS

Recent hemorrhage, severe anemia, premature detachment of placenta, immediately postpartum, parenteral use in patient with known heart disease.

ONSET OF EFFECT

PO: Within 30-60 mins., Inj IV: within mins.

DURATION OF ACTIONS

Oral: 6-8 hrs.

DRUG INTERACTIONS

Combined use with beta antagonist is not advocated.

ADVERSE EFFECTS

Dizziness, hypertension, palpitation, nausea, vomiting, rash, abdominal disturbance.

SPECIAL PRECAUTIONS

Use cautiously in CVS disease, infections, breast feeding and immediate postpartum period.

NYLIDRIN (BUPHENINE) HYDROCHLORIDE



Peripheral
anti ischaemic

INDICATIONS

- i) Intermittent claudication ii) thromboangiitis obliterans iii) thrombophlebitis iv) peripheral vascular disease v) arteriosclerotic ulcers vi) nocturnal leg cramps vii) frostbite ischemia.

MECHANISM OF ACTION

It is a peripheral vasodilator with beta stimulant effect.

DOSAGE

3-6 mg TID/BID. Max.: 12mg/day.

CONTRAINDICATIONS

Recent arterial hemorrhage, acute coronary thrombosis.

DRUG INTERACTIONS

↓dose required with other vasodilators and sympatholytics.

ADVERSE EFFECTS

Trembling, nervousness, weakness, dizziness, palpitations, anemia, nausea/vomiting, rash.

SPECIAL PRECAUTIONS

Use cautiously in severe angina pectoris, recent myocardial infarction, hyperthyroidism, abnormal hepatic functions.

PENTOXIFYLLINE



Hemorrheologic agent

INDICATIONS

- i) Nonhemorrhagic stroke ii) chronic cerebrovascular insufficiency
- iii) transient ischemic attack
- iv) Intermittent claudication v) trophic leg ulcers and gangrene vi) occlusive circulatory disturbances of the retina and cochlea vii) improving sperm motility (tried in male factor infertility).

MECHANISM OF ACTIONS

It reduces viscosity of blood and thus improves microcirculation and tissue oxygenation. RBCs become more flexible.

DOSAGE

Adults: 400 mg BD/TID. Inj.: 0.6 mg/kg/hr. Not to exceed 1200 mg in 24 hrs.

CONTRAINDICATIONS

Porphyria, hypersensitivity, acute myocardial infarction, retinal hemorrhage, lactation.

ONSET OF EFFECT

Within 2-4 weeks of treatment.

DURATION OF ACTION: 4-8 hrs.

DRUG INTERACTIONS

↓ dose required with other vasodilators and antihypertensives.

High parenteral doses may increase hypoglycemic action of insulin in diabetic patients.

ADVERSE EFFECTS

Nausea, vomiting, dyspepsia, bloating, vertigo, flushing, angina, palpitations, cardiac arrhythmias, hepatitis, jaundice and blood dyscrasias.

SPECIAL PRECAUTIONS

Use cautiously in coronary artery disease, renal dysfunction, hypotension, DM, hypersensitivity, ↑ flushing with alcohol.

SILDENAFIL CITRATE



Phosphodiesterase (PDE5) inhibitor

INDICATIONS

It is indicated for the treatment of erectile dysfunction.

MECHANISM OF ACTION

It induces erection in response to sexual arousal by causing smooth muscle relaxation in corpus cavernosum through inhibition of PDE-5.

DOSAGE

The recommended dose is 50 mg taken, approximately 1 hours before sexual activity. It may be taken anywhere from 4 hours to 0.5 hour before sexual activity. The dose may be increased to a maximum recommended dose of 100 mg or decreased to 25 mg. The maximum recommended dosing frequency is once per day.

CONTRAINDICATIONS

Hypersensitivity, potentiates the hypotensive effects of nitrates, and its administration to patients who are using organic nitrates in any form is therefore contraindicated.

DRUG INTERACTIONS

Cytochrome P450 inhibitors, beta blockers, calcium channel antagonists and other antihypertensives. (Cyto P450 inhibitors are ketoconazole, erythromycin, cimetidine, etc.)

ADVERSE EFFECTS

Headache, flushing, respiratory tract infection, angina, AV block, migraine, syncope, tachycardia, postural hypotension, MI, cerebral thrombosis, cardiac arrest paraesthesia, tremors, depression, herpes simplex, skin ulcer, esophagitis, altered LFTs, bleeding P/R, hypoglycemia, deafness, arthritis, retinal vascular disease and photosensitivity.

SPECIAL PRECAUTION

There is potential for cardiac risk during sexual activity in patients with pre-existing cardiovascular disease. It should be prescribed with caution in the following group of patients:

patients who have suffered MI, stroke, or life-threatening arrhythmia within the last 6 months; patients with resting hypotension or hypertension; patients with cardiac failure or coronary artery disease causing unstable angina; patients with retinitis pigmentosa.

In the event of an erection that persists longer than 4 hours, the patients should seek immediate medical assistance. If priapism is not treated immediately penile tissue damage and permanent loss of potency could result. It should be used with caution in patients with anatomical deformities of the penis or in patients who have conditions which may predispose them to priapism (such as sickle cell anaemia, multiple myeloma, or leukaemia). Combinations of sildenafil with other treatments for erectile dysfunction are not recommended.



Rosuchol
Rosuvastatin 10mg / 20mg Tablets

XANTHINOL NICOTINATE



x



x



Nicotinic acid prodrug

INDICATIONS

- i) Peripheral vascular disease
- ii) disordered cerebral function
- iii) hyperlipidaemia.

MECHANISM OF ACTION

It is a compound of theophylline and nicotinic acid and acts as a peripheral vasodilator.

DOSAGE

300-600 mg TID. To be taken with meals. 500 mg SR tab is taken 1-2 tab BD.

CONTRAINDICATIONS

Hypersensitivity, acute hemorrhage, recent myocardial infarction, cerebrovascular accident, pregnancy and lactation.

DRUG INTERACTIONS

↓dose required with sympatholytics and other vasodilators.

ADVERSE EFFECTS

Flushing, hypotension and hypersensitivity.

SPECIAL PRECAUTIONS

Use cautiously in labile blood pressure control, active peptic ulceration, cardiac insufficiency, pulmonary edema, oliguria and anuria.

MISCELLANEOUS

FLAVONOIDS



Haemostatic

INDICATIONS

- i) Chronic organic and functional venous insufficiency of the lower limbs ii) hemorrhoids iii) acute hemorrhoidal bleeding iv) dysfunction uterine bleeding (DUB), IUCD induced bleeding.

MECHANISM OF ACTION

The bioflavonoids and their

derivatives improve capillary/venous function by decreasing abnormal vessel permeability.

DOSAGE

1 Tab BDS with meals. Acute hemorrhage: 2 Tab TDS for 3 days then 1 Tab BD for 1 months.

CONTRAINDICATIONS

No known contraindications.

ADVERSE EFFECTS

Rarely reported : Nausea, Vomiting, Autonomic disorders.

INDICATION

Radiographic contrast medium for intra-arterial and IV procedures: Intra-arterial digital subtraction angiography, peripheral venography, cerebral/peripheral arteriography, excretory urography, coronary arteriography and left ventriculography, visceral angiography, aortography contrast computed tomography (CT) of the head and body (intrathoracic, intra-abdominal, and retroperitoneal regions) for the evaluation of neoplastic and non-neoplastic lesions.

MECHANISM OF ACTION

Systemic (intravascular/intraarterial) administration of iopromide allows and opacifies the radiographic visualization of internal body structures until significant hemodilution occurs. It is a nonionic, water soluble, tri-iodinated x-ray contrast agent for intravascular administration. Organic iodine compounds block x-rays as they pass through the body, thereby allowing the body structures containing iodine to be delineated in contrast to those structures that do not contain iodine.

DOSAGE

Digital subtraction angiography: 150 mg iodine/ml, intra-arterial single injection dose, carotid arteries: 6-10 ml, vertebral arteries: 4-8 ml, aorta: 20-50 ml, major branches of the abdominal aorta: 2-20 ml, not to exceed 250 ml cumulative dose

Cerebral Arteriography: 300 mg iodine /ml, intra-arterial single injection dose, carotid arteries: 3-12 ml, vertebral arteries: 4-12 ml, aortic arch injection (4-vessel): 20-50 ml, not to exceed 150 ml cumulative dose

Peripheral Arteriography: 300 mg iodine/ml, intra-arterial single injection dose, subclavian or

femoral artery: 5-40 ml, aortic bifurcation: 25-50 ml, not to exceed 250 ml cumulative dose.

Coronary Arteriography & Left Ventriculography: 370mg iodine/ml, intra-arterial single injection dose, right or left coronary artery: 3-14 ml, Left ventricle: 30-60 ml, not to exceed 225 ml cumulative dose

Aortography and visceral angiography: 370 mg iodine/ml, intra-arterial injection, not to exceed 225 ml cumulative dose. Max dose of iodine: 86 g

Peripheral Venography: 240 mg iodine/ml, intravenous injection, not to exceed 250 ml. Max dose of iodine: 86 g.

Excretory urography: *Adults:* 300 mg iodine/ml, intravenous injection, not to exceed 100 ml, Max dose of iodine: 86 g. *Child:* >2 yr: 300 mg iodine/ml as 1-2 ml/kg, intravenous injection, not to exceed 3 ml/kg.

Contrast agent for cardiac chambers and related arteries

Child: >2 yr: 370 mg iodine/ml as 1-2 ml/kg, intravenous injection, not to exceed 4 ml/kg.

Contrast-enhanced computerized tomography

Adults: 300 mg iodine/ml, head: 50-200 ml, not to exceed 200 ml, body: 50-200 ml as bolus injection, rapid infusion or both (usual dose for infusion: 100-200 ml); not to exceed 200 ml. Max dose of iodine: 86 g.

Child: >2 yr: 300 mg iodine/ml as 1-2 ml/kg, not to exceed 3 ml/kg.

CONTRAINdications

Not recommended for intrathecal injection.

ONSET OF ACTION

15-120 seconds post bolus injection.

DRUG INTERACTION

Iopromide may precipitate lactic acidosis when administered with biguanide agents such as metformin. Patient should stop to

administered biguanides before as well as after 48 hours of taking contrast media. Interleukins with iopromide increased the risk of delayed hypersensitivity reactions. Oral administration of cholecystographic agents with intravascular iopromide may increase the risk of renal toxicity especially in patients with hepatic function impairment.

ADVERSE EFFECTS

The most important adverse drug reactions are anaphylactoid shock, contrast induced acute kidney injury, coma, cerebral infarction, stroke, brain edema, convulsion, arrhythmia, cardiac arrest, myocardial ischemia, myocardial infarction, cardiac failure, bradycardia, cyanosis, hypotension, shock, dyspnea, pulmonary edema, respiratory insufficiency and aspiration, vomiting, back pain, urinary urgency, chest pain, dysgeusia, abnormal vision are adverse effects.

SPECIAL PRECAUTIONS

Caution should be exercised in patient with previous contrast sensitivity, allergy to iodine, asthma, hay fever and food allergies. Renal impairment, combined renal and hepatic disease, combined renal and cardiac disease, DM, sickle-cell disease, severe thyrotoxicosis, myelomatosis or anuria. In sickle cell diseases contrast agents may promote sickling following administration in homozygous genotypes. If possible, patients with homocystinuria avoid angiography due to the increased risk for thrombosis/embolism. Use cautiously in pregnancy and lactation.



NOTES



In Painful Disorders like
Spinal Cord Injury &
Painful Diabetic Neuropathy

Rx

APLENE

Pregabalin 75 / 150 mg Tablets

1st Choice in Painful Neuropathy



NICE guidelines recommend *CCB's as the first line agent of choice
in all patients aged 55 years or older¹

In Hypertension & Angina

Rx

AMADAY

Amlodipine 5 / 10 mg Tablets

Anti-hypertensive with 24 hours efficacy



Reference:

1) Barrett W. Jeffers, Incremental Blood Pressure-Lowering Effect of Titrating Amlodipine for the Treatment of Hypertension in Patients Including Those Aged >55 Years American Journal of Therapeutics 22, 278-287 (2015)

*CCB : Calcium Channel Blocker

Optimize Drug Delivery
to coincide with morning BP surge Prefer the trusted **XL[#] formulation**

In Hypertension, Angina & Heart Failure

Rx

Met XL

Metoprolol Succinate 50mg / 100mg ER Tablets

For 24hrs BP Control

Potential Advantages of Extended Release Drug Delivery¹



[#] XL : Extended Release

Ref :

- 1) Navin Dixit . SUSTAINED RELEASE DRUG DELIVERY SYSTEM , Indian Journal of Research in Pharmacy and Biotechnology Volume 1(3) May-June 2013 Page 305 -310

Before prescribing please consult the full prescribing information

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