

2013

# Hypertension

FEBRUARY

March  
2013Fr Sa Su Mo Tu We Th Fr Sa Su Mo Tu We Th Fr Sa Su Mo Tu We Th Fr Sa Su  
01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

Thursday

9th Week • 059-306

28

- Reasons :-
- Primary Hypertension → Diet & Habit
  - Secondary Hypertension → Renal Failure
  - Hormonal Disbalance
  - (\*) Hypothyroidism → ↑ Diastolic BP

<u>Category</u>	<u>Systolic BP</u>	<u>Diastolic BP</u>
① Normal	120	80 mm Hg
② High Normal	120 - 139	80 - 89
③ Hypertension		
Grade - I (mild)	140 - 159	90 - 99
Grade - II (Moderate)	160 - 179	100 - 109
Grade - III (Severe)	> 180	> 110
④ Isolated Systolic Hypertension (ISH)	≥ 140	< 90

Causes :-

- ① Vascular Stenosis
- ② Vasoconstriction
- ③ Total peripheral resistance (t.p.r.)
- ④ Increased blood volume.



## Antihypertensives Dong Classification

ABCD v/s  $\alpha/\beta (\alpha+\beta)$

A → Angiotensin Converting Enzyme Inhibitors (ACE-Is)  
+ Angiotensin Receptor Blockers (ARBs)

B → ~~β~~ Blockers Baroreceptor Stimulators

MARCH

01

Friday

9th Week • 060-305

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20

C → Calcium Channel Blockers (CCBs)

D → Diuretics

V → Vasodilators

V / S

S → Centres Sympatholytics

Arteriolar      Artery + venous

α → α-blockers

β → β-blockers

α+β → α+β blockers



⊕ ACE-Inhibitors ⇒ (Pril) → Captopril

Enalapril

Lisinopril

Perindopril

Ramipril

⊕ ARBs ⇒ (Sartan) → Losartan  
Candesartan  
Irbesartan

⊕ Baroreceptor Stimulator (Reflexly acting) ⇒ Reflex inhibition of Central Sympathetic activity  
~~B-blockers~~ ⇒ (lot) → Atenolol  
propranolol → Veratrum.  
metoprolol

Important

Next day Program:

⊕ CCBs ⇒ verapamil (Phenyl Alkyl Amine)  
Diltiazem (Benzothiazepine)

Dipine

(Dihydropyridines)

→ Amlo / Nefi / Felo / Atenodipine / Lacidipine / Nicardipine

2013

April  
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Saturday

9th Week • 061-304

02

- ④ Dinretics ⇒ 1. Thiazides → Hydrochlorothiazide  
 Chlorothalidone  
 Indapamide  
 2. High ceiling → Furosemide (Lasix)  
 3. K<sup>+</sup> Spaving → Spironolactone (Aldosterone Antagonist)

⑤ V → Vasodilators

Artery → (AMDA - Masala) → Hydralazine  
 → Minoxidil  
 → Diazoxide

Vein + Artery → Sodium Nitroprusside.

- ⑥ S → Central Sympatholytics → Clonidine ( $\alpha_2$ -Agonist)  
 →  $\alpha$ -Methyl DOPA

- ⑦  $\alpha$ -Blockers → (Zosin) → Prazosin  
 Terazosin  
 Doxazosin

→ (Amine) → Phenolamine, Phenoxybenzamine

- ⑧  $\beta$ -blockers → (101) → Atenolol / Propranolol / Metoprolol Sunday 03

- ⑨  $\alpha_1 + \beta$ -Blockers → (101) → Labetalol (Non-Selective- $\beta$  & Selective- $\alpha_1$  Blocker) -  
 carvedilol

2013

# Angina Pectoris & Myocardial Infarction

MARCH

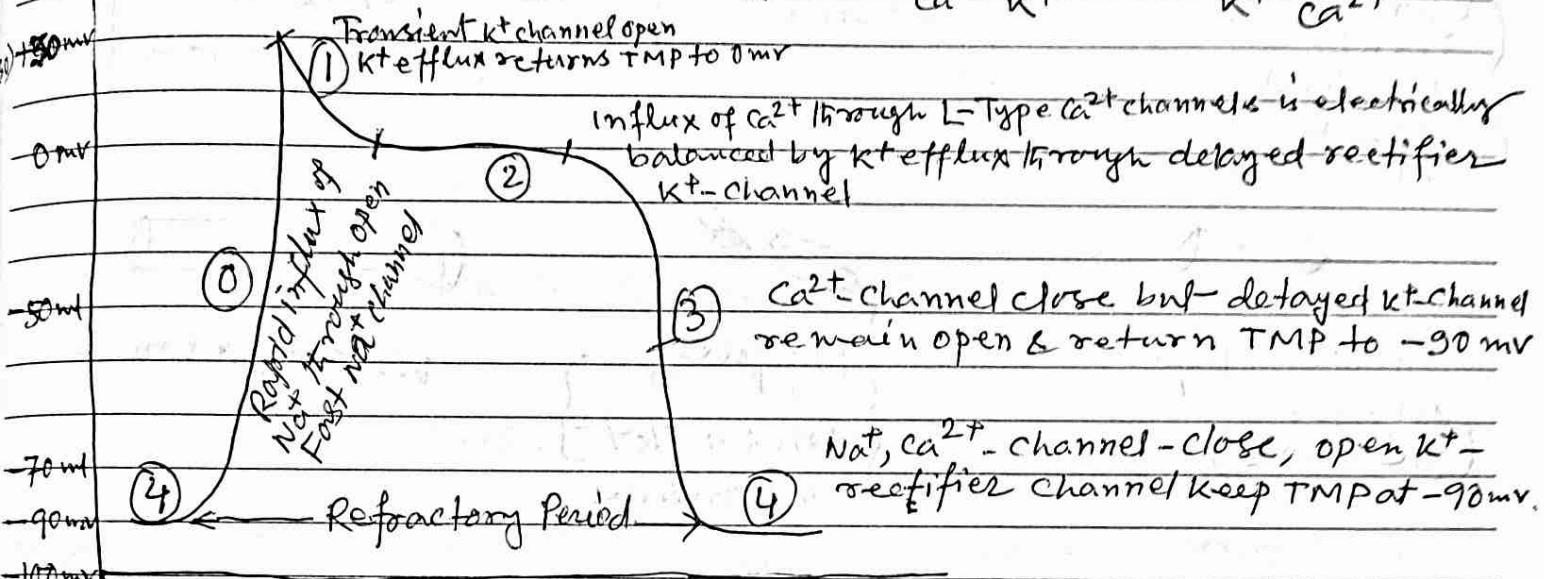
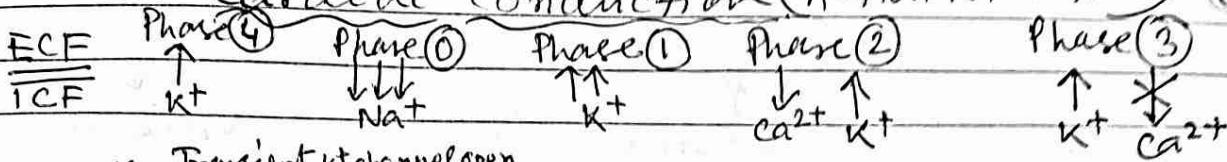
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Tuesday

05

## Cardiac conduction (Action Potential)



## Action potential (myocardial muscle) [Non-Automatic fibre]

④ TMP → Transmembrane Potential.

Phase - ① → Depolarization (Systole)

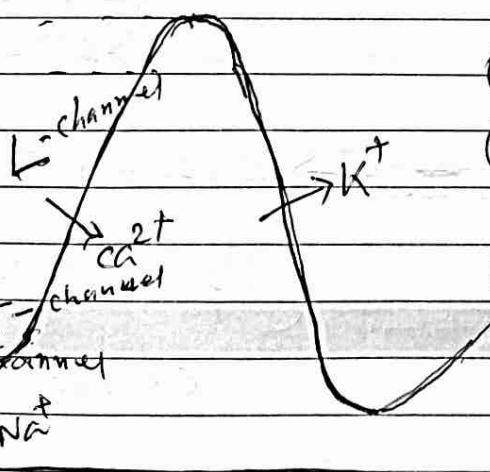
Phase - ②, ③, ④ → Repolarization (Diastole)

Na<sup>+</sup>-K<sup>+</sup>-ATPase cause fixation of Na<sup>+</sup> & K<sup>+</sup> ion inside the cell.

Ca<sup>2+</sup> channels → L → Long lasting current-

T → Transient Current-

N → Neural current-



\* Resting phase is negligible

\* Sympathetic & Parasympathetic drugs on it.

\* F-channel / HCN-channel /

Next day Program: Funny-channels are the Na<sup>+</sup>, K<sup>+</sup>-channels of Automatic fibre.

Action Potential (SA node) (Automatic fibre)

MARCH

2013

06

Wednesday

10th Week • 065-300

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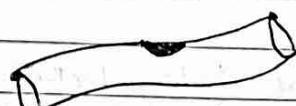
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## Angina

Chronic  
Stable  
Classical  
Effort

Unstable  
Crescendo

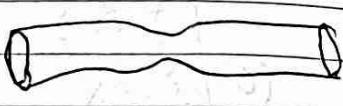
Variant  
Prinzmetal



Stable Plaque  
Atherosclerotic  
(Stenosis)



Plaque  
+  
Blood clot  
= Thrombus



vasoconstriction



Myocardial Infarction (MI)

Messily blocked

\* Severe form of Angina is  $\Rightarrow$  MI

\* Risk of angina is detected by  $\Rightarrow$  C-Reactive Protein Test (CRP-Test)

\* Distinguishing Test for MI & Acute Angina  $\Rightarrow$  Cardiac Marker  $\rightarrow$  Troponin-T-Test - ( below 1 = Normal )

1-3 = Low

3-5 = Medium

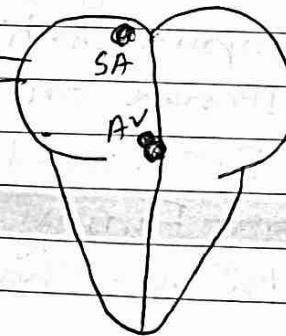
$> 5$  = High

→ Vein

(preload)

Important

nitrates



→ Artery

(Afterload)

CCBs

(Workload)

$\beta$ -blockers

$K^+$  channel open  
(Pre + Afterload)

2013

Drugs Classification

MARCH

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Thursday

10th Week • 066-299

07

Fatty &amp;

NCB K PFO - Funny - Angina I

④ N → Nitroates  $\Rightarrow$  GTN  $\rightarrow$  Glyceryl trinitrate (short)

Isosorbide mononitrate (ISMN) (long)

Isosorbide dinitrate (IDN) (long)

Erythrityl tetranitrate (ETN) (long)

Pentaerythrityl tetranitrate (PETN) (ultra-long)

④ Amyl nitrate (shortest)  $\rightarrow$  (used Tongest)

(not in Cyanide poisoning)

(MOA  $\rightarrow$   $\uparrow$  cGMP  $\rightarrow$   $\uparrow$  NO  $\rightarrow$  venodilator  $\rightarrow$   $\downarrow$  Preload)④ C  $\rightarrow$  CCBs  $\Rightarrow$  1. Phenyl Alkyl Amine  $\rightarrow$  verapamil2. Benzothiazepines  $\rightarrow$  Diltiazem3. Dihydropyridines  $\rightarrow$  (dipines)  $\rightarrow$ 

Amlodipine / Felodipine / Nitrendipine / Labetalol / Nifedipine /

(MOA  $\rightarrow$  Arteriolar dilatation  $\rightarrow$  ~~↓ RPP~~  $\rightarrow$  Afterload)④ B  $\rightarrow$   $\beta$ -blockers  $\Rightarrow$  (101)  $\Rightarrow$  Propranolol / Metoprolol / Atenolol(MOA  $\rightarrow$  Slowdown Workload of Heart)  $\downarrow$  HR  $\downarrow$  Contractility④ K  $\rightarrow$   $K^+$ -channel Openers  $\Rightarrow$  Nicorandil(MOA  $\rightarrow$   $K^+$  out  $\rightarrow$  Polarization  $\rightarrow$  L- $Ca^{2+}$  channel  $\rightarrow$   $\downarrow$   $Ca^{2+}$  activity present)  $\rightarrow$   $\downarrow$   $Ca^{2+}$  channel blockers block  $\rightarrow$  vasodilation  $\rightarrow$   $\downarrow$  Resistance  $\rightarrow$   $\downarrow$  Pre + [After]  $\downarrow$  Insulin  $\rightarrow$   $\uparrow$  Sugar④ P  $\rightarrow$  Phosphodiesterase Inhibitor  $\Rightarrow$  Dipyridamol(MOA  $\rightarrow$  PDE-IV inhibit  $\rightarrow$  Adenosin uptake  $\rightarrow$   $\downarrow$  Coronary Steal phenomenon)  $\rightarrow$  (④ have anti platelet activity)④ F  $\rightarrow$  Fatty acid Metabolism inhibitors  $\Rightarrow$  Ranolazine  
(MOA  $\rightarrow$   $\downarrow$  workload) Trimetazidine④ O  $\rightarrow$  Other  $\Rightarrow$  TrimetaZidine // Oxyphedrine④ Funny  $\rightarrow$  Funny channel Inhibitor  $\Rightarrow$  Ivabridine  
(MOA  $\rightarrow$  Slowdown diastolic depolarization of SA node)

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# Important Points.

201

08

Friday

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# Prinzmetal Angina = CCBs → Only Dihydropyridines  
Treatment → Only Amodipine ✓

# Classical Angina  
Treatment =  $\beta$ -blockers. ✓

# Stable + Unstable Angina  
Treatment = Glycerol Trinitrate (GTN) ✓

# Myocardial infarction ⇒ Thrombolytics ✓  
Treatment  
MI → SURAT  
SURAT → 1. Streptokinase  
2. Urokinase  
3. Reteplase  
4. Alteplase  
5. Tenecteplase

## Side Effects

# Nitrates ⇒ 1. Reflux Tachycardia, 2. Headache  
(Use → Nitrate +  $\beta$ -blocker)  
called Monday disease drugs.

# K<sup>+</sup>-channel Opener ⇒ 1. Hyperglycemia  
2. ↓ insulin secretion.

# Dihydropyridines ⇒ (DHPs) - (Dipines) - Amodipine  
↳ Reflex Tachycardia.

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# Arrhythmia

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Saturday

10th Week • 068-297

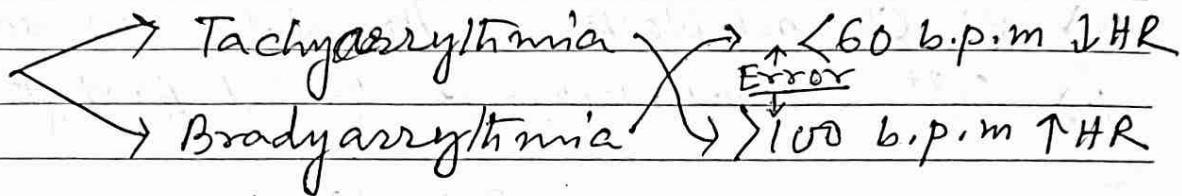
09

Any disorder of heart rate due to

— 1. Abnormal impulse generation

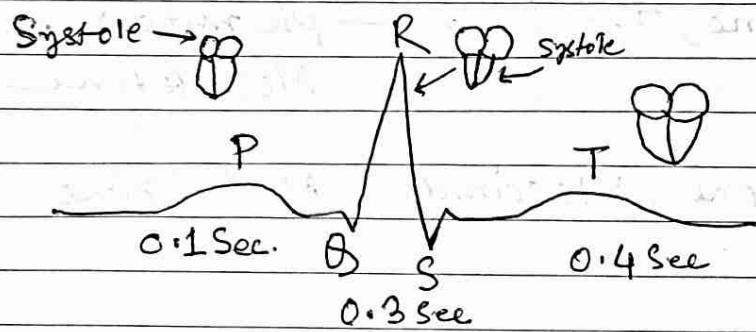
— 2. Abnormal conduction

Arrhythmia



[\* Normal Rhythm is 60 - 100 b.p.m ]

## ECG - Electrocardiogram :-



BRS → ventricular Depolarization.  
ventricular Contraction  
spread of impulse  
from AV node →  
AV bundle →  
Purkinje fibre.

(P) → Atrial Depolarization  
→ Atrial Contraction  
→ Impulse from SA node.

(T) → Ventricular Repolarization  
→ Ventricular Relaxation

## Non-Automatic Fibre

- (\*) Atricle
- (\*) ventricle
- (\*) Purkinje Fibre

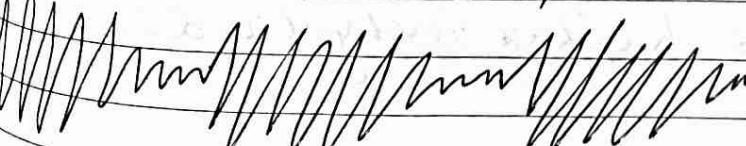
## Automatic Fibre

- (\*) SA node
- (\*) AV node
- (\*) Bundle of His

Fast Action Potential

Slow Action Potential.

Torsade de pointes ⇒ Twisting of points.

 - QRS-Complex changing - ventricular tachycardia

Rx: B-blocker, Magnesium Therapy

MARCH

# Drug Classification & Treatment -

2013

11 N Bakshi  
Monday  
11th Week • 070-295

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March  
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- 1.)  $\text{Na}^+$  channel blocker  $\Rightarrow$  Ventricular Arrhythmia
- 2)  $\beta$ -blockers  $\Rightarrow$  Atrial Arrhythmia
- 3)  $K^+$ -Channel blockers  $\Rightarrow$  Atrial + Ventricular Arrhythmia
- 4)  $\text{Ca}^{2+}$ -Channel blocker  $\Rightarrow$  Atrial Arrhythmia

## Classification

### \* Class-I ( $\text{Na}^+$ channel blockers) :-

P&D ~~Question~~ - Ia  $\Rightarrow$  Procainamide, Quinidine, Disopyramide  
Pharma ~~Question~~ Declared

L.T  $\rightarrow$  P.M. ~~Technician~~ - Ib  $\Rightarrow$  Lidocaine, Tocainide — phenytoin,  
Lab ~~Technician~~ post Mortem Mexiletine  
Karni ~~Technician~~

Proper flex ~~ko khatana~~  $\rightarrow$  Ic  $\Rightarrow$  Propafenone, Flecainide, Moricizine.  
Mor ~~ko khatana~~ ~~hai~~

### \* Class-II ( $\beta$ -blockers) :-

Bretylium is also mg  $\rightarrow$  propranolol, Esmolol, Sotalol Bretylium

### \* Class-III ( $K^+$ -channel blockers) :- (Prolong Repolarization)

ADB-reader  
short  $\rightarrow$  Amiodarone, Dofetilide, Bretylium,  
Sotalol

### \* Class-IV ( $\text{Ca}^{2+}$ -channel blocker) :-

Important two (IV)  
Only two ~~no dipines~~  $\rightarrow$  Diltiazem, Verapamil

\* DHPS have  $\rightarrow$  S/E of Reflux tachycardia

2013

Special

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Tuesday

11th Week • 071-294

12

# PSVT (Paroxysmal Supraventricular Tachycardia)  
 Treatment (Rx) - Adenosine, Digitalis

# A.V. block — Rx — Sympathomimetics — Isoprenaline  
 (Heart block) Anticholinergic — Atropine

[Electrical Signal partially/completely blocked → slow/skip beat]

# Atrial Flutter (AF)

Atrial Fibrillation (AFI)

PSVT

Digitalis (Cardiac glycosides)

AF → Atrial Flutter result from a "short-circuiting" of the normal impulse in a loop that revolves around the Right Atrium, called typical atrial flutter, which is actually curable.

AFI → Atrial Fibrillation is a more chaotic rhythm, that does not follow one set loop. Multiple ectopic foci creates multiple loops. So, the heart chamber fibrillates, quivers or shakes, rather than contracting.



AFI

PSVT

Saw tooth appearance

Racing Heart. Multiple wavelets of depolarization 120-230 b.p.m. moving around chaotically

Important

Next day Program:

PSVT → Fast heart beat at upper / supra ventricular region of heart. A racing heart between 120-230 b.p.m. starts & stops suddenly due to signal looping of a single impulse.

MARCH

201

13

Wednesday

11th Week • 072-293

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March  
2013

Chronic congestive heart failure

CHF - (Congestive Heart failure)

\* Drug of choice  $\Rightarrow$  Digitalis:

i. Cardiotonic  $\Rightarrow$  (Cardiac Glycoside)

i) Contractility  $\rightarrow$  ↑ force of Systolic contraction ↑ stroke volume  
↑ improves energy utilization.

ii) Heart Rate  $\rightarrow$  ↓ HR (by stimulation of vagus nerve)  
↑ improves circulation & causes ↓ HR

iii) Conduction velocity  $\rightarrow$  ↑ Conduction velocity (vagal depression)  
↓ conduction through AV node  
↓ depressed strong vagal extra vagal action

iv) Automacity  $\rightarrow$  ↑ ability of Purkinje fibre  
Causes ventricular extrasystole

v) Blood Pressure  $\rightarrow$  I.V. administration to normal individual  
Causes ↑ mean atrial pressure.

vi) venous system  $\rightarrow$  ↓ venous pressure in CCF individual  
Next day Program:

vii) Refractory Period  $\rightarrow$  ↑ Prolong refractory period of A-V node.

2013

# Drugs in Atherosclerosis, CHF, shock

MARCH

April  
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Thursday

11th Week • 073-292

14

- ④ Atherosclerosis →
- Fatty deposits in arteries leads to narrowing of artery
  - Increase in cholesterol,  $\beta$ -lipoproteins and Serum triglycerides, Hyperlipidemia.
  - Change in lifestyle & lipid metabolism or genetic factor.

## Classification :-

1. Drugs used to reduce biosynthesis of Cholesterol ⇒

HMG-CoA Reductase inhibitors (3-hydroxy-3-methyl glutaryl coenzyme-A) ⇒ (Statins)

⇒ Lovastatin / Simvastatin / Atorvastatin / Rosuvastatin / Fluvastatin

2. Bile acid binding Resins (Bile acid sequestrants) ⇒  
(colestipol)

cholesterol  
bile acids  
plant sterols } Cholestyramine / cholesteripol / colestevamid  
β-sitosterol

3. Activate lipoprotein lipase (Fibrate Acid derivative) ⇒

Clofibrate / Fenofibrate / Bezafibrate / Gemfibrozil

4. Inhibit triglyceride and causes lipolysis ⇒  
Nicotinic Acid. (Uric Acid)

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Friday

11th Week • 074-291

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5. Cholesterol Absorption Inhibitors  $\Rightarrow$  Ezetimibe

6. others : - Probucol, Gugnlipid

(Ezetimibe) is a non-statin member of class which  
blocks 3-hydroxy-3-methyl glutaric acid reductase - HMG CoA  
liver and (hepatocyte) -  
cholesterol absorption in intestine

and it can also inhibit low density lipoprotein

(Ezetimibe is also) inhibits protein kinase C  
(also, it is a topoisomerase inhibitor)

• Protection -

Important

Next day Program:

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April  
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# Antiplatelet Agents

MARCH

Saturday

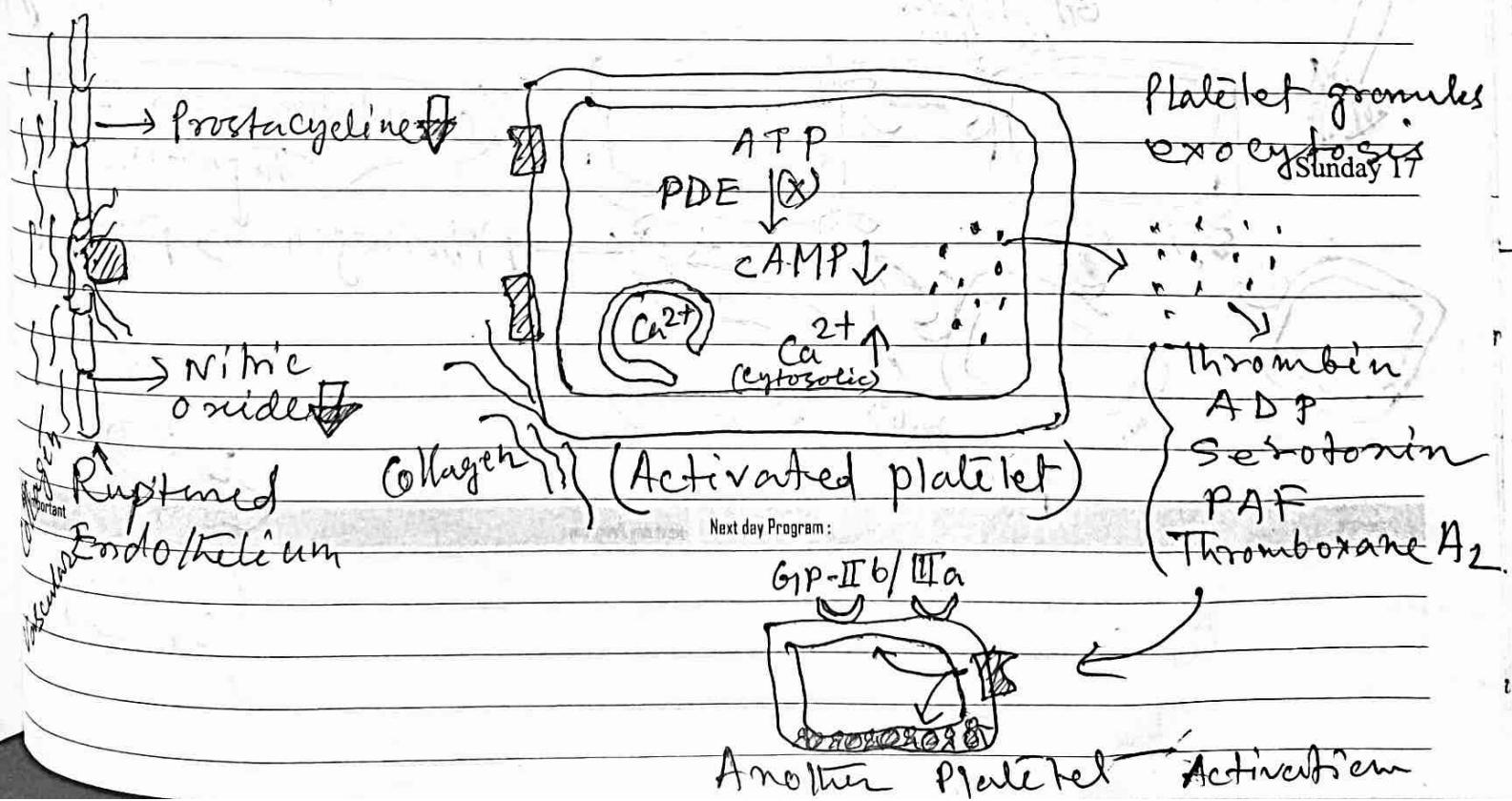
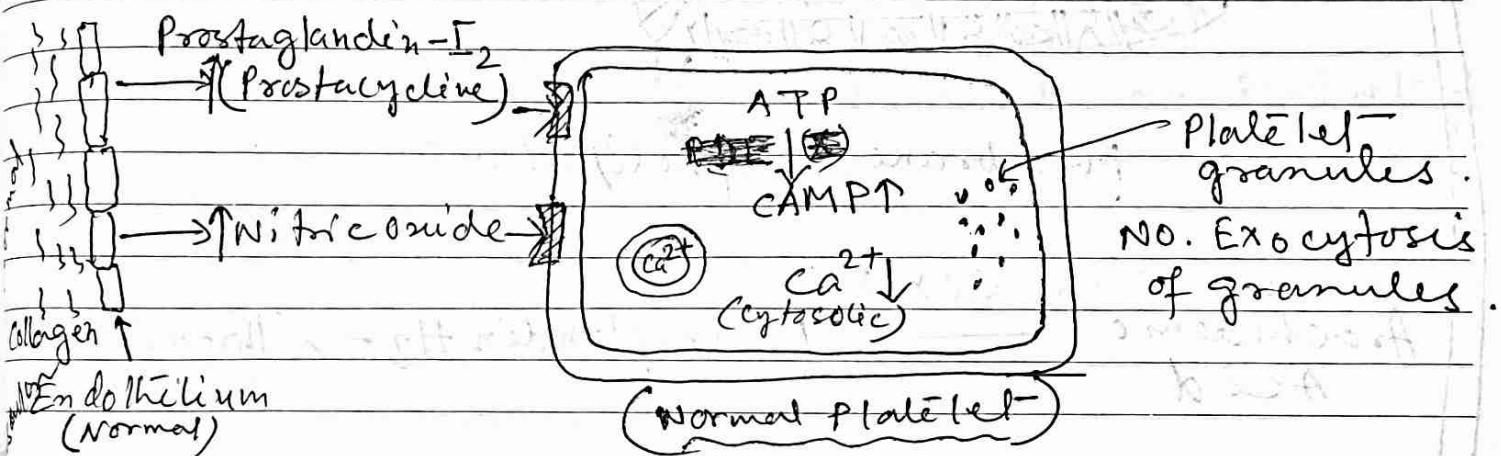
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11th Week • 075-290

Classification :-

1. Arachidonic acid Pathway inhibitors → Aspirin
2. ADP pathway inhibitors → Clopidogrel, Ticlopidine
3. Phosphodiesterase inhibitors (PDE) → Dipyridamole
4. Glycoprotein IIb/IIIa inhibitors → Abciximab, Eptifibatide.

MODE OF ACTION :-



MARCH

18

Monday  
12th Week • 077-288

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Activation of  
GPIIb/IIIa Receptor

Thrombin

ADP

Serotonin

PAP

Membrane Phospholipase

Membrane phospholipid

COX-1

Arachidonic Acid  $\rightarrow$  Prostaglandin H<sub>2</sub>  $\rightarrow$  Thromboxane

GPIIb/IIIa  
Receptor

Platelet Aggregation

Coagulation Factor IIa

Thrombin

Fibrinogen  $\rightarrow$  Fibrin

fibrinogen

& Important

Next day Program:

plug (clot)  
formation

# Platelet Aggregation Inhibitors

2013

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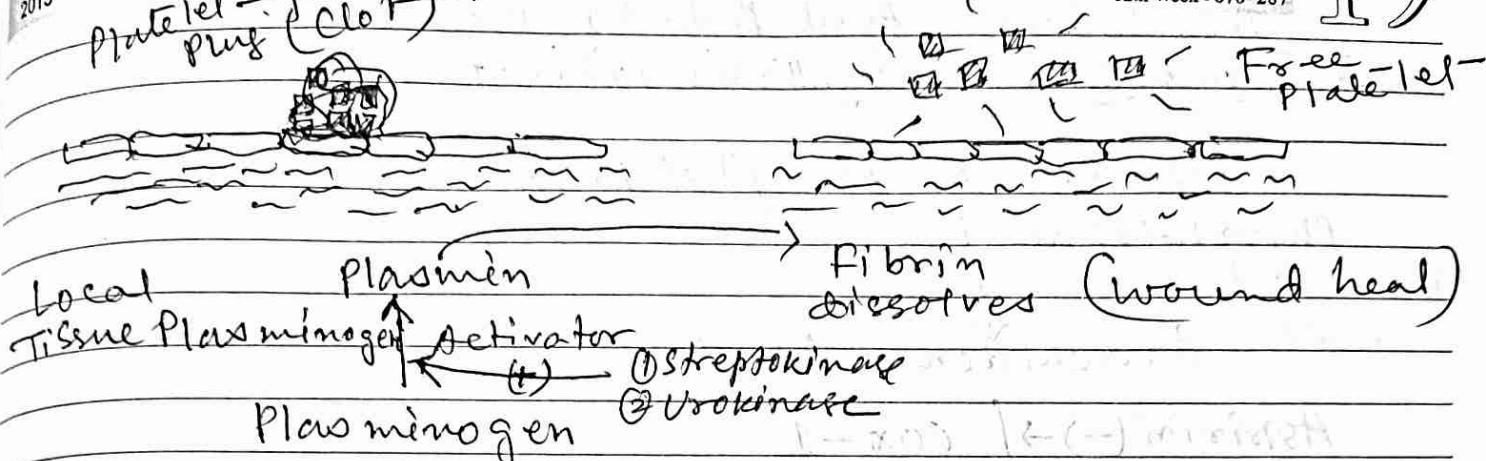
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platelet plug (clot)

Tuesday

12th Week • 078-287

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- ① Thrombosis → Adheres to the vessel wall (Platelet + Fibrin)
- ② Embolus → Floats in blood.

## Diseases

- ① Occlusive cardiovascular disease
- ② Myocardial Infarction (MI)
- ③ Acute Ischaemic Stroke
- ④ Pulmonary embolism
- ⑤ Deep vein Thrombosis

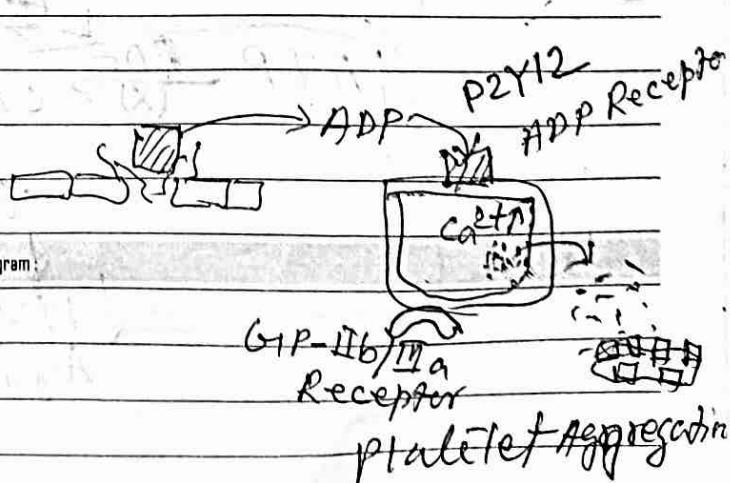
## GP-IIb/IIIa Receptor Inhibitors

- ① abciximab (abcG monoclonal)
- ② MT FeeB.A. ticle → Eptifibatide
- ③ Tgj FeeB.A. N → Tirofiban.

## ADP - Receptor blockers

- ① Ticlopidine
- ② Clopidogrel

Next day Program:



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Wednesday

12th Week • 079-286

Idonic Acid Pathway Inhibitors

## ④ Thromboxane A<sub>2</sub> Synthesis inhibitors

## Membrane Phospholipids Phospholipase /

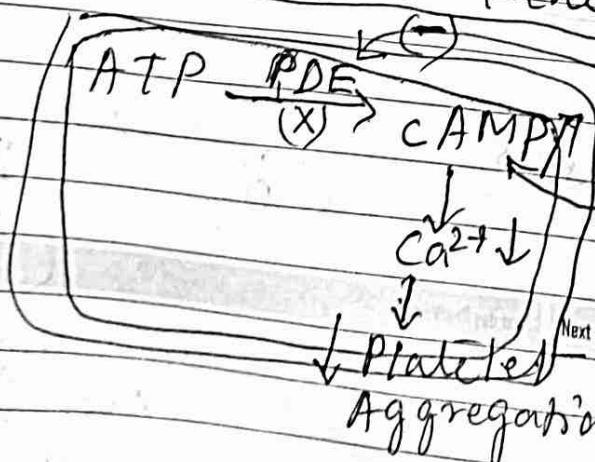
~~#achidonic Acid~~  
Aspirin (-) → / COX-1

# Prostaglandin H<sub>2</sub>

~~Prostaglandins~~  
Thromboxane A<sub>2</sub>

# Aspirin ~~cooks~~ irreversibly binds Serine amino acid of Cox-1  
(→ by Acetylation of serine)

④ Phosphodiesterase Inhibitor:



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# Anticoagulants

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April  
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Thursday

12th Week • 080-285

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## (A) In-vitro Anticoagulants :-

- i) Oxalic acid
- ii) Sodium Citrate
- iii) Sodium EDTATE

\* Sodium edetate → forms stable complexes with Ca, Mg, K, Na → prevents coagulation.

## (B) In-vivo Anticoagulants :-

i) Heparin → Natural mucopolysaccharide

→ Acts both In-vitro & In-vivo

# MOA → Interfere enzyme activity due to strong electronegativity → inhibit conversion of fibrinogen to fibrin, & of prothrombin to thrombin

# USE → Treatment & prophylaxis of deep-vein thrombosis.

→ Pulmonary embolism.

# Contra indication → Hypersensitivity to Heparin  
 → Haemophilia, other haemoreg's disorders  
 → Thrombocytopenia  
 → peptic ulcer, etc.

Dose → Heparin Sodium 1000 Units/ml inj I.V.  
 Next day Prophylactic 5000 U/ml inj I.V.

Important

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Friday

12th Week • 081-284

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March  
2013

### ii) Protamine Sulphate :-

- # immediately reverses the action of Heparin by its strong electro positive charges.
- # produces inactive complex with Heparin
- # Higher doses shows anticoagulant activity.

### iii) Oral anticoagulants :- [In-vitro → X In-vivo → do not act immediately]

#### a) Coumarin Derivatives :-

- # Warfarin Tab BP → MOA → Reduce formation of prothrombin, factor - VII, IX, X in the liver by competition with vit-K

- # onset of action 3-6 hrs
- prothrombin time comes back after 3 days of discontinue the drug.

- # Adverse effect → Rash & dermatitis

Use : → Prophylaxis of embolism in rheumatic heart disease,  
→ Prophylaxis & treatment of venous thrombosis & pulmonary embolism.

Important

→ Transient ischaemic attack

Next day Program :

- # contraindication : - Peptic Ulcer, hypertension, pregnancy, bacterial endocarditis

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Friday

12th Week • 081-284

Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su							
01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31

March  
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No To We Th Fr Sa Su Mo Tu We Th Fr Sa Su Mo Tu We Th Fr Sa Su Mo Tu We  
 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

Saturday  
12th Week • 082-283

23

Dose: → Warfarin Sodium 1mg, 2mg, 5mg Tab available.

② Prophylaxis & Treatment of thromboembolism  
→ 10mg/day for 2 days

### ⑥ Indandione Derivative:-

Phenindione Tab BP

# Onset of action 2 days & prothrombin time returns to normal within 48-72 hrs after discontinuation of drug.

- # Adverse Effect →
- ① Skin rash
  - ② Exfoliative dermatitis
  - ③ Renal damage
  - ④ mouth ulcers
  - ⑤ diarrhoea
  - ⑥ Leucopenia
  - ⑦ jaundice

⑦ vit-K → Essential for Synthesis of Factor VII, IX, X of blood clotting.

# K<sub>1</sub> & K<sub>2</sub>

K<sub>1</sub> → Phytomenadione

# deficiency due to —

- Important
- 1) Impairment of bacterial synthesis due to oral antibiotics
  - 2) Impaired absorption due to in obstructive jaundice due to lack of bile salts or ingestion of high amount of liquid paraffin