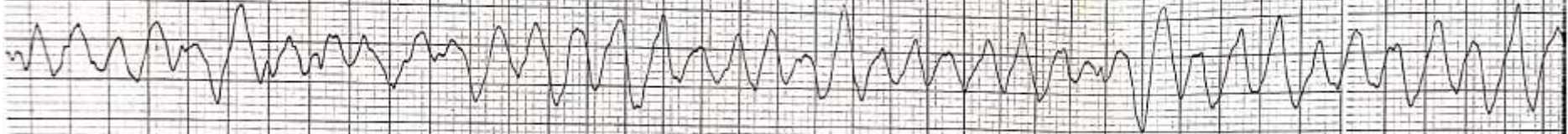


▼ Ritmo iniziale

Piastre



▼ 16:39:21

Segmento 1

Defibrillare

▼ 16:39:24

Segmento 2

Defibrillare



12219163847

Preshock

Shock 1 200J

▼ Postshock

Piastre Comb

22 Set 19

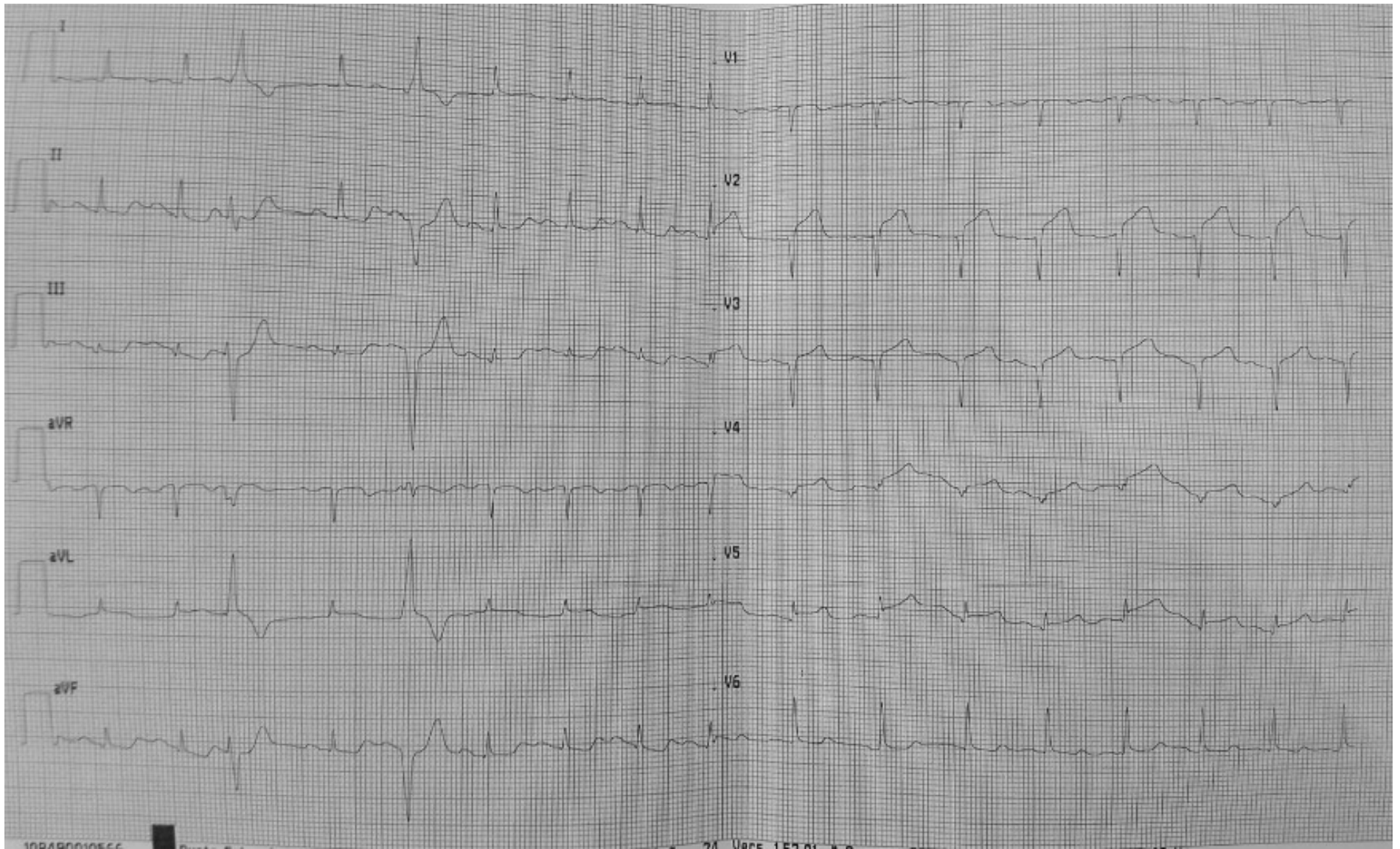
16:39:35

16:39:27

76

Piastre

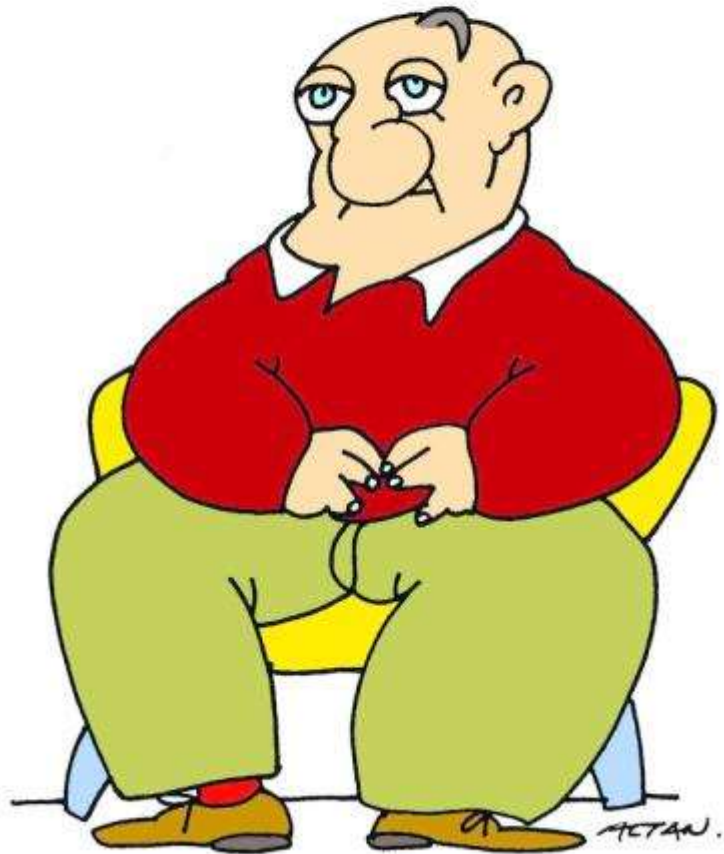




102490010566

24 Vars 157 01 x 2

DOBBIAMO RIPENSARE
TUTTO, MA NON
MI RICORDO COME SI FA.

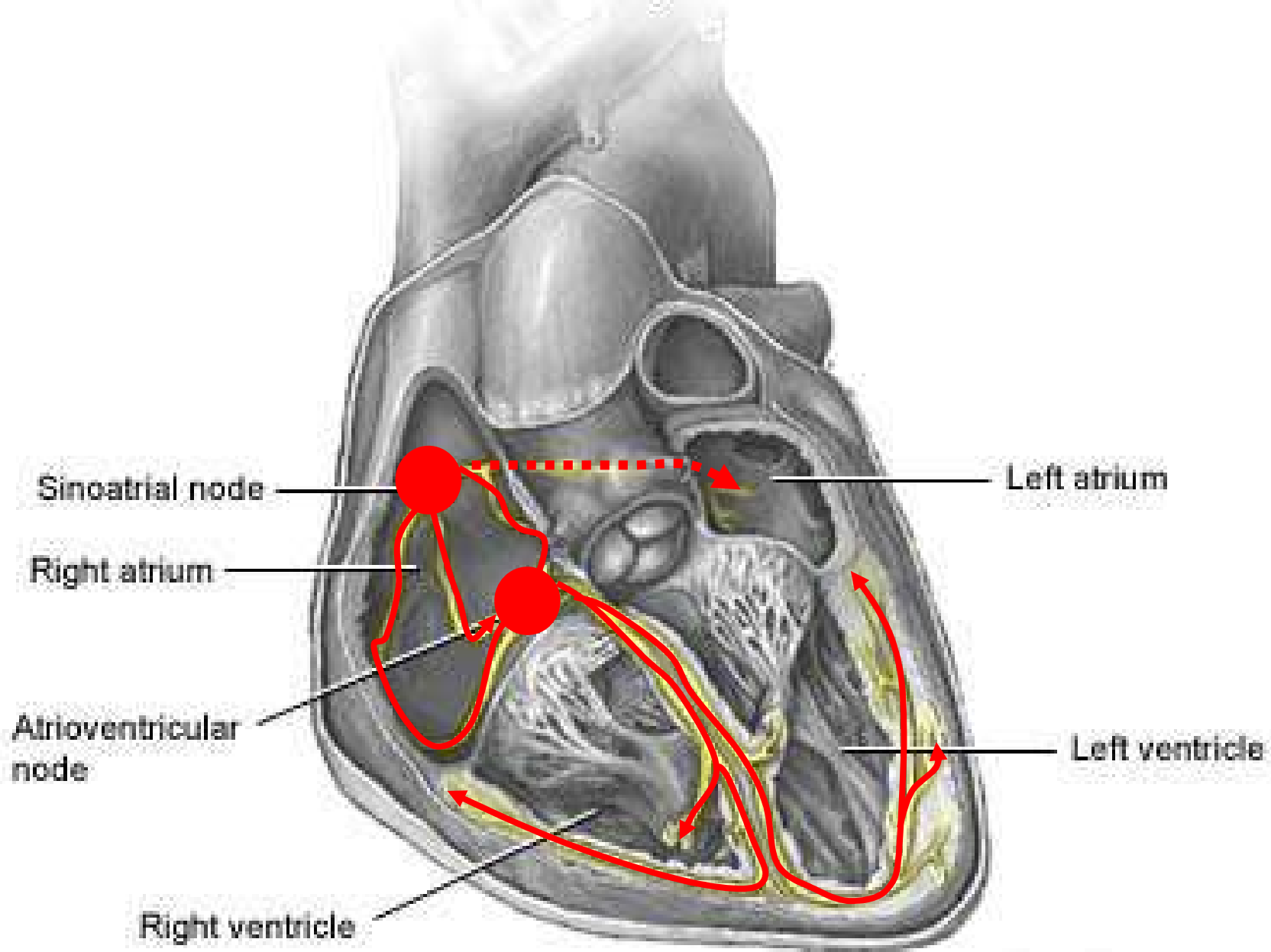


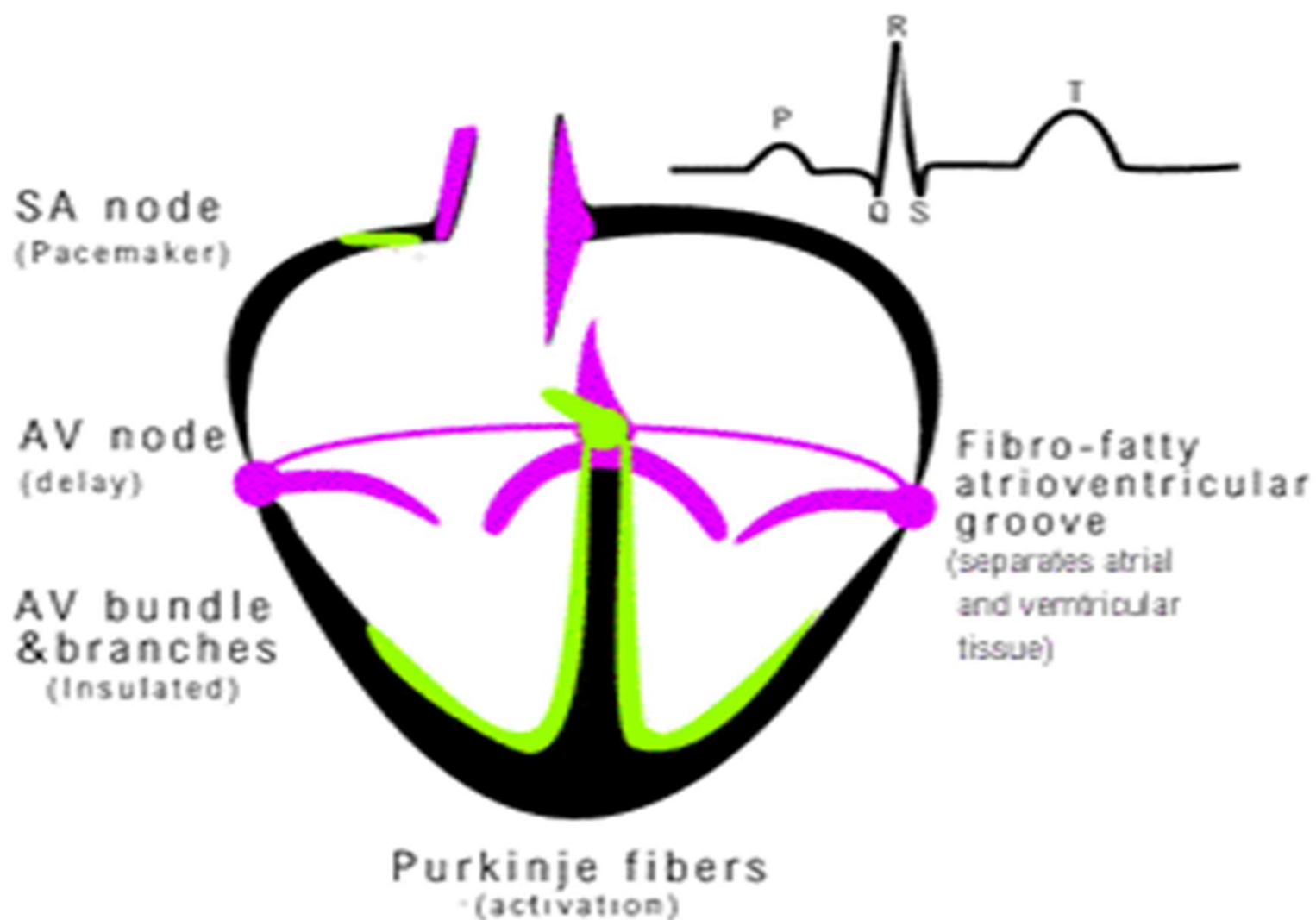
Elettrofisiologia

&

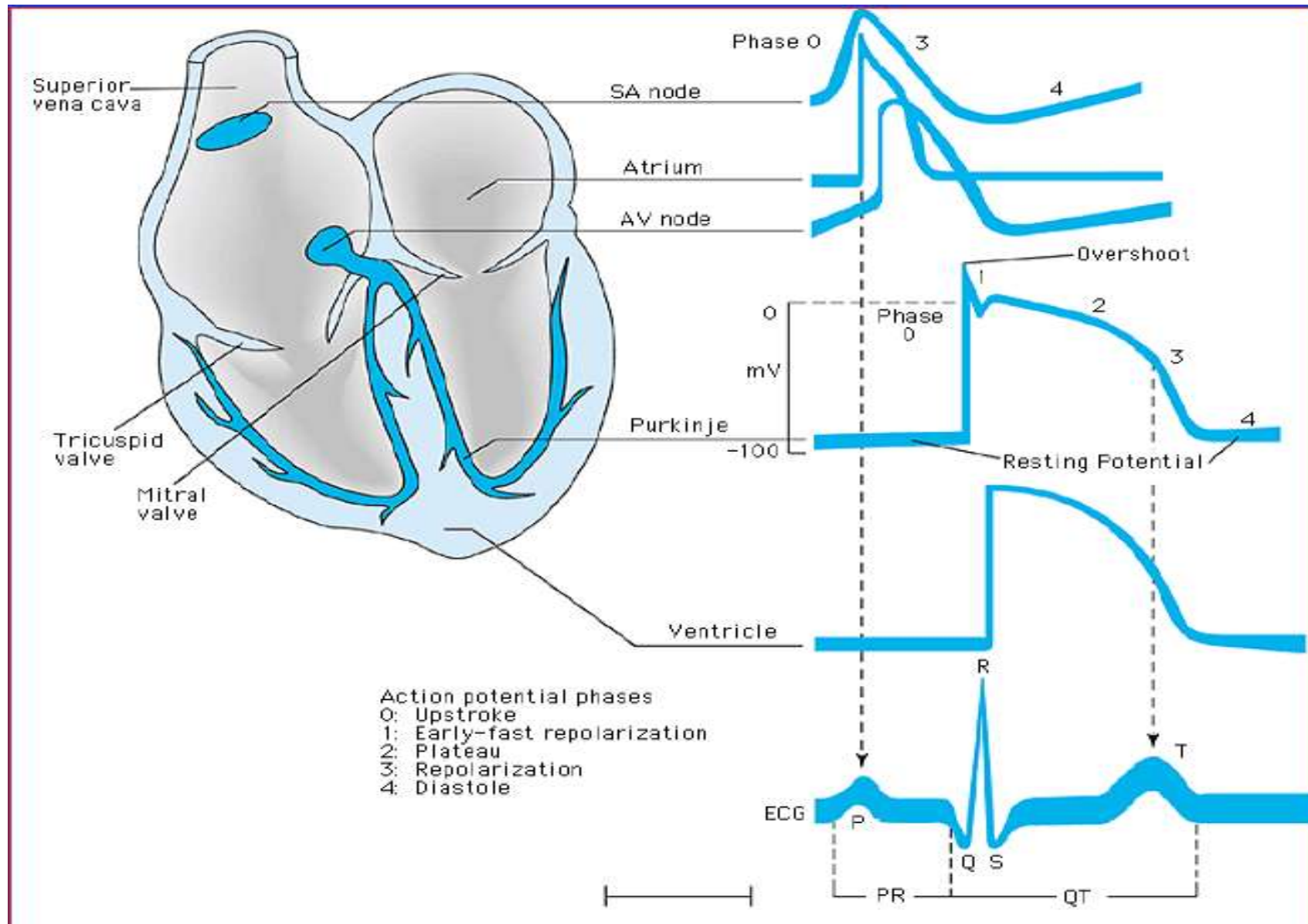
Aritmie

Intrinsic conduction system of the heart

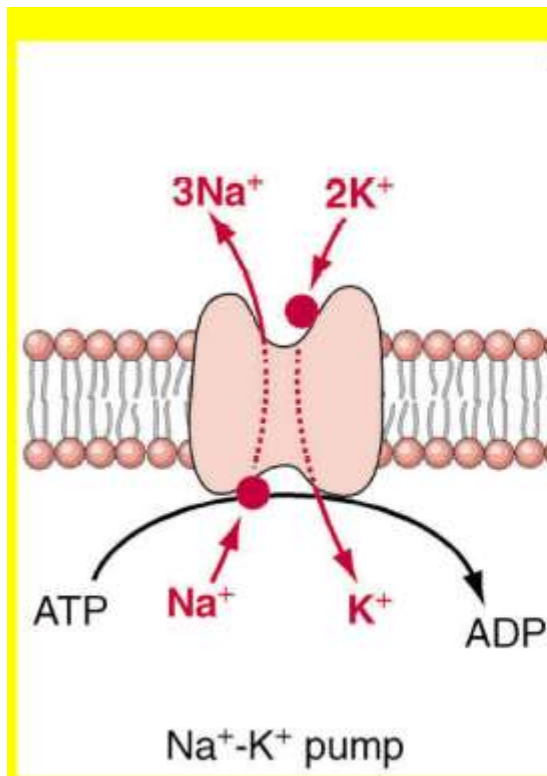




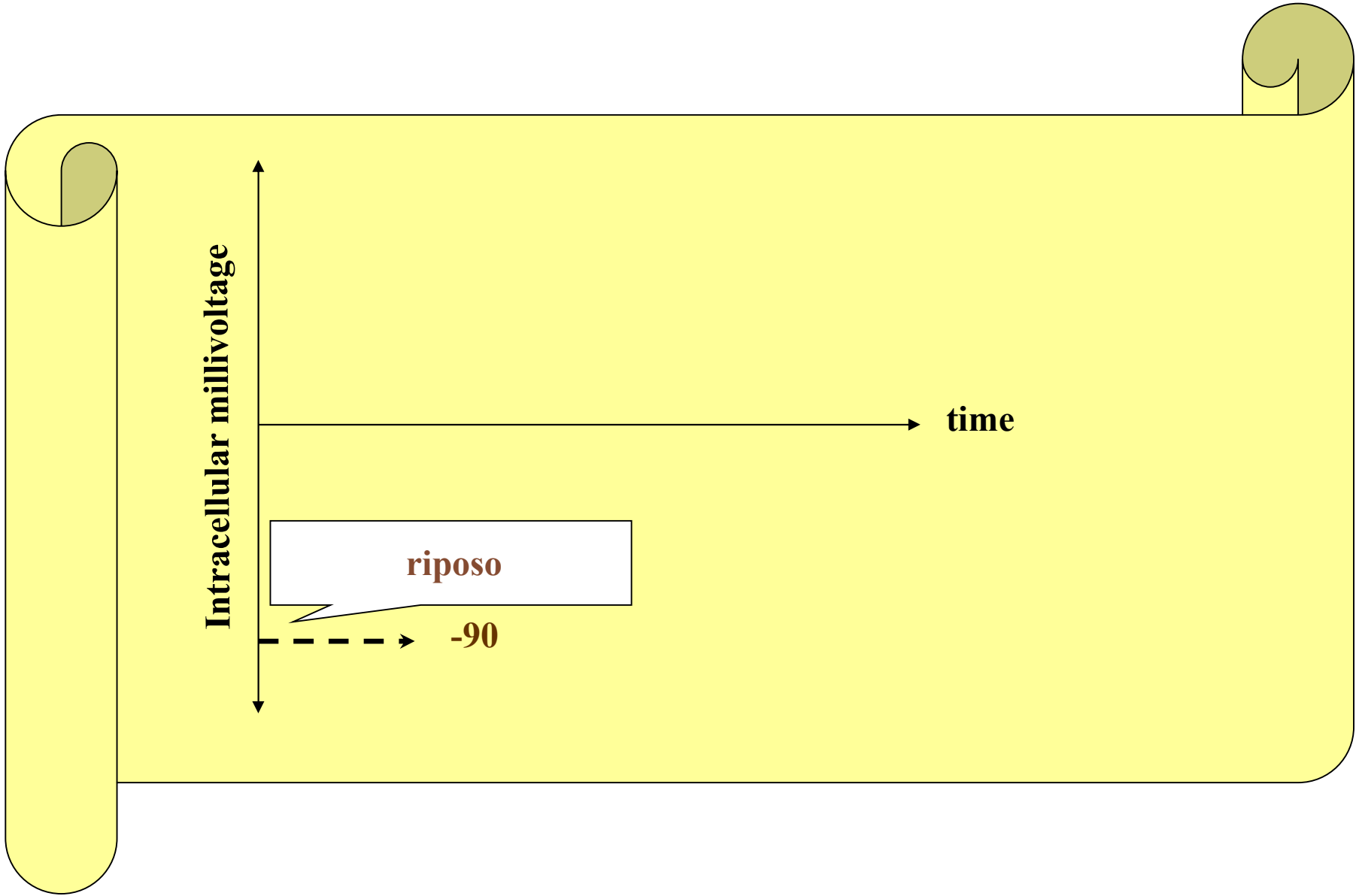
Contractile
 Conductive
 Nonconductive

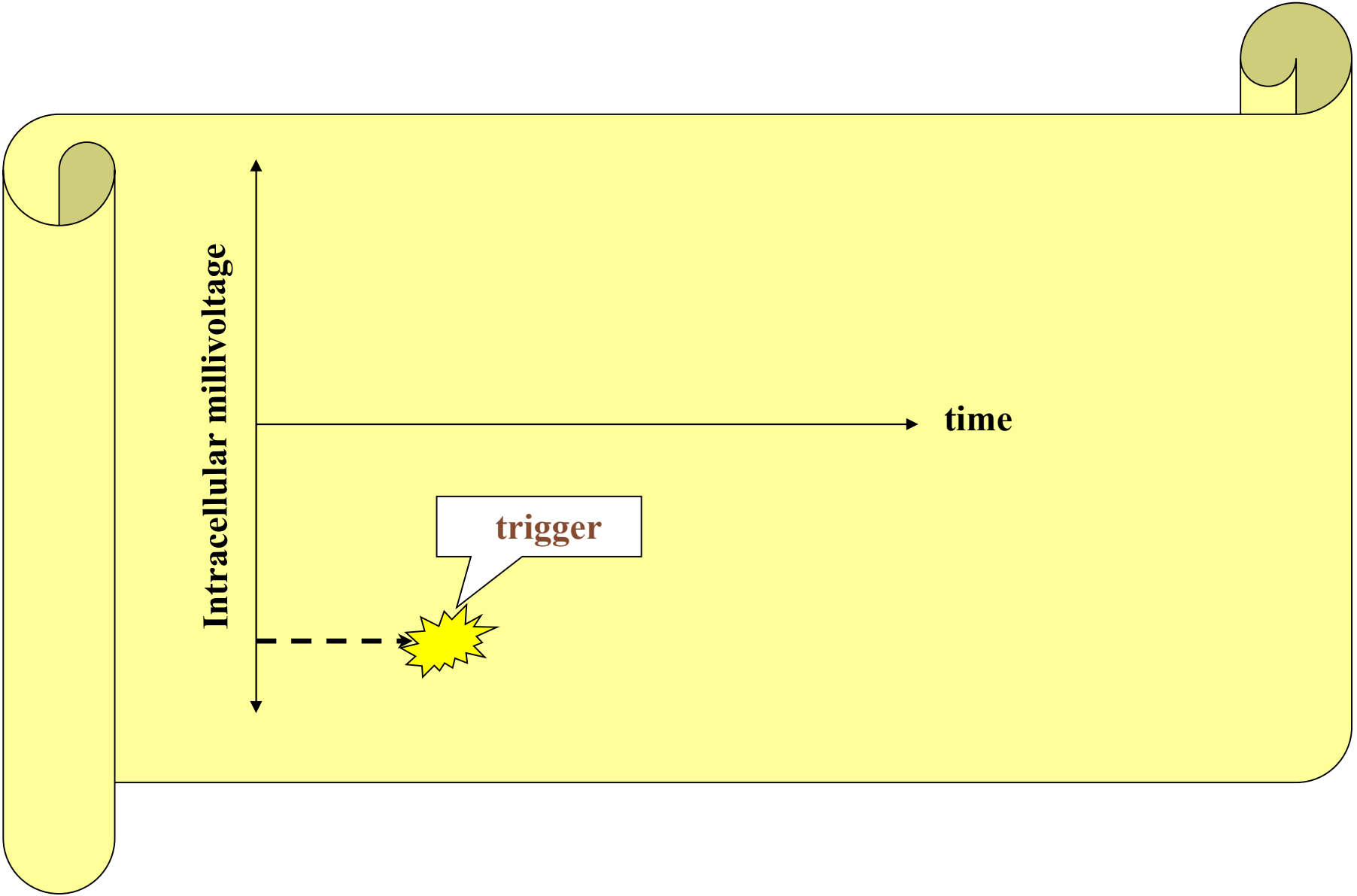


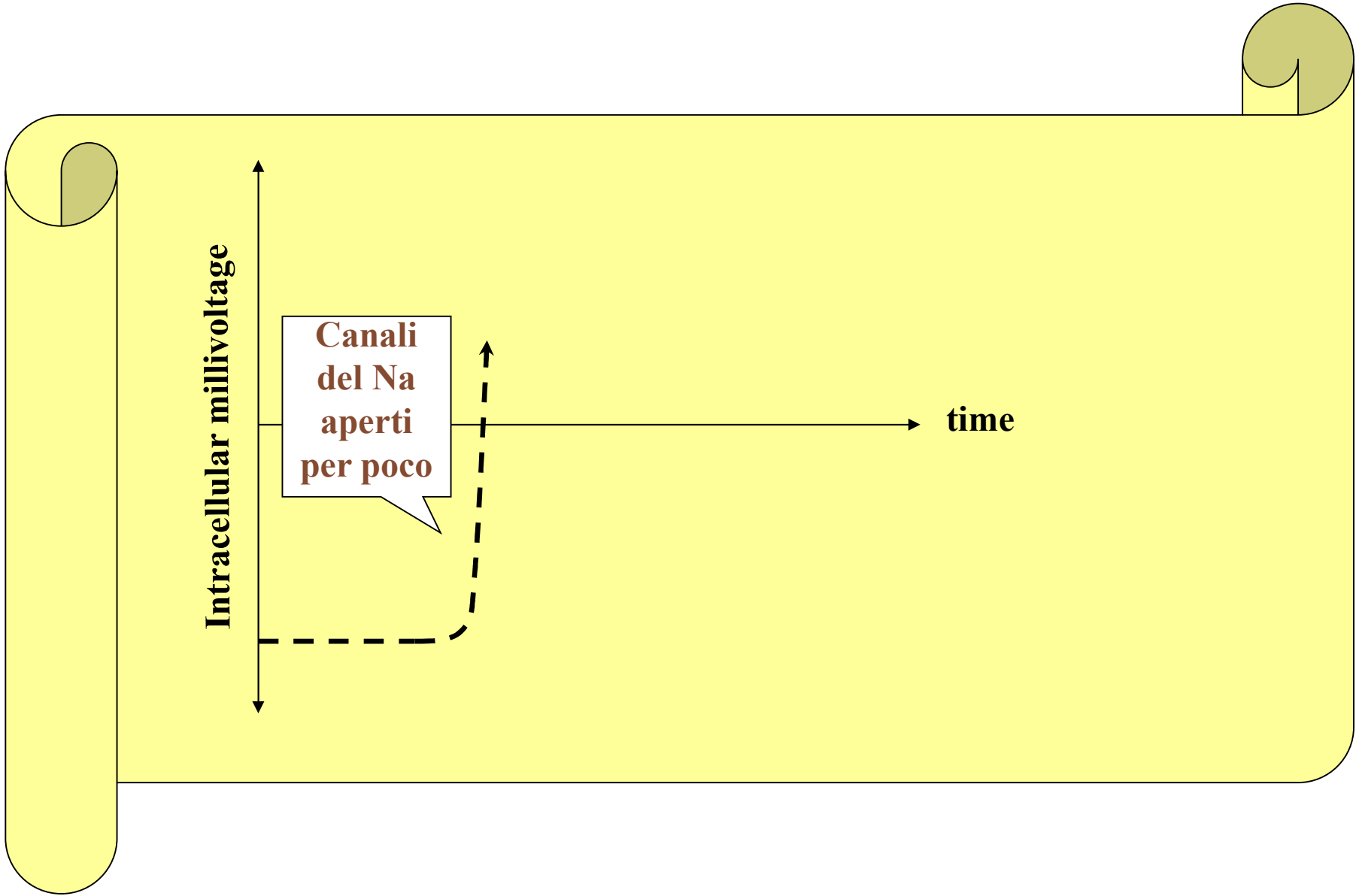
POMPA SODIO POTASSIO



- Il **potassio** che **esce** dalla cellula ed il **sodio** che **entra** nella cellula vengono ripompati all'interno ed all'esterno per merito di una pompa Na⁺/K⁺ ATPasi dipendente (consuma energia perché funzione contro gradiente)
- La pompa è elettrogenica: 3 Na⁺ : 2 K⁺



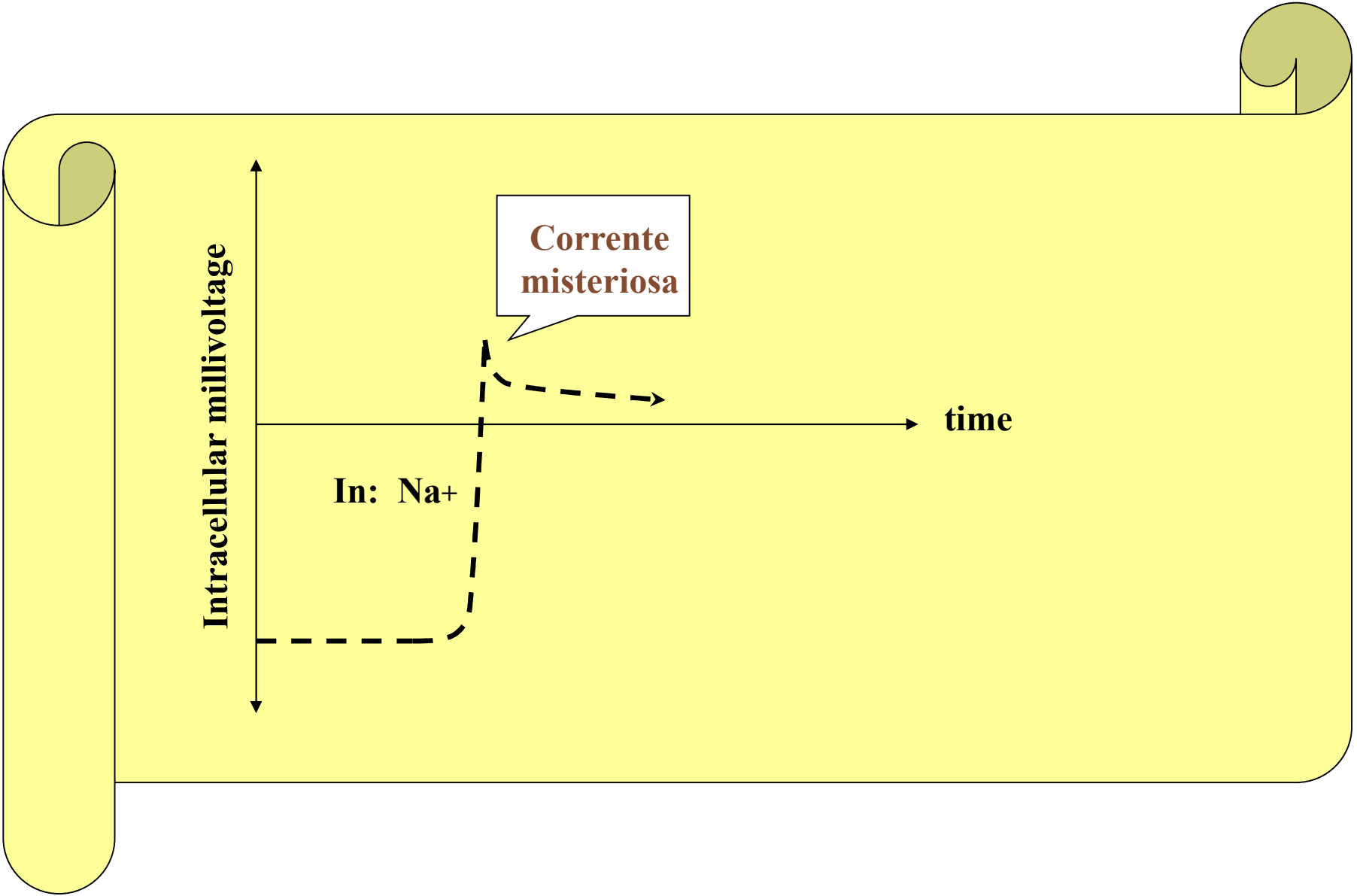




Intracellular millivoltage

Canali del Na aperti per poco

time

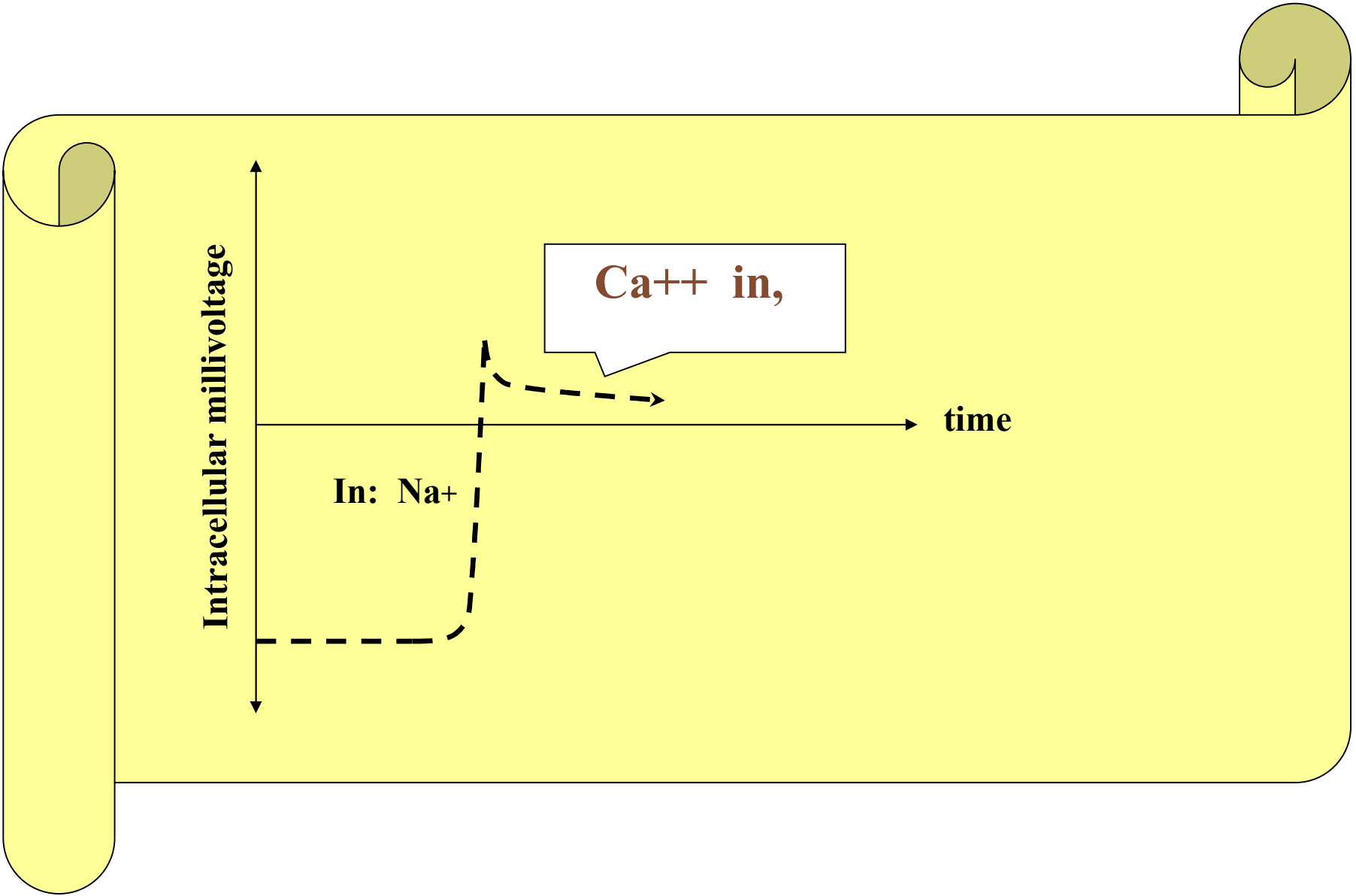


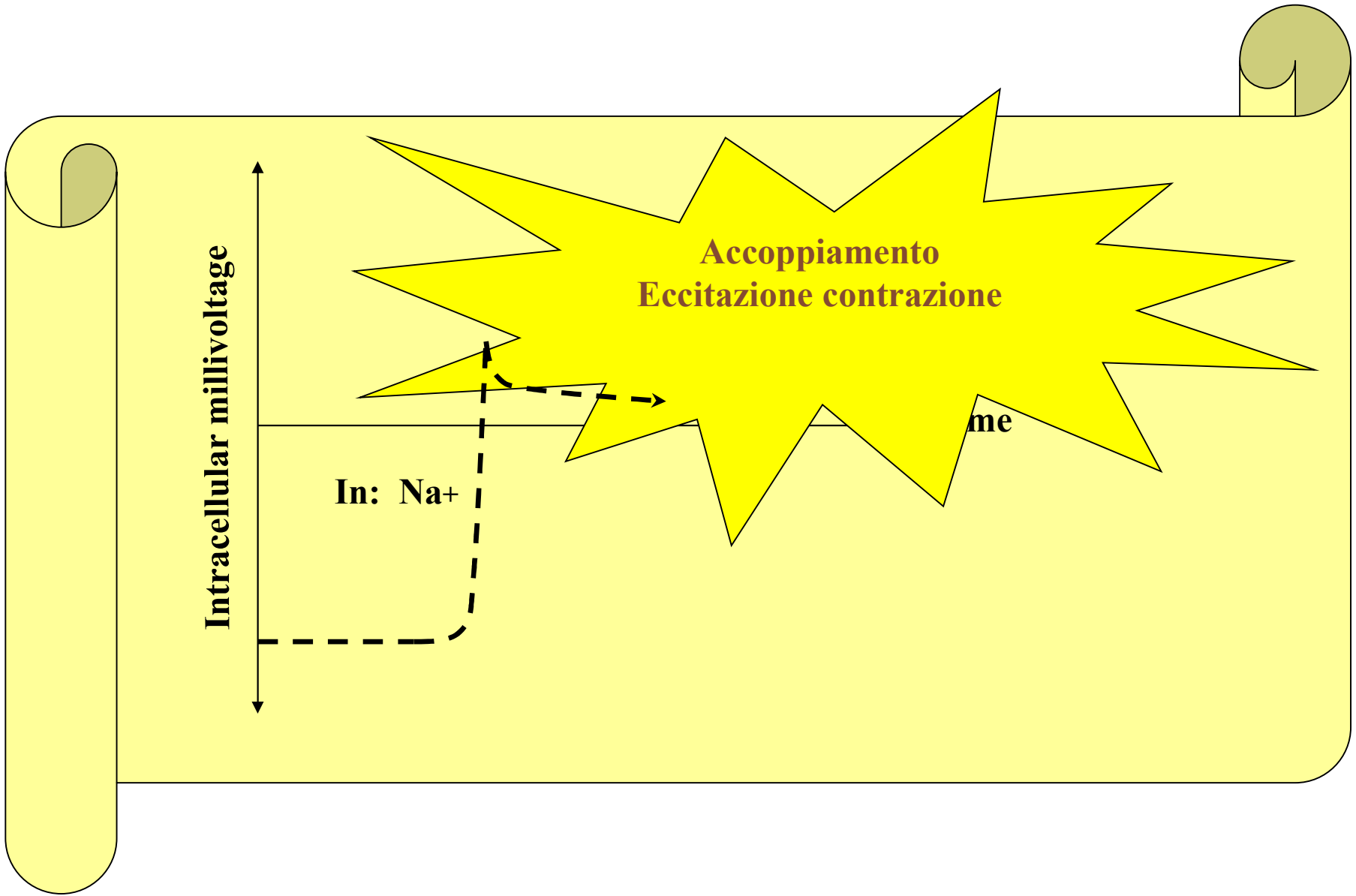
Intracellular millivoltage

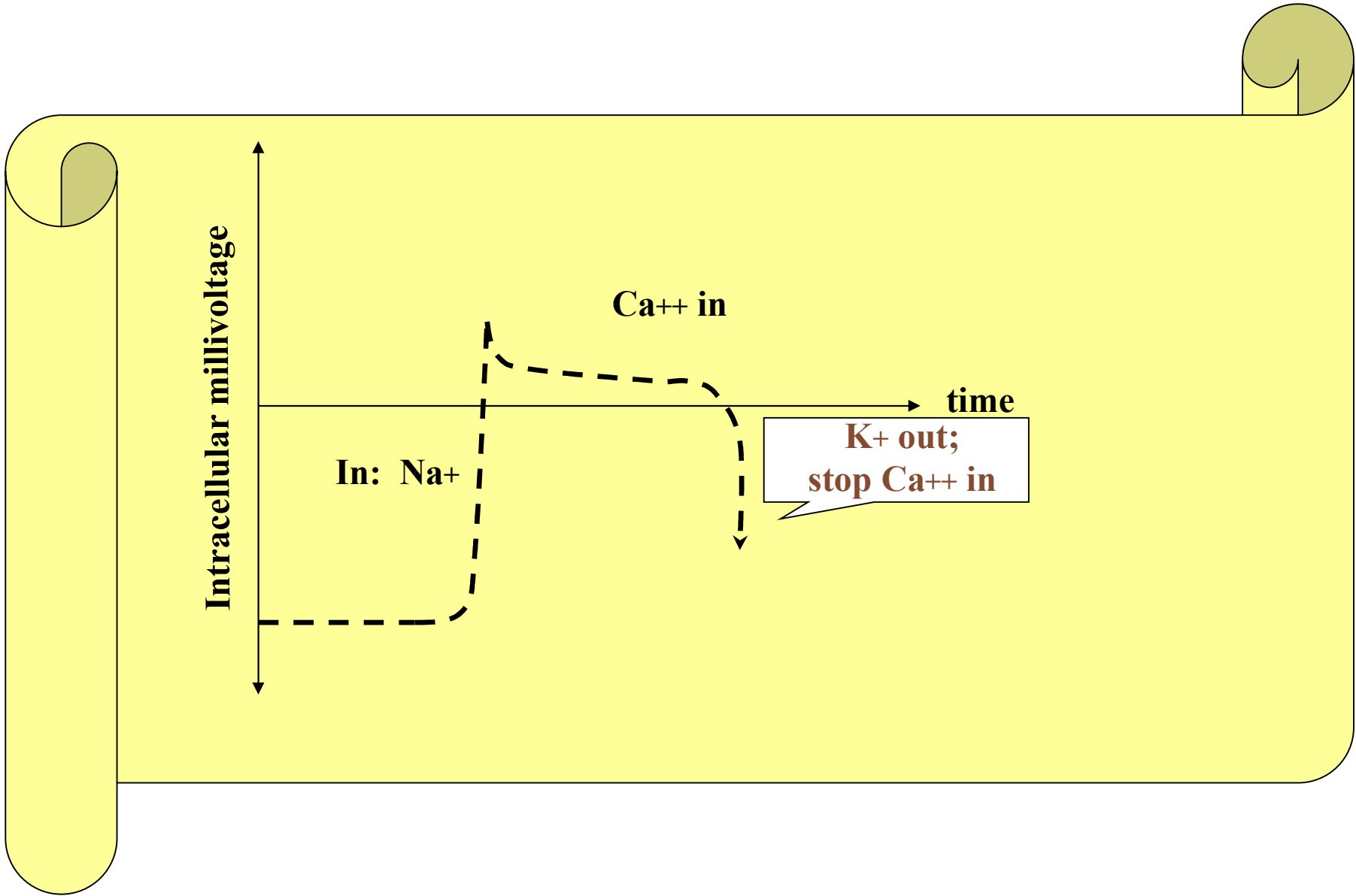
In: Na+

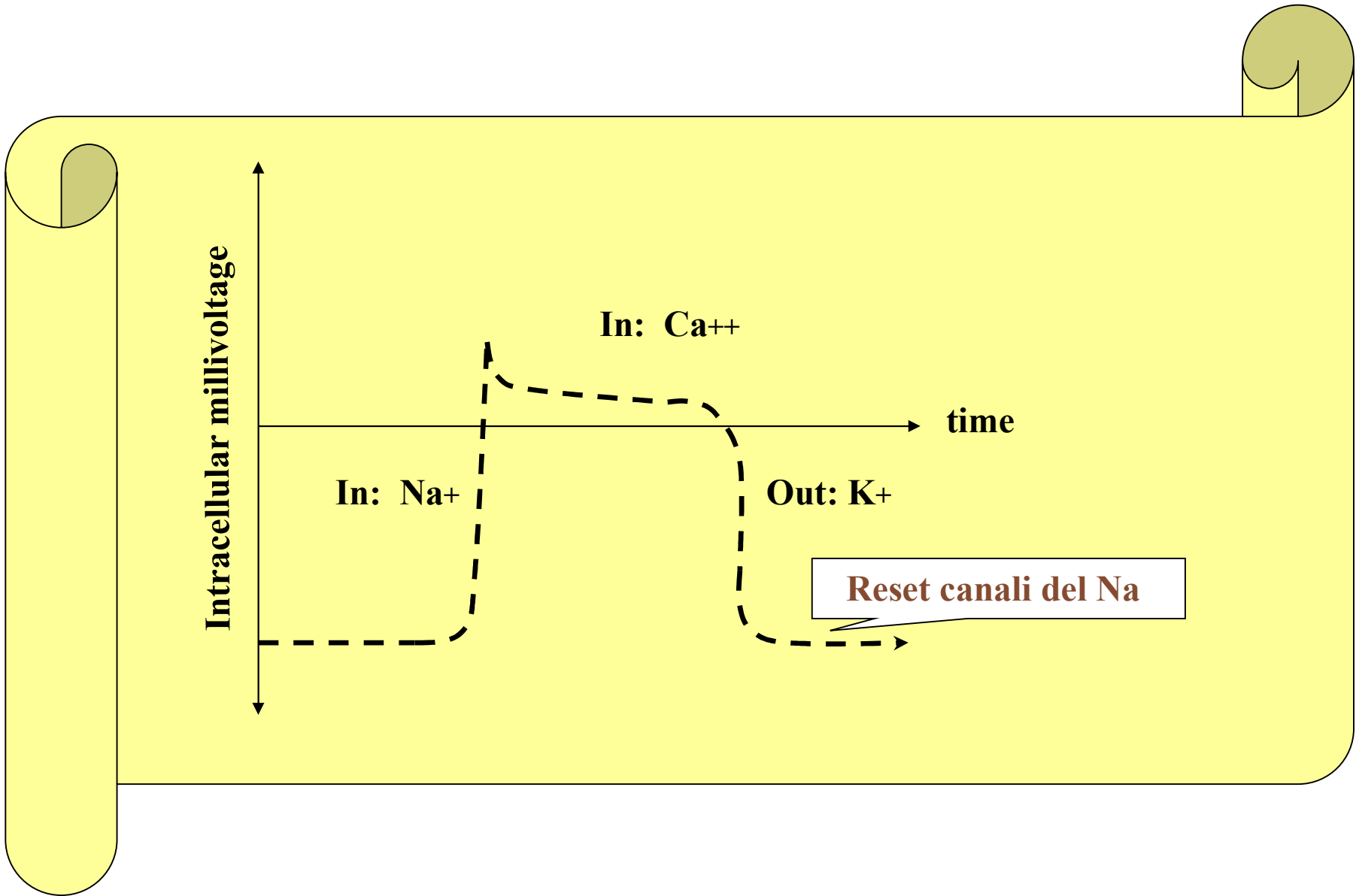
Corrente misteriosa

time

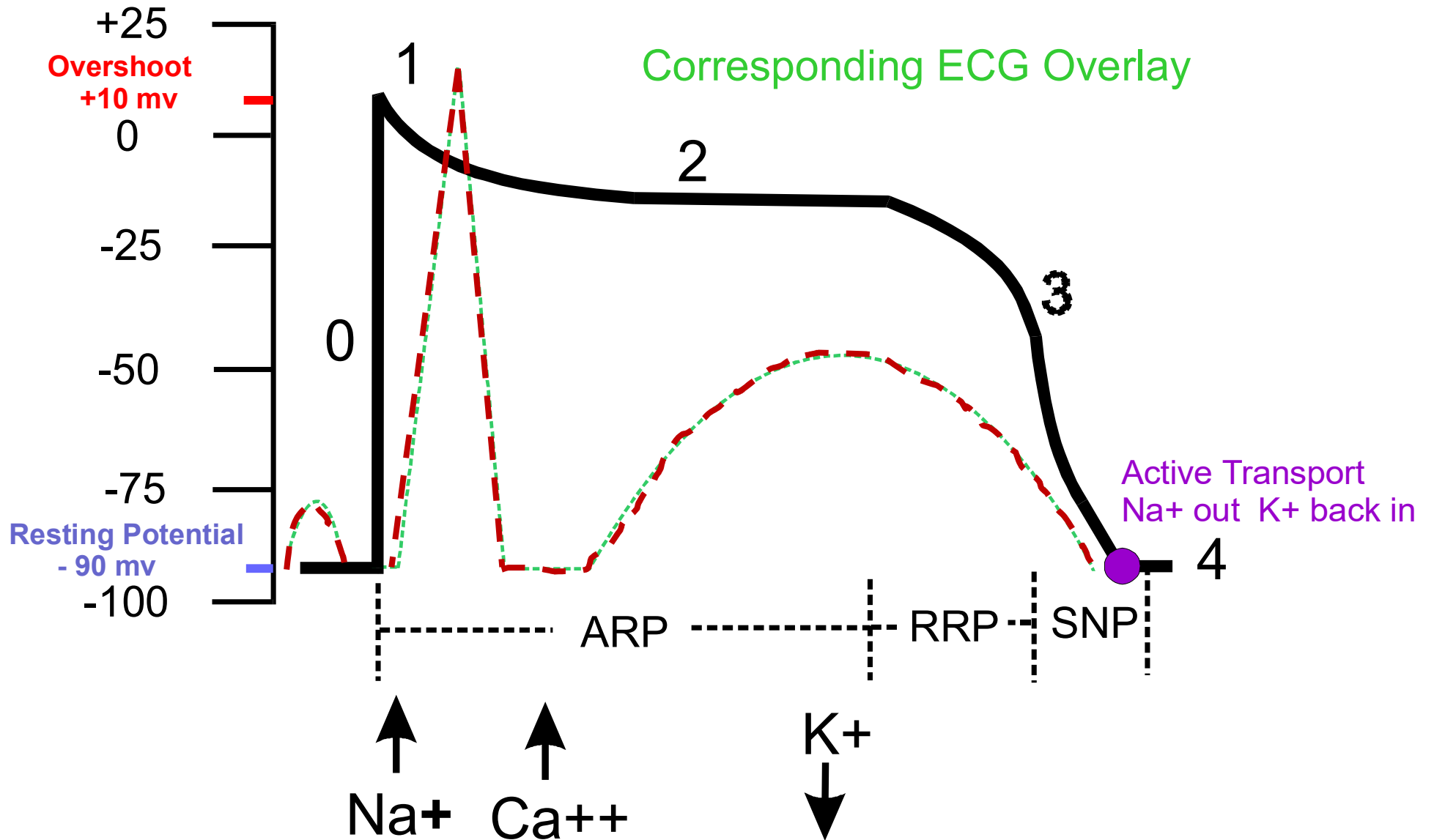




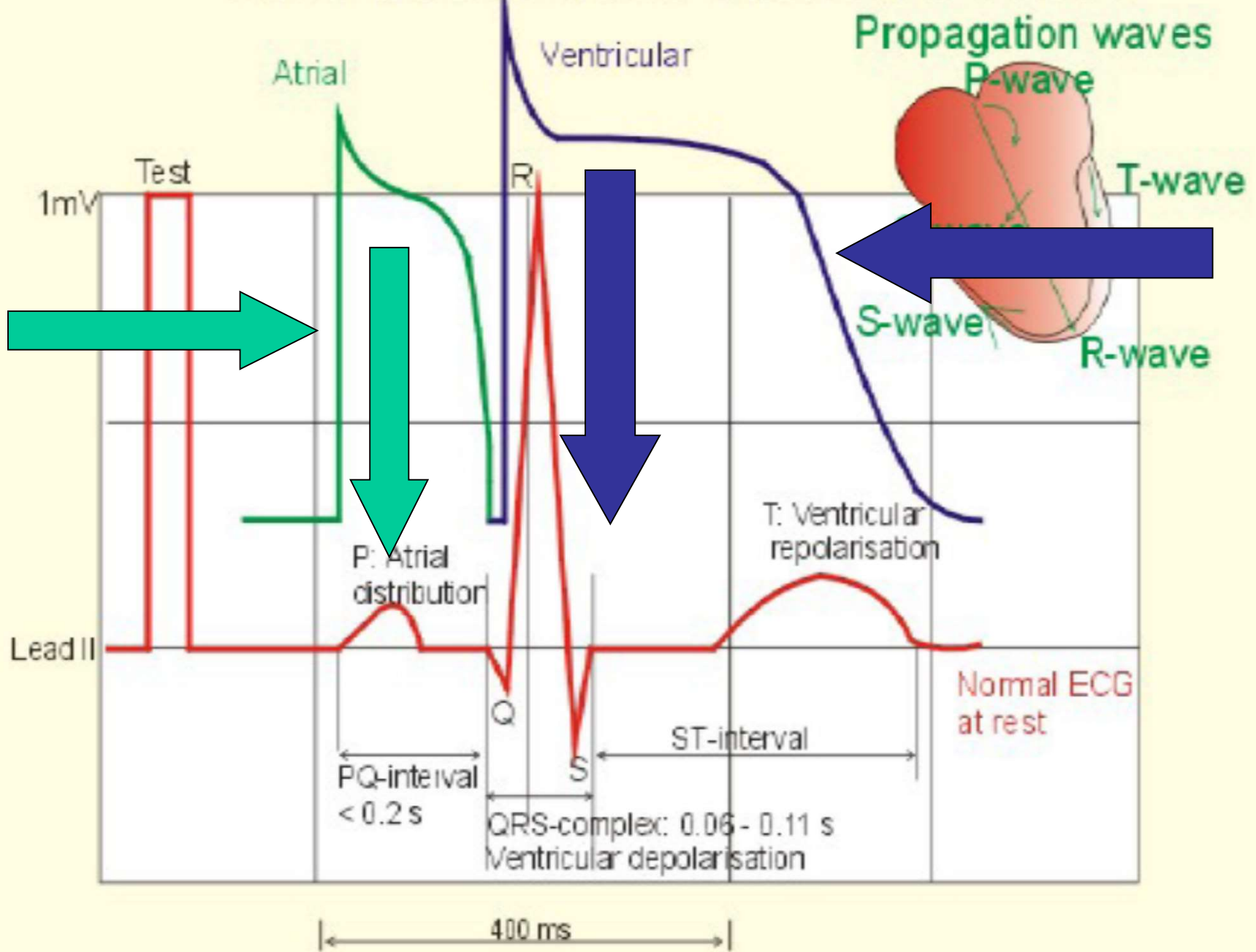




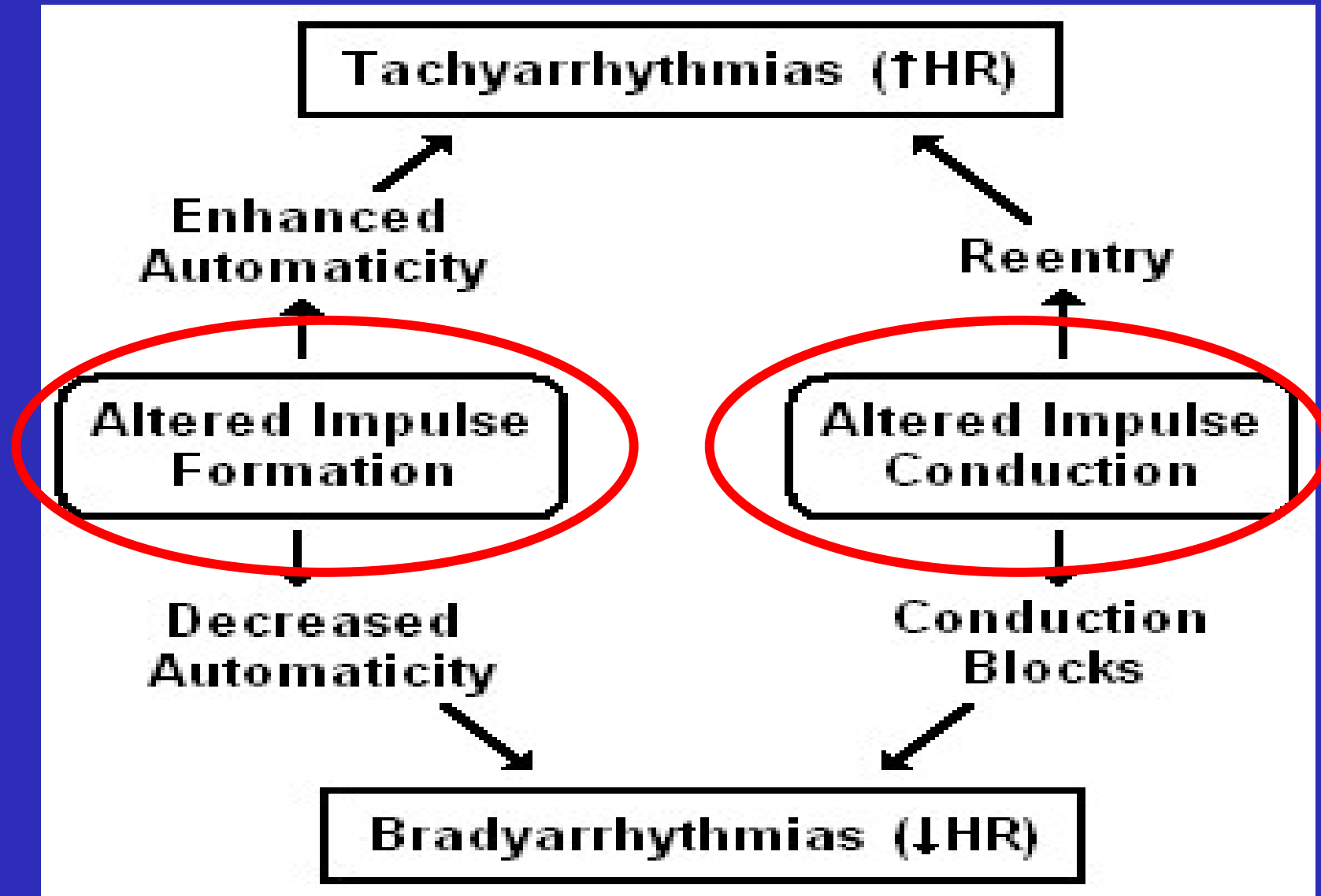
Myocardium Muscle Action Potential



Atrial Fibre & Ventricular Fibre Action Potentials



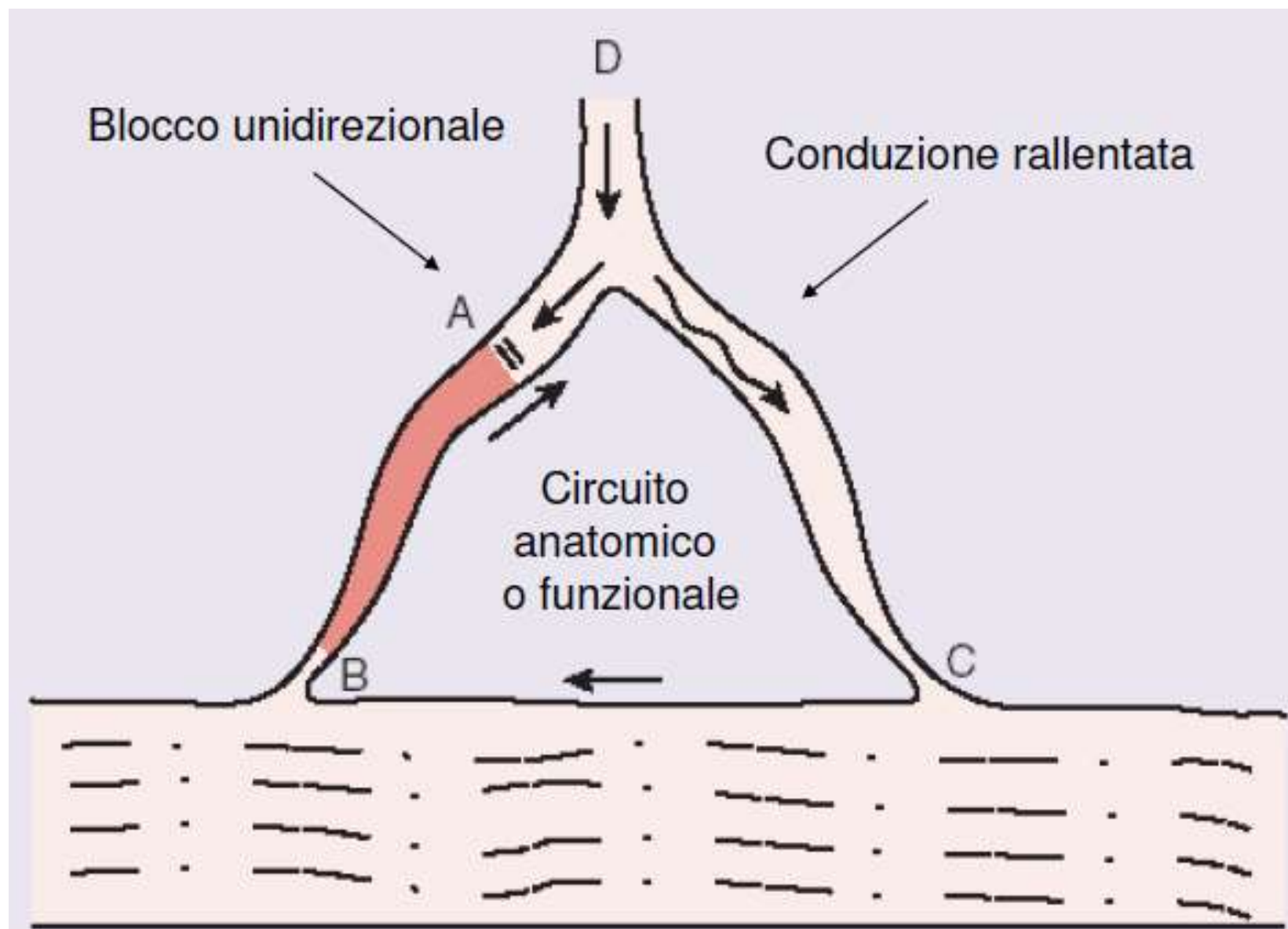
MECCANISMI BASE DI TUTTE LE ARITMIE



- Contribuiscono al "RIENTRO"

- *conduzione lenta*

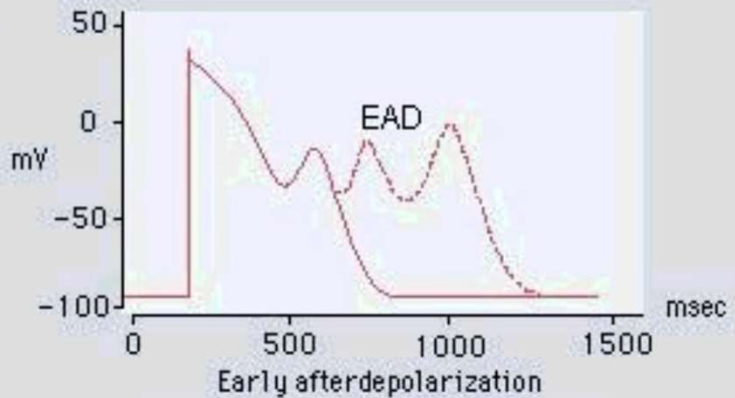
- *blocco unidirezionale*



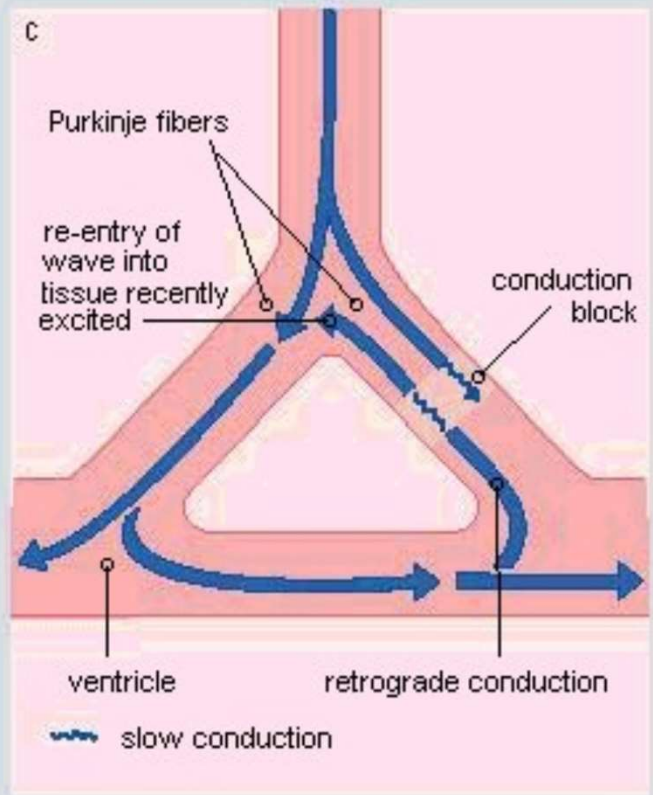
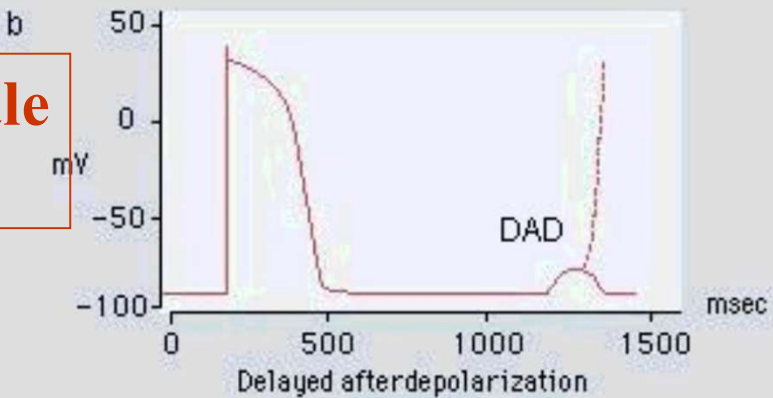
•attività innescata
(triggered activity):

RIENTRO

tdp



Digitale
TV



ELETTROGENESI DELLE ARITMIE (utilizzo mirato dell'antiaritmico)

I farmaci antiaritmici

78 anni, donna

Iper-tesa in tp con sartano + diuretico

Fibrillazione atriale cronica in tao + digitale

*Da 2 settimane aggiunto propafenone
per aumento cardiopalmo*

Viene per astenia e dispnea da sforzo

CARLASSARE, FLORIDA

ID: 000224092

1-Dic-2008 12:37:24

AMB. CARDIOLOGICO (CMP)

3-Feb-1931

Femmin. Caucasio/a

Frequenza 123 bpm

Intervallo PR * ms

Durata QRS 110 ms

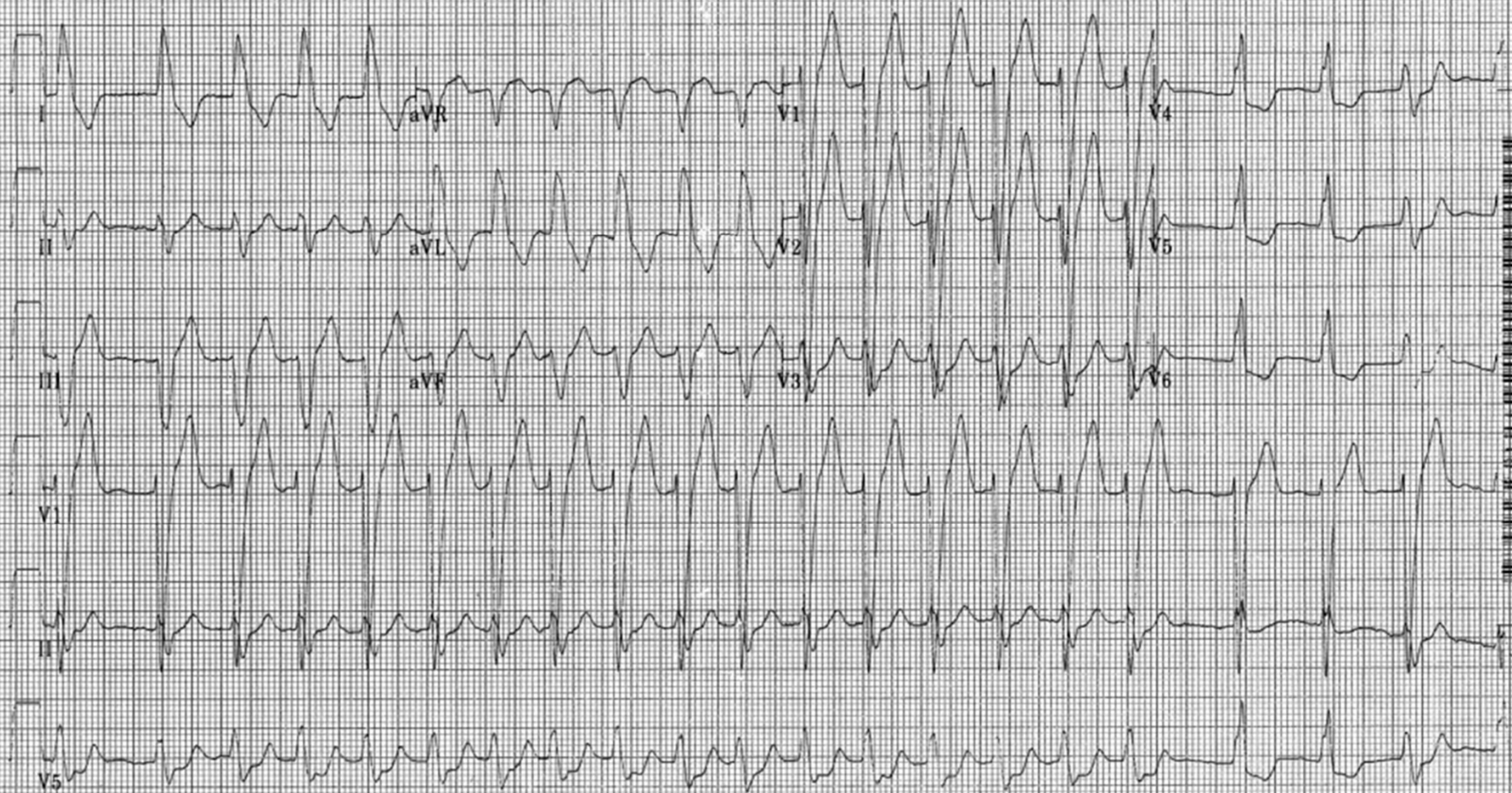
QT/QTc 336/481 ms

Loc: 63

Assi P-R-T * -14 160

PA 180/80mmHg

Non confermato



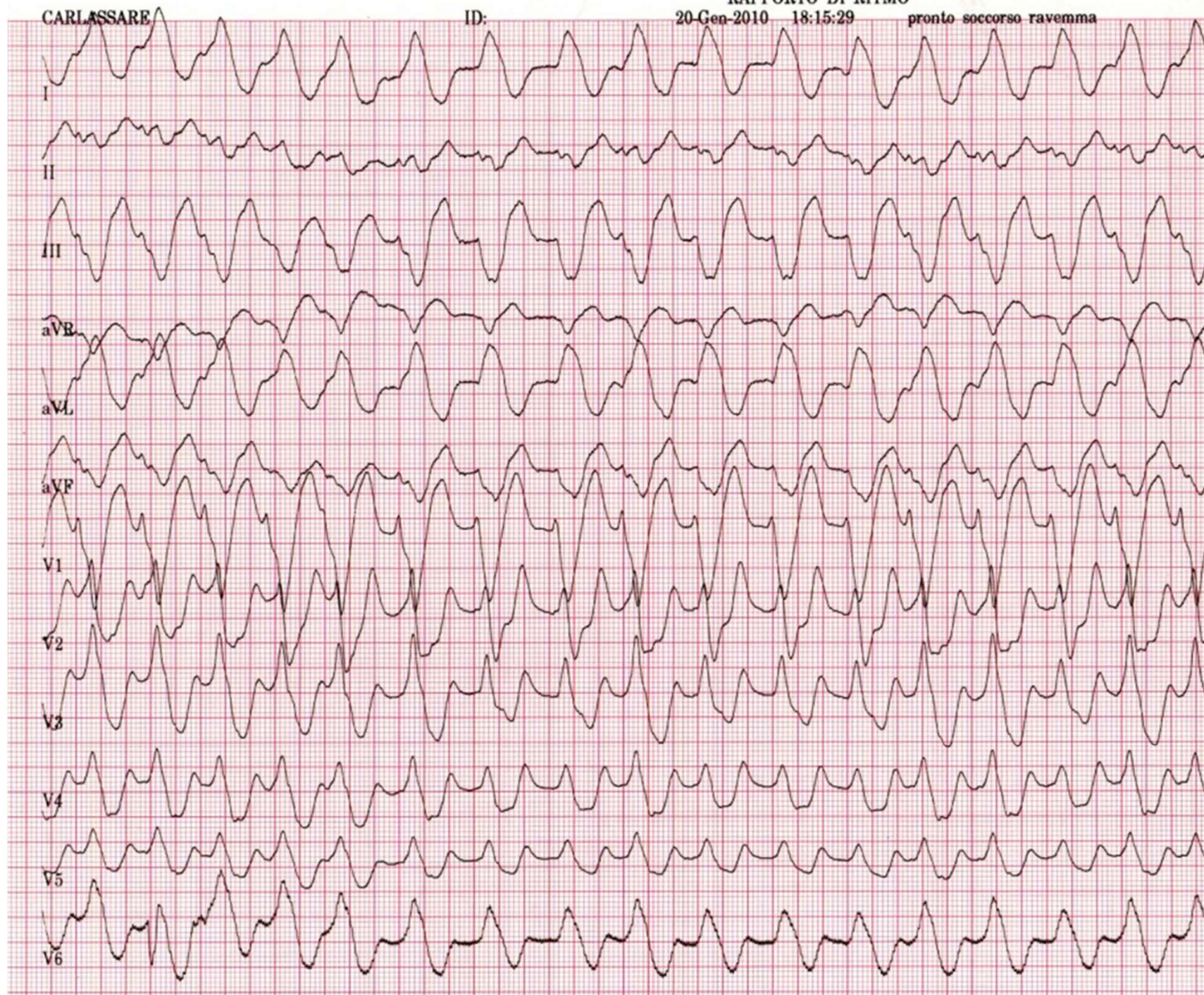
RAPPORTO DI RITMO

CARLASSARE

ID:

20-Jan-2010 18:15:29

pronto soccorso ravenna



Nome: C

05.39

55 anni

Freq vent 100 BPM

Intervallo PR * ms

Durata QRS 178 ms

QT/QTc 406/524 ms

Assi P-R-T * -60 104

FIBRILLAZIONE ATRIALE

DEVIAZIONE ASSIALE SINISTRA

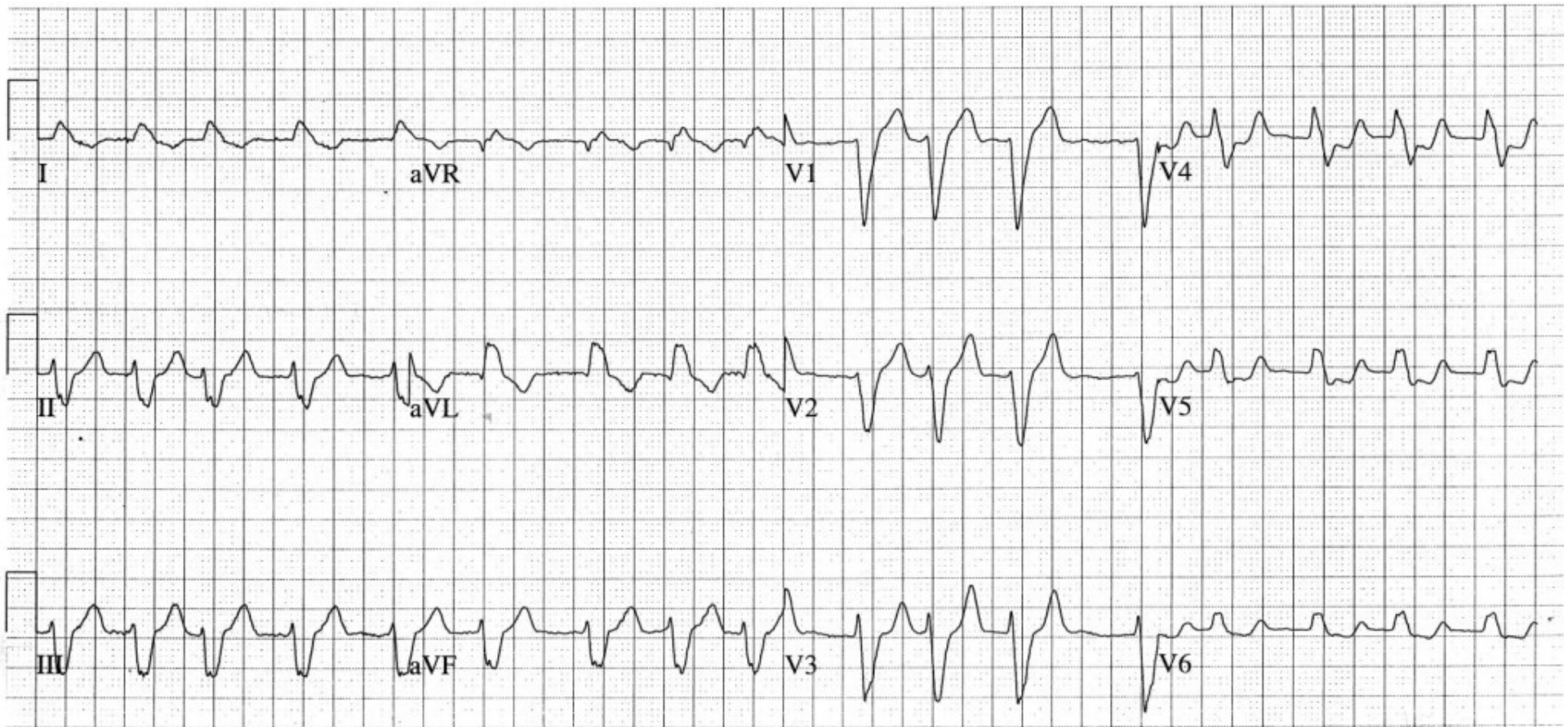
BLOCCO DI BRANCA SINISTRA

ECG ANORMALE

Loc:1

Camera: LET-5

Non Confermato



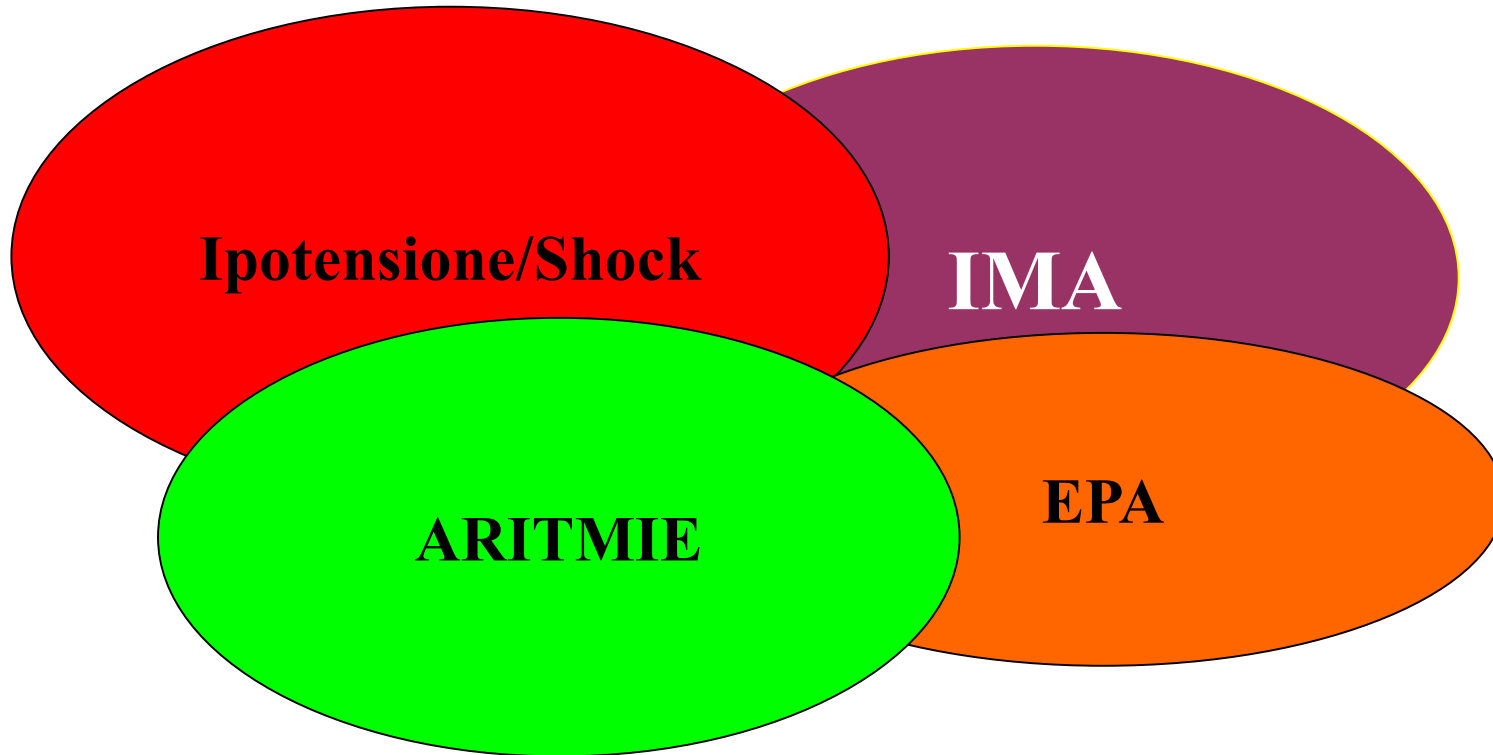
I farmaci antiaritmici



TERAPIA DELLE ARITMIE

- **Aritmie con arresto di circolo:**
-FV, TdP, PEA, asistolia
- **Aritmie instabili**
- **Aritmie stabili**

Contesto clinico: stabilità / instabilità



farmaci / DC shock

Antiarrhythmic drugs—clinical use and clinical decision making: a consensus document from the European Heart Rhythm Association (EHRA) and European Society of Cardiology (ESC) Working Group on Cardiovascular Pharmacology, endorsed by the Heart Rhythm Society (HRS), Asia-Pacific Heart Rhythm Society (APHRS) and International Society of Cardiovascular Pharmacotherapy (ISCP)

EHRA POSITION PAPER

Europace (2018) 20, 731–732

Farmaci antiaritmici

“classificazione di Vaughan – Williams”

Classe I (bloccano i canali del Na):

- **Ia Chinidina**
- **Ib Lidocaina**
- **Ic Propafenone e Flecainide**

Classe II (Beta bloccanti: antagonisti simpatici)

Classe III (bloccano i canali del K):

- **Amiodarone, Sotalolo, Ibutilide, Bretilio**

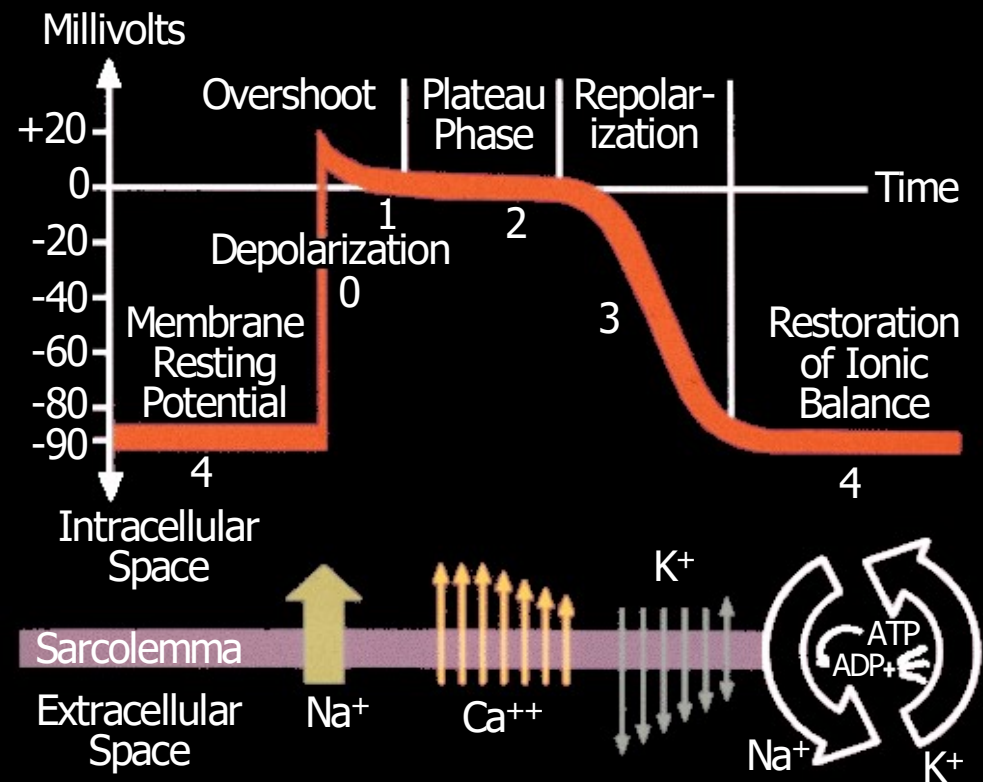
Classe IV (Ca antagonisti ND):

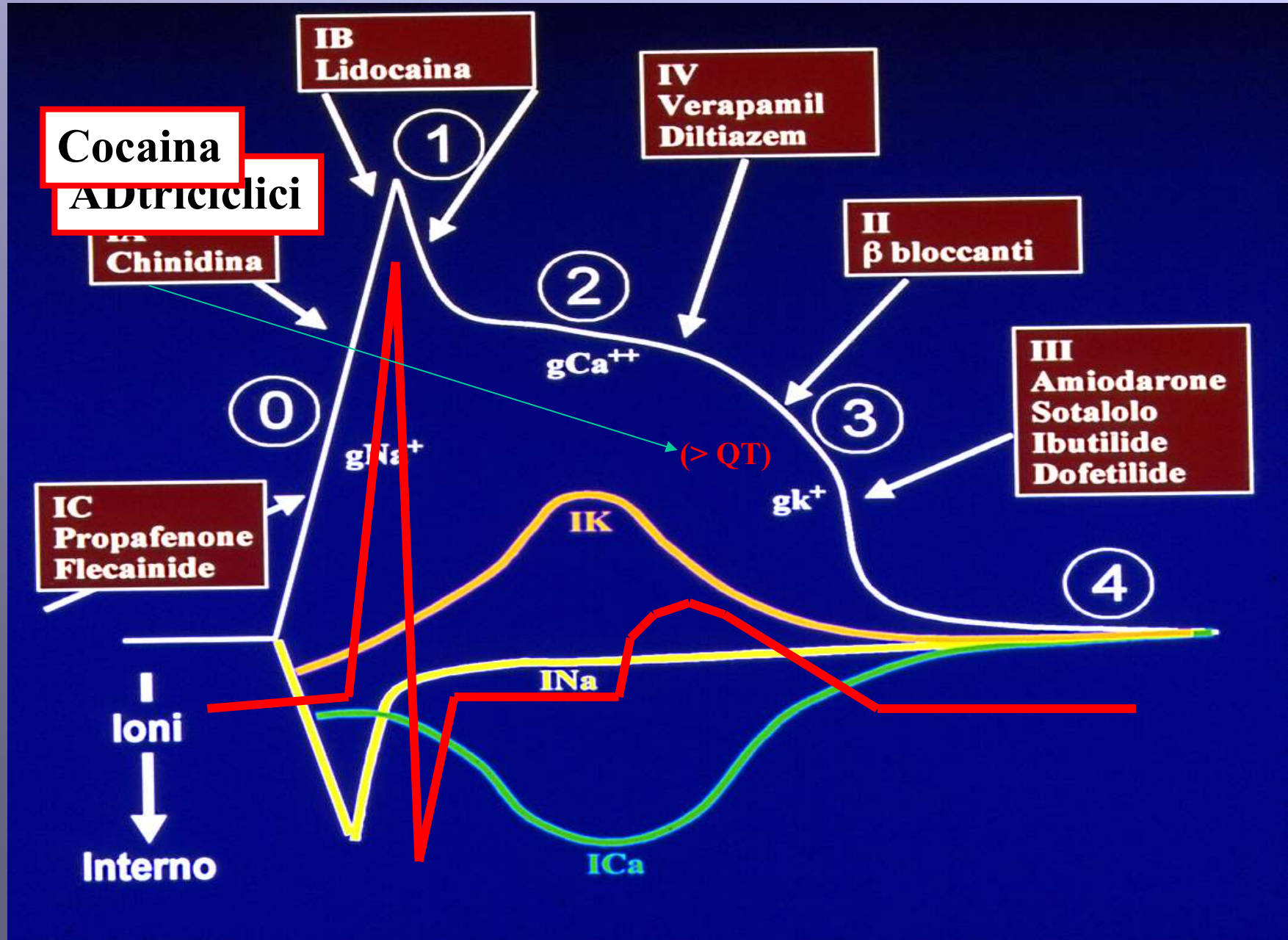
- **Verapamil, Diltiazem**

«This classification is widely used because it is easy to understand and it facilitates the discussion of potentially beneficial and adverse effects of AAD» «this approach also presents important limitations:»

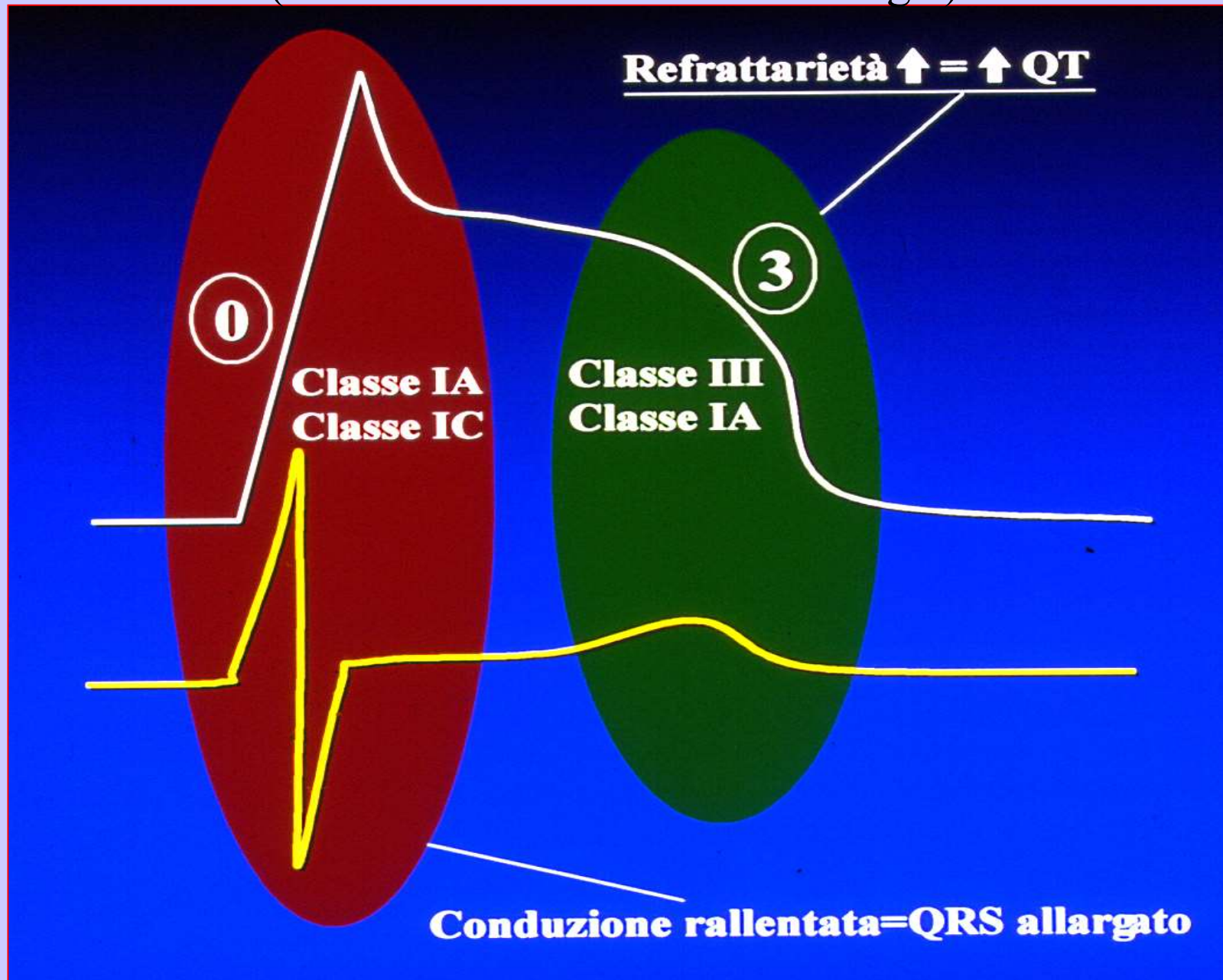
Europace (2018) 20, 731-42 position paper EHRA

Generation of Action Potential

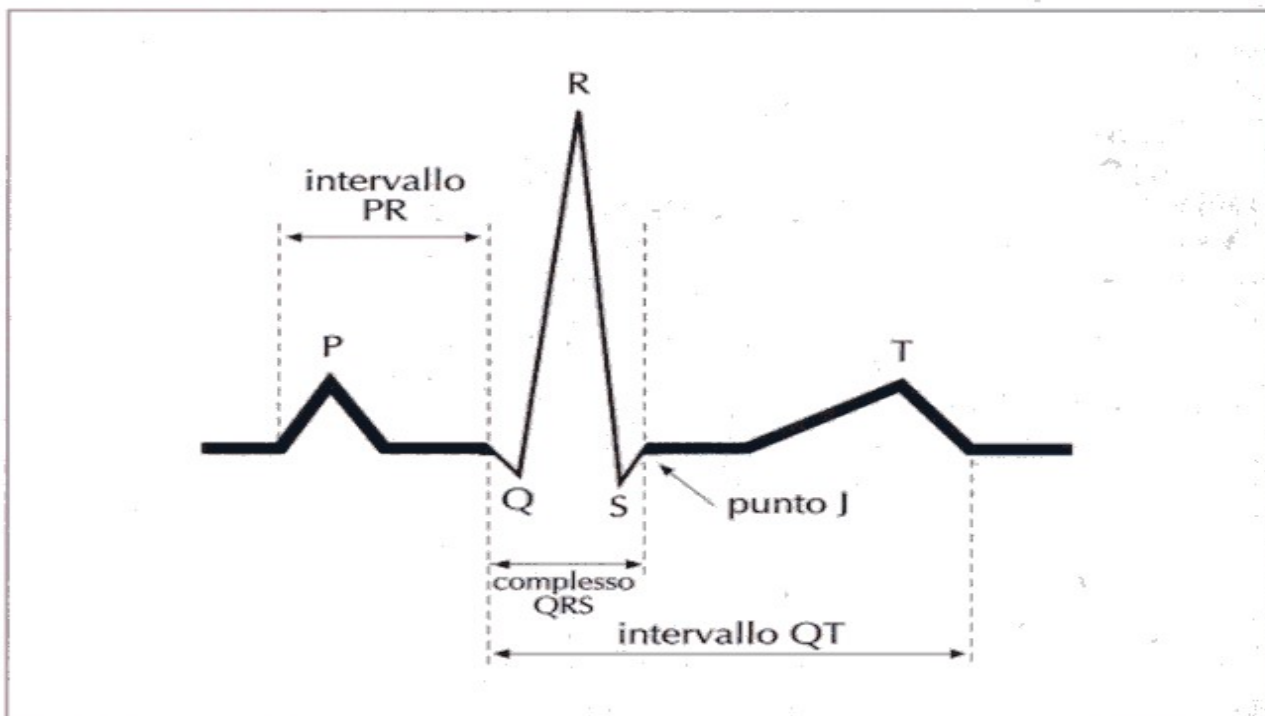




La classe I sta alla **conduzione** come la classe III sta alla **refrattarietà!!**
(Nb: correlazione tra PdA ed ecg!!)



FARMACI ANTIARITMICI ed ECG



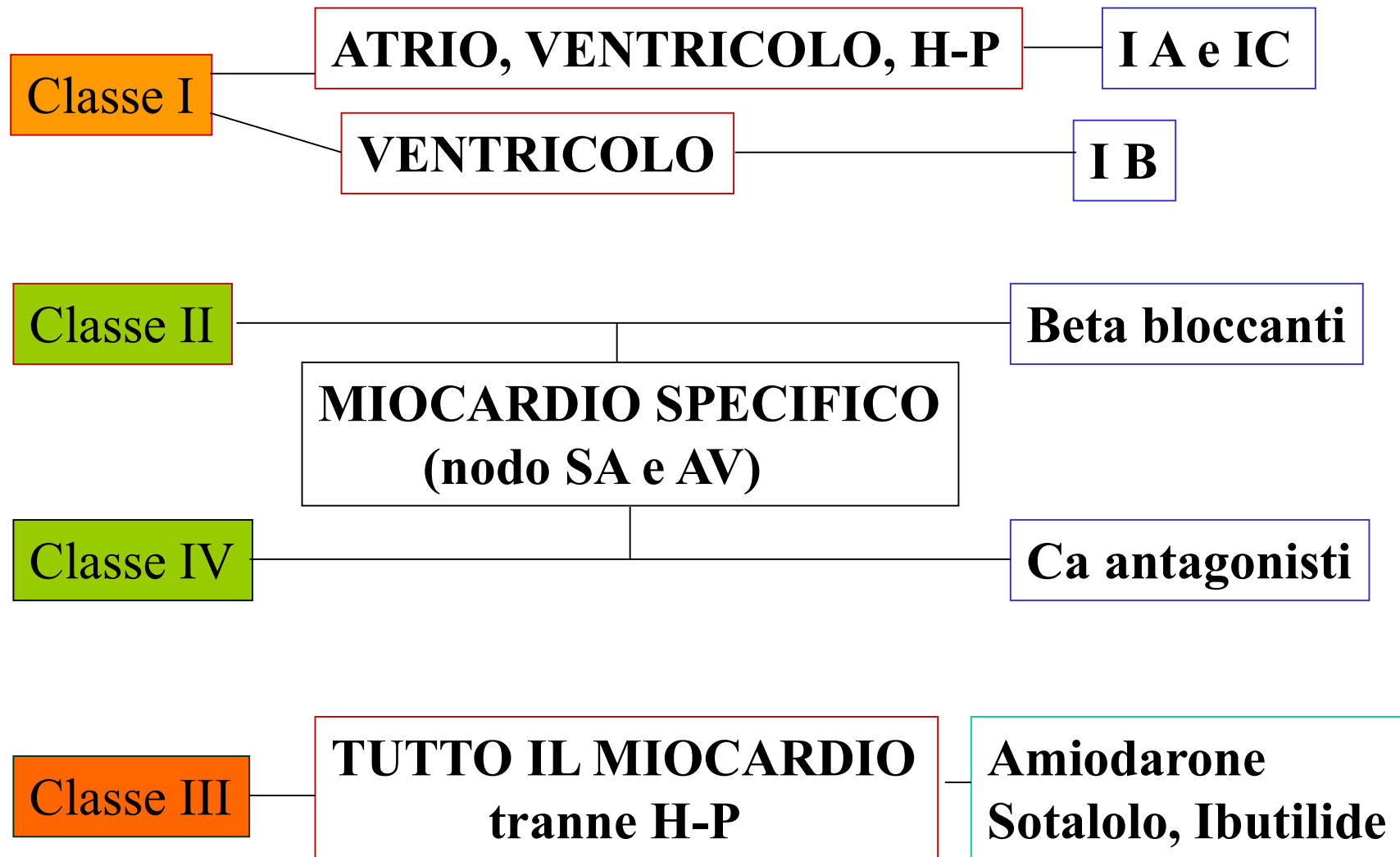
PR: tende ad allungarsi con tutti i farmaci (tranne Lidocaina)

QRS: allargamento con Propafenone e Chinidina

QT: allungamento con Amiodarone e Chinidina, **Procainamide**

N.B.: La Lidocaina non altera QRS e QT.

Farmaci antiaritmici sede d'azione



EMIVITA

4'

Verapamil
IV

1,5-2 h

Lidocaina

2,5 h

Atropina

3,5 h

Diltiazem

Adenosina
< 5sec

6-7 h

Propafenone

10-15 h

Sotalolo

12-25 h

Flecainide

36 h

Digossina

25-100 h

Amiodarone

Farmaci antiaritmici

CONOSCENZA = MANEGGEVOLEZZA

I Farmaci che usiamo:

- Adenosina
- IC (flecainide e Propafenone)
- Classe II (betabloccanti)
- III Amiodarone
- Classe IV (CaAntagonisti nDP= Diltiazem e Verapamil)

ADENOSINA

- Nucleoside purinico endogeno
- Rallenta conduzione A-V
- Emivita: inferiore a 5 secondi
- Dosi: 6 mg in bolo ev (1-3 sec) seguiti da 20 cc di soluzione fisiologica in bolo.
Ripetibile a dose doppia.
- Effetti collaterali: arrossamento cutaneo, dispnea, dolore toracico che regrediscono spontaneamente in 1-2 min
- Precauzioni: pazienti con preesistente bradicardia o SSS (arresto sinusale; BAV)

Nb: potenziata da dipiridamolo e carbamazepina, antagonizzata da metilxantine.

1 C (Propafenone, Flecainide)

- 1) **Deprimono la conduzione atriale: possibile trasformazione in FIA 1:1 !!!**
- 2) **Deprimono la conduzione sottonodale (frequenza dipendente)**



fenomeni di aberranza del QRS (controindicazione: disturbi conduzione!)

1+2= aspetto ecgrafico in DD con TV



(MSC= diminuzione FC e scomparsa dell'aberranza frequenza dipendente)

- 3) **AUMENTO QRS: se > 20 % (25 - 50 %) pericolo!!!**
- 4) **Effetto inotropo negativo (maggiore per Flecainide)**
- 5) **Controindicato in presenza di malattia del Nodo del Seno (Bradi - Tachi)**

History of Antiarrhythmic Drugs



Antiaritmici e Aritmia



ESC GUIDELINES 2020

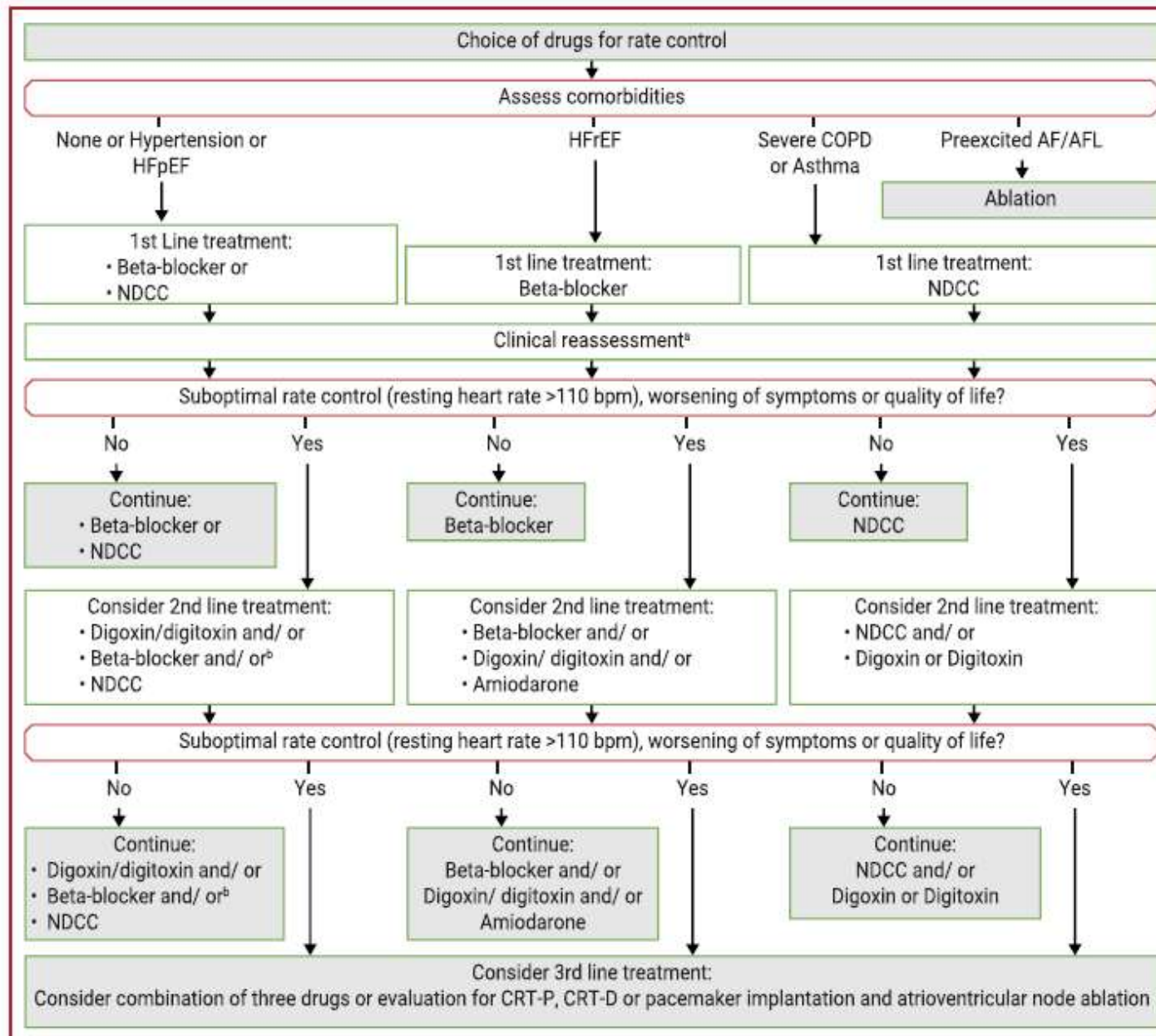
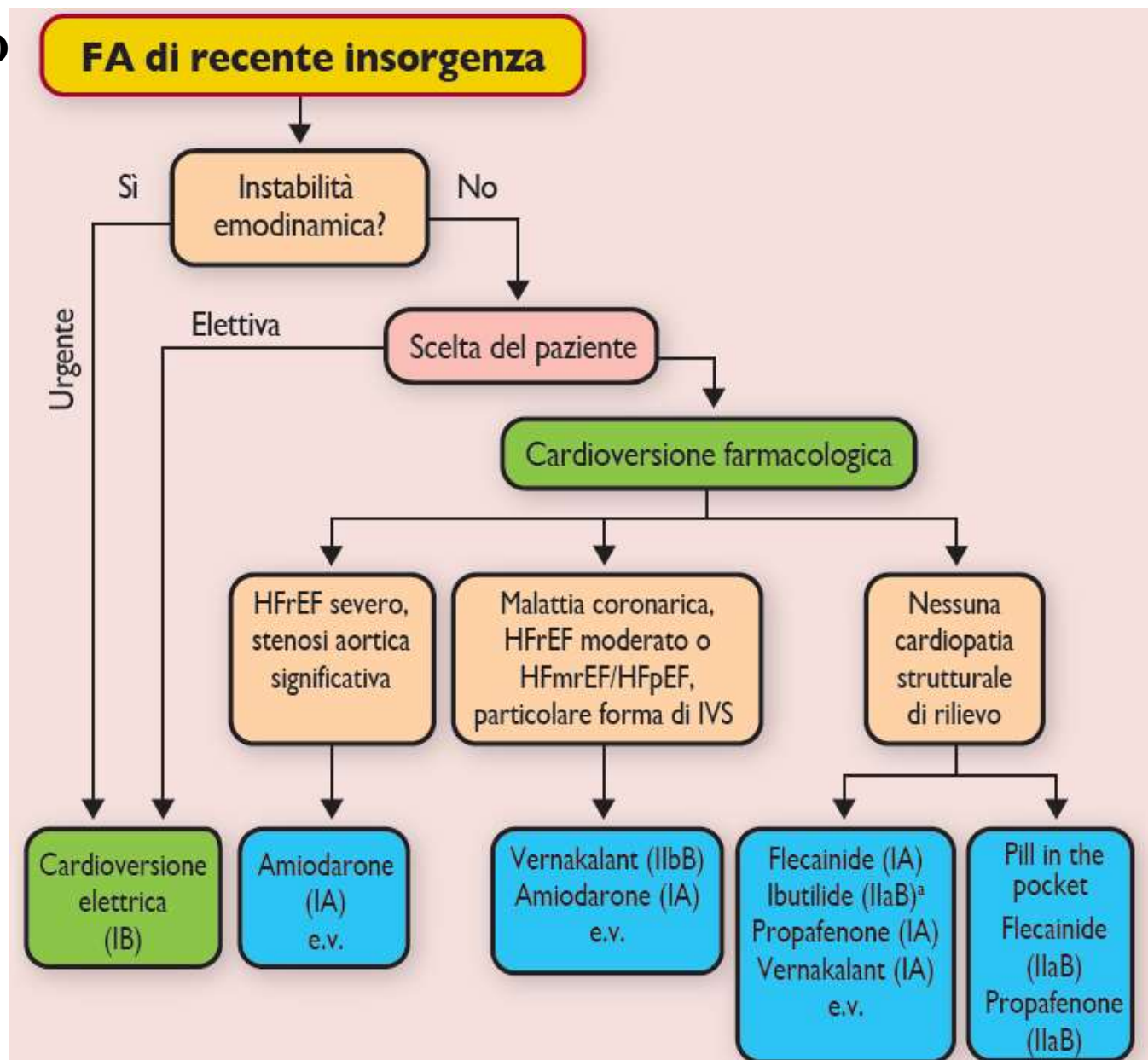


Figure 14 Choice of rate control drugs.⁴⁹⁰ AF = atrial fibrillation; AFL = atrial flutter; COPD = chronic obstructive pulmonary disease; CRT-D = cardiac resynchronization therapy defibrillator; CRT-P = cardiac resynchronization therapy pacemaker; HFpEF = heart failure with preserved ejection fraction; HFrEF = heart failure with reduced ejection fraction; NDCC = Non-dihydropyridine calcium channel blocker. ^aClinical reassessment should be focused on evaluation of resting heart rate, AF/AFL-related symptoms and quality of life. In case suboptimal rate control (resting heart rate >110 bpm), worsening of symptoms or quality of life consider 2nd line and, if necessary, 3rd line treatment options. ^bCareful institution of beta-blocker and NDCC, 24-hour Holter to check for bradycardia.

Recommendations for ventricular rate control in patients with AF (1)

Recommendations	Class	Level
Beta-blockers, diltiazem, or verapamil are recommended as first-choice drugs to control heart rate in AF patients with LVEF \geq 40%.	I	B
Beta-blockers and/or digoxin are recommended to control heart rate in AF patients with LVEF <40%.	I	B
Combination therapy comprising different rate controlling drugs ^a should be considered if a single drug does not achieve the target heart rate.	IIa	B
A resting heart rate of <110 bpm (i.e. lenient rate control) should be considered as the initial heart rate target for rate control therapy.	IIa	B

^aCombining beta-blocker with verapamil or diltiazem should be performed with careful monitoring of heart rate by 24-h ECG to check for bradycardia.



e.v. = per via endovenosa; FA = fibrillazione atriale; HFmrEF = scompenso cardiaco con frazione di eiezione intermedia; HFrEF = scompenso cardiaco con frazione di eiezione ridotta; HFpEF = scompenso cardiaco con frazione di eiezione preservata; IVS = ipertrofia ventricolare sinistra.

Table 14 Antiarrhythmic drugs used for restoration of sinus rhythm

Antiarrhythmic drugs for restoration of sinus rhythm (pharmacological cardioversion)					
Drug	Administration route	Initial dose for cardioversion	Further dosing for cardioversion	Acute success rate and expected time to sinus rhythm	Contraindications/precautions/comments
Flecainide^a	Oral ^b i.v.	200–300 mg 2 mg/kg over 10 min	-	Overall: 59–78% (51% at 3 h, 72% at 8 h)	<ul style="list-style-type: none"> ● Should not be used in ischaemic heart disease and/or significant structural heart disease
Propafenone^a	Oral ^b i.v.	450–600 mg 1.5–2 mg/kg over 10 min	-	Oral: 45–55% at 3 h, 69–78% at 8 h i.v.: 43–89% Up to 6 h	<ul style="list-style-type: none"> ● May induce hypotension, AFL with 1:1 conduction (in 3.5–5.0% of patients) ● Flecainide may induce mild QRS complex widening ● Do NOT use for pharmacological cardioversion of AFL
Vernakalant^c	i.v.	3 mg/kg over 10 min	2 mg/kg over 10 min (10–15 min after the initial dose)	<1 h (50% conversion within 10 min)	<ul style="list-style-type: none"> ● Should not be used in patients with arterial hypotension (SBP <100 mmHg), recent ACS (within 1 month), NYHA III or IV HF, prolonged QT, or severe aortic stenosis ● May cause arterial hypotension, QT prolongation, QRS widening, or non-sustained ventricular tachycardia
Amiodarone^a	i.v.	5–7 mg/kg over 1–2 h	50 mg/h (maximum 1.2 g for 24 h)	44% (8–12 h to several days)	<ul style="list-style-type: none"> ● May cause phlebitis (use a large peripheral vein, avoid i.v. administration >24 hours and use preferably volumetric pump) ● May cause hypotension, bradycardia/atrioventricular block, QT prolongation ● Only if no other options in patients with hyperthyroidism (risk of thyrotoxicosis)
Ibutilide^c	i.v.	1 mg over 10 min 0.01 mg/kg if body weight <60 kg	1 mg over 10 min (10–20 min after the initial dose)	31–51% (AF) 63–73% (AFL) ≈1 h	<ul style="list-style-type: none"> ● Effective for conversion of AFL ● Should not be used in patients with prolonged QT, severe LVH, or low LVEF ● Should be used in the setting of a cardiac care unit as it may cause QT prolongation, polymorphic ventricular tachycardia (torsades de pointes) ● ECG monitoring for at least 4 hours after administration to detect a proarrhythmic event

AAD = antiarrhythmic drug; ACS = acute coronary syndrome; AF = atrial fibrillation; AFL = atrial flutter; b.i.d. = bis in die (twice a day); CrCl = creatinine clearance; CYP2D6 = cytochrome P450 2D6; ECG = electrocardiogram; EHRA = European Heart Rhythm Association; HCM = hypertrophic cardiomyopathy; HF = heart failure; i.v. = intravenous; LV = left ventricular; LVEF = left ventricular ejection fraction; LVH = LV hypertrophy; NYHA = New York Heart Association; QRS = QRS interval; QT = QT interval; SA = sinoatrial; SBP = systolic blood pressure; VKA = vitamin K antagonist.

^aMost frequently used for cardioversion of AF, available in most countries.

^bMay be self-administered by selected outpatients as a 'pill-in-the-pocket' treatment strategy.

^cNot available in some countries.

For more details regarding pharmacokinetic or pharmacodynamic properties refer to EHRA AADs—clinical use and clinical decision making: a consensus document.¹⁶⁰

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Tabella 12 Farmaci antiaritmici per la cardioversione farmacologica

Farmaco	Via di somministrazione	Dose iniziale	Dosi successive	Rischi
Flecainide	Orale e.v.	200-300 mg 1.5-2 mg/kg in 10 min	NA	Ipotensione, flutter atriale con conduzione 1:1, prolungamento del QT. Evitare nei pazienti con cardiopatia ischemica e/o cardiopatia strutturale significativa.
Amiodarone	e.v. ^a	5-7 mg/kg in 1-2 ore	50 mg/h fino ad un massimo di 1.0 g in 24 ore	Flebite, ipotensione, bradicardia/blocco AV. Rallenta la frequenza ventricolare. Tardiva conversione a ritmo sinusale (8-12 ore).
Propafenone	e.v. Orale	1.5-2 mg/kg in 10 min 450-600 mg		Ipotensione, flutter atriale con conduzione AV 1:1, (lieve) prolungamento del QRS. Evitare nei pazienti con cardiopatia ischemica e/o cardiopatia strutturale significativa.
Ibutilide ^b	e.v.	1 mg in 10 min	1 mg in 10 min, somministrabile dopo 10 min	Prolungamento del QT, tachicardia ventricolare polimorfa/torsioni di punta (3-4% dei pazienti). Rallenta la frequenza ventricolare. Evitare nei pazienti con QT allungato, ipokaliemia, IVS severa o ridotta frazione di eiezione.
Vernakalant	e.v.	3 mg/kg in 10 min	2 mg/kg in 10 min, somministrabile dopo 15 min	Ipotensione, aritmie ventricolari non sostenute, prolungamento del QT e QRS. Evitare nei pazienti con PAS <100 mmHg, recente SCA (<30 giorni), scompenso cardiaco in classe NYHA III-IV, prolungamento dell'intervallo QT (QT non corretto >440 ms) e stenosi aortica severa.

Sincronizzazione dell'FA e allargamento del QRS

Sincronizzazione dell'FA e allargamento del QRS

bloccante atrio-selettivo dei canali del sodio

AV = atrioventricolare; e.v. = per via endovenosa; IVS = ipertrofia ventricolare sinistra; NA = non applicabile; PAS = pressione arteriosa sistolica; NYHA = New York Heart Association; SCA = sindrome coronarica acuta.

^aUtilizzare una vena periferica di grosso calibro e passare all'assunzione per via orale entro 24 ore dalla somministrazione e.v. (tramite catetere venoso centrale).

^bL'ibutilide è disponibile solo in alcuni paesi dell'Europa.

gravidanza

Indicati

- Adenosina
- DC shock
- Digitale
- Metoprololo IIa (B)

Attenzione:

Flecainide IIa (C)

Controindicati

- Amiodarone
- Atenololo



