Rhythm disorders

1) When do we use antiarhythmic therapy?

2) How do we choose the most efficient drug?

3) Which adverse undesirable effects?

4) Surveillance of an antiarhythmic treated patient.
When do we use antiarhythmic therapy?

I. **Cardiopathies:** – ischaemic – chronic, atherosclerosis, rheumatic, inflammatory origin:
   – Dilatative – from heart failure
   – Obstructive – pericarditis, myocarditis
   – Hypertrophic – from left ventricle hypertrophy
   – Valvular – from valvulopathies (mitral) and intra-atrial communication
   – Restrictive - amyloidosis
   – Metabolic: thyrotoxicosis, acute infections (pneumonia), pulmonary embolism, alcoholics (acute/chronic), drug intoxication (cigars, digitalis)

II. **Abnormal or accessory ways of impulse driving**
   – Digestive or vagal irritations,
   – Local irritations – scares after catheterisation,
   – WPW syndrome,
   – Endocrinological troubles – ovarian, deficiency serum calcium,
   – Localised infections.

III. **Functional** – Neurovegetative dystonia; viscero – visceral reflex (heart, digestive, lung, vertebral column) we are looking for:
   • Disappearance of the arrhythmia and avoiding the recurrences,
   • Decreasing of the vital risk and of the homodynamic dysfunctions consequently to the arrhythmia.
When do we use antiarhythmic therapy?

1. Immediately vital risk:
   - Ventricular tachycardia,
   - Ventricular extra-systoles over 25/ minutes,
   - With R/T phenomenon systematic,
   - Acute heart phenomena.

2. Potentially risk:
   Tachyarrhythmias which:
   - decreased diastoles,
   - severe decreased of systolic flow,
   - provoked cardiac ischemia and/or myocardial infarction.

3. Clinical manifestations: are the expression of the haemodinamical dysfunctions:
   - decreased blood flow on periphery with clinical distress,
   - chronic severe heart failure,
   - strokes.
How do we choose the efficient drug?

A. The correct diagnosis of dysrhythmia:
   • Tachyarrhythmia – for the possibility of avoiding sympathetic or vagolytic drugs,
   • Bradyarrhythmia,
   • Brady-tachy dysrhythmia – pace – maker – which can protect dysrhythmia even under treatment!
How do we choose the most efficient drug?

B. Classification of antiarrhythmics after the effects place of its action:
   a. Atrial and junctional arrhythmias:
      • Digitalis
      • Quinidine
      • Beta receptors blocking drugs
      • Verapamil (calcium antagonist with Quinidine – like action)
      • Propafenone (Rytmonorm)
   b. Ventricular arrhythmias:
      - Lydocaine – like preparations, Xylline, Procaynamide, Dysopiramide
      - Amiodarone
      - Sotalol
      - Propafenone
      - Quindine and Quinidine – like drugs
   c. Digitalis arrhythmias:
      • Xylline, Fenitoine
      • β blocking receptors drugs
How do we choose the most efficient drug?

C. Elimination of the tachyarrhythmias without an organic substratum which benefits of specific treatment (especially for young persons):
   - Excessive effort
   - Hyperthyroidism
   - Prolapse of the mitral valve (echocardiography)
   - WPW syndrome
   - Drugs, infections – coffee, smoking, alcohol, toxics;

D. Which remains are the:
- Tachyarrhythmias completely diagnosticated with vagal manoeuvres:
  - overventricular
  - ventricular
- Extrasystoles
- Tachycardia, flutter, fibrillation.
Vagal tonus stimulation manoeuvres

1. Carotidian sinus compression: pressing with the thumb or the forefinger on the sino–carotidian zone (next by the gonion) (for 15 – 20 seconds), first on the right side then on the left side when the patient is lying.

2. Compression of the eyes: on both eyes, with a moderate intensity until the sensation of black view, colloured points or shinny points. Risk of cardiac stop, retinal detachment.

3. Valsalva's manoeuvre – it's a technique for increasing the intrathoracic pressure by closing the mouth and nostrils and blowing out the cheeks, thereby forcing air back into the nasopharynx. Used several times.

4. Muller manoeuvre: forcing expiration then forcing inspiration with close glottis for 20 seconds.

5. Abdominal compression: with the hands or thighs on the patient's abdomen.

6. Irritation of oesophagus wall: swallowing unthawed bread or a big glass of water.

7. Inducing vomiting – by excitation of the posterior wail of the pharynx.
Primary sinusal tachycardia

- Correction the causes of substrate deteriorations if possible:
  - Ischaemic cardiopathies,
  - Acute rheumatic fever,
  - Thyrotoxicosis,
  - Cardiomiopathy (alcoholic, toxic),
  - WPW syndrome,
  - Pneumonia,
  - Bronchial carcinoma, other carcinoma,
  - Pericarditis,
  - Interatrial communication, others,
  - Pulmonary thrombo-embolism, so on.
Extrasystole’s treatment

General objectives:
  – removing the inductors of the causes (digitalis),
  – good and correct choosing of the drug.

**Ventricular extrasystoles:**

• 1/minute – without clinical signification,
• 2/minute – with signification; Multiples – it's important
• coupled – bi, trigemmynism – Xylline – the principal medication,
  especially for urgencies like: myocardial infarct, catheterise,
  myocarditis, digitalis intoxication.

  Cl. 1 – procaynamide, dysopiramide – for prevention of the
  recurrences.

  Cl. 2. Amiodarone or calcium – inhibitors drugs, or sotalol;

**Atrial extrasystoles:**

- beta blocking drug receptors, sotalol, amiodarone;
- sedatives, anxyolitics.
Overventricular tachyarrhythmias

- Normal aspect of the QRS complex:
  - variable ventricular frequency 100 – 200/min.
  - atrial contraction frequency between 200 – 400 – to 600/min
- Clinically may be:
  - Atrial fibrillation
  - Atrial flutter
  - Overventricular paroxystical tachycardia

The rhythm is unregulated with pulse deficiency or regulated, with a high frequency;

After eliminating the causes like thyrotoxicosis, heart failure, acute rheumatic fever, infections, valvulopathies, high blood pressure, it remains the most important etiology
- the cardiac ischemia for 90%.
Overventricular tachyarrhythmias

On the residence place:
A. ATP (Adenosine), 1 ampoule on every 4 hours i.v. - elective
B. Digitalis (dioxin) 0,5 mg/ampoule 2 ampoules i.v. depends on heart failure. Repeated to every 6 hours (2 mg/day).

Bradycardia makes any treatment unadvisable – peace maker.

C. Beta blocking drugs: propranolololum 80 – 240 mg/day → 320 mg/day or 1 mg/ampoule i.v., then 1 mg/hour until 10 mg/day. (Metoprolol)
D. Calcium blocker, Verapamil iv 1 amp. Depends on a. tension values.
E. In over-ventricular parroxystral tachycardia depends on ethiology, could associated:
   • sedatives, anxiolitic drugs: Diazepam 10 – 20 mg/day, Phenobarbital 0,01 g x 2/day, Hydroxizine 25 mg x 2/day
   • antispastic, antivomiting, antihystaminic, myorelaxing drugs.
F. Ajmallyne, 25 – 50 mg 3 times a day, oral adm. 50 mg on every 6 hours (max. 300 mg/day) i.v. Adm.: 25 – 50 mg (max. 300 mg/day in 12 hours).
Ventricular Tachyarrhythmias

- Unregulated rhythm – 100/minutes
  - variable heart sounds
  - synocarotidian compression, same principles:
    - Elimination of the auxiliary cause: stopping the digitalis or calcium antagonists
    - Thru **electric shock** – the most efficient way to solve and also the unique method for:
      - Ventricular paroxysmal tachycardia
      - Ventricular flutter
      - Ventricular fibrillation
      - = CARDIAC ARREST!!!
- !! In time of digitalisation do not recommend the electric shock.
Ventricular Tachyarrhythmias

- **Xylline** – the most important drug especially for:
  - Myocardial infarction, Acute rheumatic fever, High blood pressure,
  - 50 – 100 mg i.v. for 10 – 15 min (1 ampoule has 100 mg for 10 ml sol.) **Lydocaine** amp. 2 ml/2% or 2 ml/4%. We repeat every 2 or 3 hours until 300-500 mg/hour, and then we perform perfusion with lydocaine in physiological serum

Or:

- **Procaynamide** – 0,5 g on every 8 hours – until 2 g/day.
- **Propranololum** - 120 – 240 mg/day, **Metoprololum** iv, 100-200 mg, repeat if necessary.
- **Verapamilum** iv 1 amp. Slow rhythm perfusion, control TA.
- And **magnesium sulphate 20%** 5 – 10 ml i.v., repeated on every 2 hours.
Ventricular Tachyarrhythmias

If no results
- Cardio version.
- Rhythm must be maintained with:
  - Amiodarone (oral) 200 – 800 mg/day (200 mg per tb)
  - Mexylletine (oral – 200 – 400 mg on every 8 hours)
    - I.v. 200 mg in 5 – 10' then 250 mg on every 2 hours
  - Propafenone (rytmonorm) 100 – 300 mg on every 6 hours
    - we can also install a new pacemaker on use a mini – defibrillation device.

For ventricular flutter or ventricular fibrillation:
- Electric shock.
- Resuscitation maneuvers, external cardiac massage +/- IOT
- Xylline i.v. 1 – 2 mg/kgc until 100 mg/minute +/-
- Adrenaline 1 amp iv, ia, repeat if necessary.
Side effects of the antiarhythmic

Risk factors:
- Especially for aged persons, (ie ischaemia)
- Dysfunction of the myocardial contraction
- Proarhythmic effects (all)

Extra cardiac effects:
– Digestive – digitalis nausea, vomiting, abdominal pains
– Vagolytic effects: dry tongue, urinary retention, constipation, increasing of the intraocular pressure (so it's not indicated 12 glaucoma).
– Bronchospasm – for β blocking drugs
– Hypoglycemia – for β blocking drugs
– Thyroid disfunctions, liver disfunctions– amiodarone.
Side effects of antiarhythmics

- Sinusal junction's automatism – **disopyramide** (not indicated in congestive heart failure) is decreased, also driving impulse through A–V and intra–ventricular tissues.

- **Quinidine** – has a vagolytic effect and so it stimulates in high doses (intoxication doses) the driving impulse through the A–V junction, increasing the ventricular frequency and may lead to heart failure; that's why we do not use quinidine currently;
  - in atrial fibrillation – increases QT period and makes possible “torsade des points”.

- **Beta-blocking** receptor drugs – decreases the heart frequency, also the atrial driving and atrio-ventricular one.

- **Calcium antagonists** cardioselectivity – decreases heart frequency (do not associate with β blocking drugs), negative inotropy.
Surveillance of an antiarhythmic

Repeated electrocardiography:

- Beta blocking – dysfunctions of the sinusal junction (SSS)
  - ± Digitalis – intraventricular / atria ventricular conduction troubles
- Amiodarone – complications of/or acute myocardial infarction – impose attention
  - ± digitalis for antiarhythmic use
- repeated measurement – before and after QT, PQ, QRS, QTc > 450 msec.
  - decreasing of heart frequency under 45/min,
  - increasing amplitude of QRS complex beyond (over) 25% of the initial value when changes (dysfunctions);
- assembling:
  - Ventricular ectopies,
  - A–V blocks,
  - Severe bradycardia,
  - Sinusal dysfunction,
  - torsade du point – utilisation of an inotropic positive drug.

For acute pulmonary oedema cardiogenic shock stop the administration and we shall eliminate the negative factors: hypokaliemia;
We shall consider the eventually kidney or liver failure: for example: diuretics + quinidine + bradycardia = torsade du point
Atrial fibrillation

Summary

- Classification of patients as having paroxysmal, persistent, or permanent AF is important when selecting rhythm control therapy
- Safety should be a main consideration when choosing an antiarrhythmic intervention
- Patients with paroxysmal AF who do not have structural heart disease can choose an antiarrhythmic drug or catheter ablation as a first-line option
- Determine cause before selecting therapy for patients with breathlessness
- In patients with true heart failure, amiodarone is the treatment of first choice
Atrial fibrillation

Atrial Fibrillation

- Most common sustained cardiac arrhythmia (1%-2% of the general population)
- 5-fold increase in the risk of stroke
- 1 in 5 of all strokes is attributable to atrial fibrillation
- Risk of death from AF-related stroke is doubled

Atrial fibrillation

Antiarrhythmic Drug Management of Non-permanent AF (cont)

Minimal or no structural heart disease

- HHD
  - Dronedarone/flecainide/propafenone/sotalol
  - Amiodarone

Significant structural heart disease

- Treatment of underlying condition and prevention of remodelling – ACE-I/ARB/statins
- CHD
  - LVH
  - Sotalol
  - Dronedarone
  - Dronedarone
  - Amiodarone
- CHF
  - Amiodarone

Anticoagulation treatment

- AVK: acenocumarol, warfarine – needs control INR.
- Novel anticoagulants:
  - No needs of INR control, other mechanism of action,
  - antiFXa: apixaban, edoxaban, rivaroxaban,
  - antiFIIa: dabigatran.
# Optimal INR by indication

INR Based on Warfarin Indication

<table>
<thead>
<tr>
<th>Indication</th>
<th>INR</th>
</tr>
</thead>
<tbody>
<tr>
<td>AF&lt;sup&gt;32&lt;/sup&gt;</td>
<td>2.0–3.0</td>
</tr>
<tr>
<td>VTE prevention and DVT/PE treatment&lt;sup&gt;10,33&lt;/sup&gt;</td>
<td>2.0–3.0</td>
</tr>
<tr>
<td>MI&lt;sup&gt;34&lt;/sup&gt;</td>
<td>2.0–3.0 or 2.5–3.5</td>
</tr>
<tr>
<td>MHV&lt;sup&gt;35&lt;/sup&gt;</td>
<td>2.5–3.5 or 2.0–3.0</td>
</tr>
</tbody>
</table>

AF = atrial fibrillation.  
DVT = deep vein thrombosis.  
MHV = mechanical heart valve.  
MI = myocardial infarction.  
PE = pulmonary embolism.
## Management of elevated INR

If a patient has an elevated INR there are 3 approaches that can be taken:

<table>
<thead>
<tr>
<th>INR</th>
<th>Intervention</th>
</tr>
</thead>
</table>
| Supratherapeutic but < 5.0 | - Reduce or omit dose of warfarin  
- Check INR in 3-7 d  
- Resume at same or lower dose when INR within range |
| 5.0–9.0              | - Omit next 1 or 2 doses  
- Check INR every 24-48 h  
- Resume at lower dose when INR within range  
- Consider 1-4 mg of oral vitamin K |
| > 9.0                | - Omit warfarin  
- Give ~ 5 mg of oral vitamin K  
- Check INR in 12-24 h  
- If still > 9.0, repeat vitamin K  
- Check INR in 24 h  
- Resume at lower dose when INR within range  
- If high risk of bleeding, may consider fresh frozen plasma |
Risk assessment for bleeding

**ESC AF Antithrombotic Guidelines 2010**

**CHA$_2$DS$_2$-VASc**
(Point-based scoring system)

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Congestive heart failure/LV dysfunction</td>
<td>1</td>
</tr>
<tr>
<td>Hypertension</td>
<td>1</td>
</tr>
<tr>
<td>Age ≥ 75</td>
<td>2</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>1</td>
</tr>
<tr>
<td>Stroke/TIA/systemic embolism</td>
<td>2</td>
</tr>
<tr>
<td>Vascular disease</td>
<td>1</td>
</tr>
<tr>
<td>Age 65–74</td>
<td>1</td>
</tr>
<tr>
<td>Sex category (ie, female sex)</td>
<td>1</td>
</tr>
<tr>
<td><strong>Maximum score</strong></td>
<td><strong>9</strong></td>
</tr>
</tbody>
</table>

Source: Al-Attar et al. European J 2010;31:2330-2430
Syncope

Risk Stratification (at Initial Evaluation)

**High risk**

- Indication for ICD or PM (independently of a definite diagnosis of the cause of syncope)
- Severe structural or coronary heart disease
- Arrhythmic syncope likely
  - Syncope during exertion or supine
  - Palpitations at the time of syncope
  - Heart failure or low EF
  - NSVT
  - BBB
  - Sinus bradycardia < 50 bpm
  - AV block
  - WPW syndrome, long QT, ARVD, Brugada syndrome
- Important comorbidities (severe anemia, electrolyte disturbances, etc)

Immediate in-hospital evaluation or early intensive evaluation and treatment

Syncope

Diagnostic Examinations (Other Than Initial Evaluation)

Useful (when indicated)
- Carotid sinus massage
- Tilt testing
- Echocardiogram
- Holter/loop monitoring
- Electrophysiological test
- Exercise stress testing

Almost never useful
- EEG
- CT scan & MR
- Carotid Doppler sonography
- Ventricular SAECG
- Coronary angiography
- Pulmonary scintigraphy

## Syncope

<table>
<thead>
<tr>
<th>Causes of Loss of Consciousness in 891 Patients (According to ESC Classification)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reflex</strong></td>
</tr>
<tr>
<td>1. Vasovagal</td>
</tr>
<tr>
<td>2. Classical OH form</td>
</tr>
<tr>
<td>3. Delayed OH form (progressive)</td>
</tr>
<tr>
<td><strong>Orthostatic Hypotension</strong></td>
</tr>
<tr>
<td><strong>Cardiac Arrhythmia</strong></td>
</tr>
<tr>
<td>1. Bradycardia</td>
</tr>
<tr>
<td>2. AV block</td>
</tr>
<tr>
<td>3. PM dysf</td>
</tr>
<tr>
<td>4. Tachycardia</td>
</tr>
<tr>
<td>5. VT</td>
</tr>
<tr>
<td>6. SVT</td>
</tr>
<tr>
<td><strong>Structural Cardio-pulmonary</strong></td>
</tr>
<tr>
<td>1. ACS</td>
</tr>
<tr>
<td>2. Aortic stenosis</td>
</tr>
<tr>
<td>3. Mitral myxoma</td>
</tr>
<tr>
<td>4. Pulmonary embolism</td>
</tr>
<tr>
<td><strong>Non-syncopal</strong></td>
</tr>
<tr>
<td>1. Metabolic</td>
</tr>
<tr>
<td>2. Epilepsy</td>
</tr>
<tr>
<td>3. Intoxications</td>
</tr>
<tr>
<td>4. Drop attacks</td>
</tr>
<tr>
<td>5. Psychogenic</td>
</tr>
<tr>
<td>6. TIA</td>
</tr>
<tr>
<td><strong>Unknown Cause</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reflex: 67%</td>
</tr>
<tr>
<td>Orthostatic Hypotension: 4%</td>
</tr>
<tr>
<td>Cardiac Arrhythmia: 5%</td>
</tr>
<tr>
<td>Structural Cardio-pulmonary: 1%</td>
</tr>
<tr>
<td>Non-syncopal: 5%</td>
</tr>
<tr>
<td>Unknown Cause: 18%</td>
</tr>
</tbody>
</table>

**Syncope Unit Project (SUP) study**