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RUOLO.TALENTO.PASSIONE.IDEE

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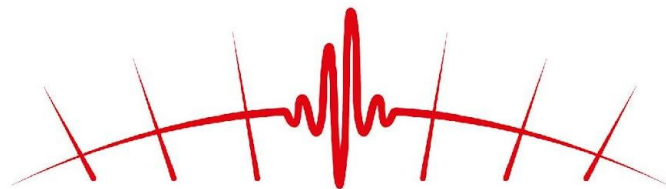


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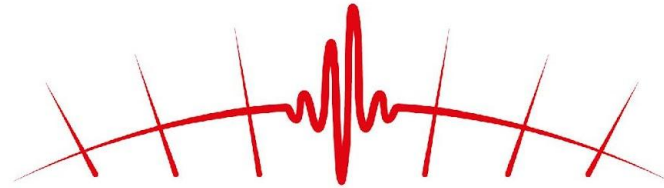
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# LE DIAGNOSI VINCENTI LE ARITMIE MAGGIORI DA TOSSICI



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## Circulation

### **AHA FOCUSED UPDATE**

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2023 American Heart Association Focused Update on the Management of Patients With Cardiac Arrest or Life-Threatening Toxicity Due to Poisoning: An Update to the American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care

*Endorsed by the American Academy of Pediatrics*

**Table 1. Applying the American College of Cardiology/American Heart Association Class of Recommendation and Level of Evidence to Clinical Strategies, Interventions, Treatments, or Diagnostic Testing in Patient Care\* (Updated May 2019)**

| CLASS (STRENGTH) OF RECOMMENDATION                                                                                                                                                                                                                                                                                                                                                                                                                        |                                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| <b>CLASS 1 (STRONG)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>Benefit &gt;&gt;&gt; Risk</b> |
| <b>Suggested phrases for writing recommendations:</b> <ul style="list-style-type: none"> <li>Is recommended</li> <li>Is indicated/useful/effective/beneficial</li> <li>Should be performed/administered/other</li> <li>Comparative-Effectiveness Phrases: <ul style="list-style-type: none"> <li>Treatment/strategy A is recommended/indicated in preference to treatment B</li> <li>Treatment A should be chosen over treatment B</li> </ul> </li> </ul> |                                  |
| <b>CLASS 2a (MODERATE)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>Benefit &gt;&gt; Risk</b>     |
| <b>Suggested phrases for writing recommendations:</b> <ul style="list-style-type: none"> <li>Is reasonable</li> <li>Can be useful/effective/beneficial</li> <li>Comparative-Effectiveness Phrases: <ul style="list-style-type: none"> <li>Treatment/strategy A is probably recommended/indicated in preference to treatment B</li> <li>It is reasonable to choose treatment A over treatment B</li> </ul> </li> </ul>                                     |                                  |
| <b>CLASS 2b (WEAK)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>Benefit ≥ Risk</b>            |
| <b>Suggested phrases for writing recommendations:</b> <ul style="list-style-type: none"> <li>May/might be reasonable</li> <li>May/might be considered</li> <li>Usefulness/effectiveness is unknown/unclear/uncertain or not well-established</li> </ul>                                                                                                                                                                                                   |                                  |
| <b>CLASS 3: No Benefit (MODERATE)</b>                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Benefit = Risk</b>            |
| <b>(Generally, LOE A or B use only)</b> <b>Suggested phrases for writing recommendations:</b> <ul style="list-style-type: none"> <li>Is not recommended</li> <li>Is not indicated/useful/effective/beneficial</li> <li>Should not be performed/administered/other</li> </ul>                                                                                                                                                                              |                                  |
| <b>Class 3: Harm (STRONG)</b>                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>Risk &gt; Benefit</b>         |
| <b>Suggested phrases for writing recommendations:</b> <ul style="list-style-type: none"> <li>Potentially harmful</li> <li>Causes harm</li> <li>Associated with excess morbidity/mortality</li> <li>Should not be performed/administered/other</li> </ul>                                                                                                                                                                                                  |                                  |

| LEVEL (QUALITY) OF EVIDENCE†                                                                                                                                                                                                                                   |                         |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
| <b>LEVEL A</b>                                                                                                                                                                                                                                                 |                         |
| <ul style="list-style-type: none"> <li>High-quality evidence‡ from more than 1 RCT</li> <li>Meta-analyses of high-quality RCTs</li> <li>One or more RCTs corroborated by high-quality registry studies</li> </ul>                                              |                         |
| <b>LEVEL B-R</b>                                                                                                                                                                                                                                               | <b>(Randomized)</b>     |
| <ul style="list-style-type: none"> <li>Moderate-quality evidence‡ from 1 or more RCTs</li> <li>Meta-analyses of moderate-quality RCTs</li> </ul>                                                                                                               |                         |
| <b>LEVEL B-NR</b>                                                                                                                                                                                                                                              | <b>(Nonrandomized)</b>  |
| <ul style="list-style-type: none"> <li>Moderate-quality evidence‡ from 1 or more well-designed, well-executed nonrandomized studies, observational studies, or registry studies</li> <li>Meta-analyses of such studies</li> </ul>                              |                         |
| <b>LEVEL C-LD</b>                                                                                                                                                                                                                                              | <b>(Limited Data)</b>   |
| <ul style="list-style-type: none"> <li>Randomized or nonrandomized observational or registry studies with limitations of design or execution</li> <li>Meta-analyses of such studies</li> <li>Physiological or mechanistic studies in human subjects</li> </ul> |                         |
| <b>LEVEL C-EO</b>                                                                                                                                                                                                                                              | <b>(Expert Opinion)</b> |
| <ul style="list-style-type: none"> <li>Consensus of expert opinion based on clinical experience</li> </ul>                                                                                                                                                     |                         |

COR and LOE are determined independently (any COR may be paired with any LOE).

A recommendation with LOE C does not imply that the recommendation is weak. Many important clinical questions addressed in guidelines do not lend themselves to clinical trials. Although RCTs are unavailable, there may be a very clear clinical consensus that a particular test or therapy is useful or effective.

\* The outcome or result of the intervention should be specified (an improved clinical outcome or increased diagnostic accuracy or incremental prognostic information).

† For comparative-effectiveness recommendations (COR 1 and 2a; LOE A and B only), studies that support the use of comparator verbs should involve direct comparisons of the treatments or strategies being evaluated.

‡ The method of assessing quality is evolving, including the application of standardized, widely-used, and preferably validated evidence grading tools; and for systematic reviews, the incorporation of an Evidence Review Committee.

COR indicates Class of Recommendation; EO, expert opinion; LD, limited data; LOE, Level of Evidence; NR, nonrandomized; R, randomized; and RCT, randomized controlled trial.

Aritmie maggiori e stati di periarresto dovuti ad avvelenamento

sono ampiamente sottoinvestigati.

La mancanza di dati in molte aree della ricerca tossicologica.

I casi segnalati sono eterogenei e difficili da studiare per quanto riguarda i veleni coinvolti, la dose, sostanze ingerite, tempistiche di presentazione e comorbidità del paziente.

I casi sono altamente suscettibili a bias di pubblicazione.

Sebbene gli studi sugli animali ben controllati possano essere utili, esiste il grande pericolo che i risultati siano modello dipendente e quindi scarsamente applicabile alla gestione di gravi avvelenamenti umani.

Di conseguenza, solo a una piccola minoranza di raccomandazioni delle linee guida (3%) lo erano sulla base di prove di alto grado (LOE A), e il 77% lo era sulla base di basso grado di evidenza (LOE C)

# CONCETTI GENERALI

- Nel 2022, più di 100 000 persone negli Stati Uniti sono morte per aritmie maligne secondarie ad avvelenamento e/o overdose da farmaci e sostanze , con un aumento del 28,5% rispetto all'anno precedente. Il novanta per cento di questi decessi sono stati involontari.
- La gestione dei pazienti con avvelenamento critico, definiti come soggetti in arresto cardiaco, shock refrattario,  
o altre condizioni che rappresentano una minaccia imminente di arresto cardiaco, spesso differisce dalla  
rianimazione standard

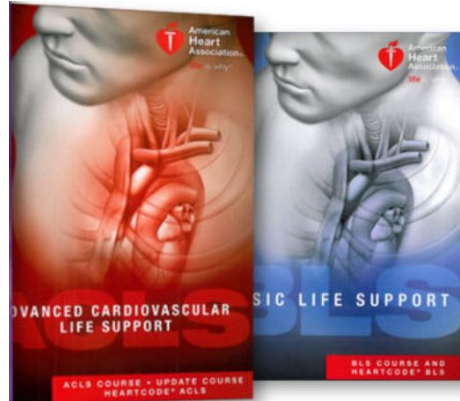
# CONCETTI GENERALI

## VALUTAZIONE PRIMARIA

## VALUTAZIONE SECONDARIA



5H -5T



- S – Signs/Symptoms
- A – Allergies
- M – Medications
- P – Past Pertinent medical history
- L – Last Oral Intake
- E – Events Leading Up To Present Illness

# CONCETTI GENERALI

1. Usare sempre approccio valutazione primaria/ secondaria con sample
2. «Toxidrome» : set di segni e sintomi per fare insorgere il sospetto

| Cardiovascular Signs                                                                                             |                                                                                                                                 |                                                                                                                      |
|------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| Tachycardia and/or Hypertension                                                                                  | Bradycardia and/or Hypotension                                                                                                  | Cardiac Conduction Delays (Wide QRS)                                                                                 |
| Amphetamines<br>Anticholinergic drugs<br>Antihistamines<br>Cocaine<br>Theophylline/caffeine<br>Withdrawal states | $\beta$ -Blockers<br>Calcium channel blockers<br>Clonidine<br>Digoxin and related glycosides<br>Organophosphates and carbamates | Cocaine<br>Cyclic antidepressants<br>Local anesthetics<br>Propoxyphene<br>Antiarrhythmics (eg quinidine, flecainide) |

| Toxidrome          | Findings                                                                                                                                                                           | Examples                                                  |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|
| 1. Sympathomimetic | Tachycardia<br>Arrhythmias<br>Agitation<br>Diaphoresis<br>Mydriasis<br>Hypertension<br>Hyperthermia                                                                                | Amphetamine<br>Cocaine<br>Ephedrine                       |
| 2. Cholinergic     | “SLUDGE” syndrome<br>Salivation<br>Lacrimation<br>Urination<br>Defecation<br>Gastrointestinal symptoms<br>Emesis                                                                   | Organophosphates<br>Insecticides                          |
| Anticholinergic    | “Mad as a hatter, blind as a bat, red as a beet, hot as a hare, dry as a bone”<br>Mental status changes<br>Mydriasis<br>Dry/flushed skin<br>Hyperthermia<br>Decreased bowel sounds | Diphenhydramine<br>Scopolamine<br>Atropine<br>Jimson weed |

# CONCETTI GENERALI

1. Usare sempre approccio valutazione primaria/ secondaria con sample
2. «Toxidrome» : set di segni e sintomi per fare insorgere il sospetto
3. Cominciare appropriate terapie di supporto/rimozione durante la ricerca del tossico

## a. Gastrolusi

Position paper update: gastric lavage for gastrointestinal decontamination [European Association of Poisons Centres and Clinical Toxicologists](#) PMID: 23418938 DOI: [10.3109/15563650.2013.770154](#)

## b. Carbone attivo

Position paper: Single-dose activated charcoal PMID: 15822758 DOI: [10.1081/clt-200051867](#)

# CONCETTI GENERALI

1. Usare sempre approccio valutazione primaria/ secondaria con sample
2. «Toxidrome» : set di segni e sintomi per fare insorgere il sospetto
3. Cominciare appropriate terapie di supporto/rimozione durante la ricerca del tossico

c. CVVHDF  
d. VA-ECMO

| Recommendations for the Use of VA-ECMO in Patients With Life-Threatening Poisoning |      |                                                                                                                                                              |
|------------------------------------------------------------------------------------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| COR                                                                                | LOE  | Recommendations                                                                                                                                              |
| 2a                                                                                 | C-LD | 1. It is reasonable to use VA-ECMO for persistent cardiogenic shock or cardiac arrest due to poisoning that is not responsive to maximal treatment measures. |
| 2a                                                                                 | C-LD | 2. It is reasonable to use VA-ECMO for persistent dysrhythmias due to poisoning when other treatment measures fail.                                          |
| 2b                                                                                 | C-EO | 3. The effectiveness of VA-ECMO for poisoned patients with cardiovascular collapse from causes other than cardiogenic shock has not been established.        |

# CONCETTI GENERALI

1. Usare sempre approccio valutazione primaria/ secondaria con sample
2. «Toxidrome» : set di segni e sintomi per fare insorgere il sospetto
3. Cominciare appropriate terapie di supporto mentre si cerca di identificare il tossico

DEFIBRILLAZIONE  
CVE  
PACING TC  
CPR PROLUNGATA

Lancet. 1997 Dec 16;2(7529):1308-9.  
doi: 10.1016/s0140-6736(97)90420-5.

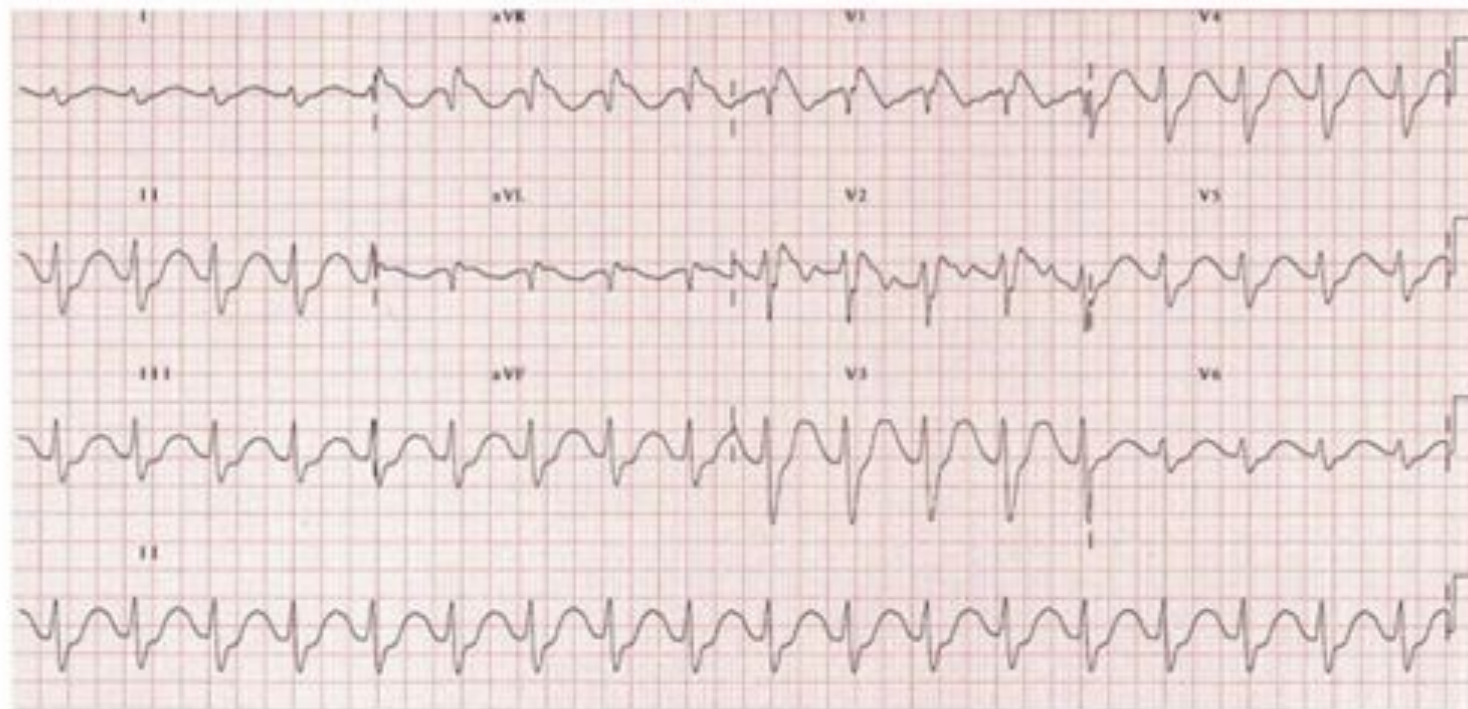
ADENOSINA  
AMIODARONE  
LIDOCAINA  
MAGNESIO  
POTASSIO  
BICARDOBATO DI  
SODIO

# CONCETTI GENERALI

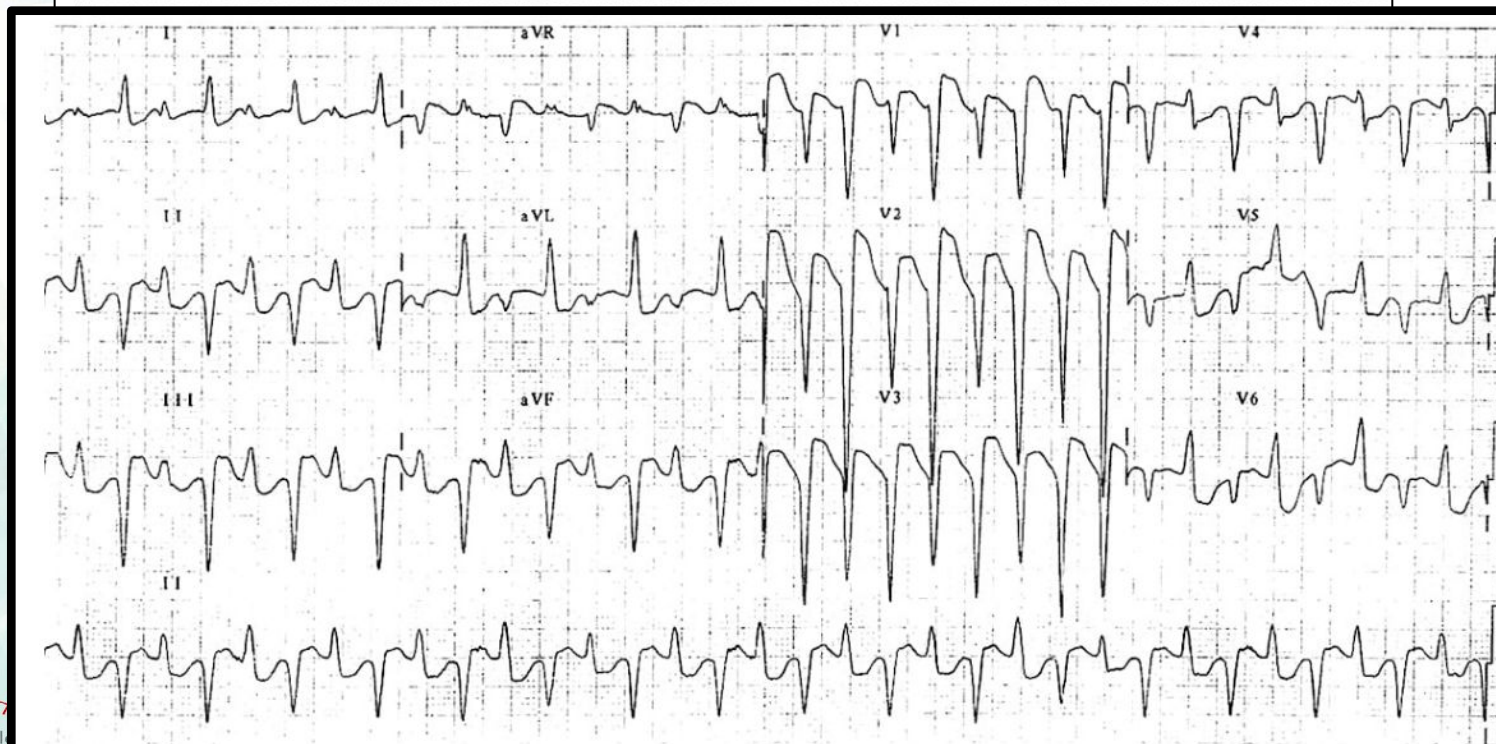
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3. Cominciare appropriate terapie di supporto mentre si cerca di identificare il tossico

## 4. ELETTROCARDIOGRAMMA?

# ECG



# CONCETTI GENERALI



**Bidirectional Ventricular Tachycardia (VT)**



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# APPROCCIO ALL'ECG IN TOSSICOLOGIA

- VALUTARE FREQUENZA E RITMO
- INTERVALLO PR – E' PRESENTE UN BLOCCO?
- DETERMINARE DURATA QRS IN DII
- VERIFICARE EVENTUALE DEVIAZIONE QRS
- DETERMINARE LA DURATA DELL'INTERVALLO QT

L'intervallo QT prolungato predispone allo sviluppo della torsione di punta, una tachicardia ventricolare polimorfa.

È più probabile che si verifichi una torsione di punta laddove è coesistente una bradicardia.

Il rischio aritmogeno per il prolungamento dell'intervallo T indotto da farmaci è previsto con precisione dal **"nomogramma QT"** che traccia il QT rispetto alla frequenza cardiaca

- EVIDENZIARE AUMENTO DI ECTOPIA

# MECCANISMO DI CARDIOTOSSICITA' E SUE MANIFESTAZIONI

**Bloccanti canali rapidi del sodio rallentano la  
fase 0 del**

**potenziale d'azione :**

- Slargamento del QRS
- Deviazione assiale destra QRS
- TV ed FV

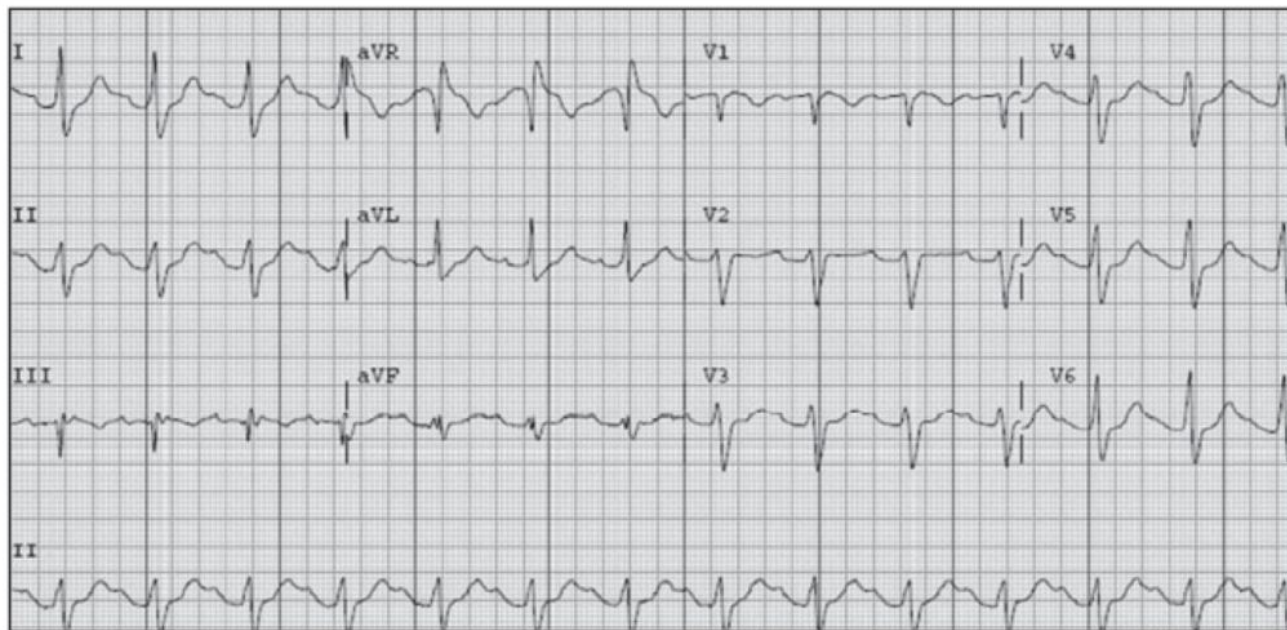
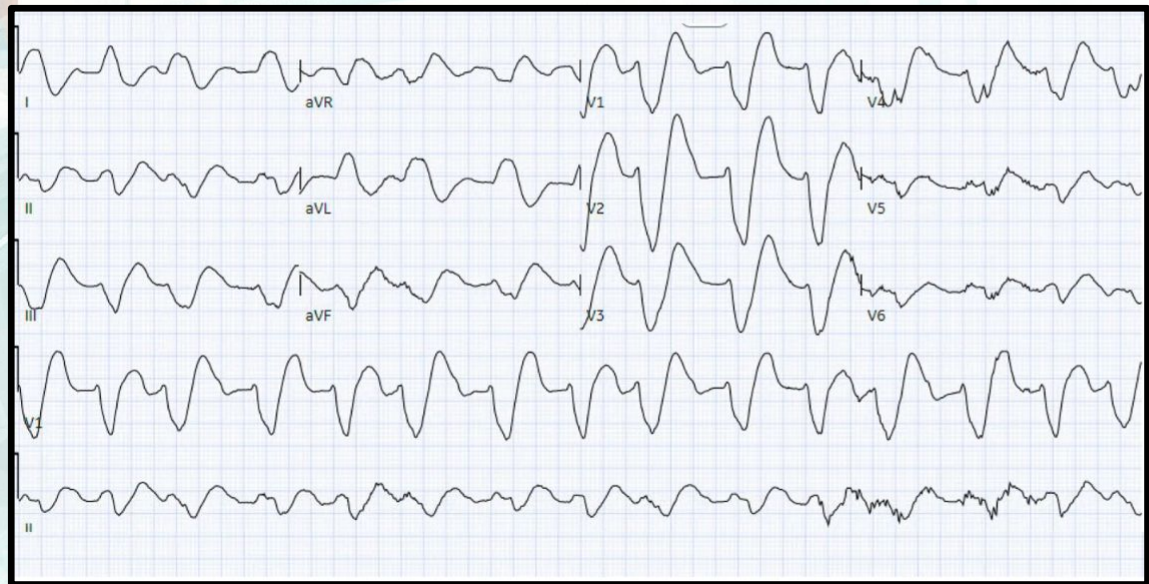


Figure 1 12-lead Electrocardiogram from a 46-year-old woman with flecainide toxicity.

Demonstrates prolonged PR and QTc intervals with widened QRS complexes, right bundle branch fascicular block patterns (flecainide level 2.0  $\mu\text{g/mL}$ ; normal range 0.20–1.0  $\mu\text{g/mL}$ ).

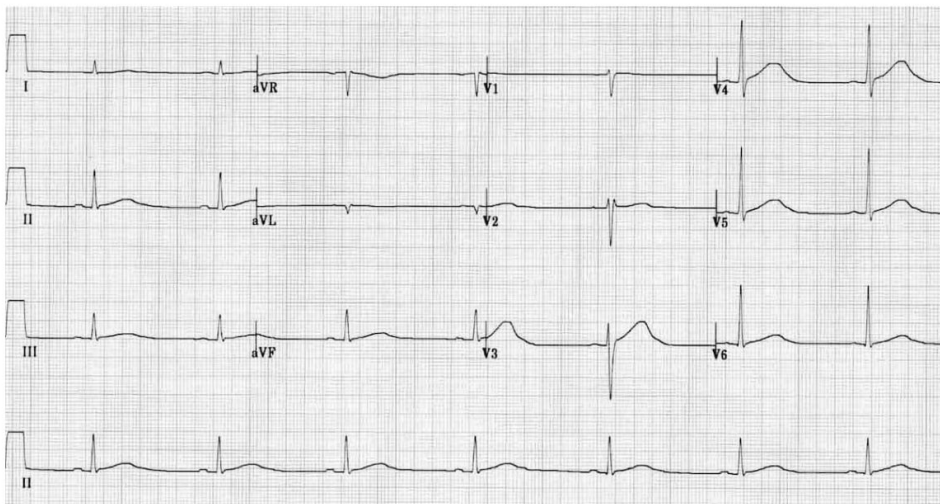


- ANTIDEPRESSIVI TRICICLICI
- Class 1A ANTIARITMICI
- Class 1C ANTIARITMICI
- ANESTETICI LOCALI
- COCAINA
- ANTIMALARICI
- AMANTIDINA
- DILTIAZEM
- CARBAMAZEPINA
- PROPRANOLO

# MECCANISMO DI CARDIOTOSSICITA' E SUE MANIFESTAZIONI CLINICHE

## Blocco dei canali del potassio in fase

- Prolungamento dell'intervallo QT
- Torsade de pointes



- AGENTI ANTIPSICOTICI
  - Haloperidol, Quetiapine,
- Class 1A agents
- Quinidine
- Procainamide
- Class 1C agents
  - Flecainide
- Class III antidysrhythmic agents
  - Sotalolo, Amiodarone
- ANTIDEPRESSIVI TRICICLICI
- Citalopram
- Antihistaminici
- Antimalarici
- Amantadine
- Macrolidi

# MECCANISMO DI CARDIOTOSSICITA' E SUE MANIFESTAZIONI

## BLOCCANTI DELLA POMPA SODIO POTASSIO ATP-asi

*DIGITALE E SIMILARI*

- Incrementano l'automatismo
- Decrementano la velocità di conduzione del nodo AV □  
blocchi dal 1° al 3° grado

# MECCANISMO DI CARDIOTOSSICITA' E SUE MANIFESTAZIONI

## **Bloccanti dei canali del calcio**

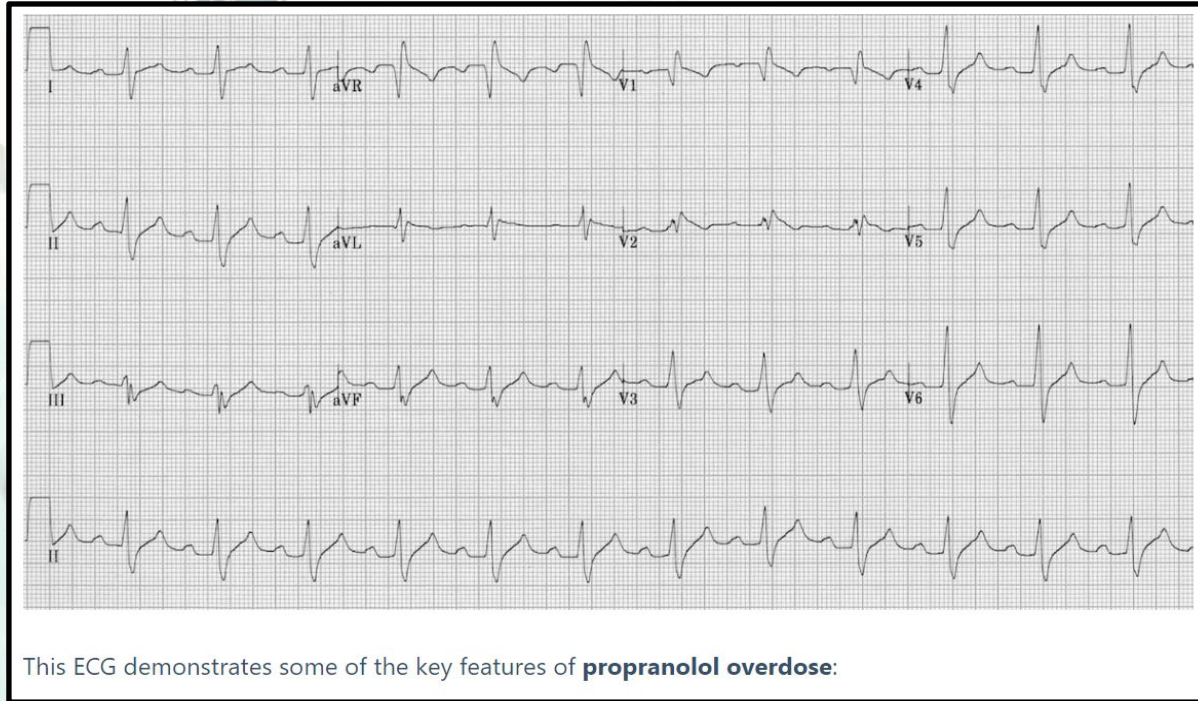
- Bradicardia sinusale
- Decrementano la velocità di conduzione del nodo AV □ blocchi dal 1° al 3° grado
- Difetti della conduzione intraventricolare

## **Bloccanti recettori beta adrenergici**

- Bradicardia sinusale
- Decrementano la velocità di conduzione del nodo AV □ blocchi dal 1° al 3° grado

# MANIFESTAZIONI CLINICHE E ANTIDOTI BETA BLOCCANTI E CALCIO ANTAGONISTI

BRADICARDIA-IPOTENSIONE- REFRATTARIA AGLI INOTROPI- IPOGLICEMIA



# MANIFESTAZIONI CLINICHE E ANTIDOTI

## BETA BLOCCANTI E CALCIO ANTAGONISTI

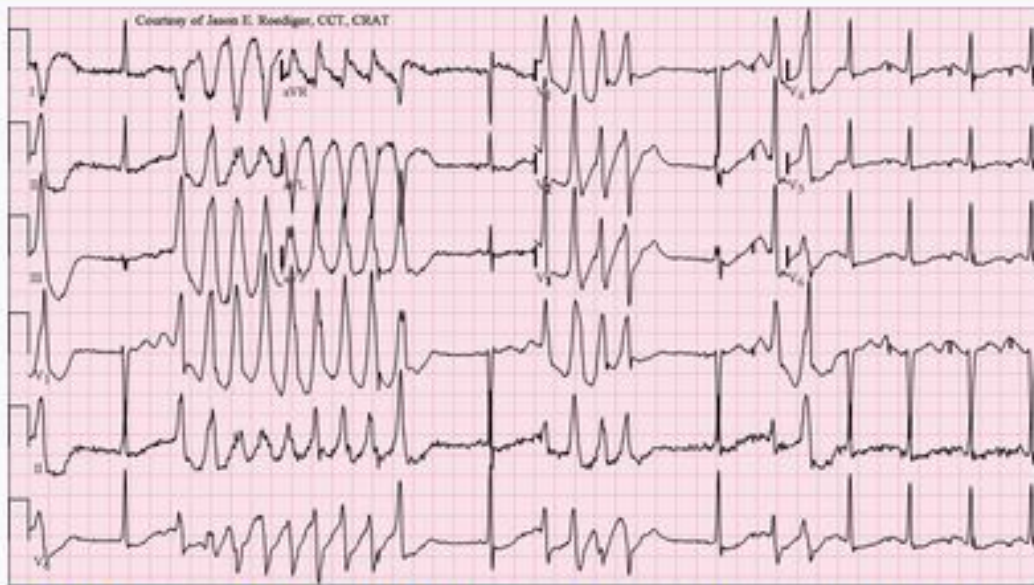
RAT

| Recommendations for the Management of Patients With Life-Threatening Beta Blocker Poisoning |      |                                                                                                                                                                                                           |
|---------------------------------------------------------------------------------------------|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| COR                                                                                         | LOE  | Recommendations                                                                                                                                                                                           |
| 1                                                                                           | B-NR | 1. We recommend that high-dose insulin be administered for hypotension due to $\beta$ -blocker poisoning refractory to or in conjunction with vasopressor therapy.                                        |
| 1                                                                                           | C-LD | 2. We recommend that vasopressors be administered for hypotension due to $\beta$ -blocker poisoning.                                                                                                      |
| 2a                                                                                          | C-LD | 3. It is reasonable to use a bolus of glucagon, followed by a continuous infusion, for bradycardia or hypotension due to $\beta$ -blocker poisoning.                                                      |
| 2a                                                                                          | C-LD | 4. It is reasonable to utilize extracorporeal life support techniques such as VA-ECMO for life-threatening $\beta$ -blocker poisoning with cardiogenic shock refractory to pharmacological interventions. |
| 2b                                                                                          | C-LD | 5. It may be reasonable to administer atropine for $\beta$ -blocker-induced bradycardia.                                                                                                                  |
| 2b                                                                                          | C-LD | 6. It may be reasonable to attempt electrical pacing for $\beta$ -blocker-induced bradycardia.                                                                                                            |
| 2b                                                                                          | C-LD | 7. It may be reasonable to use hemodialysis for life-threatening atenolol or sotalol poisoning.                                                                                                           |
| 3: No Benefit                                                                               | C-LD | 8. Intravenous lipid emulsion therapy is not likely to be beneficial for life-threatening $\beta$ -blocker poisoning.                                                                                     |

| Recommendations for the Management of Patients With Life-Threatening Calcium Channel Blocker Poisoning |      |                                                                                                                                                                                       |
|--------------------------------------------------------------------------------------------------------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| COR                                                                                                    | LOE  | Recommendations                                                                                                                                                                       |
| 1                                                                                                      | B-NR | 1. We recommend administering vasopressors for hypotension from calcium channel blocker (CCB) poisoning.                                                                              |
| 1                                                                                                      | B-NR | 2. We recommend administering high-dose insulin for hypotension due to CCB poisoning.                                                                                                 |
| 2a                                                                                                     | C-LD | 3. It is reasonable to administer calcium for CCB poisoning.                                                                                                                          |
| 2a                                                                                                     | C-LD | 4. It is reasonable to administer atropine for hemodynamically significant bradycardia from CCB poisoning.                                                                            |
| 2a                                                                                                     | C-LD | 5. It is reasonable to utilize extracorporeal life support techniques such as VA-ECMO for cardiogenic shock due to CCB poisoning that is refractory to pharmacological interventions. |
| 2b                                                                                                     | C-LD | 6. It might be reasonable to attempt electrical pacing for CCB poisoning with refractory bradycardia.                                                                                 |
| 2b                                                                                                     | C-LD | 7. The usefulness of a glucagon bolus and infusion for CCB poisoning is uncertain.                                                                                                    |
| 2b                                                                                                     | C-LD | 8. The usefulness of administering methylene blue for refractory vasodilatory shock due to CCB poisoning is uncertain.                                                                |
| 3: No Benefit                                                                                          | C-LD | 9. The routine use of intravenous lipid emulsion (ILE) therapy for CCB poisoning is not recommended.                                                                                  |

# MANIFESTAZIONI CLINICHE E ANTIDOTI BETA BLOCCANTI E CALCIO ANTAGONISTI

## Torsione di punta

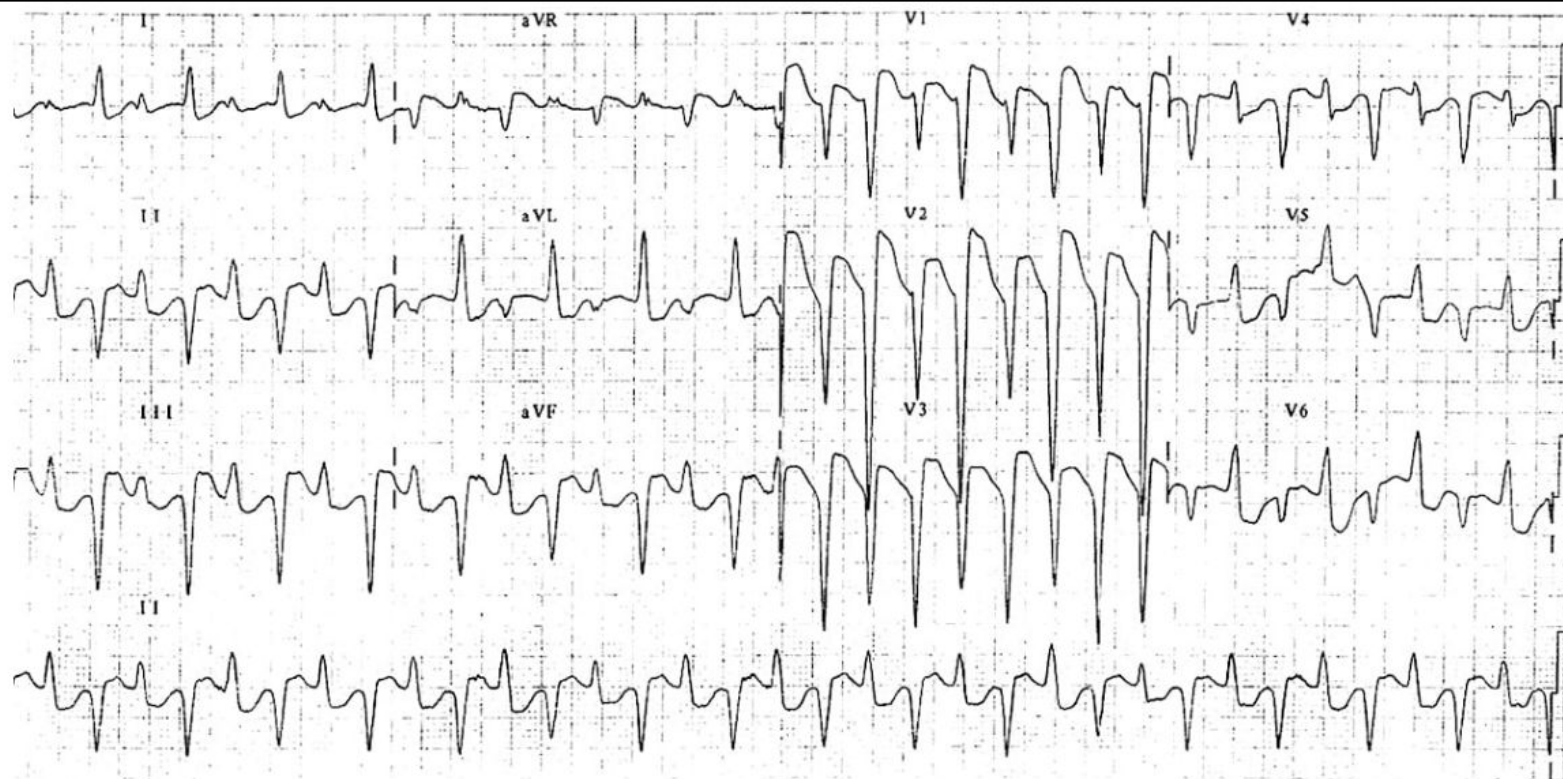


- MAGNESIO
- POTASSIO
- ISOPRENALINA
- OVERDRIVE PACING

# MANIFESTAZIONI CLINICHE E ANTIDOTI DIGITALE

CONFUSIONE , SINTOMI GI, IPERKALIEMIA E ARITMIE CARDIACHE

- Tachicardia sopraventricolare (a causa dell'aumentata automaticità)
- Risposta ventricolare lenta (a causa della ridotta conduzione AV)
- PVC frequenti (l'anomalia più comune), tra cui bigeminismo e trigemino ventricolare
- Bradicardia sinusale
- Fibrillazione atriale lenta
- Qualsiasi tipo di blocco AV (1° grado, 2° grado e 3° grado)
- FA regolarizzata = FA con blocco cardiaco completo e ritmo di fuga giunzionale o ventricolare
- Tachicardia ventricolare, inclusa VT polimorfica e bidirezionale



**Bidirectional Ventricular Tachycardia (VT)**

# MANIFESTAZIONI CLINICHE E ANTIDOTI DIGITALE

CONFUSIONE , SINTOMI GI,IPERKALIEMIA E ARITMIE CARIDACHE



6 FIALE-> ADEGUATA DOSE PER INIZIARE  
**N° DI FIALE = DIGOSSINEMIA SIERICA( NG/ML) X peso  
Kg /100**

| Recommendations for the Management of Patients With Life-Threatening Poisoning From Digoxin and Related Cardiac Glycosides |      |                                                                                                                                                                                                             |
|----------------------------------------------------------------------------------------------------------------------------|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| COR                                                                                                                        | LOE  | Recommendations                                                                                                                                                                                             |
| 1                                                                                                                          | B-NR | 1. We recommend administration of digoxin-specific antibody fragments (digoxin-Fab) for digoxin or digitoxin poisoning.                                                                                     |
| 2a                                                                                                                         | C-LD | 2. It is reasonable to administer digoxin-Fab for poisoning due to <i>Bufo</i> toad venom and yellow oleander.                                                                                              |
| 2b                                                                                                                         | C-LD | 3. It may be reasonable to administer digoxin-Fab to treat poisoning from cardiac glycosides other than digoxin, digitoxin, <i>Bufo</i> toad venom, and yellow oleander.                                    |
| 2b                                                                                                                         | C-LD | 4. It may be reasonable to administer atropine for bradydysrhythmias caused by digoxin and other cardiac glycoside poisoning.                                                                               |
| 2b                                                                                                                         | C-LD | 5. It may be reasonable to attempt electrical pacing to treat bradydysrhythmias from digoxin and other cardiac glycoside poisoning.                                                                         |
| 2b                                                                                                                         | C-LD | 6. It may be reasonable to administer lidocaine, phenytoin, or bretylium to treat ventricular dysrhythmias caused by digitalis and other cardiac glycoside poisoning until digoxin-Fab can be administered. |
| 3: No Benefit                                                                                                              | B-NR | 7. We do not recommend the use of hemodialysis, hemofiltration, hemoperfusion, or plasmapheresis to treat digoxin poisoning.                                                                                |

# MANIFESTAZIONI CLINICHE E ANTIDOTI

## BLOCCANTI CANALI DEL SODIO

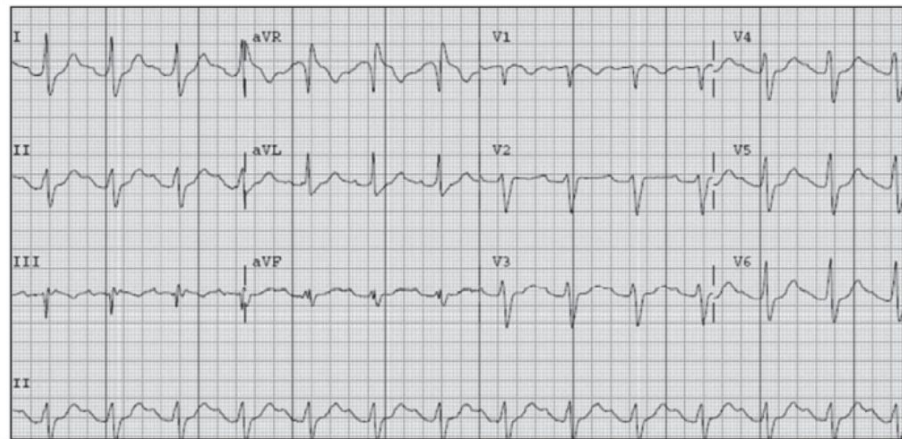


Figure 1 12-lead Electrocardiogram from a 46-year-old woman with flecainide toxicity.

Demonstrates prolonged PR and QTc intervals with widened QRS complexes, right bundle branch fascicular block patterns (flecainide level 2.0 µg/mL; normal range 0.20-1.0 µg/mL).

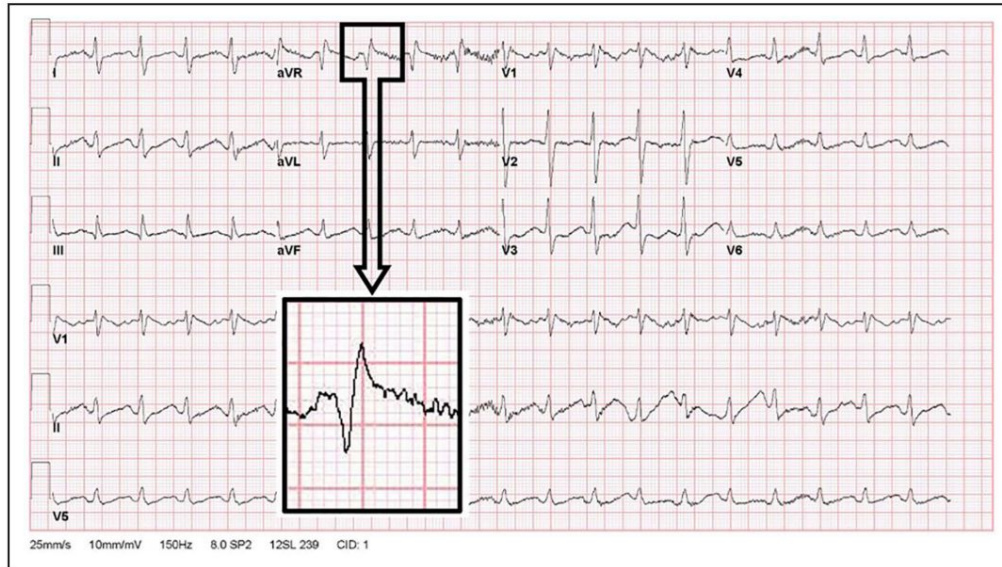
### Recommendations for the Treatment of Patients With Life-Threatening Sodium Channel Blocker Poisoning

| COR | LOE  | Recommendations                                                                                                                                                                              |
|-----|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | B-NR | 1. We recommend using sodium bicarbonate to treat life-threatening cardiotoxicity from tricyclic and/or tetracyclic antidepressant poisoning.                                                |
| 2a  | C-LD | 2. It is reasonable to use sodium bicarbonate to treat life-threatening cardiotoxicity caused by poisoning from sodium channel blockers other than tricyclic or tetracyclic antidepressants. |
| 2a  | C-LD | 3. It is reasonable to use extracorporeal life support, such as VA-ECMO, to treat refractory cardiogenic shock from sodium channel blocker poisoning.                                        |
| 2b  | C-LD | 4. It may be reasonable to use Vaughan-Williams class Ib antidysrhythmics (eg, lidocaine) to treat life-threatening cardiotoxicity from class Ia or Ic sodium channel blockers.              |
| 2b  | C-LD | 5. It may be reasonable to use intravenous lipid emulsion to treat life-threatening sodium channel blocker poisoning refractory to other treatment modalities.                               |

# MANIFESTAZIONI CLINICHE E ANTIDOTI

## BLOCCANTI CANALI DEL SODIO – TRICICLICI

### Coma Convulsioni Cardiac aritmie Acidosi



#### Recommendations for the Treatment of Patients With Life-Threatening Sodium Channel Blocker Poisoning

| COR | LOE  | Recommendations                                                                                                                                                                              |
|-----|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | B-NR | 1. We recommend using sodium bicarbonate to treat life-threatening cardiotoxicity from tricyclic and/or tetracyclic antidepressant poisoning.                                                |
| 2a  | C-LD | 2. It is reasonable to use sodium bicarbonate to treat life-threatening cardiotoxicity caused by poisoning from sodium channel blockers other than tricyclic or tetracyclic antidepressants. |
| 2a  | C-LD | 3. It is reasonable to use extracorporeal life support, such as VA-ECMO, to treat refractory cardiogenic shock from sodium channel blocker poisoning.                                        |
| 2b  | C-LD | 4. It may be reasonable to use Vaughan-Williams class Ib antidysrhythmics (eg, lidocaine) to treat life-threatening cardiotoxicity from class Ia or Ic sodium channel blockers.              |
| 2b  | C-LD | 5. It may be reasonable to use intravenous lipid emulsion to treat life-threatening sodium channel blocker poisoning refractory to other treatment modalities.                               |

# MANIFESTAZIONI CLINICHE E ANTIDOTI

## BLOCCANTI CANALI DEL SODIO – ANESTETICI LOCALI

CONVULSIONI – AGITAZIONE – DISARTRIA



### Recommendations for the Management of Patients With Life-Threatening Local Anesthetic Poisoning

| COR | LOE  | Recommendations                                                                                                                                       |
|-----|------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | C-LD | 1. We recommend the administration of intravenous lipid emulsion for local anesthetic poisoning.                                                      |
| 1   | C-LD | 2. We recommend the use of benzodiazepines to treat seizures associated with local anesthetic systemic toxicity.                                      |
| 2a  | C-LD | 3. It is reasonable to administer sodium bicarbonate for life-threatening wide-complex tachycardia associated with local anesthetic toxicity.         |
| 2a  | C-EO | 4. It is reasonable to administer atropine for life-threatening bradycardia associated with local anesthetic systemic toxicity.                       |
| 2a  | C-EO | 5. It is reasonable to utilize extracorporeal life support techniques such as VA-ECMO in local anesthetic toxicity with refractory cardiogenic shock. |

# MANIFESTAZIONI CLINICHE E ANTIDOTI

## BLOCCANTI CANALI DEL SODIO – COCAINA

### TOXIDROME SIMPATICOMIMETICA



| Recommendations for the Management of Patients With Life-Threatening Cocaine Poisoning |      |                                                                                                                                                                                          |
|----------------------------------------------------------------------------------------|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| COR                                                                                    | LOE  | Recommendation                                                                                                                                                                           |
| 1                                                                                      | C-LD | 1. We recommend rapid external cooling for life-threatening hyperthermia from cocaine poisoning.                                                                                         |
| 2a                                                                                     | C-LD | 2. It is reasonable to administer sodium bicarbonate for wide-complex tachycardia or cardiac arrest from cocaine poisoning.                                                              |
| 2a                                                                                     | C-LD | 3. It is reasonable to administer lidocaine for wide-complex tachycardia from cocaine poisoning.                                                                                         |
| 2a                                                                                     | C-LD | 4. It is reasonable to administer vasodilators (eg, nitrates, phentolamine, calcium channel blockers) for patients with cocaine-induced coronary vaso-spasm or hypertensive emergencies. |

**Table 2. Commonly Used Doses of Antidotes for Resuscitation in Critical Poisoning**

| Antidote           | Indication                                                | Initial Dose (Adult)*                                                                                                                                                                                                               | Initial Dose (Pediatric)*                                                    | Maintenance Infusion                                                                                                                                                                   | Notes                                                                                                                                                                         |
|--------------------|-----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Atropine           | $\beta$ -Blockers<br>CCBs<br>Digoxin<br>Local anesthetics | 0.5–1.0 mg every<br>3–5 min up to 3 mg                                                                                                                                                                                              | 0.02 mg/kg                                                                   | None                                                                                                                                                                                   |                                                                                                                                                                               |
| Atropine           | Organophosphates<br>Carbamates                            | 1–2 mg, doubled every 5 min                                                                                                                                                                                                         | 0.02 mg/kg, doubled every 5 min                                              | 10%–20% of the total loading dose per hour up to 2 mg/h (adults)                                                                                                                       | Titrate to reversal of bronchorrhea, bronchospasm, bradycardia, and hypotension.                                                                                              |
| Calcium chloride   | CCBs                                                      | 2000 mg<br>28 mEq $\text{Ca}^{2+}$<br>20 mL 100 mg/mL solution                                                                                                                                                                      | 20 mg/kg<br>0.28 mEq $\text{Ca}^{2+}$ /kg<br>0.2 mL/kg<br>100 mg/mL solution | 20–40 mg·kg <sup>-1</sup> ·h <sup>-1</sup><br>0.28–0.56 mEq $\text{Ca}^{2+}$ ·kg <sup>-1</sup> ·h <sup>-1</sup><br>0.2–0.4 mL·kg <sup>-1</sup> ·h <sup>-1</sup><br>100 mg/mL solution  | Titrate to blood pressure. Do not exceed serum ionized calcium concentration 1.5–2 times the upper limits of normal. Administer through central line, especially in children. |
| Calcium gluconate  | CCBs                                                      | 6000 mg<br>28 mEq $\text{Ca}^{2+}$<br>60 mL 100 mg/mL solution                                                                                                                                                                      | 60 mg/kg<br>0.28 mEq/kg $\text{Ca}^{2+}$<br>0.6 mL/kg<br>100 mg/mL solution  | 60–120 mg·kg <sup>-1</sup> ·h <sup>-1</sup><br>0.28–0.56 mEq $\text{Ca}^{2+}$ ·kg <sup>-1</sup> ·h <sup>-1</sup><br>0.6–1.2 mL·kg <sup>-1</sup> ·h <sup>-1</sup><br>100 mg/mL solution | Titrate to blood pressure. Do not exceed serum ionized calcium concentration 1.5–2 times the upper limits of normal.                                                          |
| Digoxin immune Fab | Digoxin                                                   | Acute overdose: 1 vial for every 0.5 mg digoxin ingested<br>Chronic poisoning: Use formula: dose in vials=serum digoxin concentration (ng/mL)×weight (kg)/100<br>Acute overdose, critically ill, ingested dose unknown: 10–20 vials | Same as adult                                                                | None                                                                                                                                                                                   | 1 vial contains 40 mg Fab. Lower doses may be equally effective. <sup>8</sup>                                                                                                 |
| Digoxin immune Fab | Yellow oleander<br><i>Bufo</i> toad venom                 | 1200 mg (30 vials)                                                                                                                                                                                                                  | Unknown                                                                      | None                                                                                                                                                                                   |                                                                                                                                                                               |
| Glucagon           | $\beta$ -Blockers<br>CCBs                                 | 2–10 mg                                                                                                                                                                                                                             | 0.05–0.15 mg/kg                                                              | 1–15 mg/h (adult)                                                                                                                                                                      | Anticipate vomiting.                                                                                                                                                          |
| Flumazenil         | Benzodiazepines                                           | 0.2 mg, titrated up to 1 mg                                                                                                                                                                                                         | 0.01 mg/kg                                                                   | None                                                                                                                                                                                   | Many contraindications                                                                                                                                                        |

|                     |                                    |                                                                          |               |                                                                                |                                                                                              |
|---------------------|------------------------------------|--------------------------------------------------------------------------|---------------|--------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| Hydroxocobalamin    | Cyanide                            | 5 g                                                                      | 70 mg/kg      | None                                                                           |                                                                                              |
| Insulin             | $\beta$ -Blockers<br>CCBs          | 1 U/kg                                                                   | Same as adult | 1–10 U·kg <sup>-1</sup> ·h <sup>-1</sup>                                       | Regular human insulin. Monitor for hypoglycemia, hypokalemia, volume overload.               |
| ILE                 | Local anesthetics                  | 1.5 mL/kg up to 100 mL                                                   | Same as adult | 0.25 mL·kg <sup>-1</sup> ·min <sup>-1</sup> for up to 30 min                   | All studies use 20% lipid emulsion.                                                          |
| Methylene blue      | CCBs<br>Methemoglobinemia          | 1–2 mg/kg, repeated every hour if needed                                 | Same as adult | 1 mg·kg <sup>-1</sup> ·h <sup>-1</sup> (for vasodilatory shock)                | Maximum 5–7 mg/kg                                                                            |
| Naloxone            | Opioids                            | 0.2–2 mg IV/IO/IM<br>2–4 mg intranasal<br>Repeat every 2–3 min as needed | 0.1 mg/kg     | Two-thirds of the waking dose per hour                                         | Titrate to reversal of respiratory depression and restoration of protective airway reflexes. |
| Pralidoxime         | Organophosphates                   | 1–2 g                                                                    | 20–50 mg/kg   | 400–600 mg/h (adult)<br>10–20 mg·kg <sup>-1</sup> ·h <sup>-1</sup> (pediatric) |                                                                                              |
| Sodium bicarbonate† | Sodium channel blockers<br>Cocaine | 50–150 mEq                                                               | 1–3 mEq/kg    | Prepare 150 mEq/L solution, infuse at 1–3 mL·kg <sup>-1</sup> ·h <sup>-1</sup> | Watch for hypernatremia, alkalemia, hypokalemia, hypochloremia.                              |
| Sodium nitrite      | Cyanide                            | 300 mg                                                                   | 6 mg/kg       | None                                                                           | Watch for hypotension.                                                                       |
| Sodium thiosulfate  | Cyanide                            | 12.5 g                                                                   | 250 mg/kg     | None                                                                           |                                                                                              |

# TAKE HOME MESSAGE

- LE ARITMIE MAGGIORI DA TOSSICI SONO RARE?
- ENTRARE NELLA DIAGNOSI DIFFERENZIALE DEI PAZIENTI CON ARITMIE MAGGIORI IN PRONTO SOCCORSO
- CERCARE DI INQUADRARE IL PAZIENTE GRAZIE AL RICONOSCIMENTO DELLA TOXIDROME
- TERAPIA EMPIRICA DI SUPPORTO E RIMOZIONE DELL' AGENTE ANCHE TRAMITE VA-ECMO
- TERAPIA DELL'ARITMIA SULLA BASE DELL' ANOMALIA ECG-GRAFICA PRESENTE
- ANTIDOTO E TERAPIA MIRATA SE RICONOSCIMENTO DEL TOSSICO



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