Cardioverting with Confidence!
Class Code 142

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Cardioverting with Style!
Which of the following is the largest?

- A: A Peanut
- B: An Elephant
- C: The Moon
- D: A Kettle
Definition of Cardioversion

Cardioversion is an electrical method to restore a rapid heart beat back to sinus rhythm.
Questions, questions, questions!

1. Would you cardiovert this rhythm?

2. Would you defibrillate this rhythm?
Cardioversion

Most elective or non-emergency cardioversions are performed:

- To treat atrial fibrillation or atrial flutter to regain heart rhythm.
- The electrical shock disrupts the abnormal electrical circuit(s) in the heart.
Cardioversion

Or, cardioversion is used in emergency situations to correct: A rapid abnormal rhythm associated with:

* Faintness
* Low blood pressure
* Chest pain
* Difficulty breathing
* Loss of consciousness
Types Of Cardioversion

Cardioversion can be “chemical” or “electrical”

- **Chemical cardioversion**: refers to the use of antiarrhythmic medications to restore the heart's normal rhythm.

- Administration of flecainide, dofetilide, propafenone, amiodarone or ibutilide is recommended for pharmacological cardioversion of AF.

  (Level of Evidence: A)
Types Of Cardioversion

**Electrical cardioversion**: (AKA "direct current" or DC cardioversion):

Is a procedure whereby a synchronized electrical shock is delivered through the chest wall to the heart through special electrodes or paddles that are applied to the skin of the chest and back.
Admission 12 lead ECG: Cardiovert or Defibrillate?

Postcardioversion 12 lead ECG

Equipment

- Defibrillator with a synchronizing button
- Crash cart
- Oxygen mask, intubation equipment
- Drugs!
Drugs to Consider Prior to Cardioversion

- Diazepam (Valium)
- Midazolam (Versed)
- Etomidate (Amidate)
- Methohexital (Brevital)
- Propofol (Diprivan)
- Above with or without: Fentanyl or Morphine
Current Therapy
QUIK-COMBO Therapy Electrodes

Standard Paddles
Potential Complications

- The most common complications are harmless arrhythmias, such as atrial, ventricular and junctional premature beats.
- Serious complications include ventricular fibrillation resulting from high amounts of electrical energy, digitalis toxicity, severe heart disease, or improper synchronization of the shock with the R wave.
Potential Complications

- Thromboembolization is associated with cardioversion in 1-3% of patients.

- Especially in patients with atrial fibrillation who have not been anticoagulated prior to cardioversion.
Potential Complications

- Myocardial necrosis can result from high-energy shocks.
- ST segment elevation can be seen immediately and usually lasts for 1-2 minutes.
- ST segment elevation that lasts longer than 2 minutes usually indicates myocardial injury unrelated to the shock.
Potential Complications

- Pulmonary edema is a rare complication of cardioversion and is probably due to left ventricular dysfunction or transient left atrial standstill.
Potential Complications

- Painful skin burns can occur after cardioversion or defibrillation.
- They are moderate to severe in 20-25% of patients.
- They most likely are due to improper technique and electrode placement.
Narrow-Complex Supraventricular Tachycardia Algorithm.


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Learn and Live
1. Assess appropriateness for clinical condition. Heart rate typically ≥150/min if tachyarrhythmia.

2. Identify and treat underlying cause
   - Maintain patent airway; assist breathing as necessary
   - Oxygen (if hypoxemic)
   - Cardiac monitor to identify rhythm; monitor blood pressure and oximetry

3. Persistent tachyarrhythmia causing:
   - Hypotension?
   - Acutely altered mental status?
   - Signs of shock?
   - Ischemic chest discomfort?
   - Acute heart failure?

4. Synchronized cardioversion
   - Consider sedation
   - If regular narrow complex, consider adenosine

5. Wide QRS? ≥0.12 second
   - No
     - IV access and 12-lead ECG if available
     - Vagal maneuvers
     - Adenosine (if regular)
     - B-Blocker or calcium channel blocker
     - Consider expert consultation
   - Yes
     - Synchronized cardioversion

6. Yes
   - IV access and 12-lead ECG if available
   - Consider adenosine only if regular and monomorphic
   - Consider antiarrhythmic infusion
   - Consider expert consultation

Doses/Details

Synchronized Cardioversion
Initial recommended doses:
- Narrow regular: 50-100 J
- Narrow irregular: 120-200 J biphasic or 200 J monophasic
- Wide regular: 100 J
- Wide irregular: defibrillation dose (NOT synchronized)

Adenosine IV Dose:
First dose: 6 mg rapid IV push; follow with NS flush.
Second dose: 12 mg if required.

Antiarrhythmic Infusions for Stable Wide-QRS Tachycardia

Procainamide IV Dose:
20-50 mg/min until arrhythmia suppressed, hypotension ensues, QRS duration increases >50%, or maximum dose 17 mg/kg given.
Maintenance infusion: 1-4 mg/min. Avoid if prolonged QT or CHF.

Amiodarone IV Dose:
First dose: 150 mg over 10 minutes. Repeat as needed if VT recurs. Follow by maintenance infusion of 1 mg/min for first 6 hours.

Sotalol IV Dose:
100 mg (1.5 mg/kg) over 5 minutes. Avoid if prolonged QT.
Cardioversion Starting Doses

- Atrial fibrillation: 120-200 J
- Stable monomorphic VT: 100J
- Other SVT, atrial flutter: 50-100 J

All above increase in a stepwise fashion
Differences Between Cardioversion & Defibrillation

- What's the difference?
  - Defibrillation - the shock is non-synchronized
  - Cardioversion - designed to be synchronized with the “R” wave (during the absolute refractory period)
  - Cardioversion is used to control tachyarrhythmias with a pulse
  - Initial joules are typically less than during defibrillation to start with
  - Not instantaneous, hold buttons down until it discharges
Differences Between Cardioversion & Defibrillation

- Another major difference concerns the circumstance defibrillation usually performed as an emergency treatment.
- Cardioversion is usually, but not always a planned procedure.
Cardioversion vs Defibrillation

- What is the same
  - Same safety precautions
  - Same pad placement
Contraindications for Cardioversion

- Dysrhythmias due to enhanced automaticity such as in digitalis toxicity and catecholamine-induced arrhythmia
- Multifocal atrial tachycardia
- For dysrhythmias due to enhanced automaticity such as in digitalis toxicity and catecholamine-induced arrhythmia, a homogeneous depolarization state already exists.
- Therefore, cardioversion is not only ineffective but is also associated with a higher incidence of post shock ventricular tachycardia/ventricular fibrillation.
Cardioversion

- **Practice Pearls**
  - CI for poison/drug induced tachycardia
  - Some units need to be connected to EKG leads as well as defib paddles
  - Most units default after every cardioversion to the “defib” mode
  - Hold the “shock” button in until it has time to synch before it delivers the shock.
  - Don’t expect it to fire immediately when pushed like when defibrillating.
Pearls From My Friend Paul

- “Biggest mistakes I see in cardioversion are not giving enough drugs before shocking and not starting at high enough joules to make it work first time. If you need to shock a second time is when you find out you didn't give enough versed or whatever before the first shock, the patient is ripping off the pads and not wanting to get shocked again and saying bad things about your family..... At least with pads you can sneak up on them, with paddles they saw it coming........”
In Conclusion

- So, now you can cardiovert with confidence!!!
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