



EXTERNAL PACEMAKER



Escambia County, Florida - ALS/BLS Medical Protocol

Safe, effective external cardiac pacemakers are now available, allowing the paramedic to initiate cardiac pacing rapidly in the pre-hospital setting.

Pacing is an important therapeutic modality for the treatment of symptomatic bradycardia.

Background

External pacers were actually developed many years ago, but the early models were not very effective and caused excessive pain.

Transvenous pacers (where a pacer wire is threaded through central veins into the right ventricle) have been available for some time, and are most effective. However, placement of a transvenous pacer is often time-consuming and difficult, as well as invasive, with several potential complications.

Transthoracic pacers (electrode needle inserted directly through the chest wall into the heart) are also effective, but placement is just as invasive and difficult as the transvenous route.

Neither type is suitable for field use. New developments in external pacing technology have produced several pacing units that are safe, effective, and easy to use. With practice, these units can be applied and pacing begun within less than a minute.

Indications

External pacing can be used in the following settings:

1. **Symptomatic bradycardia with pulse:** In patients with symptoms (significant hypotension, altered mentation, chest pain) due to any form of bradycardia, treatment should include supplemental oxygen, ventilatory support as needed, and establishment of IV access and placement of the pacer on the patient.

Pacing should be started if the patient does not respond to atropine, if IV access cannot be obtained, if symptoms are so severe that waiting for a response to



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atropine would be dangerous or in lieu of atropine.

Sedation should be given to patients who are aware of their situation before pacing is started. Sedation with Lorazepam (Ativan) 1-2 mg IV.

In patients with severe bradycardia but no symptoms, the external pacer should be put in place, but not turned on unless the patient's status deteriorates.

NOTE:

If bradycardia and **no pulse**, this should be treated as [Pulseless Electrical Activity](#).

The lack of a pulse in this situation is due to inadequate myocardial perfusion.

Epinephrine and CPR is the treatment of choice.

EXTERNAL PACEMAKER PROCEDURE

Operation

Several different external pacers are available. While control panels may look different, they have several features in common. The pacer switch should be kept in the off position until all connections and settings are completed.

The following steps are needed to initiate pacing

1. Set pacer mode to demand or fixed rate pacing:

Most prehospital pacers (Medtronic LP 10, LP11, [LP 12](#); Zoll; HP) are preset in the demand mode. Demand pacers are able to monitor the patient's rhythm (either with their own monitors or attached to a defibrillator monitor), sensing each beat and firing only when the patient's heart rate is too slow. Most demand pacers have an adjustment for sensitivity, which sets a threshold amount of electrical activity needed from the patient's heart to be recognized as a beat. There may be some pacers that



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only have the fixed rate (asynchronous") mode, where the pacer will fire repeatedly at the selected rate, regardless of the patient's own rhythm. However, fixed rate pacers are usually not used prehospital.

2. **Set desired heart rate**, usually 50-70 beats per minute.
3. **Set desired energy level**. Start with 40 mA in conscious patients, higher in unconscious patients.
4. **Attach monitoring electrodes and cables**. This is needed for pacers that are set on demand mode.
5. **Attach pacing electrodes and cables**. One electrode is placed anteriorly over the heart, and the other is placed posteriorly. Alternately one is placed on the anterior right chest (sternum) and the other is placed on the lateral left chest (apex).
6. **Record a strip of the patient's own rhythm**.
7. To initiate pacing, **turn on the pacing switch and look for pacer spikes on the monitor**. If not present, recheck patient's rhythm (may be fast enough to inhibit pacer) and equipment.

To assess the effectiveness of the pacer:

Check for a pulse. The pacer will make chest and back muscles twitch at the same rate as the heart, so palpation of the left carotid or left femoral artery can be misleading. Check for a right carotid, right femoral or either brachial pulse.

Pulse present with pacer spikes: Measure BP. If adequate, transport the patient and monitor frequently. If BP is inadequate, consider increasing the pacer rate to 70-80 beats per minute. If still hypotensive, consider a fluid challenge and/or dopamine. Record a strip of the pacer rhythm for documentation.

No pulse with pacer spikes: Check EKG for "capture". A T-wave should follow each pacer spike if the heart muscle is being stimulated by the pacer.



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(a) Capture present but no pulse with pacer spike:

Continue treatment as if Pulseless Electrical Activity (PEA)-intravenous fluids and/or dopamine. Increasing the pacer's energy setting won't help.

(b) No capture present: Increase the pacer's energy setting step-wise to maximum, checking for a pulse with each change. If still no pulse, no capture, then recheck all settings, cables, battery charge, and electrode placement. **Recheck the patient's own rhythm--it may be ventricular fibrillation which must be immediately defibrillated.**

(c) Continue all other supportive measures (CPR, oxygen, ventilation, drugs, etc.)

Conscious patients may be alarmed by the muscle twitching and will need reassurance. Patients who complain of intolerable pain from the pacer will require analgesics. To minimize the pain, use the lowest energy setting that will produce a pulse.

External pacers are very safe to use. There is no risk of electrical shock from touching the patient or from performing other procedures during pacing.

Reference

University of Miami School of Medicine: External Cardiac Pacing, 1988.



Bradycardiac patient with signs of hypoperfusion



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Pacer on and attached to patient. Note proper sensing as demonstrated by "flags" on the QRS



Pacer rate set and timing circuit activated. Current to the patient is raised until capture



Increasing the current to an effective level causes ventricular "capture". Assess vital signs



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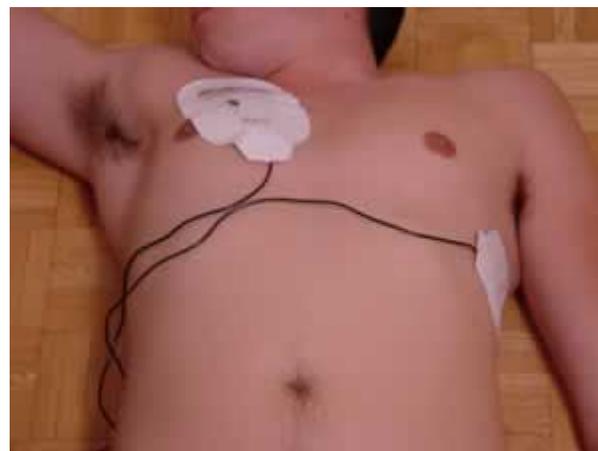
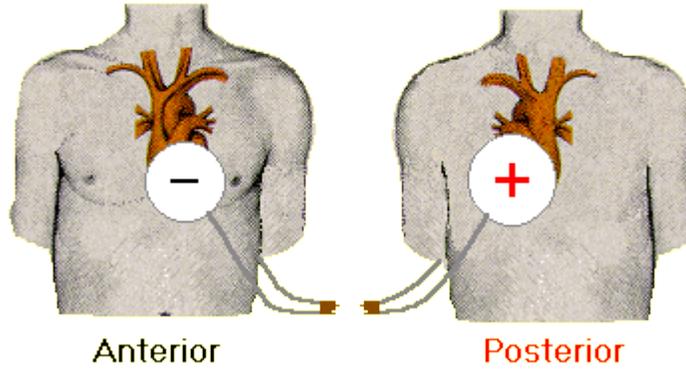

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