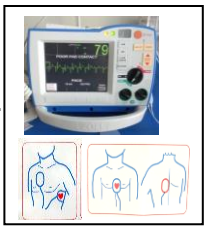
TEMPORARY PACEMAKERS HINTS
(DUAL CHAMBER 5392 PACER)

2018

TYPES OF PACERS



TRANSCUTANEOUS: (VENTRICULAR pacing only)

- **Through the skin** via gel electrode pads placed on the chest and back.
- Disadvantage: Pain / discomfort
- Potential loss of capture with movement or sweating

TRANSVENOUS: (VENTRICULAR pacing only)

- Electrode wires placed via 6 Fr introducer through the subclavian or intrajugular vein:
- The wire is threaded through the R atrium into the R ventricle where it is in contact with the endocardial layer of the heart.
- **Temporary:** until a permanent pacer is placed or dysrhythmia is corrected
- May also be through a specialized Swanz Ganz catheter (PACING SWAN)

EPICARDIAL (TRANSTHORACIC) :

- Wires are placed on the epicardial surface of the heart during surgery
- Atrial, Ventricular, and AV Sequential pacing possible**.**
- **RIGHT wires are always ATRIAL**
- **LEFT wire are always VENTRICULAR**

PERMANENT: implanted subcutaneously : usually has 2 leads and poles.

CARE OF PATIENT with NEW PERMANENT PACER

1) Restrict limb movement for 24-48 hours	5) Medic alert bracelet
2) No shower or bath for 48 hours	6) Activity intolerance may still be present regardless of the new pacer
3) Teach & observe site for bleeding and infection	7) Avoid electromagnetic interference: MRI, hand wands at airports, electrolysis.
4) Monitor VS and teach accurate pulse taking	8) Avoid constrictive clothing over the pacer site.

WHAT DO THE LETTERS MEAN?

1st letter: the chamber **PACED**

2ND letter: the chamber **SENSED**

3RD letter: **what happens** when pacer senses the beat

4TH letter : Programmability

5TH letter: Antitachycardia functions

(These are not applicable to temporary pacers)

- **A = Atrial**
- **V = Ventricle**
- **D = Dual**

- **I = INHIBIT**
- **T = TRIGGER**
- (both A & V are sensed but if no QRS follows the P wave within a certain time interval , then the V will be paced)

Mode	Paced	Sensed	Result
AAI	Atrial	Atrial	Inhibits
AOO Asynchronous	Atrial	⊘	⊘
VVI	Ventricular	Ventricular	Inhibits
VOO Asynchronous	Ventricular	⊘	⊘
DVI	A & V	Ventricle	Inhibits
DOO Asynchronous	A & V	⊘	⊘

DDD mode:

•Atrial (Pwave) **sensed** = **Inhibition** (pacer does not fire)
•Atrial (Pwave) **Not sensed** = **Trigger** : pacer fires an atrial spike

If AV conduction is normal
•If QRS is **sensed** = **Inhibition** (V pacer spike does not fire)
•If QRS is **NOT sensed** (absent or delayed) = **Trigger** : pacer fires a ventricular spike

An upper rate is set for the ventricular response to avoid tracking rapid atrial activity. (Menu 2)

INDICATIONS FOR PACING
* symptomatic bradycardia (low BP, low CO, syncope)
* advanced heart blocks or conduction disturbances (pauses)
* ventricular dysrhythmias
* absence of underlying rhythm
* overdrive pacing attempts to terminate malignant supraventricular and ventricular dysrhythmias

If an open heart patient becomes bradycardic and still has their epicardial / transthoracic …..

CONNECT & START THE TEMPORARY PACER 1ST ! Don't wait!

The heart has 2 separate mechanism:

ELECTRICAL: deals ONLY with the stimulus and **CONDUCTION** system within the heart. (depolarization)

MECHANICAL: is the actual **CONTRACTION** of the muscle (the heart beat and movement of blood!)

REMEMBER: conduction can still happen even if the mechanical heart beat does not.
PULSELESS ELECTRICAL ACTIVITY (the pt has no pulse)

PACER CONTROLS

RATE: normally 60-100
*the number of impulses per minute the pulse generator may send, depending upon chosen mode.

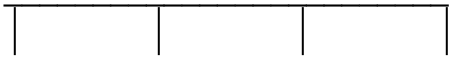
OUTPUT: The **amount of energy** that the pacer sends to the heart.
Measured in milliamps.

m A: milliamps (measurement of current)
low .5 - 20 high

CAPTURE:
The heart's response to the pacer by DEPOLARIZING (+ a pulse)
the cardiac muscle responds to the electrical stimulus.

STIMULATION THRESHOLD:
The **minimal** amount of energy needed to stimulate depolarization.

1) Set the mA to a low number
2) Dial up the mA until capture is obtained
   (spike followed by depolarization/capture + pulse)
3) Then **ADD 2** (to make sure you keep the capture !)
or
Some physicians prefer to start at mA 20
then dial down until you loose capture : but always ADD 2

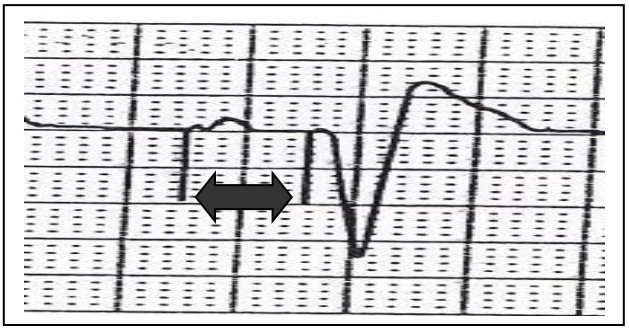


LOSS OF CAPTURE
WHAT'S THE PROBLEM ???
1) the **PACER**
2) the **WIRES**
3) the **PATIENT**

PROBLEM		
PACER • Batteries • Faulty generator	**WIRES** • Dislodged • Disconnected • Damaged • Transvenous wire not touching the heart tissue	**PATIENT** • Heart tissue is refractory • Electrolyte imbalance • MI, ischemia, hypertrophy • Severe acidosis , hypoxemia
TO CORRECT THE PROBLEM		
Change the batteries Change the pacer	• Check the wires • Check the connections • Changing position of the patient (on to side) For transvenous pacer	• INCREASE the mA • Correct 02 or acid imbalance • Initiate CPR if necessary.

A V INTERVAL

- Amount of time between the **atrial spike** (stimulus) and the **ventricular spike** in AV Sequential pacing
- 120 to 200 msec normal
- measured in **millisecs** *(like the PR interval in secs)*
- Promote adequate ventricular filling from atrial kick



1) Scroll ▲▼ to select AV interval

2) Press ↵ **ENTER**

AV Interval changes automatically when pacer rate is changed
Rarely is this manually changed

SENSITIVITY .5 - 20

The **pacer's** ability to **"sense"** or "see" the **pt's intrinsic heart beat**
When the **pacer senses** the intrinsic beat it **INHIBITS** the pacer **(It should not fire)**

REMEMBER the **T wave is the most vulnerable** wave of the cycle.
A stimulus sent when the heart is repolarizing can cause V FIB (R on T phenomenon)

The **higher** the number the **lower** the sensitivity
The **lower** the number the **higher** the sensitivity

HIGH # [20] = LOW sensitivity

- Problem: UNDERSENSING
- **Pacer does not sense an intrinsic beat** so it **fires a stimulus.**
- **UNDERSENSING → OVERPACING !**
- **DANGER**: a stimulus hits the R wave = **R on T lead to V fib**

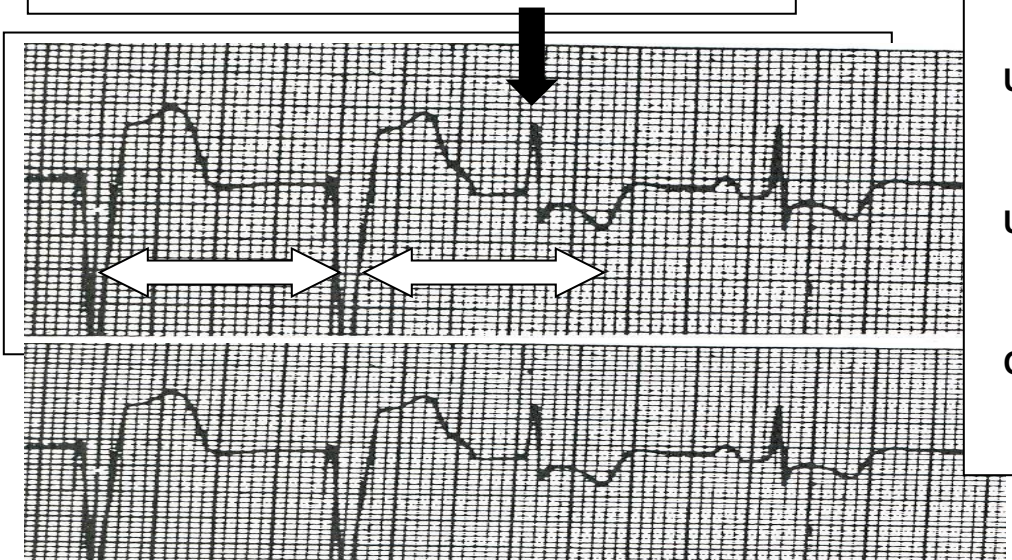
LOW # [.5] = HIGH sensitivity

- Problem: OVERSENSING ; Too sensitive
- **Pacer senses everything** and **thinks it is a beat:**
  hiccups, outside electrical interference, IV pumps, electric razors
- **OVERSENSING → UNDERPACING**
- **DANGER: the pacer will NOT fire even when you need it to!**

DEMAND PACING
- Uses Sensitivity to determine when to fire and NOT to fire.
- Pacer delivers stimulus **ONLY IF** the patient's heart fails to fire as fast as the predetermined rate (the distance between R-R interval is timed)

EXAMPLE:
- Demand pacer is set at rate of 72
- The white arrow illustrates the **pacing interval** (the distance from spike to spike)
- The pacer MUST wait this long before it fires another stimulus
- If the pacer **senses** a beat before the end of the interval: it **should not fire**

QRS was sensed: Pacer **DID NOT** fire !



OVERSENSING → **UNDERPACING**
Picks up Hiccups !
DOES NOT FIRE WHEN YOU NEED IT TO !
= ASYSTOLE

UNDERSENSING → **OVERPACING**
DOESN'T SEE
DOESN'T CARE
FIRES ANYWAY !
R on T
V fib

DOO

ASYNCHRONOUS PACING

Turns OFF sensitivity + turns UP mA
[maximum]
A mA = 20
V mA = 25

The Strongest / Fastest stimulus will win!

Pacer delivers set rate of impulses per minute
regardless of the patient's intrinsic rhythm
NO sensitivity : pacer will fire no matter what!

Not usually necessary in Ventricular Pacing
Pacer must be stronger and faster than
intrinsic heart rate !
Overdrive: set rate must be faster than pt

To discontinue DOO press the ↵ key

***DOO** button works even if the controls are locked or the pacer is OFF*

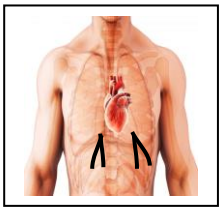
If the pacer is OFF: the DOO button will turn the pacer ON & activate Asynchronous mode
[This is a quick way in an emergent situation: to turn on the pacer / mA goes to max to get capture / press ↵ to immediately get your sensitivity back!

TO SET SENSITIVITY (PHYSICIAN ONLY)

- Position dial at MOST sensitive setting (1mV)
- Adjust pacer rate to 10 less than pt intrinsic rate
- Reduce mA to minimum
  (to prevent pacer from competing with intrinsic rhythm
- Turn the sensitivity dial counterclockwise
  (higher mV) until:
  - **VENT. SENSE (orange light) stops flashing** and
  - **VENT. PACE (green light) starts flashing**
  (This is sensitivity threshold)
- Adjust the sensitivity indicator to **half** threshold value
- RESET THE mA and RATE TO THEIR ORIGINAL SETTINGS!

Connection / Adapter Cables are REQUIRED:

Connecting the Pacer: **Transthoracic pacing wires:**



2 wires coming out of the **Right** side of the chest are connected to the **ATRIA**

2 wires coming out of the **Left** side of the chest are connected to the **VENTRICLE**

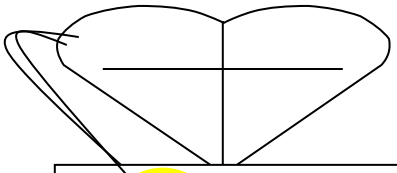
ATRIAL PACING: [AAI mode]

- Can be used when **conduction system** of the heart ***beyond the SA node is normal.***

USES: [the pacer is only stimulating a p wave: the QRS must follow from the heart!]

- **Sinus Bradycardia** symptomatic
- **Sick Sinus Syndrome**
- **Sinus Arrythmia**
- **Sinus Rhythm**: Higher heart rate to increase cardiac output (better perfusion)
- Junctional Rhythm may work

R L

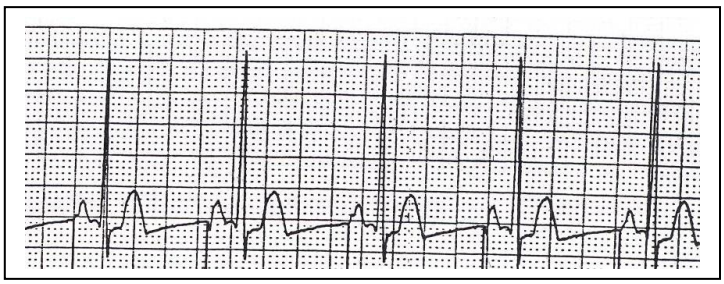


1) Attach the 2 **Right (atrial wires)** to the extension cable marked **ATRIAL** on top of the pacer.

2) **Turn the Ventricle mA to 0**
this will give you atrial pacing only

[You can also scroll down to the bottom of the screen / choose Mode Selection
Press ↵
Scroll to AAI mode

Press ↵



Rhythm: spike will be followed by P wave then **normal** width QRS

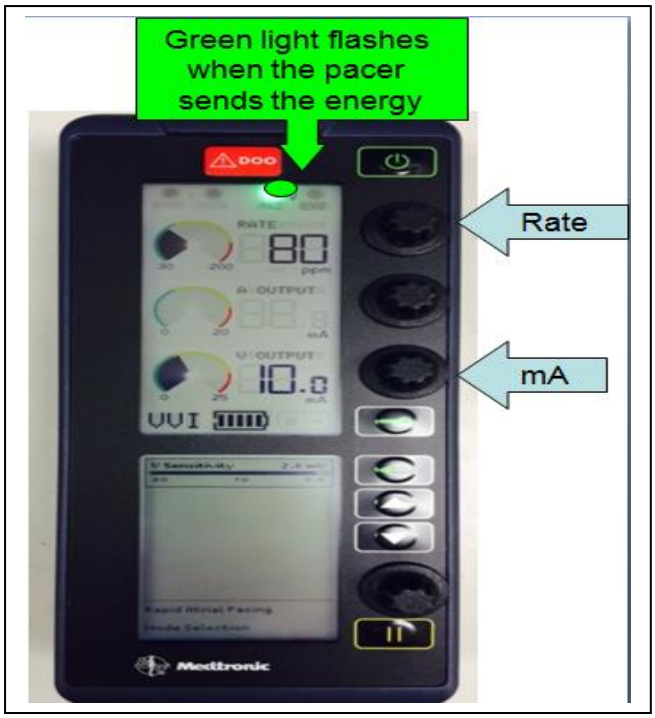
VENTRICULAR PACING: [VVI mode]

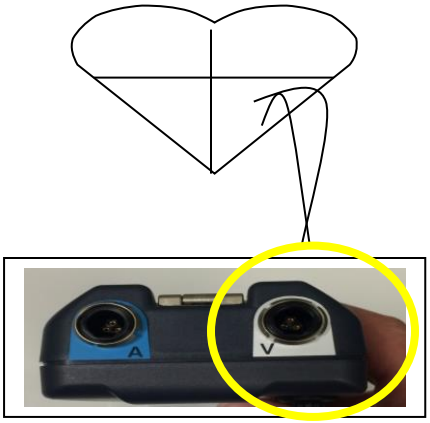
- Stimulates **ONLY** the ventricles only.
- Disadvantages:
    1. **No atrial kick** if patient does not have their own intrinsic p waves
       Atrial kick is 20 – 30 % of cardiac output **decreased cardiac output**
    2. **Thrombus** -no atrial contraction => blood clot in the atrium

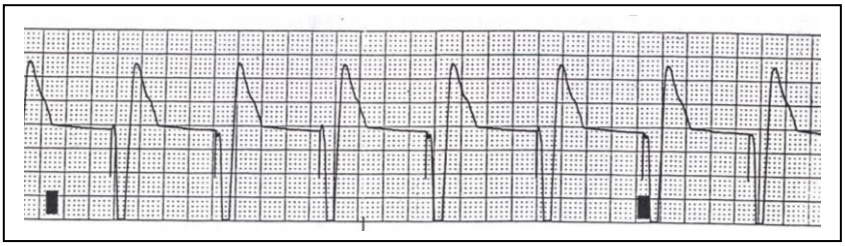
TO VENTRICULAR PACE with Epicardial Wires

1. Place the **2 left VENTRICULAR** wires into the **ventricular poles**
2. Set the pacer rate
3. Turn the Atrial mA to 0 (off)
4. Set the Ventriclar mA (Stimulation threshold +2)

[This can also be accomplished: Scroll to bottom of screen Choose Mode Selection



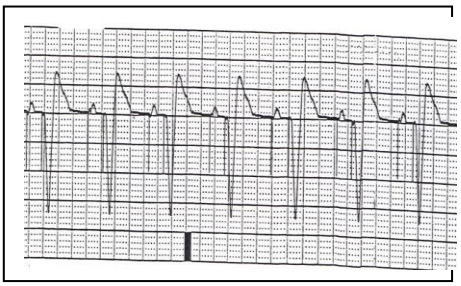




Ventricular Pacing Rhythm: **spike** will be followed by a **widened QRS**.
(wider because the conduction through the ventricles is slower)
The atrium will not be stimulated by the pacer.

AV SEQUENTIAL PACING:

- Stimulates the atria then the ventricles in sequence
- Advantage: Atrial kick for better cardiac output and perfusion.



TO AV SEQUENTIAL PACE

1) Place patient's **right wires** into the atrial (blue) poles
   Place patient's **left wires** into the ventricle (white) poles
2) Set the Rate
3) Check the AV interval
   - This is preset by the dual chamber pacer and does not need to be changed.
   - Measured in millisecs (correlates with PR interval)
4) Set the atrial and ventricular mA (stimulation threshold + 2)

RAPID ATRIAL PACING

Used to overdrive the **ATRIA** out of rhythms with rapid atrial rates (A fib and A flutter)

- **NEVER use this with Ventricular only Pacing**

During A-V Sequential Pacing
Activating RAP disables the Ventricular Rate and Ventricular mA
so only the Atrial stimulus goes through

1. Press  to open the menu
2. Press \/ arrow to Scroll down to **Rapid Atrial Pacing**
3. Press  to select
4. Set the rate at which you want the ATRIA to be stimulated with turn knob
   Example A flutter : atrial rate is usually between 250 – 350
   A- Fib : atrial rate is usually 350 +
5. **Press and HOLD** the RAP button
6. The atrial pacer will continue to fire at the rapid rate until you release the button.

Technique of Overdrive Pacing for Atrial Flutter
(Smith and Hood 2007)

- When two atrial epicardial wires are in situ, each wire should be tested to confirm that it is recording only an atrial ECG and to measure the atrial rate.
- The pacing pulse width should be increased to 2ms and pacing begun at **20mA at 100 beats per minute to confirm the absence of ventricular capture**.
- The pacing rate should be **increased to 20 beats faster than the intrinsic atrial rate** (typical atrial rates are 250 – 280 bpm and may be as high as 330bpm)
- The ECG should be observed to **confirm atrial capture** .
- **After 30 seconds the pacing rate should be increased by a further 20 bpm**.
- **Atrial capture is confirmed by**
  1) an increase in HR as the pacing rate is increased.
  2) a subsequent abrupt fall in hear rate as the AV conduction ratio increases (2:1 to 3:1 to 4:1)
  3) a constant relationship between the pacing spikes and the flutter wave.
- **Pacing is abruptly stopped after 1 – 2 minutes of atrial capture.**
- Which typically results in the establishment of sinus rhythm.
- If sinus rhythm is not present the process should be repeated after reversal of the atrial lead polarity.
- If it is still unsuccessful, deliberate induction of atrial fibrillation should be attempted by burst pacing at rates of 600 per minute for 30 seconds or until Afib wnsues.
- Pacing induced atrial fibrillation is typically unstable and frequently reverts spontaneously to sinus rhythm, though reorganization of atrial flutter is possible."

SAFETY TIPS FOR TEMPORARY PACERS

- **CONTROLS Lock 60 seconds after last adjustment was made.**
  when not manipulating pacer setting : to avoid patient tampering. (lock automatically engages)
- Press and hold the lock button the middle right corner of the pacer

SECURE THE PACER

- **FOR MOBILE PATIENT:** Secure pacer box to the patient using the "pacer pouch" with straps securely fastened around patient neck.
  (Make sure you do not impede blood flow to their head!)

DO NOT PUT TAPE DIRECTLY ON THE FACE OF THE PACER!!!!
Use the hooks located on the back of the pacer when securing the pacer
The adhesive gets into the dials making them difficult to adjust.

SECURE THE WIRES

- Wear gloves while securing **transthoracic (epicardial) pacing** wires in Preservative Free test tubes Tape the tubes to the chest.

- Secure **transvenous pacing wires** with a stress loop before taping to prevent wires from being dislodged if the pacer gets tugged.

- **DO NOT PLACE TAPE ON THE PLASTIC SHEATH / COVER**: The sheath / cover is placed ONLY to keep the wire sterile and DOES NOT prevent the wire from being pulled. Torn plastic cover = contaminated

Change the Battery: Medtronic Pacer (2 AA Alkaline batteries)

- The New Medtronic pacer will flash a red battery picture
- When you change the battery the pacer will continue to pace for several seconds without battery.
- **To change the battery**
  1. Push the button on the bottom of the pacer (looks like a belly button)
  2. When the battery drawer pops out
  3. Replace the battery just like the picture inside the battery drawer
  4. Slide the battery door closed

PREVENT MICROSHOCK AND ELECTRICAL INTERFERENCE

- Wear rubber gloves when handling pacer wires
- Use only a grounded electrical bed
- Allow pt only to use **rechargeable** electric razor or nonelectric razor
- Keep other electrical equipment off of the bed if possible.

OTHER CAUSES OF ELECTRICAL INTERFERENCE:

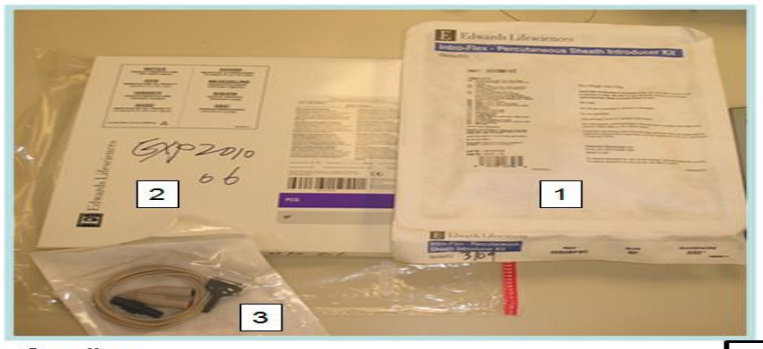
- Electrocautery
- Defibrillation current
- Radiation therapy
- MRI devices
- TENS units (transcutaneous electrical nerve stimulation

LESS COMMON BUT VERY REAL COMPLICATIONS OF TEMPORARY PACING WIRES

- Endocarditis
- Myocardial perforation
- Cardiac tamponade
- Infection
- Hiccups: dislodged wire touching diaphragm

Refernces: Medtronic Technical Manual Dual Chamber Temporary Pacemaker 5388. 2000.
Thelan,Lynne, et al. Critical Care Nursing, Diagnosis and Management, 4th Ediction, Mosby Corporation, 2002.
Lynn-McHale, D. and Carlson, K.(2001) AACN Procedure Manual for Critical Care 4th Ed. W.B. Saunders Company Philadelphia.

HINTS FOR FLOATING A TRANSVENOUS PACER

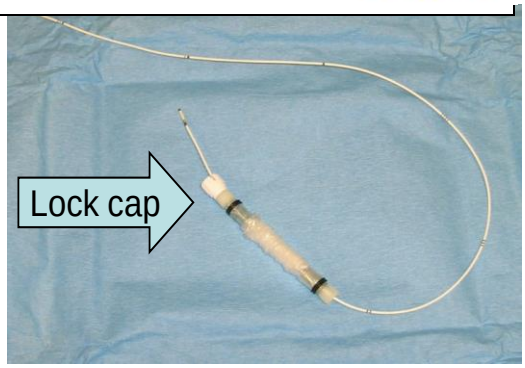


Supplies:
1) Edwards 6F Intro-Flex Percutaneous Sheath Introducer Kit
2) Edwards Bipolar Pacing Catheter
3) Disposable Adapter (Remington)
4) Pulse Generator (Pacer Box)

Sherri Welch 2015 TV Pace 5392

6F introducer

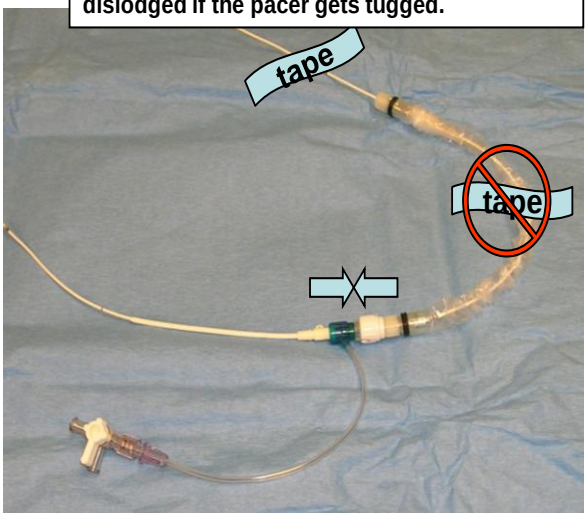
placed via IJ or Subclav



Prior to floating the pacer wire: place the **plastic sheath** over the pacer wire with the lock cap at the distal end.

Once the wire is placed and capture is established: snap / lock the plastic sheath onto the introducer and stretch the plastic sheath several inches to maintain sterility of the pacer wire for repositioning.

Secure transvenous pacing wires with a stress loop before taping to prevent wires from being dislodged if the pacer gets tugged.



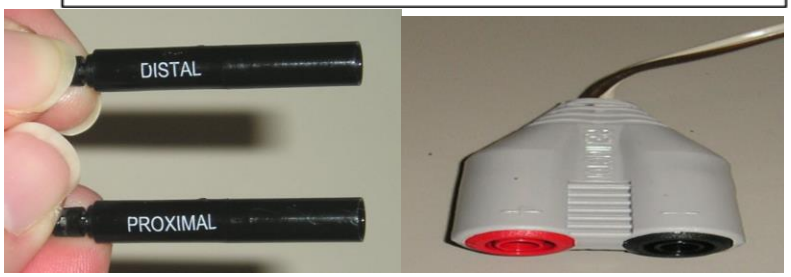
Do Not Put Tape over the plastic sheath !

- This will not secure the catheter
- Tearing will cause contamination

Transvenous Pacer Hints 2
Sherri Welch 2012

1) Test the balloon by inflating with 1.5 cc
2) Connect the adapter cable to the Ventricular Pacer Port
3) Connect the pacer wires to adapter cable

Proximal	(+) Postitive : Red
Distal	(-) Negative : Black



Transvenous pacing use
VVI Mode Only

Do not use DDD mode.

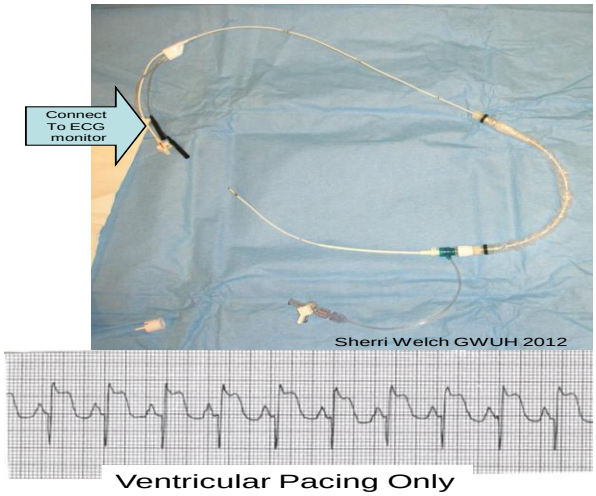
* *Even if you only have the V wire connected the Atrial mA continues to fire*

* *If the V connection senses the atrial mA The Ventricular mA will be inhibited [it will not fire]*

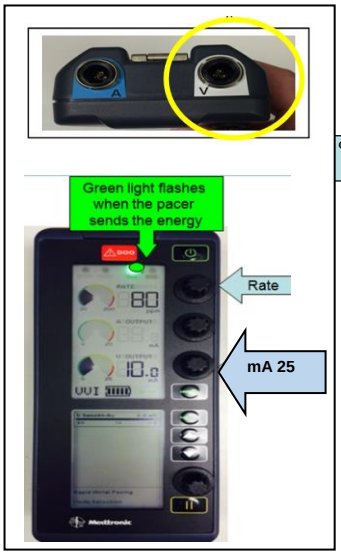
Floating the pacer wire

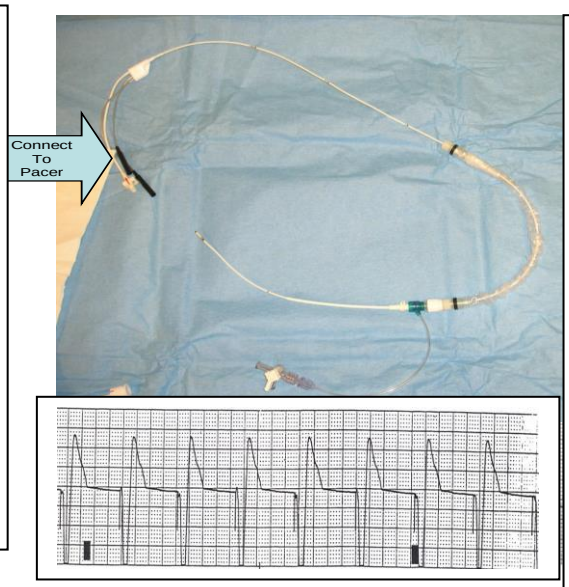
(Elective)

1. Connect the Distal Negative (-) Electrode to the ECG Lead V
2. Continuously monitor the V lead on the bedside monitor
3. Pass the wire through the introducer to 20 cm.
4. Inflate the balloon
5. Advance the wire forward while observing the ECG tracing.
6. Look for ST elevation in the V lead This indicates the pacerwire is in contact with the myocardium (May see LBBB and L axis deviation)
7. Set / Check Stimulation Threshold



Ventricular Pacing Only





Connect Pacer
1. Pacer extension wire to Ventricular [V] pole
2. Connect Distal to Negative [Black]
3. Connect Proximal to Positive [Red]

Continuous ECG

Pass pacer wire through introducer to 20 cm
[Maintain the catheter curve toward the heart
Inflate balloon with 1.5 cc

Turn Pacer ON
Set Rate per MD [must be higher than patient rate]
Set **Ventricular mA to 25**
[Do not use ASYNCH mode]

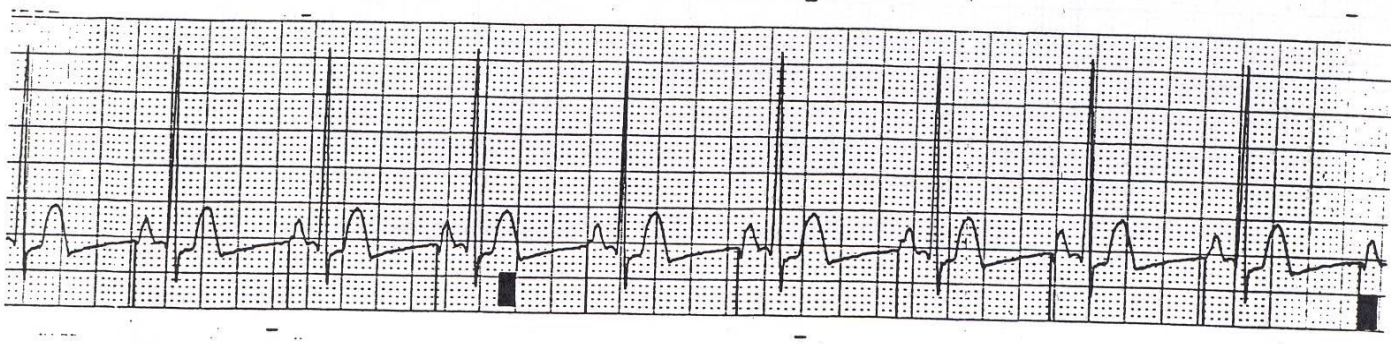
Advance pacer wire until Ventricular Capture
[Spike followed by wide QRS + pulse]

Check the Stimulation Threshold
[Minimal mA to capture then add 2mA]

Secure / lock the plastic steri sleeve
Document the depth of the catheter in cm

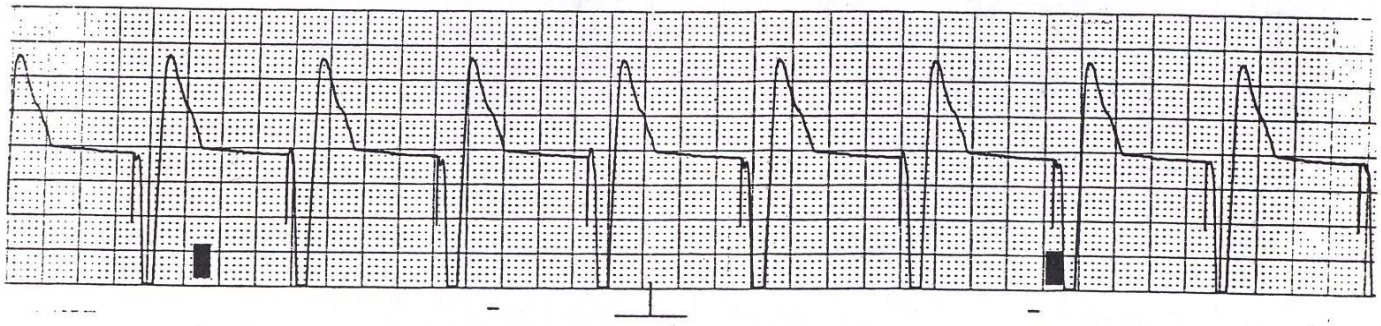
Sherri Welch MSN, RN, CCRN
Temporary Pacer Hints 2018

PACER FAMILY (LOOK FOR THE SPIKES)



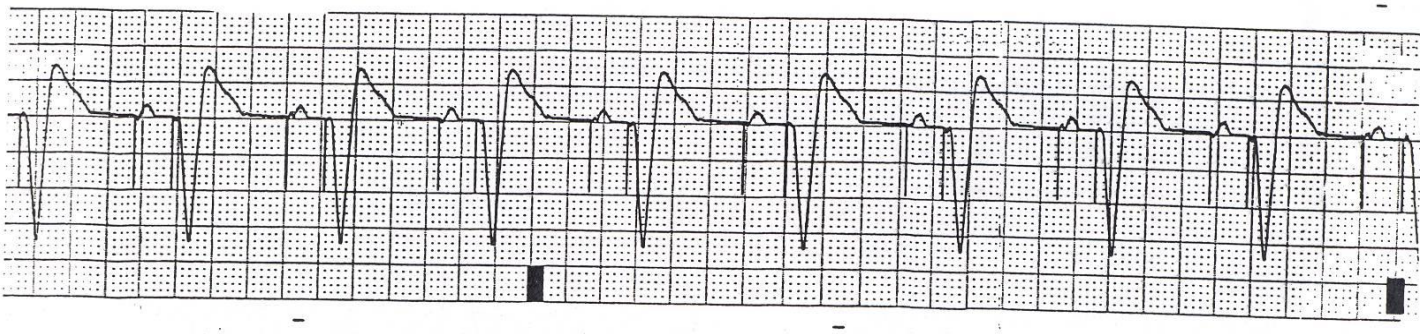
IR / REG :_____ RATE:_____ P:QRS:_____ PRI:_____ QRS:_____

RHYTHM: Atrial Pacer spike - P - normal QRS



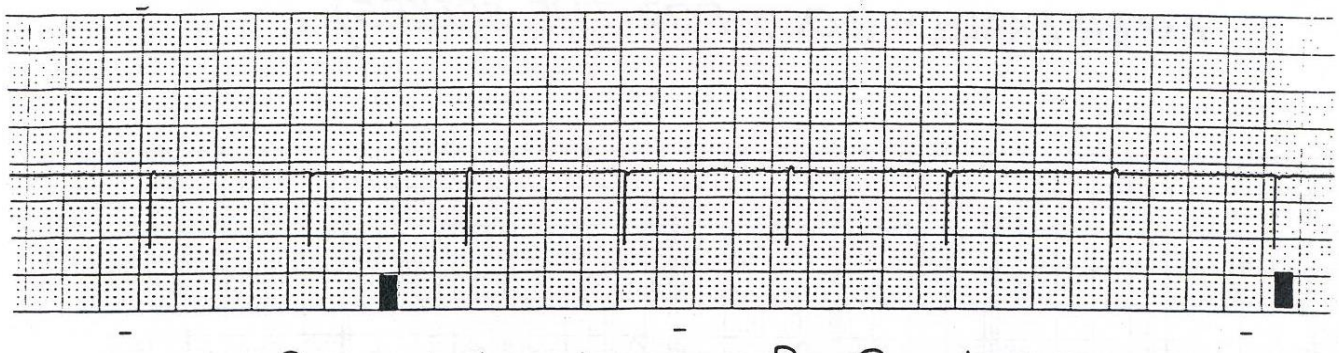
IR / REG :_____ RATE:_____ P:QRS:_____ PRI:_____ QRS:_____

RHYTHM: Ventricular Pacer spike - WIDE QRS

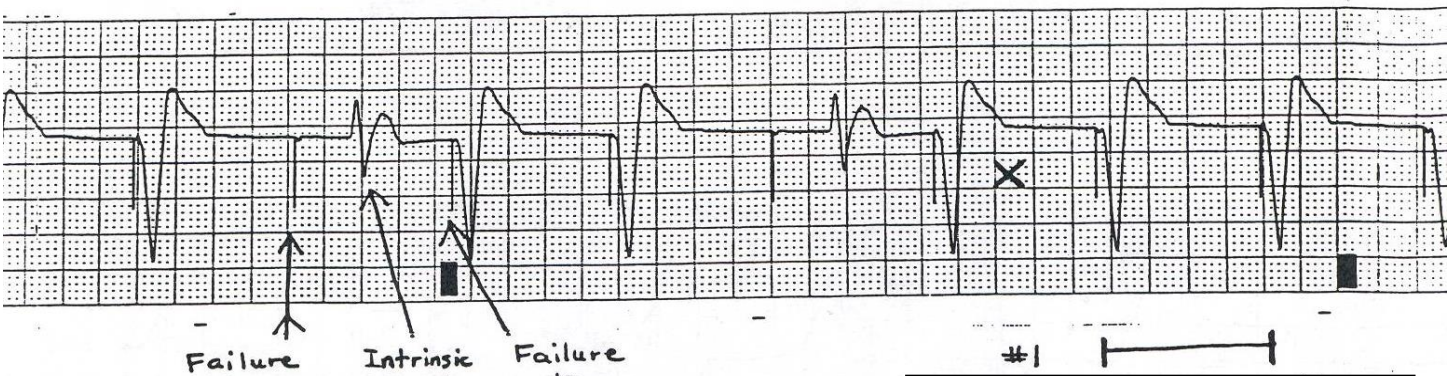


IR / REG :_____ RATE:_____ P:QRS:_____ PRI:_____ QRS:_____

RHYTHM: A-V Sequential Pacer spike - P - spike - WIDE QRS



Complete Loss of Capture



Spike with No Response

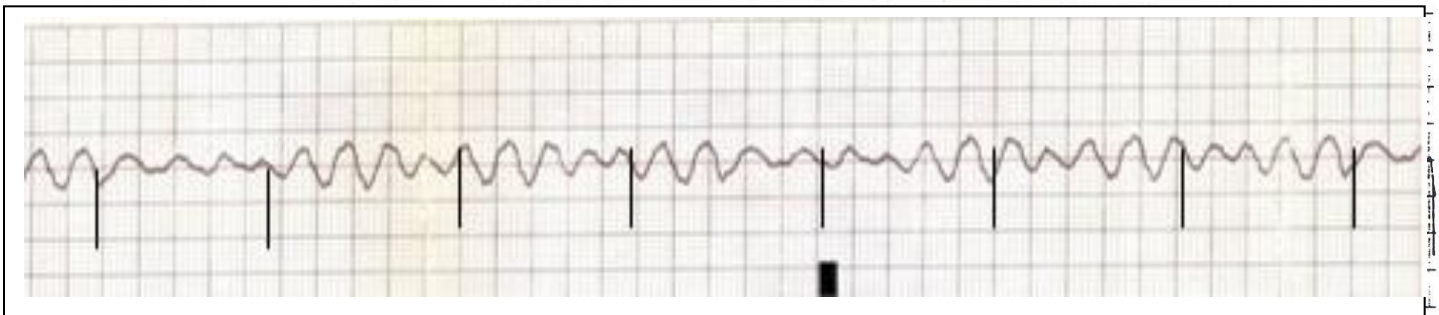
Fired too soon after patient's heart beat

To check sensitivity with the rhythm
1) Measure spike to spike
[this is the pacing interval / timing]

2) Locate an Intrinsic [pt] beat.

3) When the pacer senses a beat;
it should wait this long [pacing interval]
after the beat before it fires again.

4) Failure to Sense: The pacer did not wait long enough to fire [X]
if the pacer fires to soon the impulse could hit the T wave [R on T -> Vfib]



pacer spike

V-fib with pacer spikes

The pacer continues to fire because there are NO QRS's