

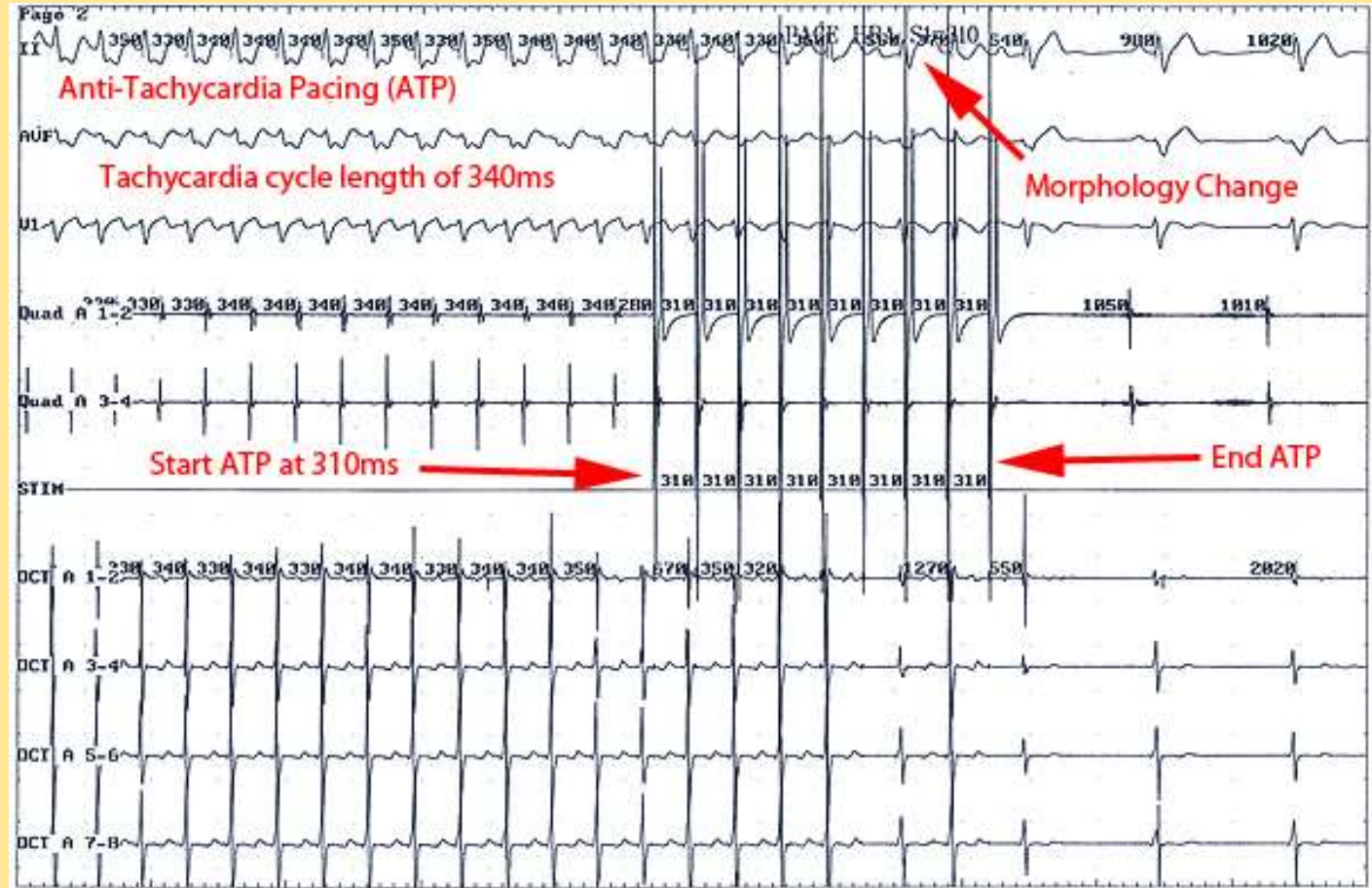
Overdrive pacing and elective DC cardioversion: How I do it?



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Over drive pacing (anti tachycardia pacing)

- Pacing rapidly in tachycardia zone to enter circuit thus interfering, interrupting and blocking the reentry - called “Entrainment”.
- In automatic tachycardia pacing in close vicinity of the tachycardia focus results in an electrical line of barrier which acts as an exit block



Main advantage of ATP

- Less injury unlike DC cardioversion.
- Can be administered as many time as required.
- Some tachycardias specifically respond to ATP only.

How to perform overdrive pacing ?

- Conventional temporary pacing lead can be used.
- Special leads may be required for paired pacing.
- The rate of pacing is generally faster (81% & 88% of Cycle length)
- Connotes a pacing at more than the tachycardia rate.
- The duration of pacing may be 30 seconds to 2 minutes as necessary



Different types of overdrive pacing

- **Coupled pacing** - Patient's own spontaneous rhythm is used to trigger a pacemaker stimulus - alternate beats or pacing beats which is coupled with the patient's own rhythm
- **Paired pacing** - Two pacing stimuli are given. The first impulse is maintained constant, second impulse is done with varying coupling interval to scan the entire cardiac cycle. At some point it would block the reentrant circuit.
- **Random paired pacing** - The atrium is delivered a pair of random stimuli (Like a bite of snake!) is delivered into the atria. This can revert many of the reentrant atrial and ventricular tachycardia

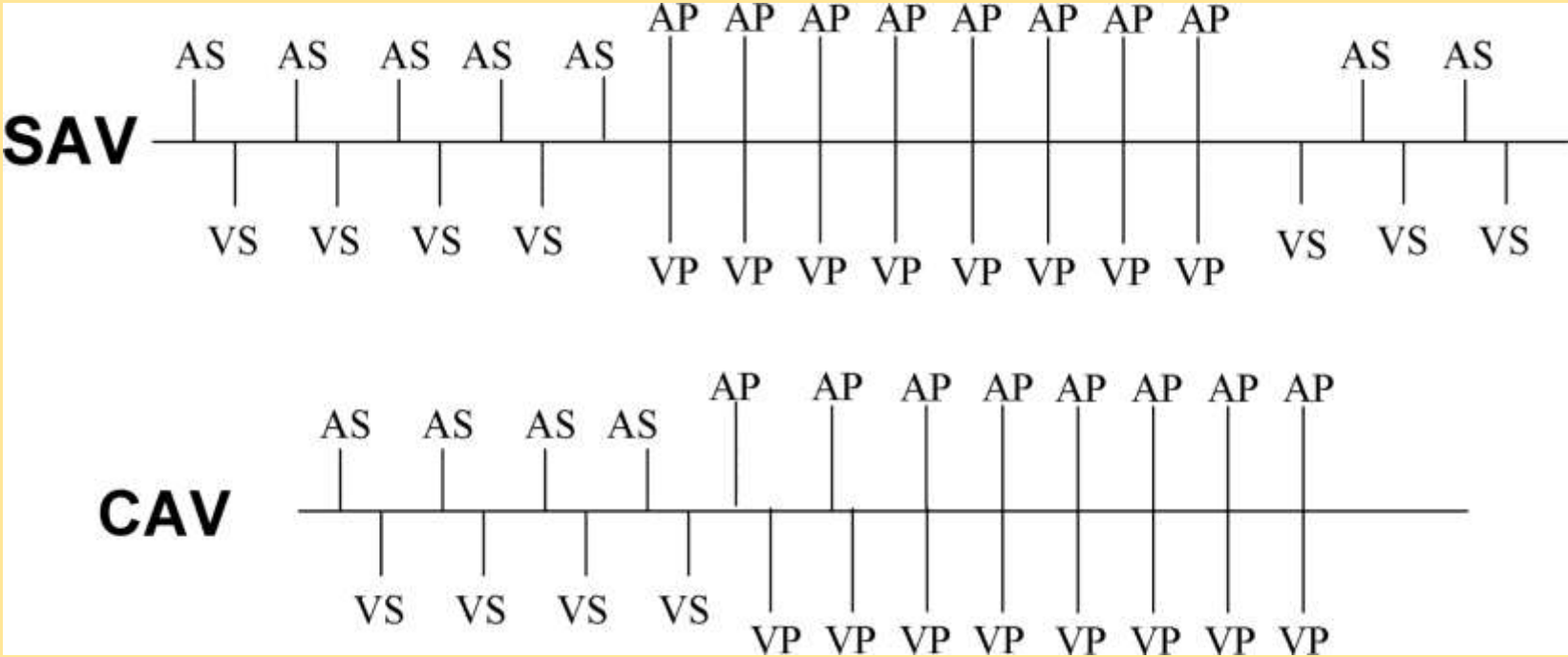
Currently ATP is useful in

- Recurrent atrial tachycardia, atrial flutters
- Refractory ventricular tachycardia especially with enhanced automaticity (Early ischemic VT)
- Digoxin induced tachycardias
- Some cases of Tachy brady syndrome

What is the caution for using ATP ?

- Pacing a ventricle rapidly carries a risk of inducing ventricular fibrillation
- Whenever possible should be administered through an atrial lead
- It is also a fact many times when the ventricular overdrive pacing fails to revert a VT , an atrial overdrive pacing has been successful
 - This is due to the more uniform depolarization wave fronts , that reach the ventricle and reset the VT

Simultaneous (SAV) and Convergent (CAV) atrial and ventricular ATP



Elective DC cardioversion

- **Cardioversion** - Defined as a “synchronized DC discharge, and does not apply to ventricular defibrillation or to the pharmacologic reversion of arrhythmias.”
- Electrical discharge is synchronized with the R or S wave.
- Synchronization with early part of QRS complex avoids energy delivery near apex of T wave, which coincides with a vulnerable period for induction of VF.
- The peak of the T wave represents the terminal portion of the refractory state when adjacent heart fibers are in differing states of repolarization.
- **Defibrillation** refers to an unsynchronized discharge of energy and is only recommended for [ventricular fibrillation](#) (VF).

Cardioversion

- Alive, unstable, tachyarrhythmia
- Unstable?
 - Signs of low cardiac output: systolic hypotension < 90 mmHg, altered mental status
 - Excessive rates >150/min
 - Chest pain
 - Heart failure
- Synchronized cardioversion is shock delivery that is timed (synchronized) with the QRS complex



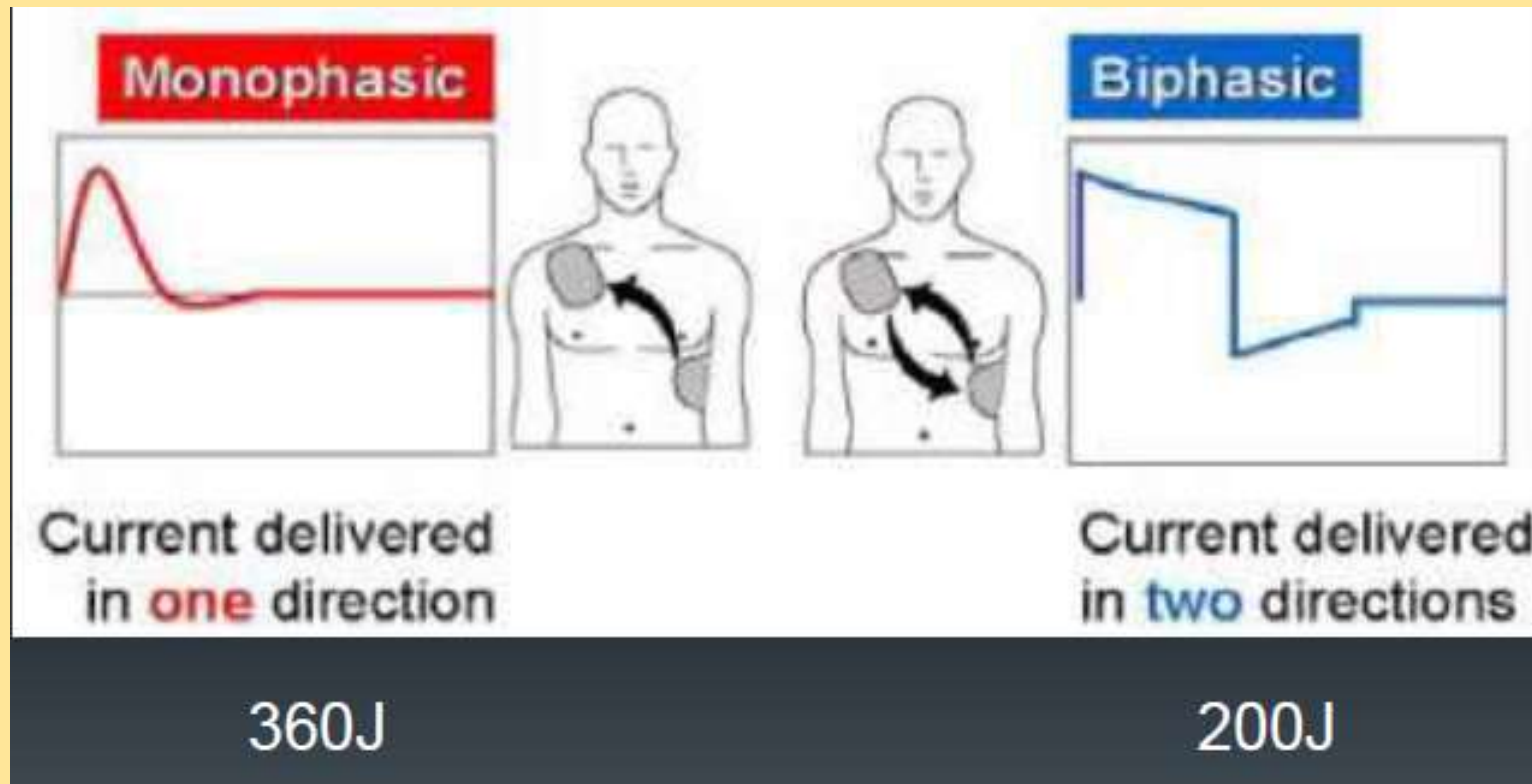
Basic principles

- Transient delivery of electrical current causes a momentary depolarization of most cardiac cells allowing the sinus node to resume normal pacemaker activity.
- With reentrant arrhythmia, such as PSVT, VT electrical cardioversion interrupts the self-perpetuating circuit and restores a sinus rhythm.
- Much less effective in treating arrhythmia caused by increased automaticity (eg, digitalis-induced tachycardia, catecholamine-induced arrhythmia) since the mechanism of the arrhythmia remains after termination

2 Types

- Monophasic sinusoidal waveform (positive sine wave)
- Biphasic truncated waveform.

The more recent use of biphasic cardioversion has shown that less energy is required to convert to a normal sinus rhythm.



Indications

- Any patient with narrow or wide QRS complex tachycardia (ventricular rate >150) who is unstable (eg, chest pain, pulmonary edema, lightheadedness, hypotension)
- Stable VT that does not respond to a trial of intravenous medications
- Supraventricular tachycardia due to reentry
- Atrial fibrillation
- Atrial flutter
- Atrial tachycardia ?
- Monomorphic VT with pulses

Contraindications

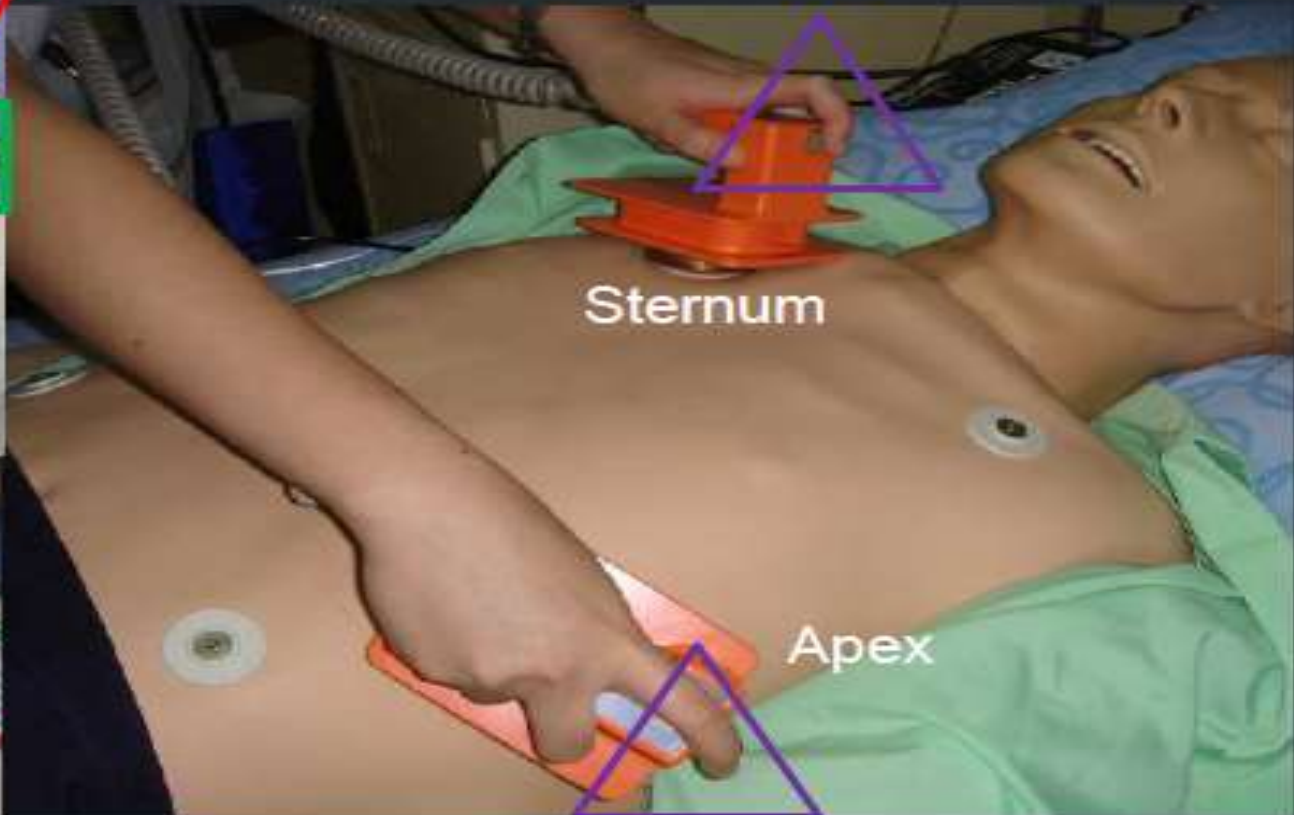
- Digitalis toxicity—associated tachycardia,
- Sinus tachycardia caused by various clinical conditions,
- Multifocal atrial tachycardia
- Atrial fibrillation who are not anticoagulated

Technique

- ACLS guidelines should be followed as indicated.
- Intravenous access, airway management equipment
- Sedative drugs - short-acting agent such as midazolam or propofol, fentanyl
- The defibrillator should be placed in the synchronized mode, which permits a search for a large R or S wave
- **Placement of paddles: Two options**
 - Anterolateral position – 4th, 5th LICS on midaxillary line & 2nd and 3rd RICS
 - Anteroposterior position - between the tip of the left scapula and the spine & 2nd and 3rd RICS.

Special consideration

- Anticoagulation for AF/Atrial flutter if duration >48hours
- TEE – shows clot then anticoagulation for 3 weeks before & 4 weeks after cardioversion
- Mechanical function of the atrium lags by up to 7 days after restoring sinus rhythm



- Anterolateral position – 4th, 5th LICS on midaxillary line & 2nd and 3rd RICS



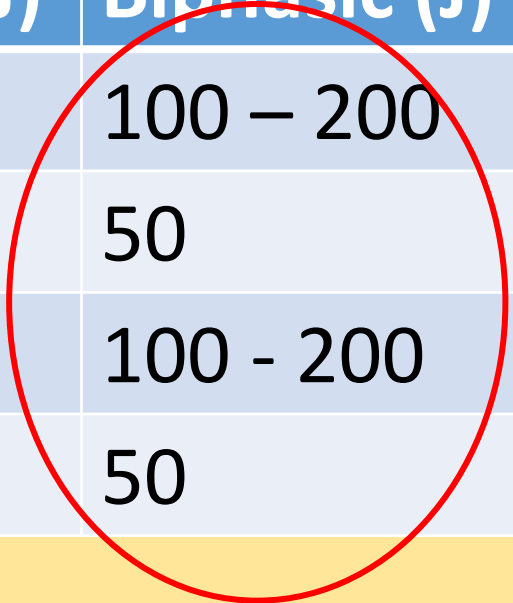
Anteroposterior position - between the tip of the left scapula and the spine & 2nd and 3rd RICS.

- The paddles should be placed firmly against the chest wall to avoid arcing and skin burns
- Pacemakers and ICDs should be at least 10 cm from direct contact with paddles and should eventually be interrogated for any malfunction after cardioversion.
- The anteroposterior approach is preferred in patients with implantable devices to avoid shunting current to the implantable device and damaging the system.

Since the skin can conduct away a significant portion of the current, conductive gel or pre-gelled pads are commonly used to ensure good contact. Under ideal circumstances, only 10-30% of the total current reaches the heart.

Energy requirements for Cardioversion

Conditions	Monophasic (J)	Biphasic (J)
AF	300	100 – 200
Atrial Flutter	100	50
VT	200	100 - 200
SVT	100	50



Complications

- The patient may **become hypoxic or hypoventilate** from sedation.
- Most **burns** from shocks are superficial partial-thickness burns, but a few are deep.
- Cardiac complications include **dysrhythmia** (Bradycardia, AV Block, Asystole, VT/VF), **hypotension, and pulmonary edema**.
- **Post cardioversion VF** - 2 types.
 - The first type occurs immediately after a shock and is related to **improper synchronization**. Readily responds to defibrillation (unsynchronized countershock).
 - The second type is related to **digitalis toxicity** and manifests within a few minutes. Junctional or paroxysmal atrial tachycardia, then VF, which can be difficult to convert to a sinus rhythm.

Defibrillation

Cardioversion

Not synchronised

Synchronised on the R
wave

For cardiac arrest

For periarrest
tachyarrhythmias
(unstable)

Higher energy joules

Lower energy joules

No escalating energy for
next shock

Escalate for next shock
(100 - 200 - 300 - 360J)

CARDIOVERSION



- Elective Procedure
- Client Awake & Frequently Sedated
- Synchronized With "QRS"
- 50 - 200 Joules
- Consent Form
- EKG Monitor



- Emergency
- V-Fib / V-Tach
- No Cardiac Output
- Begin With 200 Joules
Up to 360
- Client Unconscious
- EKG Monitor

DEFIBRILLATION

CJ-MUSA

Automated AED @ KLIA

1

Push the button to release the lid and turn on the defibrillator.

**2**

Pull the handle to get the electrode pads and adhere them to the person's chest as shown.

**3**

Press the flashing button if told to do so.²⁶



Conclusion

- Pacemakers are not only meant to treat bradycardias but also tachycardias
- Although some complications appear critical, DC synchronized cardioversion is usually safe and effective if performed by well-trained personnel.

Thank you