**MOCK SCENARIO -TRANSCUTANUOUS PACING**

**Scenario: JENNY BROWN**

**Patient : Jenny Brown 60 yo**

Presenting complaint:

Unconscious collapse at the shopping centre approximately one hour ago. She felt light headed prior to this but she did not have any chest pain.

He husband brought her to the ED

When we arrived she had a GCS15 HR 38 and BP 110/60.

Shortly after arrival she complains of being dizzy and she seems a bit confused her obs are:

HR 33 BP 80/58 GCS 14 O2sats 98% RA RR 18

The nurse presses the emergency buzzer.

All pharmacological treatments administered such as atropine , adrenaline, isoprenaline have minimal affect.

Transcutaneous pacing improves output.

Facilitator #1:

Operates console and observes scenario

Facilitator #2

Observes scenario

**Actors:**

Nurse: Mrs Brown had an unconscious collapse at the shopping centre approximately one hour ago. She felt light headed prior to this but she did not have any chest pain.

When we arrived she had a GCS15 HR 38 and BP 110/60.

She just complained of being dizzy and she seems a bit confused her obs are:

HR 33 BP 80/58 GCS 14 O2sats 98% RA RR 18

**Room Set Up**

“MOCK SCENARIO” Sign on Door

 nursing chart at end of bed with observations

 medication chart- empty

 fluid chart – empty

1 18G IV cannula insitu

Patient in hospital gown

Covered with two blankets

ECG – complete heart block

Oxygen saturation monitoring
02 mask and nasal prongs

Non invasive BP monitoring

Resus trolley

Defibrillator/ Pacer

Defibrillation/ Pacing pads

Intubation equipment checked and available

* 7 cm endotracheal tube (ETT)
* LMA size 4,5
* NPA
* Guadels
* 20 ml syringe
* Satin slip introducer
* ETCO2 monitoring
* Lubricant
* McGill’s forceps
* Laryngoscope
* Size 3 & 4 McIntosh blades (light source checked and functioning)
* Tape to secure ETT

Drugs available for rapid sequence intubation (RSI) and treatment:

* Thiopentone 500mg powder for reconstitution
* Suxamethonium 100mg in 2ml
* Ketamine 200mg in 2ml
* Propofol 200mg in 20ml
* Midazolam 5mg in 5ml, 5mg in 1ml, 15mg in 3ml, 50mg in 10ml
* Fentanyl 100 micrograms in 2ml, 500 micrograms in 10ml
* Rocuronium 50mg in 5ml, 100mg in 10ml
* Vecuronium 4mg or 10mg powder for reconstitution
* Metaraminol 10mg in 1ml
* Adrenaline 1mg in 1ml, 1mg in 10ml
* Atropine minijet, 600 micrograms in 1ml
* 1mg Adrenaline 1:1000
* 1mg Adrenaline 1:10000
* 1mg Adrenaline Minijet
* Aramine 10mg
* Isoprenaline
* N/saline bags 100ml/ 200ml/ 500ml/ 1lit

**Protocols**

 Isoprenaline infusion protocol

 Adrenaline infusion protocol

 Morphine infusion protocol

 Midazolam infusion protocol

**Console Instructions:**

HR to 32 with CHB

Decrease BP to 80/40

Maintain sats initially at 98%

Jenny becomes slightly confused and complain of dizziness

*Treatment of CHB*

Atropine 600mcg to 2mg increase HR to 45 with no change in BP

Adrenaline boluses of 20-50mcg no change in HR or BP or with Adrenaline or Isoprenaline infusion

With application of external pacemaker increase HR to 70 and provide electrical capture with subsequent increase in BP to 120/70

If not sedated prior to commencing pacing , groan loudly and complain about pain from electrical pacing

 **Learning objectives**

* Transcutaneous Pacing is a rapid, minimally invasive method of emergency cardiac pacing
* It may temporarily substitute for transvenous pacing.
* Electrodes are applied to the skin of the anterior and posterior chest walls, and pacing is initiated with a pacer.
* In an emergency setting, this pacing technique is faster and easier to initiate than transvenous pacing.
* *temporary* and is indicated for short intervals as a bridge until transvenous pacing can be initiated or until the underlying cause of the bradyarrhythmia (e.g., hyperkalemia, drug overdose can be reversed
* During an asystolic cardiac arrest, although there is little evidence that external pacing is successful in this setting. Randomized studies which have compared external pacing by paramedics with other approaches to treat asystole have shown little difference in mortality, and survival is poor regardless of the approach used
* minimally invasive.
* prehospital use and inhospital use in the cardiac catheterization laboratory, operating room, intensive care unit, and on general medical floors.
* The technique may be preferable to transvenous pacing in patients who have received thrombolytic agents.
* Limited experience suggests that TCP also may be useful in the treatment of refractory tachydysrhythmias by overdrive pacing
* Although small pediatric electrodes for TCP have been developed, experience with pediatric TCP has been limited.

**Indications**

Symptomatic\* bradycardia unresponsive to pharmacological treatment ( atropine, isoprenaline, adrenaline)

* Mobitz II
* Complete Heart block

\*Symptomatic bradycardia : haemodynamic compromise, altered level of consciousness and heart failure.

 **Contraindications**

* Asystole

**Equipment**

Transcutaneous pacemakers have demand and fixed mode pacing

They are often combined with a defibrillator in a single unit.

All transcutaneous pacemakers have similar basic features.

Most allow operation in either a fixed rate (asynchronous) or a demand mode (VVI).

Most allow rate selection in a range from 30 to 200 beats/min.

Current output is usually adjustable from 0 to 200 mA.

combined defibrillator-pacemakers can use a single set of electrodes for ECG monitoring, pacing, and defibrillation.

**Patient preparation**

Inform patient and the relatives

Obtain consent where possible

**Minimizing discomfort**
Pain is related primarily to contraction of skeletal muscle. This can be minimized by proper anterior pad placement, specifically, just medial to rather than directly over the left pectoral muscle, and by using the minimum current necessary to ensure electrical capture.

Sedation with a short-acting agent, such as midazolam, an intravenous analgesia with an opiate, or both should be considered if the clinical situation permits their use.

Sedation may be necessary to improve tolerance of transcutaneous pacing.

Consider agents that will provide the most cardiovascular stability

**Pad application**

Prepare chest wall

Remove clothing and jewellery from chest area

Ensure skin is dry

If hair prevents good pad contact with the skin, shave the area before applying pads.

Place electrode pads on patient’s chest:
Pacemaker pads, often labeled "front/back" or "anterior/posterior"

Anterior-lateral placement position ( over right precordium and over cardiac apex )

Anterior-posterior placement position ( over the cardiac apex and just medial to the left scapula) .

Use a rolling motion to avoid forming air pockets at the interface between the skin and pads

Do not place pads over open cuts, sores, GTN patches or metal objects.

Do not reverse the pads.

Connect the pacing electrode pads to the defibrillator.

ECG monitoring leads should also be attached if the pacemaker pads are not multifunction electrode pads. If an ECG monitor is not an integral part of the unit, *an output adapter to a separate monitor is required* to “blank” the large electrical spike from the pacemaker impulse and allow interpretation of the much smaller ECG complex. Without blanking protection, the standard ECG machine is swamped by the pacemaker spike and is uninterpretable. This could be disastrous because the large pacing artifacts *can mask treatable ventricular fibrillation*

*Turn the defibrillator / montor ON*

*Turn Pacer ON*

*Select Pacing Mode:*

1. *Demand Mode ( Synchronous Pacing):*

*Senses intrinsic myocardial electrical activity*

*Delivers pacing impulse when underlying heart rate is below the preset pacing rate*

*LED marker is evident on each intrinsic QRS waveform that is detected by a sensing mechanism*

***Pacing generally should be started in the synchronous (demand) mode***

1. *Fixed mode ( Asynchronous pacing)*

*Does not sense intrinsic myocardial electrical activity*

*Delivers pacing impulse at preset regular fixed rate,* independent of intrinsic cardiac activity. In theory, this could induce arrhythmias if stimulation occurs during the vulnerable period of the cardiac cycle.

*Set the Pacer Rate:*

* *Select rate 80-100bpm*
* For most patients, the heart rate should be set to 80.

Establish Electrical Capture

The current should initially be set to zero milliamperes (mA).

The current (output) is increased in 10-mA increments until each pacing spike is followed by a broad complex QRS . This indicates Electrical Capture.

Confirm Mechanical Capture

Once electrical capture is established assess the patients carotid or femoral pulse

The presence of a pulse confirms mechanical ( physiological ) capture

Check the patients blood pressure. If low , this can be improved by increasing the heart rate

Observe the patient for signs of improved circulation once pulse is established:

Improved skin colour and warmth

Improved mentation

The patient may require increased sedation as the conscious level improves

Preparations should be made for placement of transvenous pacing once TCP is established

**Complications**
***Pain*** is the most common side effect and as noted above may be minimized by proper pad placement, use of the lowest effective current, and judicious administration of sedatives and analgesics.

***Coughing and hiccups*** may occur secondary to stimulation of the diaphragm and thoracic muscles.

***Skin burns*** have been reported with prolonged use.

Troubleshooting Pacing:

Failure to Capture



Single pacing spike not followed by QRS complex

* Increased pacing threshold – increase output setting, replace multifunction defibrillation electrode pads
* improper pad placement (directly over the sternum, scapula, or thoracic spine)
* poor skin contact (excessive hair, wet skin, or pad loosely applied)
* inadequate current output
* faulty or improperly set-up equipment.
* Loose connections
* Lead fracture
* Battery failure / not connected to AC source
* Anatomic impediments to current delivery may include fluid (pericardial effusion) or air (pneumothorax, chronic obstructive pulmonary disease [COPD]).

Failure to sense

 

* Loose connection
* Lead fracture

Interference on heart rhythm waveform:

* + Monitoring electrodes placed too close to pacing electrodes
	+ Unable to detect intrinsic R wave – change monitoring lead election

 ILCOR Guidelines, 2005

*Treatment Recommendation*

* For symptomatic bradycardia, give atropine 0.5 to 1 mg IV, repeated every 3 to 5 minutes, to a total of 3 mg.
* Be prepared to initiate transcutaneous pacing quickly in patients who do not respond to atropine (or second-line drugs if these do not delay definitive management).
* Pacing is also recommended for severely symptomatic patients, especially when the block is at or below the His-Purkinje level.
* Second-line drugs for symptomatic bradycardia include dopamine, adrenaline, isoproterenol,and theophylline.
* Consider IV glucagon if β-blockers or calcium channel blockers are a potential cause of the bradycardia.
* Atropine should not be used in patients with cardiac transplants.

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