Synchronised electrical cardioversion

Synchronised electrical cardioversion (SEC) is the delivery of a shock to the myocardium to terminate a tachyarrhythmia. To minimise the risk of inducing cardiac arrest the shock is timed (synchronised) so that it is delivered with the R wave.

**Indications**
SEC is indicated if the patient has a tachyarrhythmia and is unstable and compromised, for example with impaired consciousness, chest pain, heart failure, hypotension or other signs of shock (Nolan et al, 2005). It can also be considered if drug therapy is ineffective.

**Synchronisation**
The shock must be delivered with the R wave and not the T wave (Deakin and Nolan, 2005), as delivery of the shock during the refractory period of the cardiac cycle (T wave) could induce ventricular fibrillation (Tawn, 1967). The defibrillator must therefore be synchronised with the electrocardiogram reading.

Sometimes synchronisation can be difficult in ventricular tachycardia. If the patient is unstable the shock should be delivered unsynchronised to avoid a prolonged delay in restoring sinus rhythm (Resuscitation Council (UK), 2006).

**Monophasic and biphasic waveforms**
A monophasic waveform is when the shock travels from one paddle to the other. A biphasic waveform, which is more effective, is when it travels from one paddle to the other and then back again (Page et al, 2002).

For cardioversion of a broad complex tachycardia and atrial fibrillation, 120–150 joules (J) biphasic (200J monophasic) is recommended initially. For cardioversion of a regular narrow complex tachycardia or atrial flutter, lower energy levels are usually successful (70–120J biphasic and 100J monophasic) is recommended initially (Resuscitation Council (UK), 2005).

**Safety considerations**
Due to the risk of a cerebral embolism arising from stasis of blood in the left atrium, a patient who has had atrial fibrillation for more than 48 hours should normally not receive SEC until she or he has been fully anti-coagulated, or if transoesophageal echocardiography has confirmed the absence of an atrial clot (Resuscitation Council (UK), 2006).

**Procedure**
- If possible record a 12-lead ECG.
- Explain the procedure to the patient. Consent should be obtained if possible. If the patient is conscious, she or he must be anaesthetised or sedated for the procedure (Nolan et al, 2005).
- Ensure the resuscitation equipment is immediately at hand.
- Establish ECG monitoring using the defibrillator that is going to be used for cardioversion (Fig 1).
- Select a monitoring lead that provides a clear ECG trace on the monitor, for example lead II.
- Press the ‘synch’ button on the defibrillator (Fig 2).
Check the ECG trace to ensure that only the R waves are being synchronised (Fig 3). In other words, a ‘synchronised’ dot or arrow should appear on each R wave and not on any other parts of the ECG complex, for example on tall T waves.

Apply defibrillation gel pads to the patient’s chest, one just to the right of the sternum, below the right clavicle, and the other in the mid-axillary line, approximately level with the V6 ECG electrode or female breast (Deakin and Nolan, 2005).

Select the appropriate energy level on the defibrillator (see above for recommended levels).

Position the defibrillator paddles firmly on the defibrillation pads (Fig 4).

Charge the defibrillator and shout ‘stand clear’.

Perform a visual sweep to ensure that all personnel are clear.

Check the ECG monitor to ensure that the patient is still in the tachyarrhythmia that requires cardioversion, that the synchronised button remains activated and that it is still synchronising with the R waves.

Press both discharge buttons simultaneously to discharge the shock (Fig 5). There is usually a slight delay between pressing the shock buttons and shock discharge.

Re-assess the ECG trace. The ‘synch’ button will usually need to be reactivated if further cardioversion is required (on some defibrillators it is necessary to actually switch off the ‘synch’ button if further cardioversion is not indicated). Stepwise increases in energy will be required if cardioversion needs to be repeated (Deakin and Nolan, 2005). Amiodarone is indicated if three attempts at cardioversion have been unsuccessful (Nolan et al, 2005).

After successful cardioversion, record 12-lead ECG.

Monitor the patient’s vital signs until they have fully recovered from the anaesthetic or sedative.

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**REFERENCES**


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**PROFESSIONAL RESPONSIBILITIES**

All nurses who carry out clinical procedures must have received approved training, undertaken supervised practice and demonstrated competence in the clinical area. The onus is also on the individual to ensure that knowledge and skills are maintained from both a theoretical and a practical perspective. Nurses should also undertake this role in accordance with an organisation’s protocols, policies and guidelines.