CIED (Cardiac Implantable Electronic Devices) - Surgical Patients - Full Clinical Guideline

Reference no.:CG-CARDIO/2023/015

- **Objective** To ensure the safe planning and delivery of procedures using diathermy or other forms of electromagnetic interference (EMI) for patients with CIED's.

Scope

- There are two main categories of CIED: permanent pacemakers and implantable cardioverter defibrillators (ICDs) which are also pacemakers.
- ICD sensing can be deactivated by taping a magnet firmly in place over the palpable device.
- Pacemaker inhibition in a pacemaker only device i.e., not an ICD, can be prevented by taping a magnet firmly in place over the palpable device.
- Some ICDs produce an audible tone upon magnet application (sometimes a brief tone and sometimes on every R wave) which indicates that the device has been deactivated and the magnet is correctly placed.
- In the event of uncertainty about device type or management in any given clinical scenario please obtain advice from the pacing clinic or on-call cardiologist.

Pacemakers

- There is a small risk that pacemaker output can be inhibited by diathermy/ electromagnetic interference (EMI). Electro-stimulation leading to EMI includes but is not limited to Trans-cutaneous electrical nerve stimulation (TENS), Gastric electrical stimulation and Neurostimulation. For patients who are pacemaker dependent this could cause a period of asystole if a magnet is not applied. A magnet taped over the pacemaker will prevent any inhibition of pacemaker function. Magnet application causes asynchronous pacing mode with a rate of usually 80 – 100 bpm.

ICD

- There is a risk that an ICD will sense diathermy/EMI which could initiate shocks from the device. A magnet taped over the ICD will temporarily deactivate the ICD and prevent shocks caused by diathermy. Any time the magnet is removed the ICD will perform normally and will deliver normal function (e.g., any appropriate therapy in the instance of a fast heart arrhythmia**).** A magnet over an ICD does not affect pacemaker function in any way. Most ICD patient are not pacemaker dependent.

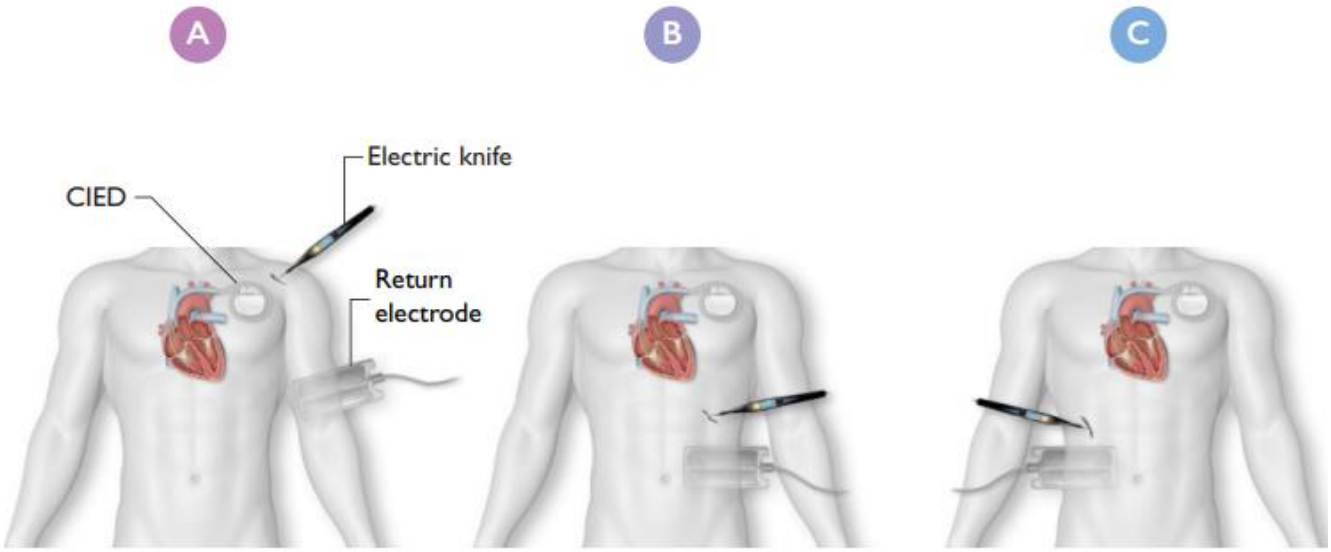
It is recommended that patients with temporarily deactivated ICDs have continuous ECG monitoring, and during the peri-operative period are accompanied by personnel skilled in early detection and treatment of arrhythmias. In high-risk patients (e.g. pacemaker-dependant or ICD patients), or if access to the torso will be difficult during the procedure, it is recommended to place transcutaneous pacing/defibrillation pads prior to non-cardiac surgery

ICD patients who are also Pacemaker Dependent .

- A magnet should still be applied to deactivate the ICD when the patient is having diathermy.
- However the magnet application will not affect pacemaker function and therefore there is a small risk of the pacing output being inhibited by diathermy.

- Where standard diathermy/electrocautery is unavoidable, limit its use to short bursts and ensure that the return electrode is anatomically positioned so that the current pathway
- between the two electrodes is as far away from the CIED as possible. Use bipolar configuration. The ECG should always be monitored and in the case of pacing inhibition, the diathermy burst stopped.

Conclusion – In a patient with an ICD, the magnet response will always be to deactivate an ICD and the pacing behaviour will not change to asynchronous mode. If an asynchronous mode of pacing is manifest following application of a magnet, it is highly unlikely that an ICD is present .



Optimal location of return electrode during unipolar electrosurgery in patients with cardiac implantable electronic devices, depending on the surgery site. CIED, cardiac implantable electronic device. Use of bipolar electrocautery, short (,5 s) bursts of impulses, with the lowest effective energy, operating with

pen or stylus away (.15 cm) from the device can minimize the risk of interference with the device. (A) Surgery site on ipsilateral site above CIED. (B) Surgery on ipsilateral site below CIED. (C) Surgery on contralateral site

Process for managing cardiac devices.

Pre op

- At point of identification that a patient due to undergo surgery has an implanted cardiac device (CIED) the surgical team (e.g. surgeon, anaesthetist or pre-op assessment nurse) should attempt to determine whether this is (GROUP A) bradycardia-treatment (regular-type) pacemaker or cardiac resynchronization pacemaker (CRT) or (GROUP B) a 'high-energy' tachycardia-treatment device with the capacity to deliver anti-tachycardia pacing or shocks. These include ICDs and CRT-D devices. This information can be found under 'Pace-care' visits in the results section of iCM, or by telephoning the pacing clinic (89011 or 88839, 9-5pm Mon-Fri; or the on-call cardiology registrar out-of-hours).
- The surgical team should determine whether diathermy/EMI (especially unipolar or electrocautery) is likely to be required during surgery.
- The pacemaker clinic will advise on the patient's level of pacing dependency and intrinsic rhythm. This is usually most relevant for bradycardia-treating pacemakers. A pacing amount of 99% or above is associated with pacemaker dependency.
- Pacemaker intervention: Intervention is generally performed by magnet application rather than re-programming. Advice will be given by Pacing clinic. For Group A (brady pacemaker/CRT) devices a magnet will set 'asynchronous pacing mode' and prevent inappropriate pacing inhibition due to electrical interference e.g., diathermy. For Group B devices magnet application generally leaves bradycardia pacing unaltered but deactivates tachycardia treatments (anti-tachy pacing and shocks).
- Magnet application: there may be cases where it is felt that magnet placement is contraindicated due to a) the proximity to the surgical site or b) movement of the patient, c) large body habitus. In these cases, the ICD can be programmed off by the Physiologists from pacing clinic preoperatively, but must be programmed back on post op. **These cases need to be booked in advance with pacing clinic.**
- OOH/ emergency cases. It may not be known or documented whether the device is an ICD or a pacemaker (the patient may be unknown to follow up in Derby). In these cases, tape a magnet over the device which will deactivate ICD therapy (shocks) if present and ECG should be always monitored. In a patient with an ICD, the magnet response will always be to deactivate an ICD and the pacing behaviour will not change to asynchronous mode. If an asynchronous mode of pacing is manifest following application of a magnet, it is highly unlikely that an ICD is present.

During surgery

- To monitor the patient vital signs with ECG and or pulse oximetry during surgery and apply and remove magnet before and after surgery.
- Availability of external defibrillation, with the patient connected pre op to the pads in an AP position away from the ICD in cases where the ICD has been deactivated.

Post Op

- **It is the responsibility of the surgical team and theatre staff to organise magnet application pre-op and magnet removal ASAP post-op.** The pacing clinic can advise on availability of magnets and assist by arrangement but cannot be personally responsible for magnet handling in theatre. *NB: Note ICD therapy remains disabled during magnet application and thus ECG monitoring by theatre/ anaesthetic staff needs to be in place during the period that the ICD is deactivated.*

In the event of Cardiac Arrest

- In the case of cardiac arrest due to Ventricular tachycardia/ventricular fibrillation, removal of the taped-on magnet will result in therapy being delivered by the ICD.
- There is no risk to any healthcare professional performing CPR or touching the patient when an ICD delivers a shock. The shock is internal and low output (<40 Joules) so little or no current is present at the patient's skin.

References

Medtronicacademy.com/feature/magnet

Sjmglobal.com

Bostonscientific.com – magnet use with BSC pacemakers, CRTP and ICDs April 2013.

Documentation Controls

Development of Guideline:	Dr D Kelly - Lead Cardiologist - Cardiology
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