

A case report of caesarean section for a patient with ICD with no magnet deactivation or reprogramming

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Introduction:

- Pacemakers and Implantable Cardioverter Defibrillators (ICD) are highly sophisticated electronic medical implants designed to treat abnormal slow or fast heart rhythms in response to electrical signals within the heart.¹

Electro magnetic interference (EMI) may cause:

- Inhibition of pacing due to ventricular over sensing of EMI. Since these signals are interpreted by the device as R waves, no pacing is generated. This may result in profound bradycardia or asystole in a pacing-dependent patient.
- Misinterpretation of EMI as a tachyarrhythmia, resulting in delivery of inappropriate shock(s) or anti-tachycardia pacing by an ICD.
- Direct damage to the CIED, altering its ability to deliver treatment for ventricular tachycardias or pacing.

- **ICDs are designed to treat life threatening arrhythmias and any EMI’s may be misinterpreted as a ventricular arrhythmia causing inappropriate initiation of anti-tachycardia therapy or delivery of shocks.**
- Inappropriate shocks from an ICD are associated with increased mortality and hence it is avoided during surgery by magnet deactivation or re-programming.
- There is evidence that EMI is more likely to affect device function if it is used near the pulse generator or leads, typically, in surgeries superior to the umbilicus.
- We would like to present an interesting obstetric case with ICD in situ which was performed as per the updated British Heart Rhythm society guidelines. The recent guideline suggests that in surgical procedures below the umbilicus, it is reasonable not to carry out ICD deactivation/pacemaker reprogramming.

Case Report:

- A 30 year old multipara (G4P3) was planned for an elective LSCS.
- She had a history of VF cardiac arrest in 2016 which was successfully resuscitated, followed by a single chamber ICD insertion and a cardiac ablation later that same year.
- She had an emergency LSCS in 2018 and a knee arthroscopy in 2022 under spinal anaesthesia, with magnet deactivation of the ICD.
- Following cardiology opinion and MDT discussion, she was booked for an elective LSCS. Her ICD device was checked for adequate function.
- **A plan was made to follow the recent updated British Heart rhythm society guidelines. As the surgery was below the umbilicus, the ICD was not deactivated.**
- The procedure was performed under spinal anaesthesia with the use of bipolar diathermy uneventfully. A magnet device and a defibrillator were available in theatre if required.

Table: Management of CIEDs during interventional procedures

	Pacemaker		Implantable Defibrillator	
	Pacing dependent	Not dependent	Pacing dependent	Not dependent
Surgery above umbilicus	Consider reprogramming* to fixed rate if prolonged diathermy anticipated***	Monitor during surgery to ensure no inhibition of pacemaker. No reprogramming	Deactivation** of ICD & consider reprogramming to fixed rate pacing Or Magnet application only if prolonged diathermy not anticipated	Deactivation** of ICD Or Magnet application
Surgery below umbilicus	Monitor during surgery to ensure no inhibition of pacemaker. No reprogramming. Clinical magnet should be available	Monitor during surgery to ensure no inhibition of pacemaker. No reprogramming	Monitor during surgery to ensure no inhibition of pacemaker or inappropriate therapies. Reasonable not to deactivate ICD. Clinical magnet should be available	
Cardiac surgery	Reprogramming likely to be required		Deactivation** of ICD +/- reprogramming during surgery	
Eye surgery	As for general surgery if monopolar diathermy is used			
Endoscopy (see below for magnetic anchor guidance)	Consider reprogramming to fixed rate if prolonged diathermy or argon beam anticipated*	Monitor during procedure to ensure no inhibition of pacemaker. No reprogramming	Deactivation** of ICD & consider reprogramming to fixed rate pacing if diathermy/argon anticipated Or Magnet application only if prolonged diathermy / argon not anticipated	Deactivation** of ICD if diathermy/argon anticipated Or Magnet application

Discussion:

- Pacemakers and ICDs have been designed with a high degree of tolerance to electrical and magnetic interference fields and special filtering components have been incorporated to minimise the effects.
- Communication with the cardiac implantable electronic devices (CIED) care team should provide important information about the type of device (PM, ICD, CRT, ICM), adequacy of function, current settings, specific recommendations for reprogramming with a programming machine or magnet application, and clinical implications of the expected response.
- **In a prospective cohort study, use of a monopolar ESU caused clinically meaningful EMI in 20 percent (5/70) of patients during noncardiac surgery above the umbilicus, in 29 percent (10/34) of those undergoing intrathoracic cardiac surgery, but in 0 percent (0/40) if surgery was below the umbilicus.²**
- As per the recent guidelines, for surgeries below the umbilicus, a magnet deactivation is unnecessary, considering the distance between the device and surgical site. However, a magnet should be immediately available for emergency use. Post-op checks are usually not required unless programming has been altered.³

References:

1. <https://bhhs.com/wp-content/uploads/2023/10/CIED-Surgical-Guidance-Derm-2023.pdf>
2. <https://www.uptodate.com/contents/perioperative-management-of-patients-with-a-pacemaker-or-implantable-cardioverter-defibrillator>
3. <https://associationofanaesthetists-publications.onlinelibrary.wiley.com/doi/epdf/10.1111/anae.15728>