Migration of a new generation implantable loop recorder: a case report

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Background
Implantable loop recorders (ILR) are widely used in patients with syncope, palpitations, or cryptogenic stroke. Implantable loop recorder implantation is considered a minimally invasive, low-risk procedure, however, rare complications can occur, including device migration.

Case summary
A 65-year-old woman underwent implantation of the new generation Biotronik ILR—BioMonitor 3—at a typical, standard location as part of recurrent syncope workup. The procedure was unremarkable, without acute complications. The remote communication with the device was lost 1 week later. Chest X-ray and chest computed tomography confirmed device migration into the left postero-inferior part of the pleural cavity. We were able to establish direct device communication from the patients’ dorsum (back). The device was retrieved with forceps during thoracoscopy without further complications.

Discussion
There are few published cases of ILR migration into the pleural cavity. To our knowledge, this is the first published case of subpleural penetration of the new generation of Biotronik ILR (BioMonitor 3) which is small in size and has a sharp antenna. We assume that the ILR migrated about a week post-implantation. We suggest that the subcutaneous implantation be done with a minimal penetration angle and parallel to the sternum with close follow-up after the procedure.

Keywords
Implantable loop recorder • ILR • Biotronik • BioMonitor 3 • Migration • Penetration • Case report

Learning points
• For the small new generation of implantable loop recorders (ILRs), we recommend that the subcutaneous implantation be done with a minimal penetration angle and parallel to the sternum.
• We recommend to consider ILR repositioning in cases of unusually significant local pain post-implantation together with a relatively large measured R wave.

Introduction
Implantable loop recorders (ILR) have considerably changed the role of ambulatory electrographic monitoring in recent years due to their small size, lack of external leads, long battery durability, and excellent safety profile. Despite the low complication rate, rare adverse events were reported. Besides causing local site reactions and infections, ILRs were found to be displaced beyond the site of implantation.

There are a few published cases of ILR migration into the pleural cavity: two cases of Medtronic Reveal LINQ migrations into the pleural space and to the anterior abdominal wall.1,2 Another case of pleural penetration of BioMonitor 2 (Biotronik) was described.3

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Biotronik's next-generation ILR is smaller than its predecessor (77.5 mm × 8.6 mm × 4.6 mm in size), including a small flexible antenna, and comes ready to inject, with the device pre-assembled in a one-piece injection tool.

**Timeline**

| Timeline | Event |
|----------|-------|
| 0        | Insertion of loop recorder |
| Immediately post-procedure | Chest pain |
| 1 day    | Chest X-ray |
| 1 week   | Loss of device sensation by the patient |
| 1 month  | Loss of communication with the device in the standard position |
| 35 days  | Repeat chest X-ray and computer tomography for device location |
| 40 days  | Device extraction through thoracoscopy |

**Case presentation**

A 65-year-old woman with a background of hypertension, stroke, and fibromyalgia was admitted to the cardiology department due to recurrent malignant syncope with no prodrome. Her resting electrocardiogram (ECG) demonstrated sinus rhythm with complete right bundle branch block and left anterior hemiblock. The medical testing included 24 h-Holter ECG, stress-echocardiography, and nuclear test which were unremarkable.

Eventually, she underwent implantation of the new generation Biotronik ILR—BioMonitor 3—according to standard procedure protocol: the skin was pinched perpendicular to the intended tunnelling direction at the left fourth intercostal space between suprasternal notch and left nipple with a small angle. The tunnel was created in the subcutaneous fat-layer in parallel to the skin surface, and the tunnelling tool was advanced until it reached the blue stop. The knob was unlocked, the white handle was fixed and the blue part was pulled back for device release. A clean ECG signal was observed; the measured R wave was 1.98 mV (Figure 1). The wound was unremarkable. Just after the procedure, the patient complained of sharp local chest pain. Chest X-ray demonstrated ILR at the normal expected position, and no pneumothorax was

![Figure 1](https://academic.oup.com/ehjcr/article/5/2/ytab043/6141548) Interrogation of the implantable loop recorder immediately after the implantation showing R-wave amplitude of 1.98 mV.
During the post-procedure period, the patient felt well with no chest pain but kept touching and moving the subcutaneous device until she had stopped feeling it about 1 week later. The remote communication with the device at the standard location was lost and the patient was invited for interrogation in the pacemaker clinic. During that visit, we were able to interrogate the device from the left lower chest area (Figure 2). A repeat chest X-ray (Figure 3A,B) and computer tomography (Figure 4A–C) located the device in the left postero-inferior part of the pleural cavity.

A video-assisted patient thoracoscopy was performed. A 5-mm port was placed in the left mid-axillary line in the fifth intercostal space. The ILR was found free in the pleural space (Figure 5). The device was retrieved with forceps and the patient had no further complications during a follow-up of 40 days.

**Discussion**

We present for the first time a case of subpleural penetration of the new generation of Biotronik ILR (BioMonitor 3). In previously described cases of ILR migration the patients were presented with sharp sudden pleuritic pain on the 5th and 35th days, respectively, correlating with the ILR penetrations dates into the pleural cavity.\(^1\)\(^2\) In our case, we could not identify the exact timing of penetration. The pain was rendered to the "usual" atypical chest pain she had been suffering for a long time, prior to the procedure.

The average amplitude of BioMonitor3 R waves is 0.7 mV. In our case, the relatively large R-wave amplitude of 1.98 mV most probably represented deep device implantation (BIO|CONCEPT. BIOMONITOR III Study, unpublished). The same phenomenon was observed in a previous case.\(^1\)
We speculate that the tip of the device was initially implanted deep with an angulation toward the intercostal muscle. Thereafter, the patient’s manually pushing probably contributed to the migration into the pleural space.

**Conclusion**

For the smaller new generation of ILRs, we suggest that subcutaneous implantation be done with a minimal penetration angle and parallel to the sternum, in order to prevent possible subpleural migration. We also suggest to consider repositioning of the ILR in cases of unusually significant local pain post-implantation which co-exist with a relatively large measured R wave.

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**Supplementary material**

Supplementary material is available at European Heart Journal - Case Reports online.

**Slide sets:** A fully edited slide set detailing these cases and suitable for local presentation is available online as Supplementary data.

**Consent:** The authors confirm that written consent for the submission and publication of this case report including images and associated text has been obtained from the patient in line with COPE guidance.

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