Late Migration of a CardioMEMS™ Wireless Pulmonary Artery Hemodynamic Monitoring Sensor

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The CardioMEMS™ heart failure (HF) system is an ambulatory pulmonary artery pressure monitoring system designed to help manage patients with difficult to control HF symptoms and to reduce the need for hospitalizations due to acute HF exacerbations. It is currently approved for use in patients with New York Heart Association class III symptoms and a previous hospitalization for congestive heart failure within the last year, regardless of ejection fraction.[1,2] The entire system consists of a small pressure sensor (Figure 1) that is percutaneously placed in a branch pulmonary artery and can be remotely interrogated, in the hospital and at home, using a receiver.

Available evidence within the literature indicates that the device implant is a safe process with no major complications being reported.[1–4] The implant procedure is simple and involves a pulling thread that secures the tightly bound sensor to the delivery catheter. Once pulled, the nitinol loops on either end of the sensor spring open and secure the sensor into the branch pulmonary artery by their outward force. The loops are oversized in relation to the artery diameter by design to keep the sensor stable until endothelialization occurs. The loop diameter is 1 cm, whereas the recommended arterial diameter is 5 to 7 mm. In practice however, in many cases, the distal loop may be the only anchor as the proximal loop may be in an artery with a diameter bigger than the loop diameter. Because there is no secure anchoring mechanism (such as a hook or a barb), there is a possibility that even when deployed in an appropriate-sized artery, the sensor may migrate from the deployed position before endothelialization occurs. To the best of our knowledge, no cases of late device migration have been reported in published literature.

In this report, we describe a case in which the sensor was deployed in an appropriate-sized artery but had a late migration after 4 months.

Case Report

The patient is a 70-year-old man with HF with preserved ejection fraction, New York Heart Association III HF symptoms, and history of multiple hospitalizations because of cute decompensated HF over the preceding year. He was referred by his HF team for placement of CardioMEMS™ sensor. In the catheterization laboratory, patient underwent right heart catheterization through right common femoral vein access. This was followed by angiography of the left lower lobe pulmonary artery to identify optimal position for device placement (Figure 2). CardioMEMS™ sensor was successfully deployed into a branch of the left pulmonary artery and placement confirmed under fluoroscopy (Figure 3). Good strength signals were obtained from the sensor post-deployment, and the sensor readings were used per our protocol to help manage his HF.

However, ≈4 months post-placement, we lost signal and no sensor readings could be obtained. A chest x-ray was done to confirm sensor position, and it showed that the sensor had migrated to the right lung (Figure 4). Once the sensor position was identified, we were again able to obtain readings by placing the wand over the new location.

Discussion

We describe a previously unreported complication of late migration of the CardioMEMS™ sensor.

Sensor migration is most likely to happen during the implant procedure especially if implanted in a less than ideal anatomy or if it jumps proximally during implant. However, the mechanisms of late implant migration are not as clear. Possible mechanisms could be placement in a larger than recommended pulmonary artery, a more horizontal rather than vertical orientation of the artery, or a more proximally located artery. None of these were true for this case. Other possible mechanisms could be related to the position in which the patient sleeps (risk of migration might be higher if patient sleeps in the right lateral position in case of a left-sided implant) or violent bouts of coughing, etc. Another interesting observation here was that the sensor actually migrated to the contralateral lung and did not fall back into the right ventricle. This is likely because of the direction of blood flow in the main pulmonary artery and is reassuring.

In this patient, no adverse outcome occurred and the sensor continued to perform well in the migrated location. However, recognition of this possibility (even late after the implant) is important for several reasons. First, during informed consent, this should be discussed with the patient as it is possible that migration to an alternate location may result in device malfunction or worse complications if it migrates to the right ventricle. Second, if the sensor signals are lost, then the possibility of migration into the contralateral lung should be considered and

Received February 21, 2017; accepted February 28, 2017.
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(*Circ Heart Fail*. 2017;10:e003948. DOI: 10.1161/CIRCHEARTFAILURE.117.003948.)

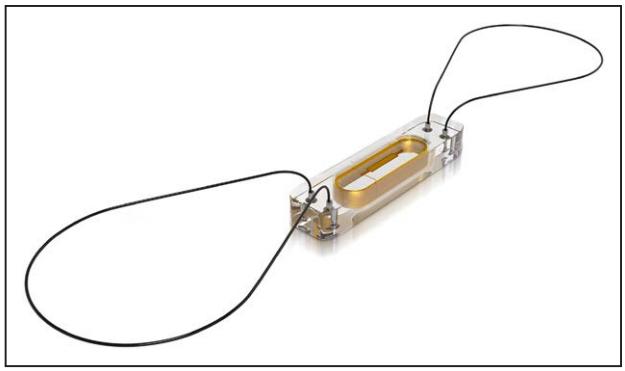
a chest x-ray should be performed. Third, awareness of the possibility of sensor migration should further emphasize the importance of meticulous search for an appropriate-sized branch pulmonary artery to further decrease its chances of occurring.

Conclusions

We describe a case of late CardioMEMS™ sensor migration where the sensor moved from one lung to another after several months. This potential complication of the device has never been reported before.[1–4] Although it did not cause any device malfunction in our patient, this certainly could be a serious complication that warrants thorough consideration during the device's placement and follow-up.

Disclosures

None.



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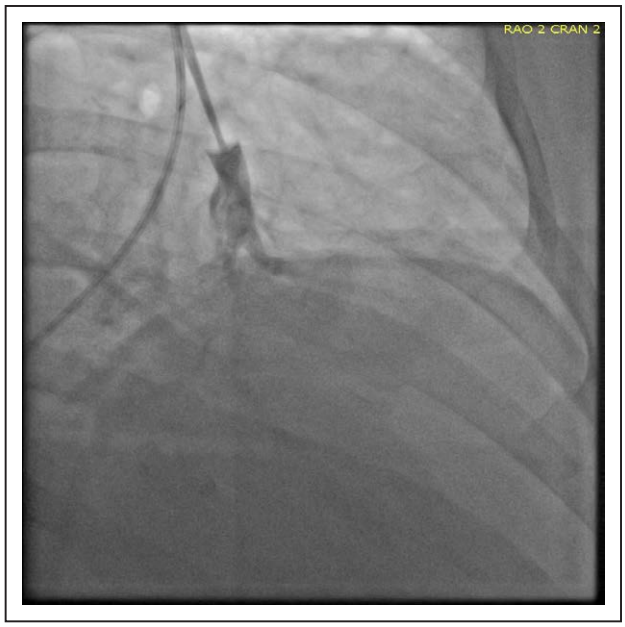

Figure 2. Angiogram of left lung pulmonary artery branch.

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KEY WORDS: cardiac catheterization ■ fluoroscopy ■ heart failure ■ heart ventricles ■ pulmonary artery

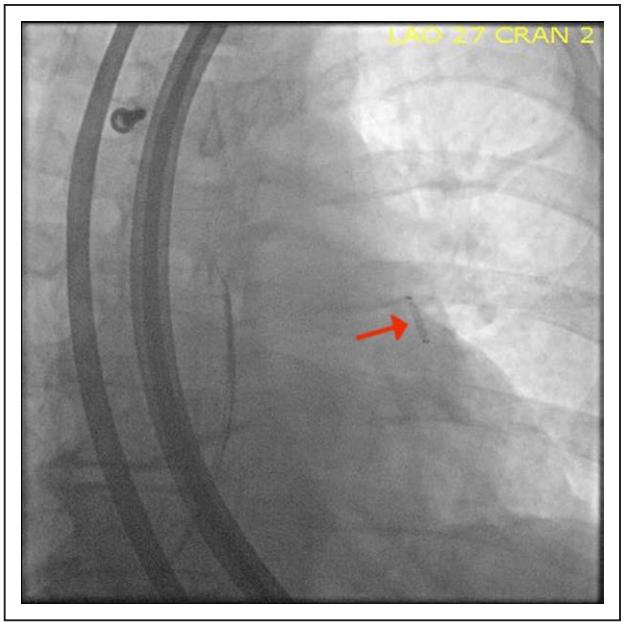

Figure 3. X-ray confirming sensor deployment into the left lung pulmonary artery branch.

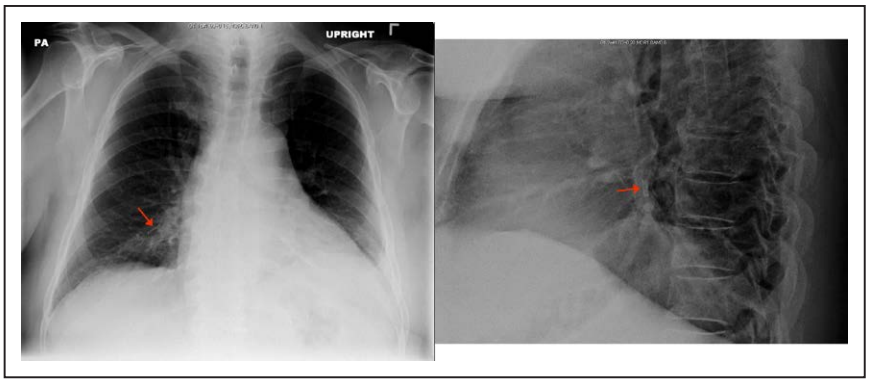

Figure 4. Chest x-ray confirming migration of the sensor into the right lung.

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Circ Heart Fail. 2017;10:
doi: 10.1161/CIRCHEARTFAILURE.117.003948
Circulation: Heart Failure is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231

Print ISSN: 1941-3289. Online ISSN: 1941-3297