

Fracture of the Port Catheter and Migration Into the Coronary Sinus: Case Report and Brief Review of the Literature

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ABSTRACT

INTRODUCTION: Totally implantable venous device has a good safety profile, although certain complications may occur. Late mechanical complications include catheter fracture and cardiac migration which are rarely occurring in approximately 0.1% to 1% of patients.

CASE PRESENTATION: A 33-year-old woman referred by the surgical oncologist for port catheter fragment extraction through endovascular approach. She was asymptomatic on presentation and has a history of hypertension and smoking. Chest X-ray showed a port catheter fragment previously thought to be in the right atrium at the level of 8-9 thoracic vertebrae (right heart catheterization showed that the port catheter fragment was in the coronary sinus). Angiography of the right outflow tract indicates that the fragment was not in the outflow tract or pulmonary arteries but posterior to it. It was concluded that the port catheter fragment had migrated deep into the coronary sinus and the snare was unable to pull the fragment. It was deemed unfeasible to remove the fragment through the endovascular approach.

DISCUSSION: The port catheter fracture had migrated entirely into the coronary sinus and to the deep of our knowledge; this was the fourth case reported in the current literature. We tried to do a review of previous similar case reports; interestingly, this was the only case where the fragmented catheter was situated deep within the coronary sinus without any part of the fragment projected to the right atrium. This made the retrieval of the fragment much more difficult with a high chance of failure.

CONCLUSIONS: Migration of totally implantable venous device into coronary sinus is a rare but possible complication and might be difficult to remove if the position is unfavorable.

KEYWORDS: fracture, totally implantable venous device, port catheter, coronary sinus, migration

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Introduction

Totally implantable venous device (TIVD), also known as a port catheter, is a device that establishes an access to the central venous circulation and is widely used to deliver chemotherapeutic drugs in cancer patients.¹ TIVD has a good safety profile although certain complications may occur. Late mechanical complications include catheter fracture and cardiac migration which are rarely occurring in approximately 0.1% to 1% of patients.² This may cause arrhythmia, thromboembolism, infection, and cardiac arrest prompting fragment extraction through endovascular or surgical removal.³ The site to which the fractured fragments migrate varies, with the most prevalent being the right heart chambers.^{4,5} Coronary sinus is approximately 15 to 65 mm in length, is formed by greater cardiac vein and main posterolateral vein. It is located at the posterior portion of the coronary sulcus and drains directly to the right atrium near the junction of posterior interventricular and coronary sulcus. Thebesian valve may cover the atrial ostium.

Migration of the port catheter to the coronary sinus is very rare and may cause a potentially fatal complication due to thrombosis.^{5,6} We would like to report a case managed by the means of endovascular by an interventional cardiology in which a fractured port catheter fragment was found to have migrated deep into the coronary sinus and unfeasible to remove.

Case Presentation

A 33-year-old woman referred by the surgical oncologist for port catheter fragment extraction through an endovascular approach. Port catheter was implanted 5 years prior for chemotherapy of colon cancer. The catheter was fractured and migrated to cardiac region on X-ray 4 years before admission and the patient refused removal through surgery (endovascular removal was not available at the hospital at that time). She was asymptomatic on presentation and has a history of hypertension and smoking. Cardiopulmonary physical examination and electrocardiography were within



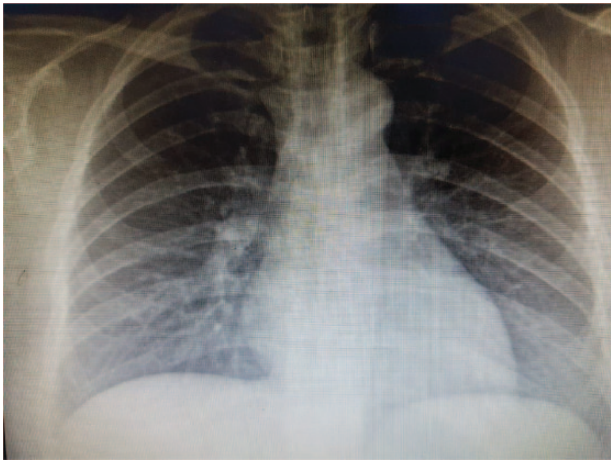


Figure 1. Postero-anterior chest X-ray showed a port catheter fragment previously thought to be in the right atrium at the level of 8-9 thoracic vertebrae.

normal limits. Chest X-ray showed a port catheter fragment, previously thought to be in the right atrium, at the level of 8-9 thoracic vertebrae (Figure 1). On cardiac catheterization laboratory a 12F sheath was cannulated to the right femoral vein and Amplatz Goose Neck 4F was introduced to the right atrium through inferior vena cava from the right femoral vein. Right heart catheterization showed that the port catheter fragment was in the coronary sinus (Figure 2A and B). Angiography of the right outflow tract indicates that the fragment was not in the outflow tract or pulmonary arteries but posterior to it (Figure 2C). It was concluded that the port catheter fragment had migrated deep into the coronary sinus and the snare was unable to pull the fragment. Echocardiography reassured us that the fragment was located in the coronary sinus (Figure 3). It was deemed unfeasible to remove the fragment through the endovascular approach and was decided to proceed

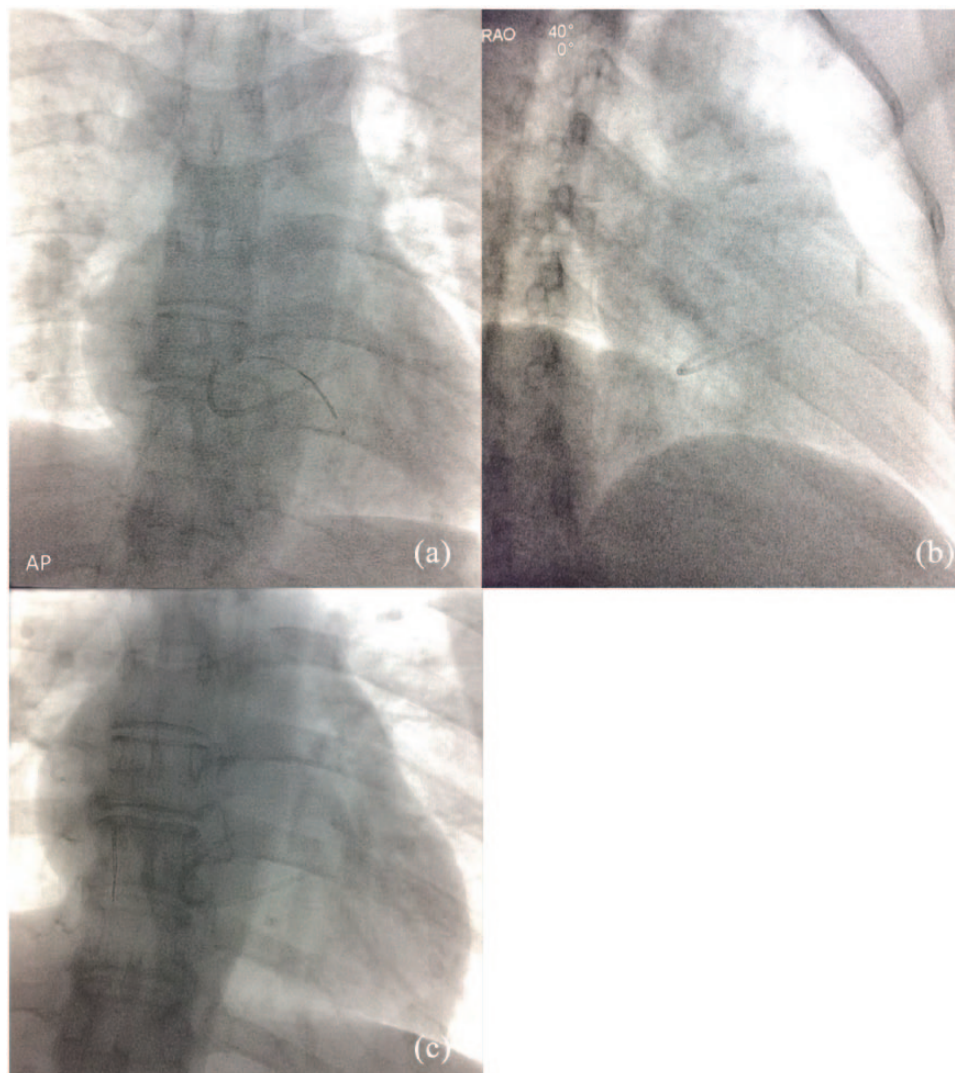


Figure 2. Port catheter fragment was visualized upon right heart catheterization. (A and B) Angiography of the right atrium and ventricle. (C) Fragment was posterior to the right ventricular outflow tract and pulmonary trunk. These indicate that the position of the port catheter fragment was within coronary sinus.

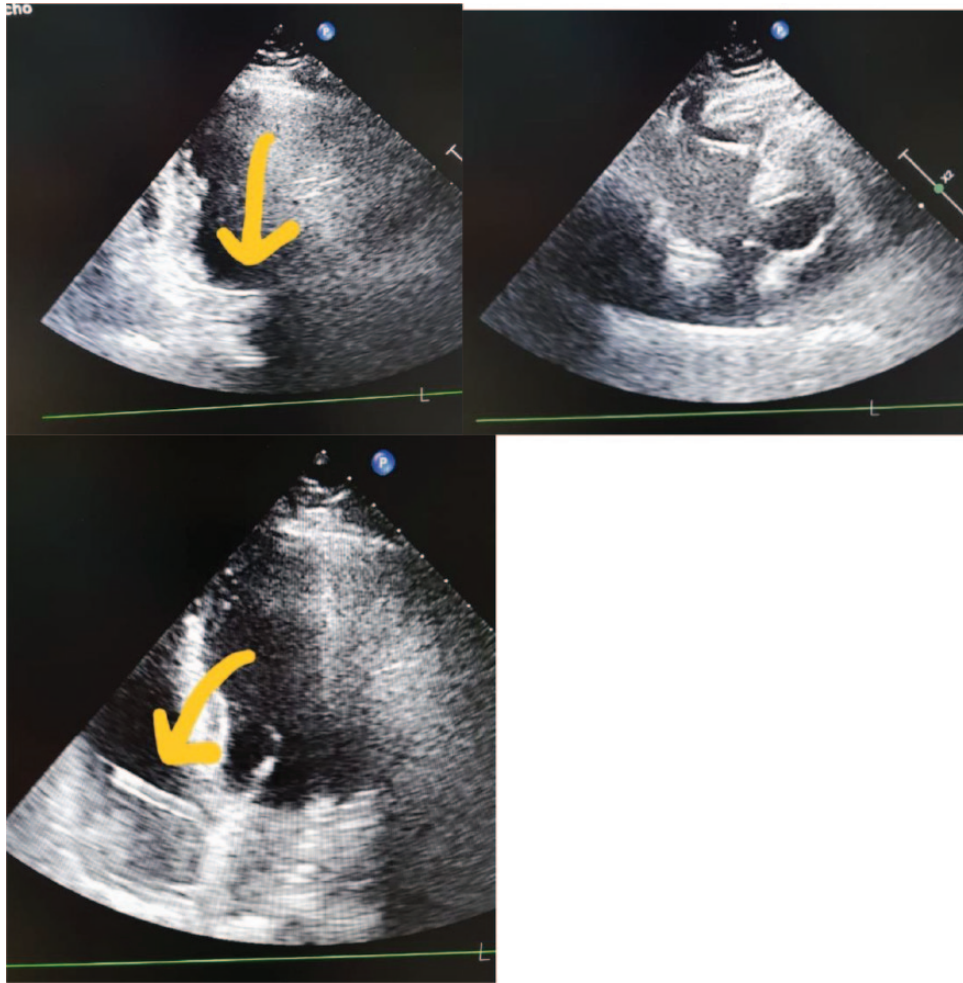


Figure 3. Echocardiography was suggestive that the port catheter fragment had migrated into the coronary sinus.

with surgical intervention. The patient refused the latter and preferred the fragment to be left away as long as it does not cause any symptoms.

Discussion

Port Catheter fracture is a late mechanical complication of TIVD placement.^{2,4} Catheter fracture and rupture was used to be more prevalent in 1970s; it became much rarer (approximately 0.1% of TIVD placement) in recent years.^{2,7,8} This improvement may result from a better port catheter technology which affords more resistance to shearing and higher pressure infusion.⁹ Modern TIVD consists of an injection port and a radiopaque silicone or polyurethane catheter.

Three most identifiable causes of fracture or dissection of the port catheter are (1) *pinch-off syndrome*, a mechanical complication of port catheter placement which was initially reported in 1984 and was a consequence of catheter impingement between the first rib and the clavicle, (2) being some types of external contact force such as the use of seatbelt and tight clothing, (3) flushing of the catheter with small syringe

leading to building up of pressure intra-catheter leading to weakness and subsequent fracture of the catheter over time.¹ Other documented risk factors include products or manufacturing defects, “worn out” or material fatigue, malfixation of the ports to the local tissue causing inappropriate movement of port catheter junction, infection, and sites of TIVD insertion.⁸ A certain type of catheter material, especially polyurethane, has also been shown to be associated with the higher risk of fracture.^{10,11}

The site to which the fractured catheter fragment migrates varies from inferior-superior vena cava, right atrium, right ventricle, hepatic vein, left and right pulmonary artery, and coronary sinus, with the right heart chambers being the most prevalent sites.^{5,7,12} According to Cheng et al., the most common location (proximal-distal part) includes superior vena cava-right atrium (23.9%), right atrium-inferior vena cava (20.6%), right atrium-hepatic vein (11.9%), and right atrium-right ventricle (10.8%).⁴ There are several factors that were shown to affect the location to which the fracture fragments migrate, these include the entry route and gravity, the length and stiffness of the catheter materials,

Table 1. Review of three case reports of port catheter fracture and migration into the coronary sinus.

CASE NUMBER	SYMPTOMS	REFERENCE NUMBER	DEVICE USED	RESULTS AND FATAL COMPLICATION
1	Palpitation	13	Loop-snare	Success, no
2	Asymptomatic	14	Loop-snare and basket	Success, no
3	Cervical pain	5	Loop-snare	Success, no

the pattern of flow in the vessel or cardiac chamber, and patient position/posture at the time of the fracture.⁴

The clinical presentation differs from being asymptomatic, resistance to irrigation, mild pain or swelling in clavicular region, shoulder pain, chest pain or discomfort, palpitation, to lethal arrhythmias.^{1,4,7,8,13} In most cases, the presentation is benign with no or minimal symptoms experienced by the patients. In two case-series studies, an increased resistance to infusion/irrigation was the most common characteristic suggestive of catheter fracture^{4,7} (Table 1).

Cardiac perforation, thrombosis, embolism, dysrhythmia, endocarditis, or sepsis were the fatal complications that may develop due to the migration of fractured port catheter fragment.¹³ To prevent these complications, extraction of the fragmented catheter must be carried out expeditiously by endovascular intervention or surgical approach. Endovascular intervention is the preferred approach due to its effectiveness and lower complication rate compared with surgery.^{1,5,15} There are three techniques available to extract the foreign materials percutaneously: the loop-snare, helical baskets, and the forceps techniques.^{5,14,15} The choice for vascular access includes femoral vein, internal jugular vein, and the basilic vein, although the former is the most commonly used approach.

In our case, the port catheter fracture had migrated entirely into the coronary sinus and to the deep of our knowledge, this was the fourth case reported in the current literature. We tried to do a review of previous similar case reports (Table 1); interestingly, this was the only case where the fragmented catheter was situated deep within the coronary sinus without any part of the fragment projected to the right atrium.^{5,14,15} This made the retrieval unfeasible by endovascular approach. The symptoms caused by the migration of fragment to the coronary sinus seemed to be similar to the other migration sites albeit its rarity. Coronary sinus thrombosis as the fatal complication was not observed in our case.

Conclusions

Migration of TIVD into the coronary sinus is a rare but remains one of the possible migration site. It might be difficult to remove through endovascular method if it is situated deep in the coronary sinus such as the case in our patient. Surgical approach to remove the fragments should be done whenever possible to avoid adverse events.

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Author Contributions

AAL admitted and managed the patient. AAL, RP, and IH drafted the manuscript and perform extensive research on the topic. AT and MW perform extensive research on the topic. All authors reviewed and approved of the final manuscript.

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