Management of a Broken Atrial Catheter Migrated into the Heart: A Rare Complication of Ventriculoatrial Shunt
—Case Report—

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Abstract

A 21-year-old male, who had undergone a ventriculoatrial shunt for hydrocephalus 5 years previously, became stuporous. A roentgenogram revealed that the distal segment of the broken atrial catheter had migrated and become lodged in the heart. Because the fragment had not adhered to the myocardium, it was easily retrieved by the transvenous approach with a retriever catheter. If the migrated catheter does not adhere to the myocardium, transvenous catheter retrieval is absolutely necessary. If, however, the migrated catheter adheres to the myocardium, an open thoracotomy would be required for retrieval, or the alternative of warfarin administration without retrieval may be the treatment of choice, as long as other problems do not occur.

Key words: ventriculoatrial shunt, catheter migration, management

Introduction

The management of hydrocephalus remains a major neurosurgical problem. Clinical investigations have shown that ventriculoperitoneal (VP) shunts are associated with a lower mortality and morbidity than ventriculoatrial (VA) shunts, and are therefore usually the treatment of choice for hydrocephalus. However, where VP shunts are not appropriate, VA shunts remain the second choice.

The most serious complications of VA shunts are shunt infections, thromboemboli, and misplacement or blockage of the atrial catheter. Migration of the distal segment of a broken atrial catheter is a less common but equally significant complication. Holden and Crow retrieved the broken segment from inside the heart via thoracotomy. Tatsumi and Howland introduced a new technique, a transvenous approach using a Curry retriever catheter, and successfully retrieved a broken segment from the right atrium via the transjugular approach.

We report the successful retrieval of the detached intracardiac segment of an atrial catheter by the percutaneous transvenous approach. We also consider whether retrieval of the detached intracardiac catheter is absolutely necessary.

Case Report

A 21-year-old male with hydrocephalus was admitted to our hospital in a stuporous state. Five years previously, repeated malfunctions of VP shunts and the development of peritonitis and ileus had made conversion to a VA shunt necessary. A medium pressure valve was inserted.

Computed tomographic scans identified recurrence of hydrocephalus, suggesting a malfunction of the VA shunt. A roentgenogram showed disruption of the atrial catheter in the right side of the neck. The distal segment of the catheter was detected in his heart.

An 8 Fr introducer was inserted into the right femoral vein. A right ventriculogram of the heart using a 7 Fr angiographic balloon catheter (Berman,
Arrow International, Inc., Reading, Pa., U.S.A.) was performed to determine the precise location of the detached intracardiac catheter segment and rule out adherence to the myocardium. The right ventriculogram showed that the distal tip of the segment had migrated into the pulmonary arterial trunk, but the proximal (broken) end of the segment remained in the right atrium (Fig. 1). Both ends of the segment moved freely with cardiac pulsation, indicating that the segment had probably not adhered to the myocardium. Therefore, pulmonary infarction might result from further migration into the peripheral pulmonary artery. We concluded that retrieval was possible and absolutely necessary.

The balloon catheter was replaced with a Curry retriever catheter (Cook, Inc., Bloomington, Ind., U.S.A.), and we were able to lasso the intracardiac segment within a few minutes (Fig. 2). There was no resistance when gentle traction was exerted on the Curry retriever catheter, so the intracardiac segment had not adhered to the myocardium. We slowly withdrew the Curry retriever catheter together with the lassoed segment. The retrieval was successful without complications. We then revised the VA shunt.

**Discussion**

Neurosurgeons are rarely involved in the management of intracardiac catheter migration. The retrieval would probably be carried out by interventional radiologists or cardiologists. Nevertheless, neurosurgeons should be aware of the problem, because they are responsible for VA shunt procedures.

There are two objectives in the management of the detached intracardiac catheter. First, the shunt must be reestablished to relieve hydrocephalus. Second, thromboembolism, septicemia and cardiac complications, such as arrhythmias and tamponade, must be prevented. The conventional approach to the second objective is the retrieval of the intracardiac catheter. The preferred method is the transvenous approach, which is also used by interventional radiologists. If unsuccessful, an open thoracotomy is usually required, which is highly invasive. However, we wonder whether catheter retrieval is absolutely necessary.

The detached intracardiac catheter may not be such a serious problem, comparable to the silicone-coated electrodes used in permanent pacemakers. Pacemaker complications with lead placement, though rare, do occur. In particular, pulmonary embolism, a fatal complication, occurs in 0.2-3.2% of patients with permanent pacemakers compared to 0.6-3.5% of patients with VA shunts. The statistical difference is not significant. Therefore, if the detached intracardiac catheter adheres to the myocardium and further migration cannot occur, retrieval may not be necessary.

However, the risk of thromboembolism will continue for life in patients with a detached intracardiac catheter fixed in the myocardium as with patients with a pacemaker. Therefore, administration of the warfarin may be necessary to prevent thromboembolism. The intracardiac catheter can then be left in situ as long as other problems do not occur.

In the management of intracardiac catheter migration, the first priority is to determine whether retrieval is necessary. We believe that right ventriculography of the heart should be performed to detect the precise location and mobility of the detached intracardiac catheter, and therefore the pos-
sibility of further migration of the fragment. If the migrated catheter does not adhere to myocardium, retrieval is absolutely necessary, because further migration and subsequent pulmonary infarction may take place. Transvenous catheter retrieval is the technique of choice, followed by open thoracotomy.

If the migrated catheter adheres to the myocardium, cardiac tamponade or severe arrhythmia may occur immediately after withdrawing the retriever catheter that has lassoed the detached intracardiac catheter. Therefore, an open thoracotomy is required for retrieval, but the alternative of administration of warfarin without retrieval may be the treatment of choice, as long as other problems, such as septicemia, endocarditis, arrhythmias, tamponade, etc., do not occur.

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References


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