

## Cut-down method for perm catheter insertion in patients with completely occluded internal jugular vein

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The primary site for a hemodialysis catheter insertion is the right internal jugular vein (IJV) followed by the left IJV and subclavian vein. In cases when veins of the upper extremities are exhausted, femoral veins are an alternative insertion location. Femoral catheter insertions should only be used for short periods because of the increased risk of infection. There is a percutaneous technique to recanalize occluded central veins for hemodialysis catheter insertion. We experienced success with a cut-down method for permcath through a completely occluded IJV. We, therefore, find surgical recanalization to be better than percutaneous method in terms of cost and safety.

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**Key Words:** Cut-down, Internal jugular vein, Occlusion, Perm catheter

### INTRODUCTION

Hemodialysis using a catheter has increased in the United States, Canada, and Europe. The reason for the increased catheter usage is the inability to create functioning arteriovenous fistula (AVF) because of exhausted vessels and comorbidity [1]. The primary site for a hemodialysis catheter insertion is the right internal jugular vein (IJV) followed by the left IJV. Subclavian and femoral veins are alternative insertion locations. It is not recommended to use dialysis catheters for maintenance hemodialysis, because hemodialysis catheters showed a significantly greater morbidity and mortality risk due to infection and central vein obstruction in comparison with the use of AVF and arteriovenous graft (AVG).

Repeated catheter insertion can cause venous obstruction. It is hard to puncture and insert a guidewire into the lumen at an already occluded jugular vein or subclavian vein. In cases where jugular vein or subclavian vein is exhausted, a femoral vein approach can be attempted. Femoral catheter insertions

should only be used for short periods because of the increased risk of infection and central venous obstruction [1]. Herein, we experienced permcath insertion via totally occluded jugular vein due to previous catheter insertion in a patient with end-stage renal disease. In this method, catheter insertion using the femoral vein could be avoided. This is the first report, worldwide, of a surgical method reusing a fully occluded vein for hemodialysis catheter insertion.

### CASE REPORT

This report was approved by the Institutional Review Board of Soonchunhyang University Seoul Hospital (approval number: SCHUH 2019-05-023). A 54-year-old woman was transferred due to permcath malfunction of the left subclavian vein. The patient suffered from diabetes for 20 years. Previous access history was permcath insertion via right IJV 6 months prior, right elbow AVF with primary failure, left elbow AVF with primary failure, and permcath via left subclavian vein.

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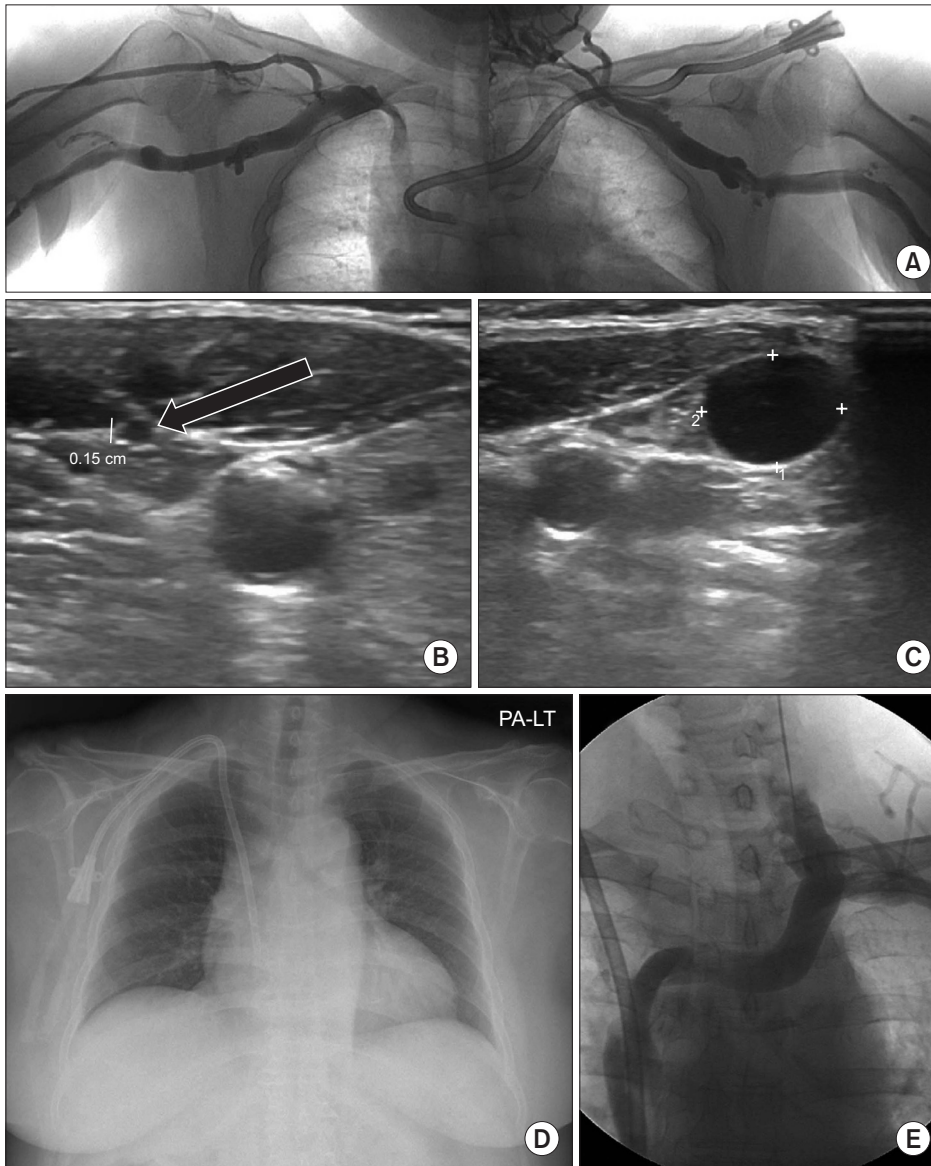
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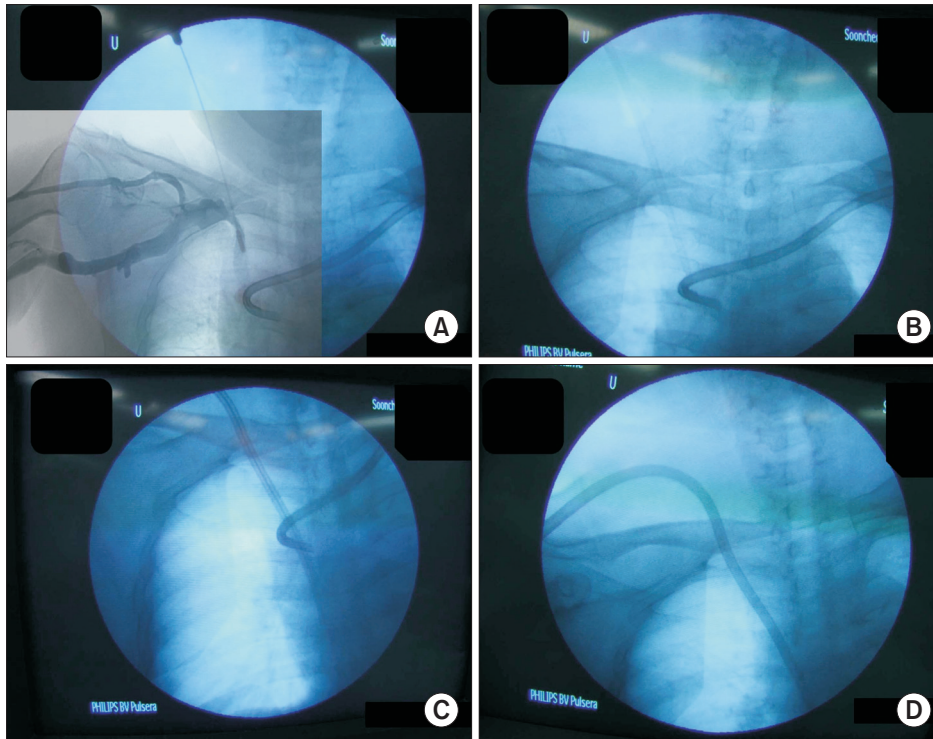


**Fig. 1.** (A) Hemodialysis catheter tip malposition induced catheter malfunction. Both ascending arm venography showed stenosis of the left subclavian vein with collaterals. Right innominate vein stenosis also suspected in the venography. (B) Doppler ultrasonography revealed already occluded right IJV. Diameter of right IJV was checked as 1.5 mm. Lumen of the vein was completely collapsed without compressibility. (C) Diameter of left IJV was about 10 mm without stenosis. (D) Chest X-ray after catheter insertion showed no immediate complications. (E) Venography showed not definite stenosis from left IJV to the right atrium.

Chest X-ray showed catheter tip malposition of the left subclavian vein permcath. Both ascending arm venography revealed left subclavian vein stenosis. Right innominate vein stenosis was also suspected. Doppler ultrasound showed stenotic occlusion of the right IJV. The size of the occluded right IJV was about 1.5 mm. Left IJV was intact, which was about 10 mm in size. The left IJV was preserved for further vascular access creation (Fig. 1).

The procedure was performed under local anesthesia in the supine position. Ultrasound again confirmed the position of the occluded right IJV. An approximately 5-cm longitudinal skin incision was created along the lateral boarder of the lateral limb of the right sternocleidomastoid muscle. Upward retraction of the sternocleidomastoid muscle exposed the carotid artery and right IJV. The adventitia of the IJV was relatively intact. Venotomy was performed in the occluded IJV at a 3-cm distance

from the confluence with the subclavian vein. Garrett vascular dilators were gently inserted into the space that was thought to be the true lumen of IJV. Simultaneously, a C-arm was used to check the trajectory of the Garrett vascular dilator. A dilator, from 1 mm up to 5 mm, was used to dilate the occluded IJV. The vascular dilator tip seemed to reach into the right innominate vein. Aplastic vein dilator was inserted into the IJV. Blood aspiration test confirmed intravascular placement that showed no resistant regurgitation. A hydrophilic guide wire was inserted and a 14.5F 19-cm perm catheter insertion was finished as usual (Fig. 2). The right IJV permcath functioned well. The brachio-jugular AVG created later at the left upper-arm of the patient.



**Fig. 2.** (A) Garrett vascular dilator was inserted into right innominate vein through previously occluded right internal jugular vein. Ascending arm venography was overlapped on the C-arm image. This image confirmed the exact position of vascular dilator. (B) Plastic vein dilator was inserted into the vein. Blood aspiration test showed regurgitation without significant resistant. (C) Tunneled cuffed dual lumen hemodialysis catheter was placed. (D) There was no immediate complication such as hemopneumothorax, catheter kinking, catheter malposition, etc. Immediate catheter function test with syringe aspiration showed no resistant. Left perm catheter removal was done.

## DISCUSSION

Perm catheter is ideally used with a plan for subsequent permanent access. The order of preference for the site of placement of dialysis catheters is right IJV, left IJV, external jugular veins, subclavian veins, and femoral veins [2]. Subclavian catheter placement has a high association with stenosis. Subclavian catheter should be performed in the patient whom further arm accesses will not be planned. In this patient, hemodialysis was initially started with the permcath via the right IJV. After primary failure with right and left elbow AVF, the permcath was inserted via the left subclavian vein. When the patient was transferred to our hospital, left subclavian vein stenosis and right IJV occlusion was diagnosed. The right innominate vein also seemed to be slightly stenosed. However, the left IJV was intact. The diameter of the left IJV was about 10 mm. Jugular venography after left subclavian permcath removal also showed intact flow from the left IJV to the right atrium. The next permanent access could be AVG using the left IJV as outflow at the left upper-arm of the patient. The patient needed bridge permcath. Right IJV and left subclavian vein were stenosed after just one catheter procedure in this patient. Other vein sites such as a right subclavian vein or femoral vein would be at high risk of stenosis. The completely occluded right IJV was surgically reopened and used for catheter insertion successfully.

A percutaneous technique for unconventional access has been introduced in the literature [3]. Needle recanalization is a technique of using a needle to go through a chronically

thrombosed venous segment or to artificially create a new tract to the central vein. This technique creates a new tract by needle for catheter insertion. The mean patency of this percutaneous technique is reported as 13 months [4]. Needle recanalization needs stent insertion or balloon dilatation. Sometimes contrast extravasation into mediastinum could be seen [4]. However, open surgical method can create a passageway through the true lumen or subintimal space of a totally occluded IJV. Garrett vascular dilators have a blunt smooth tip. Vein perforation can be prevented with gentle maneuvering under C-arm guide. Even extravasation in cases of vessel tearing is limited due to totally collapsed jugular vein. Furthermore, a 'cut-down' method is less expensive than percutaneous needle recanalization. With this technique, a previously exhausted vein can be reused for dialysis. Using a femoral vein for catheter insertion could be avoided.

## CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

## ACKNOWLEDGEMENTS

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