# Image-Guided Percutaneous Central Venous Port Insertion: An Alternative and Unconventional Anterior Jugular Vein Approach

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## *Abstract*

Common venous access sites for percutaneous central venous port insertion include the internal jugular, subclavian, and external jugular veins, with the common femoral vein, used less frequently due to a higher risk of infection. However, vascular access becomes particularly challenging in cases of venous occlusion or thrombosis. We report a case of a 38-year-old female with a history of multiple venous access procedures and chronic occlusion of all conventional access sites. CT venography of the thorax revealed a patent right anterior jugular vein, right brachiocephalic vein, and superior vena cava, allowing for a successful image-guided percutaneous central venous port placement via the right anterior jugular vein.

**Keywords:** Anterior jugular vein, internal jugular vein thrombosis, central venous port, venous access.

## Introduction

Central venous port insertion is a widely performed and well-established interventional radiology (IR) procedure, offering a safe and reliable method for long-term venous access.[1] However, in patients with difficult venous access due to prior occlusion or thrombosis, alternative approaches must be considered. Thorough anatomical knowledge and pre-procedural CT venography play a crucial role in identifying nonconventional, yet viable venous access routes.[2]

We present a patient with sickle cell disease and multiple venous access failures, requiring advanced radiological assessment and central venous port insertion to facilitate appropriate treatment.

## Case Report

A 38-year-old female with sickle cell disease was admitted under hematology care due to an extensive vaso-occlusive crisis requiring further management. She had a history of multiple venous/central line insertions—including, peripherally inserted central catheters (PICC), and central venous ports—complicated by thrombosis and line-related infections.

Examination revealed a right chest wall central venous port was observed with dehiscence of the overlying skin and no signs of local inflammation, tenderness, or systemic infection. The patient was alert and hemodynamically stable. Three blood cultures were negative for bacterial growth, and her inflammatory markers, were within normal ranges (Table 1), confirming her suitability for central venous port insertion.

**Table 1:** Coagulation profile and inflammatory markers of the patient.

| Biochemical Parameters | Normal Reference values | Patient Parameters |
|---|---|---|
| Hemoglobin | 11-14.5g/dl | 7.2 |
| Prothrombin time | 9.9-11.5 sec | 10.5 |
| INR | 0.90-1.1 | 0.98 |
| APTT | 26.8-36.8 sec | 31.5 |
| TLC | 2.4-9.$510^9$/L | 8000 |
| C Reactive Protein | 0-5mg/L | 5 |
| ESR | 0-15mm/L | 80 |

A pre-procedural CT venography performed prior to her previous central venous port insertion, revealed complete occlusion of the bilateral internal jugular, external jugular, subclavian, and left brachiocephalic veins. The right brachiocephalic vein and superior vena cava were patent, with the prior central venous port tip positioned in the upper right atrium. A 3D volume-rendered CT venography image demonstrated a dilated and tortuous right anterior jugular vein draining into a patent right brachiocephalic vein as a tributary that opened into the right internal jugular and subclavian veins (Fig. 1).

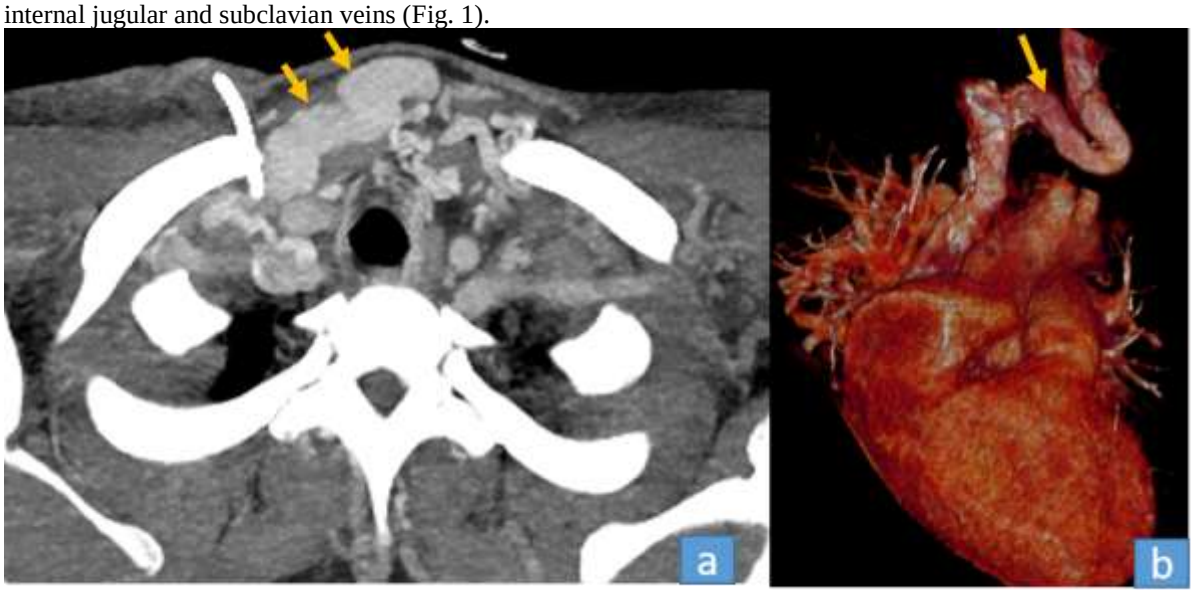


**Figure 1.** (a) Axial contrast-enhanced MIP CT venography image at the suprasternal notch level and (b) 3D VR image demonstrating a dilated, tortuous right **anterior** jugular vein draining into the confluence of right external jugular vein. *MIP: Maximum Intensity Projection; VR: Volume Rendering.*

Given the lack of viable conventional access sites, the patient was referred to interventional radiology (IR) for central venous port insertion. A multidisciplinary venous access team (MDT) determined that instead of placing a temporary central venous line, a new central venous port should be inserted via the prominent right anterior jugular vein, as it was the only available long-term venous access option.

Under aseptic precautions and ultrasound guidance, the horizontal limb of the right anterior jugular vein was accessed using a Micropuncture® Access Set (Cook Medical, USA). A 0.018-inch guidewire was carefully advanced through the horizontal part of the anterior jugular vein into the patent right brachiocephalic vein and further into the right atrium. This wire was then exchanged for a 65 cm long 5F KMP catheter (Cook Medical, USA), and a Radifocus™ Guide Wire M Stiff (Terumo International, Japan) was successfully advanced into the right atrium.

A central venous port was then threaded over the stiff Terumo guidewire, with the catheter tip positioned in the upper right atrium. The left anterior chest was tunneled in a retrograde fashion from the venipuncture site to the central venous port pouch (Fig. 2).

**Figure 2.** (a) Initial fluoroscopic image showing the micropuncture guidewire coursing from the horizontal limb of the anterior jugular vein to the right brachiocephalic vein (arrow). (b) Venogram DSA study obtained through a 5F sheath demonstrating a patent right brachiocephalic vein and superior vena cava (arrow). (c) Post-central venous port insertion final check radiograph showing the left anterior chest wall central venous port (arrow) in situ, with the catheter coursing from the left to the right side. *DSA: Digital Subtraction Angiography.*

The anterior jugular vein central venous port insertion was successfully performed in accordance with the Society of Interventional Radiology (SIR) standards of practice—Quality Improvement Guidelines for Central Venous Access.[3] The previous right anterior chest wall central venous port was removed as it posed a risk of infection due to the overlying skin dehiscence,.

The patient was discharged in satisfactory condition. A three-month interventional radiology follow-up revealed no signs of local infection at the port insertion site, and the port remained patent and functional.

## Discussion

Chronic venous occlusions and difficult venous access are common clinical challenges encountered in clinical practice, particularly in busy interventional radiology (IR) departments. The most frequent causes include long-term venous access requirements, line-related thrombosis, and infections. In most cases, venous access can be successfully achieved through ultrasound-guided venous puncture by a trained interventional radiologist.[4] However, in cases of extensive chronic occlusions, evaluating collateral drainage pathways and the central venous system becomes significantly more challenging. CT venography serves as a crucial imaging modality in such complex cases, aiding in the identification of collateral pathways and potential alternative venous access sites.[5]

The anterior jugular vein is not a commonly utilized site for central venous port insertion due to its small caliber and subcutaneous location, running between the anterior border of the sternocleidomastoid muscle and the midline of the neck.[6] At the root of the neck, the vein courses posterior to the sternocleidomastoid muscle, terminating in the external jugular or subclavian veins on each side. The jugular venous arch, formed by communication between the bilateral anterior jugular veins, is located just above the sternum in the suprasternal space.[7] However, in cases of chronic occlusion of the primary venous access sites, these communication channels may become prominent, leading to dilatation and tortuosity of the anterior jugular vein, thereby establishing collateral circulation. In such cases, the anterior jugular vein may serve as a viable and safe access point.

Common venous access sites for long-term central venous catheters, tunneled dialysis catheters, Hickman lines, and central venous ports include the internal jugular, subclavian, and common femoral veins.[3,8] However, patients with conditions such as sickle cell disease, malignancies, and total parenteral nutrition (TPN) dependence often require repeated, long-term venous access, predisposing them to thrombosis, line-related infections, and chronic occlusions of both the peripheral and central venous systems.[1,3,8]

Alternative unconventional venous access routes, such as transhepatic and translumbar access to the inferior vena cava (IVC), have also been described for dialysis catheter placement. However, these approaches are associated with significant complications, including frequent line occlusion, poor catheter backflow, hepatic vein/IVC thrombosis, and reduced patient compliance, making them less favorable choices.[9,10]

Currently, there are no established consensus guidelines regarding the use of unconventional venous access sites, their long-term outcomes, complication rates, or the ideal timing for cross-sectional imaging. Our case report highlights an alternative, safe, and unconventional venous access site in a select group of patients with extensive chronic venous occlusions. Imaging and a thorough understanding of venous anatomy play a pivotal role in identifying feasible access routes, particularly in challenging cases. However, larger studies with detailed long-term follow-up are required to validate the safety, efficacy, and clinical outcomes of this approach.

## Disclosure

Institution review board (Medical ethical committee) approval was exempted for the case report.

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