

# Thyrocervical artery - jugular fistula following internal jugular venous catheterization

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## ABSTRACT

Arteriovenous fistula (AVF) is an anomalous communication between an artery and a vein, caused by an iatrogenic or traumatic etiology. Surgically created upper limb AVF remains the preferred vascular access for patients on maintenance hemodialysis. Nonetheless central vein cannulation for hemodialysis is a common procedure done in patients who need hemodialysis. We incidentally detected a thyrocervical artery - jugular fistula in a patient on maintenance hemodialysis. He underwent a successful intra arterial coil embolization of the feeding vessel. Review of literature has shown that, a thyrocervical artery - internal jugular vein arteriovenous fistula following a central venous catheterization has not been reported so far.

**Key words:** Arteriovenous fistula, arteriovenous fistula embolization, complications of catheterization, hemodialysis catheterization

## Introduction

Placement of an uncuffed double lumen catheter for initiating hemodialysis (HD) is a common interventional procedure performed by a nephrologist. Right internal jugular vein is the preferred initial access site for catheter placement using the Seldinger technique. It is thought to be safer than the subclavian or the femoral vein sites. Although central venous catheterization is frequently performed, various complications of central venous catheter insertion have been reported. Arteriovenous fistula following central venous catheterization is a very rare complication,<sup>[1]</sup> with only isolated case reports of carotid jugular fistula. Ultrasound-guided central venous catheterization could reduce the complication rate and increase success rate.

We report, a case of an iatrogenic fistula between the thyrocervical branch of subclavian artery and the right internal jugular vein following a failed attempt at internal jugular venous catheterization for HD, which was incidentally detected after a period of 1 year. To the best of our knowledge a thyrocervical artery; internal jugular vein arteriovenous fistula following central venous catheterization has not been described in the literature so far.

## Case Report

A 32-year-old male was diagnosed to have immunoglobulin a (IgA) nephropathy and systemic hypertension in 2010. He progressed to end-stage renal disease within 2 years and was initiated on HD at another center through a non-tunneled uncuffed left internal jugular catheter. He gave history of an attempted right internal jugular catheterization for HD 1 year ago at another center, but the procedure was unsuccessful. He had been undergoing intermittent HD through left radiocephalic fistula for the last 1 year. He was admitted in our center for pretransplant evaluation. Clinically he appeared poorly dialyzed, orthopneic, and pale. On physical examination, blood pressure was 180/100 mmHg, a diffuse thrill was felt, and a bruit heard in the right supraclavicular fossa; systemic examination was unremarkable. Doppler evaluation of neck showed dilated right internal jugular vein with hyperdynamic circulation exhibiting biphasic

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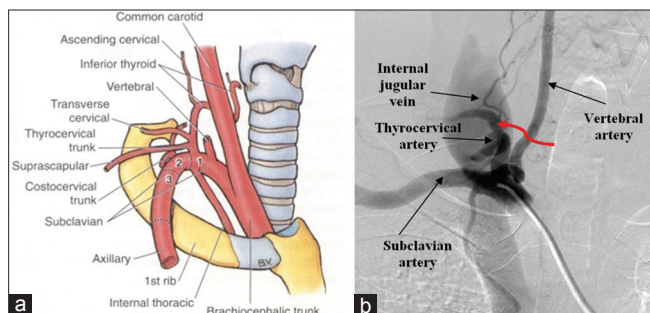
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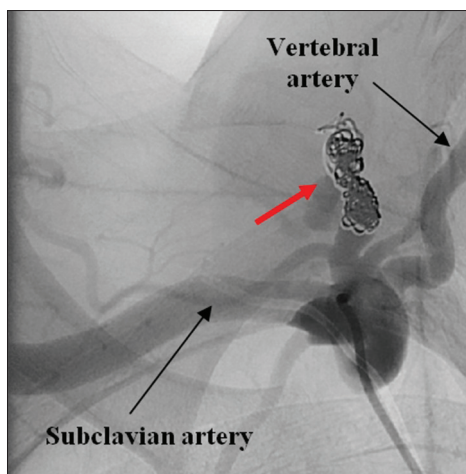
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wave pattern. An angiogram was done which showed an abnormal connection between the thyrocervical branch of right subclavian artery and right internal jugular vein, resulting in dilatation of the internal jugular vein [Figure 1]. Feeder artery was embolized using multiple 035 and 018 coils [Figure 2]. Check angiogram after the procedure showed collapse of the fistulous track [Figure 3] and follow-up angiogram after 48 h shows that the arteriovenous fistula has been completely closed.



**Figure 1:** (a) Graphical representation of the normal anatomy of the subclavian artery and its branches. (b) Shows the patient's angiogram with the abnormal arteriovenous fistula (curved arrow) between the thyrocervical branch of subclavian artery and the internal jugular vein



**Figure 2:** Intra-arterial coil embolization (arrow) of thyrocervical artery



**Figure 3:** (a) Shows check angiogram immediately after the procedure. (b) Angiogram done after 48 h showing complete occlusion of the arteriovenous fistula connecting the thyrocervical branch of subclavian artery and the internal jugular vein

## Discussion

Although arteriovenous fistula is the vascular access of choice for HD, central venous catheters are commonly used in patients with renal failure requiring dialysis. The preferred choice of access for HD would be right internal jugular vein, femoral veins, left internal jugular vein, and finally subclavian vein in that order.

Central venous catheterization has a complication rate ranging from 5 to 19%.<sup>[2]</sup> Complications of central vein catheterization can be classified into mechanical, infectious, and thrombotic complications. Mechanical complications include arterial puncture, hematoma, pneumothorax, hemothorax, cardiac arrhythmia, and malpositioned catheter. The most common predictor of complication is an unsuccessful insertion attempt, with complications rates as high as 28%.<sup>[3]</sup> Vascular injuries during central vein catheter insertion include a wide spectrum of complications, with arterial puncture being the most common. Even though arterial puncture is generally self-limiting, it can lead to substantial morbidity or death. Forty percent of carotid punctures are associated with a hematoma.<sup>[4]</sup>

Traditionally, the site of the needle insertion for central venous catheter insertion is determined by the landmark method; by palpating the structures in relationship to the concerned vein. The use of ultrasound for central venous catheterization increases success rate, while simultaneously decreasing procedural time and complication rate. Central vein catheter placement under ultrasound guidance reduces the risk of carotid puncture (7-10%) to virtually zero.<sup>[5]</sup> Therefore, it should be employed especially in patients who are obese with short neck, those with coagulopathy or on anticoagulant therapy, severe hypovolemia, respiratory distress, and with altered regional anatomy. An iatrogenic carotid jugular fistula is an extremely rare complication. In the literature, the occurrence of carotid jugular arteriovenous fistula has been reported as a rare complication following cannulation of the internal jugular vein.<sup>[6]</sup> Long standing arteriovenous fistula causes venous engorgement of the collateral veins producing a continuous machine like murmur, diminished distal arterial pulse, and ipsilateral limb edema of the extremity; and if left untreated, the fistula may lead to high output heart failure, arrhythmias, or thromboembolic episodes.

Our patient developed a fistula between the thyrocervical branch of subclavian artery and the right internal jugular vein following the failed internal jugular venous catheterization done 1 year ago and clinically he had features of high output cardiac failure.

Although color Doppler, computed tomography (CT), or magnetic resonance imaging (MRI) can identify the arteriovenous fistula, in most cases conventional angiography is still required for accurate localization of lesion and tailoring of the surgical or endovascular treatment.<sup>[7]</sup> Surgical options include partial resection, ligation, and primary repair. Surgical corrections are more common and less expensive in the treatment of arteriovenous fistulas, but carry high perisurgical mortality and morbidity rates in patients on HD or with multisystem problems. Therefore, endovascular procedures are becoming widely popular in the recent years due to the development of new endovascular techniques.

Stent placement<sup>[8]</sup> or transcatheter intravascular embolization<sup>[9]</sup> with metallic coils, covered stent implants, detachable balloons, or glue (N-butyl-2-cyanoacrylate) have been utilized frequently for endovascular treatment of arteriovenous fistulas. Endovascular repair of such injuries is a safe and reasonable treatment option with lower morbidity and mortality when compared to open surgical approach. Our patient successfully underwent intra-arterial coil embolization of the feeding vessel.

## Conclusion

Iatrogenic arteriovenous fistula is a rare complication of internal jugular vein catheterization. Considering the long-term harmful effects of an arteriovenous fistula, prompt measures are to be taken to close the fistula. Intra-arterial coil embolization is a simple and safe option for management, as compared to surgical methods. The use of Doppler-guided venous catheterization is likely to reduce the mechanical complications of central vein catheterization for HD.

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