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Case Report

Percutaneous Closure of an Iatrogenic Radial Arteriovenous Fistula using Handmade Stent Graft: A Case Report

Amdouni Moussi N*, Noamen A, Haggui A, Hajlaoui N and Fehri W

Faculty of medicine of Tunis University Tunis El manar, 27 Beiruth Street Ariana, Tunisia

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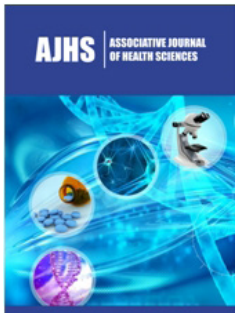

***Corresponding author:** Nourchene Amdouni Moussi, Faculty of medicine of Tunis University Tunis El manar, 27 Beiruth Street Ariana, Tunisia

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Abstract

Background: Iatrogenic arteriovenous fistulas (AVFs) are rare vascular complications following arterial catheterization, particularly with the transradial approach. Although often asymptomatic, they may lead to local or hemodynamic consequences requiring intervention. While surgical repair has traditionally been the standard treatment, percutaneous techniques-especially covered stent implantation-have emerged as effective, minimally invasive alternatives.

Case Presentation: We report the case of a 71-year-old woman with a history of breast cancer, hypertension, and severe aortic stenosis, who underwent coronary angiography followed by percutaneous coronary intervention (PCI) via right radial artery access as part of a pre-transcatheter aortic valve implantation (TAVI) workup. Two weeks after the procedure, she presented with a 1 cm pulsatile mass at the radial puncture site. Clinical examination revealed a palpable thrill without distal ischemia. Doppler ultrasound confirmed the presence of an arteriovenous fistula between the radial artery and the superficial radial vein.

Given the patient's comorbidities and the localized nature of the lesion, a percutaneous approach was selected. A handmade covered stent was constructed intra-procedurally using balloon material and deployed across the fistulous communication via distal radial access. Post-deployment angiography demonstrated complete closure of the fistula, with restoration of normal arterial flow. Clinical resolution was immediate, with disappearance of the thrill. Follow-up Doppler ultrasound confirmed fistula occlusion and good stent patency with laminar flow.

Discussion: This case highlights several important aspects of managing iatrogenic radial AVFs. Although rare, repeated arterial punctures increase the risk of such complications. Early diagnosis using Doppler imaging is essential for optimal management.

Percutaneous closure with covered stents offers a safe and effective alternative to surgery, particularly in high-risk patients. The use of a handmade stent graft represents an innovative solution in settings where commercial devices may be unavailable, demonstrating feasibility and favorable short-term outcomes.

Conclusion: Percutaneous closure of iatrogenic radial AVFs using covered stents is a reliable and minimally invasive strategy. Handmade stent grafts may serve as a practical alternative in selected cases, providing effective fistula exclusion with rapid recovery and low complication risk.

Introduction

Iatrogenic arteriovenous fistulas (AVFs) are abnormal connections between an artery and a vein that can occur as unintended complications of medical procedures such as arterial catheterization. These fistulas can lead to significant clinical symptoms, including swelling, pain, and reduced blood flow to distal extremities, which may necessitate intervention. Traditionally, surgical repair has been the mainstay treatment; however, advances in interventional cardiology have introduced minimally invasive alternatives such as percutaneous covered stent placement.

This case report discusses the successful management of an iatrogenic radial AVF using a handmade stent graft. This approach highlights the efficacy and safety of percutaneous techniques in the treatment of vascular complications. We aim to contribute to the growing body of literature supporting the use of minimally invasive strategies for AVF repair, offering a less invasive option with potentially lower complication rates and faster recovery times compared to open surgery.

Case Report

A 71-year-old female with a history of breast cancer, hypertension, and severe aortic stenosis, admitted to the cardiology department for a coronary artery angiography as part of the pre - transcatheter aortic valve implantation (TAVI) workup via the right radial artery access using a 6-French (6F), 7cm sheath showing a severe stenosis of the right coronary artery, the first diagonal artery and the first obtuse artery. An angioplasty was performed one week later, via the same access, again using a 6F radial sheath. After the percutaneous coronary intervention (PCI), the radial artery sheath was promptly removed. Hemostasis was achieved by applying an adjustable plastic clamp on the radial artery. Over the course of 2 hours, the clamp was gradually released while the access site was closely monitored for any signs of bleeding or hematoma. Once satisfactory haemostasis was confirmed, the clamp was removed.

2 weeks later the patient presented with a 1-centimetre pulsatile lump on the right wrist. She did not experience any finger claudication or numbness. Physical examination revealed a palpable thrill at the right radial puncture site, but there was no evidence of circulatory compromise to the hand. An ultrasound with color Doppler imaging of the right upper limb showed a permeable radial artery with spectral demodulation due to a slight increase in diastolic flow, with a turbulent zone communicating the radial artery with the superficial radial vein presenting an arterialized flow, evoking an arteriovenous fistula. The decision was to opt for percutaneous closure of the arteriovenous fistula via stent implantation.

After the placement of a 6F sheath via the distal radial access, a 6F guiding catheter was used to perform an angiogram of the radial artery showing a connection between the radial artery and the radial vein (Figure1). We then prepared our handmade covered stent with a 3 x 15mm balloon and a 3x25mm stent, the balloon was inflated at 2atm and the proximal and distal tips of the balloon catheter were cut with a surgical blade and removed. The remaining middle shaft of the balloon was extracted as a thin sheet. Afterward the outer surface of the stent was covered with this extracted material and it was compressed between the thumb and index finger to ensure that the material did not peel off from the stent (Figure 2).

Figure 1: Arteriovenous fistula between the radial artery and the radial vein.

Figure 2: Handmade covered stent graft.

After crossing the site of the fistula in the radial artery using a 0.14 guidewire, the produced handmade stent was passed through and was placed at the site of the fistula, and it was inflated up to 12atm (Figure 3).

Figure 3: Closure of the AVF with the handmade stent graft.

The control angiogram showed the sealing of the fistula, and the clinical control showed the disappearance of the palpable thrill.

The next day, we performed a Doppler ultrasound, which showed that the arteriovenous communication was occluded and the stent showed a good patency with a laminar flow.

Discussion

This case report highlights the management of an iatrogenic radial arteriovenous fistula (AVF) in a 71-year-old female with a complex medical history, including breast cancer, hypertension, and severe aortic stenosis. Vascular access site complications are rare [1] but necessitate immediate assessment and management due to their potential for adverse outcomes. These complications can often be treated percutaneously with covered stents, achieving high technical success and thus avoiding the need for high-risk urgent vascular surgery.

An iatrogenic AVF occurs when a fistula, an abnormal connection between an artery and a vein, is inadvertently created during a medical procedure, such as an arterial catheterization.

The transradial approach is associated with a very low rate of vascular complication such as AVF [1].

In our case the AVF developed following repeated percutaneous coronary interventions (PCI) via the right radial artery and as it was proven multipuncture (> 1 puncture) is a predictive factor of a complication such as AVF [2].

Percutaneous treatment by implantation of covered stent was initially described in femoral sites [3-5], showing good results compared to surgery. Iatrogenic AVF was also described in the radial site in many cases [6,7] but its management percutaneously remains rare.

Usually a covered stent, which is a small tube covered with a graft material, is used to occlude the abnormal connection, but in our case we created a handmade stent graft using a balloon [8]. The stent was deployed across the fistula, covering the opening between the artery and the vein.

Post-deployment imaging (angiography) was used to confirm the closure of the fistula and normal blood flow. This outcome underscores the efficacy of percutaneous stent placement in managing iatrogenic AVFs, particularly in patients with multiple comorbidities where surgical intervention poses higher risks.

This case exemplifies the successful application of a handmade stent for the percutaneous closure of an iatrogenic radial AVF. The approach highlights several key considerations: The importance of timely diagnosis and intervention in managing vascular access site complications, the feasibility and effectiveness of using covered stents as a minimally invasive alternative to surgery and the potential for custom stent preparation in situations where commercially available options may be limited.

Conclusion

Percutaneous closure of an iatrogenic radial AVF using a stent is an effective and less invasive alternative to surgical repair, offering quicker recovery and fewer complications. Proper patient selection, careful planning, and precise execution are crucial for the success of the procedure.

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