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Case Report Open Access

Delayed Pseudoaneurysm after PCI Treated by Ultrasound-Guided Manual Radial Artery Compression: A Case Report

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Abstract

Although uncommon, radial artery access site complications are likely to become more frequent with the increased adoption of transradial cardiac catheterization, the incidence of radial artery pseudoaneurysm (PSA) has also increased. The treatments for radial artery PSA include ultrasound-guided radial artery compression, ultrasound-guided percutaneous thrombin injection, and surgical repair. This report is about a delayed radial artery PSA patient after percutaneous coronary intervention (PCI), treated by manual radial artery compression under the real-time monitoring of color Doppler ultrasound (CDU); the effect was significant.

Keywords: Cardiac catheterization; Radial artery access; Complications; Pseudoaneurysm

Introduction

Dr. Campeau reported the percutaneous radial artery approach for coronary angiography in 1989. Since then, this approach has been widely used in clinical intervention diagnosis and treatment due to several advantages: there is no body position restriction, the inflicted injuries are small, and few complications of the puncture site arise [1]. However, with the increasing use of the radial artery approach, the incidence of radial artery pseudoaneurysm (PSA) has also increased. The treatments for radial artery PSA include ultrasound-guided radial artery compression, ultrasound-guided percutaneous thrombin injection, and surgical repair [2]. This report is about a delayed radial artery PSA patient after percutaneous coronary intervention (PCI), treated by manual radial artery compression under the real-time monitoring of color Doppler ultrasound (CDU); the effect was significant.

Case Report

The patient was a 74-years-old woman. She was hospitalized because of increased blood pressure for about 20 years and dizziness for 10 days. The past history included high blood pressure, a lacunar infarction, and cholecystectomy, the latter due to cholecystolithiasis. The family has a history of high blood pressure. Results of the physical examination were as follows: temperature, 36.3°C; respiratory, 20 breaths per minute; pulse, 87 beats per minute; blood pressure, 181/89 mmHg (1 mmHg=0.133 kPa). She was conscious and assumed an active posture. No yellow discoloration or bleeding was seen on skin and mucosa. The lymph nodes were without swelling. The neck was soft and had no vein distension. The lungs were clear for auscultation and had no dry or wet riles. No murmur was heard when examining the heart. The abdomen was soft and non-tender. No lower extremity edema was seen. The physical reflex was normal and no pathological reflex was induced.

Other examinations

ECG: normal sinus rhythm.

Echocardiography: 2-dimensional echocardiography revealed a dilated left atrium. The septum was a little thick. Mild regurgitation was seen in the mitral and tricuspid valves. The chamber sizes were as follows: LA (anteroposterior), 37 mm; LV (anteroposterior), 47 mm; RA (left to right), 42 mm; RV (left to right), 37 mm. The wall thickness was as follows: IVSD, 12 mm; LVPWD, 10 mm. The LV systolic function was: LVEF, 63% (M type); FS, 34%. The LV diastolic function test revealed E/A<1 (mitral valve flow).

A lipid blood test showed the following: total cholesterol-3.88 mmol/L; low-density lipoprotein cholesterol (LDL-C)-2.40 mmol/L; high-density lipoprotein cholesterol (HDL-C)-0.96 mmol/L; and triglycerides-1.98 mmol/L.

The blood routine test, liver function, renal function, and coagulation test all revealed no obvious abnormalities.

In the brain MRI, a lacunar infarction and partial softening lesions were seen in the bilateral frontoparietal white matter and the basal ganglia; brain atrophy was also seen.

Coronary angiography (CAG): The right radial CAG indicated severe stenosis of the left circumflex branch and the right coronary artery. The informed consent was signed and then PCI was performed. The drug-eluting stents were implanted in the left circumflex branch and the right coronary artery stenosis (Figure 1). A TR Band tourniquet was used to stop the bleeding. The patient was sent to the intensive care unit for further observation.

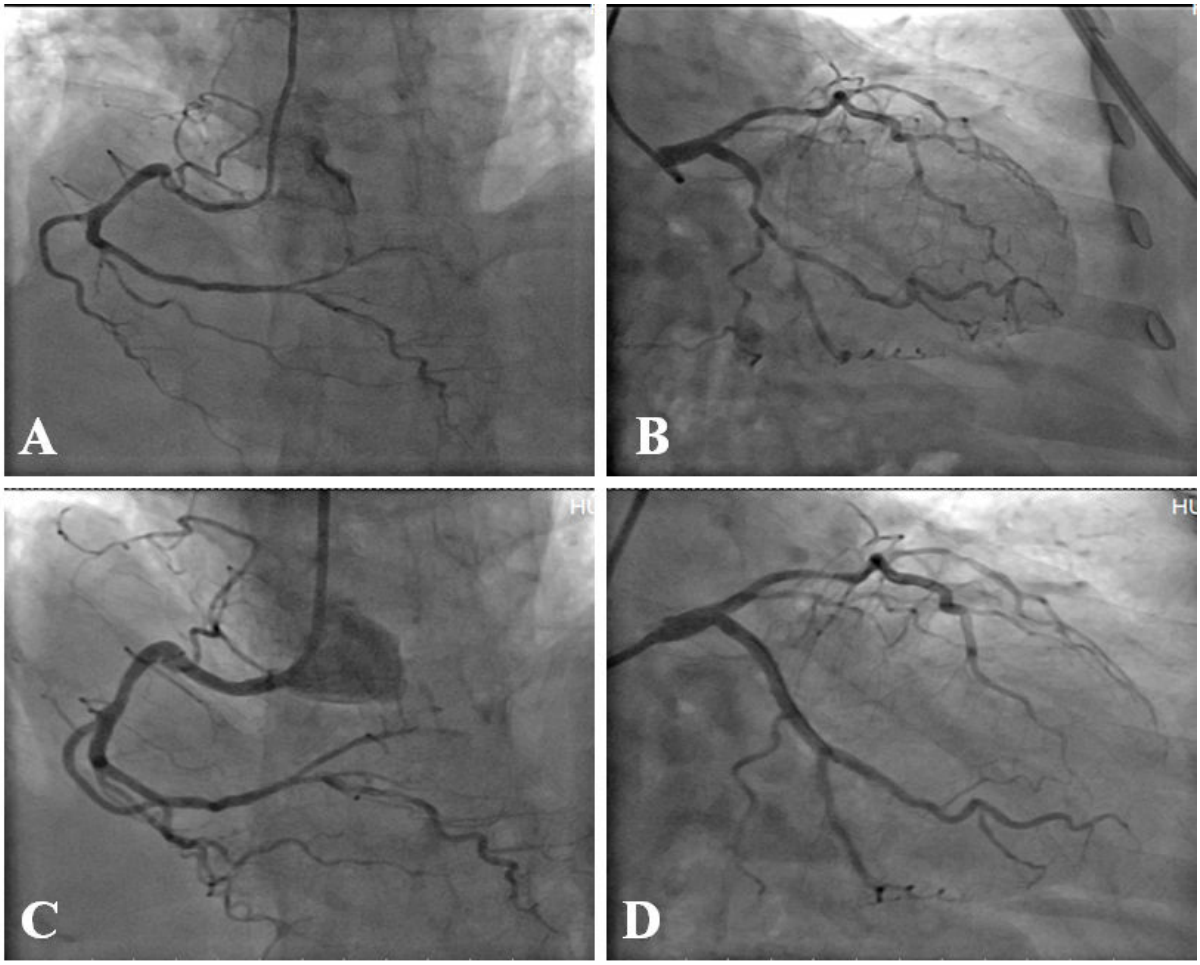

Figure 1: Patient coronary angiography. (A) Before the implantation of the right coronary artery stent. (C) After the implantation of the right coronary artery stent. (B) Before the implantation of the left circumflex branch stent. (D) After the implantation of the left circumflex branch stent.

On the first and second day after PCI, the patient complained of pain in the right radial artery puncture site. No swelling was noted. On the third postoperative day, the patient again complained of pain in the right radial artery puncture site and in the right thumb. By now, obvious swelling was seen in the puncture site. A pulsatile mass was also found by palpation. The local skin temperature had slightly increased. The right wrist and fingers were freely mobile. The peripheral circulation was good and no cyanosis was noted. The possibility of delayed right radial artery PSA was considered.

The radial artery CDU showed an inhomogeneous echo area of approximately 4.3*1.9 cm in the front right radial artery. The shape was irregular, but the border was clear. The blood flow signal was strong in this area. An artery wall rupture with a width of about 0.18 cm was noted between the rear echo area and the radial artery. The spot was localized 1.6 cm from the skin and could be closed under pressure. The color Doppler flow imaging (CDFI) detected bidirectional blood flow signals in the radial artery and the inhomogeneous echo area. At this point, an intravenous injection of morphine (3 mg) was given. Local compression under color ultrasound was applied for 20 min. Then CDU was again performed, which showed that the original rupture had closed, but another one was found. Local compression was applied for 20 min for a second time. The CDU showed the second rupture had also closed. Then the patient was bandaged by using elastic bandage and returned to the ward.

On the fourth day after PCI, the radial artery color ultrasound was reviewed. An inhomogeneous echo mass of approximately 4.1*1.4 cm was seen in the anteroposterior radius of the right radial artery. The mass was irregular and the boundaries were clear. Sheets of hyper- and hypo-echoic tissue could be seen inside the mass. The CDFI showed no obvious blood flow connection to the right radial artery (Figure 2).

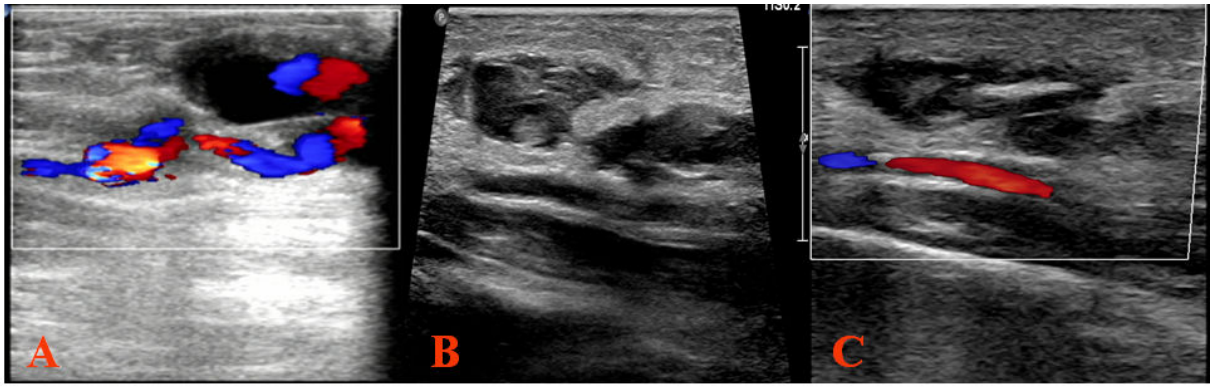

Figure 2: Ultrasound image of radial artery PSA. (A) Before radial artery PSA compression. (B) After radial artery PSA compression. (C) Second day after radial artery PSA compression.

Discussion

After Dr. Judkins adopted coronary artery angiography *via* the femoral artery in 1967, the femoral artery approach was the standard treatment for PCI therapy. However, the femoral artery is deep and the incidence of postoperative complications, which include puncture site hematoma, PSA, arteriovenous fistula, and severe bleeding, is high. Patients who need active anticoagulation after PCI are especially prone to these complications. The movement restriction and bed rest can induce lower-extremity venous thrombosis, pulmonary embolism, urinary retention, and other complications. With increasing patient age, the success rate and safety of interventional therapy also gradually decrease [3,4].

Since Dr. Campeau first used the radial artery approach for PCI, this technique has been improved and the instruments have been updated continuously. Radial artery access certainly offers advantages in terms of vascular complication; in one large single center series, radial artery access clinically relevant vascular complications were as low as 0.6% [5]. Most hospitals use the radial artery approach as the first choice for PCI therapy. However, the incidence of iatrogenic radial artery PSA has also increased. Although rare, these situations can be disastrous, ultimately threatening life and limb. Known risk factors of access site complications include the ongoing systemic anticoagulation, an elevated body mass index, inadequate compression post procedure, and/or alternatively to delay bleeding complicating anticoagulation, etc [5,6]. PSA refers to the arterial blood flow into the perivascular tissue through the arterial wall break and the formation of one or more cavities [7,8]. In cancer patients, arterial blood can flow into a tumor cavity during the systolic period and flow back into the artery during the diastolic period. The main causes of PSA include arterial trauma, infection, vasculitis, vascular surgery, and interventional therapy. Currently, interventional therapy is one of the main causes of PSA. Some research has reported an incidence of 0.03%-1%. The PSA can compress the peripheral nerves and blood vessels and cause pain, numbness, and other symptoms. Because the PSA wall has no muscular or elastic layer as arteries do, it can grow and expand under the continuous blood pressure. Life threatening bleeding can happen once the aneurysm is broken. Therefore, it is essential to treat PSA promptly.

At present, the treatment methods of radial artery PSA are usually the same as the treatment of femoral artery PSA, which include ultrasound-guided compression, ultrasound-guided percutaneous intraluminal injection of thrombin, and surgical repair. In 1991, Dr. Fellmeth combined local manual compression methods with ultrasound [9]. In the reported case, the cause of PSA may be related to anticoagulant status, multiple punctures, and inappropriate compression after surgery. Minimize unnecessary operations, and care after removal of the sheath is critical to prevent radial artery occlusion and complications associated with inadequate hemostasis. Under the guidance of the ultrasound, local compression was given at the spot where the aneurysm and artery connect to cause aneurysm embolization. Although this method may have disadvantages because of the long compression time, patient discomfort, and a high recurrence rate, it is safe and widely used. In this case, the patient had the rupture successfully closed using this method.

Disclosures

The authors have no conflicts of interest to disclose.

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Author's Contribution

# Ling Chen and Chun-yu Wang contributed equally.

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