Clinical Case Report

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Novel treatment of severe radial artery spasm using "homemade sheathless technique"

A case report

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Abstract

Rationale: Transradial access (TRA) is common for cardiac catheterization, but radial artery spasm (RAS) is suggested to be highlighted. Severe radical artery spasm could be solved by a relative novel approach called "sheathless technique," using a Tiger diagnostic catheter.

Patient concerns: A 73-year-old woman presented to our institution with a recurrent feeling of discomfort in her chest. Her electrocardiogram showed ST segment depression. Her medical history indicated arterial hypertension, diabetes, and chronic renal failure. She was on hemodialysis for 5 years for the management of renal problems. Five stents were implanted from femoral access in another hospital via 2 percutaneous coronary interventions. The patient agreed to angiography this time and wanted a more comfortable solution.

Diagnosis: Recurrent exertional angina was confirmed based on the chief complaint, electrocardiogram, and history.

Interventions: After a successful radial artery puncture, a 6F arterial sheath pipe and a 5F Tiger diagnostic ductus could only advance slightly because of the RAS. Glonoin and verapamil functioned with the help of the radial sheath, and systemic nitroglycerin was applied later but had a negative outcome. Warm covers were positioned on the antebrachium, but no relief was reported.

The "homemade sheathless technique" was applied. The 5F tube was held, and the 6F sheath was withdrawn. A blade was used to damage the sheath in reverse, and the excess sheath tube was removed.

Outcomes: The diagnostic catheter was successfully advanced to the ascending aorta, enabling left main and right coronary engagement and angiography. No significant coronary lesion was observed. The patient was discharged 3 days after angiography. Moreover, no complications were observed. A follow-up for 1 month after discharge also showed no complications.

Lessons: Severe RAS causing failure of TRA is frequent in the transradial catheterization procedure. The sheathless technique may be useful in relieving spasm when other measures fail.

Abbreviations: FMD = flow-mediated dilatation, PCI = percutaneous coronary intervention, RAS = radial artery spasm, RCTs = randomized controlled trials, The PRAGMATIC study = A Prospective Randomized Trial comparing Radial Artery Intimal Hyperplasia resulting from a 7F Transradial Sheathless Guide vs. a 6F Transradial Sheath/Guide Combination in Coronary Intervention, TRA = transradial access.

Keywords: coronary angiography, radial artery spasm, transradial cardiac catheterization

1. Introduction

Transradial access (TRA) is associated with a lower degree of net adverse clinical event rates than femoral access for cardiac catheterization in patients with acute coronary syndrome[1]; however, particular dilemmas and complexities such as radial artery spasm (RAS) are suggested to be highlighted. The common treatment methods for radial artery spasm include various intra-arterial, intravenous, and topical medications,[2] which commonly involve calcium channel blockers and nitrates.[3–6] Unfortunately, debate still persists on topical medications alleviating RAS during transradial percutaneous procedures.[2] The efficacy and safety of flow-mediated dilatation in relieving RAS were recently reported.[7,8] In addition, a novel approach of pressure-mediated dilatation for the treatment of RAS proved to be feasible and safe, with better results compared to those of pharmacologic strategy.[9] We present herein the case of a patient who was immune to vasodilators, sedation, and arm warming. Severe radial artery spasm was treated using a relatively novel approach, called "sheathless technique," with the aid of a Tiger diagnostic catheter (Terumo, Somerset, New Jersey).

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Figure 1. 6F arterial sheath pipe (Terumo, Somerset, New Jersey) and 5F Tiger diagnostic catheter (Terumo, Somerset, New Jersey) could only advance slightly because of RAS (panel A), which was resistant to vasodilators and application of arm warmth (panel B). RAS = radial artery spasm.

2. Case presentation

A 73-year-old woman presented to our institution with recurrent uncomfortable feeling in her chest. Her electrocardiogram showed ST segment depression. Her medical history also indicated arterial hypertension, diabetes, and chronic renal failure. She was on hemodialysis for 5 years for the management of her renal problems. A total of 5 stents were implanted through the femoral access in another hospital via 2 percutaneous coronary interventions (PCIs). This time, we tried radial access for coronary angiography to meet the patient's needs in terms of comfort. As predicted, problems were observed after radial artery puncture. 6F arterial sheath pipe (Terumo, Somerset, New Jersey) and 5F Tiger diagnostic catheter (Terumo, Somerset, New Jersey) could only advance slightly because of RAS (Fig. 1 A). Glonoin and verapamil functioned with the help of the radial sheath rather with no enhancement. Systemic nitroglycerin was later applied but had a negative outcome. Warm covers were positioned on the antebrachium, but no relief was reported. Switching to the femoral artery pathway was our priority, but the patient disagreed. Anesthesia preparations facilitating the whole narcosis were made to moderate RAS (Fig. 1B). We again explained to the patient that we need to give up if the procedure fails.

We came up with the idea of the "homemade sheathless technique" in case of failure, although the technology was originally applied for other purposes. The 5F tube was held, and the 6F sheath was withdrawn (Fig. 2A). A blade was reversely used to damage the sheath (Fig. 2B). The excess sheath tube was removed (Fig. 2C and D). As a last resort, although with much difficultly (Fig. 3A), the diagnostic catheter was successfully advanced to the ascending aorta, enabling left main and right coronary engagement and angiography (Fig. 3B and C). No significant coronary lesion and complications were observed (Fig. 3D). The total fluoroscopy time was 30.6 min and 100 mL of contrast was used. The patient was discharged 3 days after angiography, and no complications were observed. No complications were observed during follow-up at 1 month of discharge.

3. Ethics statement

The case was approved by Panyu Central Hospital Ethics Committee. The patient signed an informed consent before angiography. Informed consent for the publication of this case report was obtained from the patient's family member.

4. Discussion

Our "sheathless technique," which is used in native and classified vasodilators, enables us to alleviate serious RAS and successfully perform angiography in such cases. Our technique offers an alternative method to the completely "sheathless approach," wherein cardiac catheterization might be applied to utilize diagnostic catheters close to single manipulators to solve the radial spasm problem.

TRA is a favorable access to cardiac catheterization, including noncoronary and peripheral interventions.[10,11] One of the most general complications faced by operators when performing catheterization is radial artery spasm. This spasm results in tension and decreases the success rate of the procedure. Adding warmth to the forearm and administering nitroglycerin injection are better when a spasm occurs. In the presented case, we used

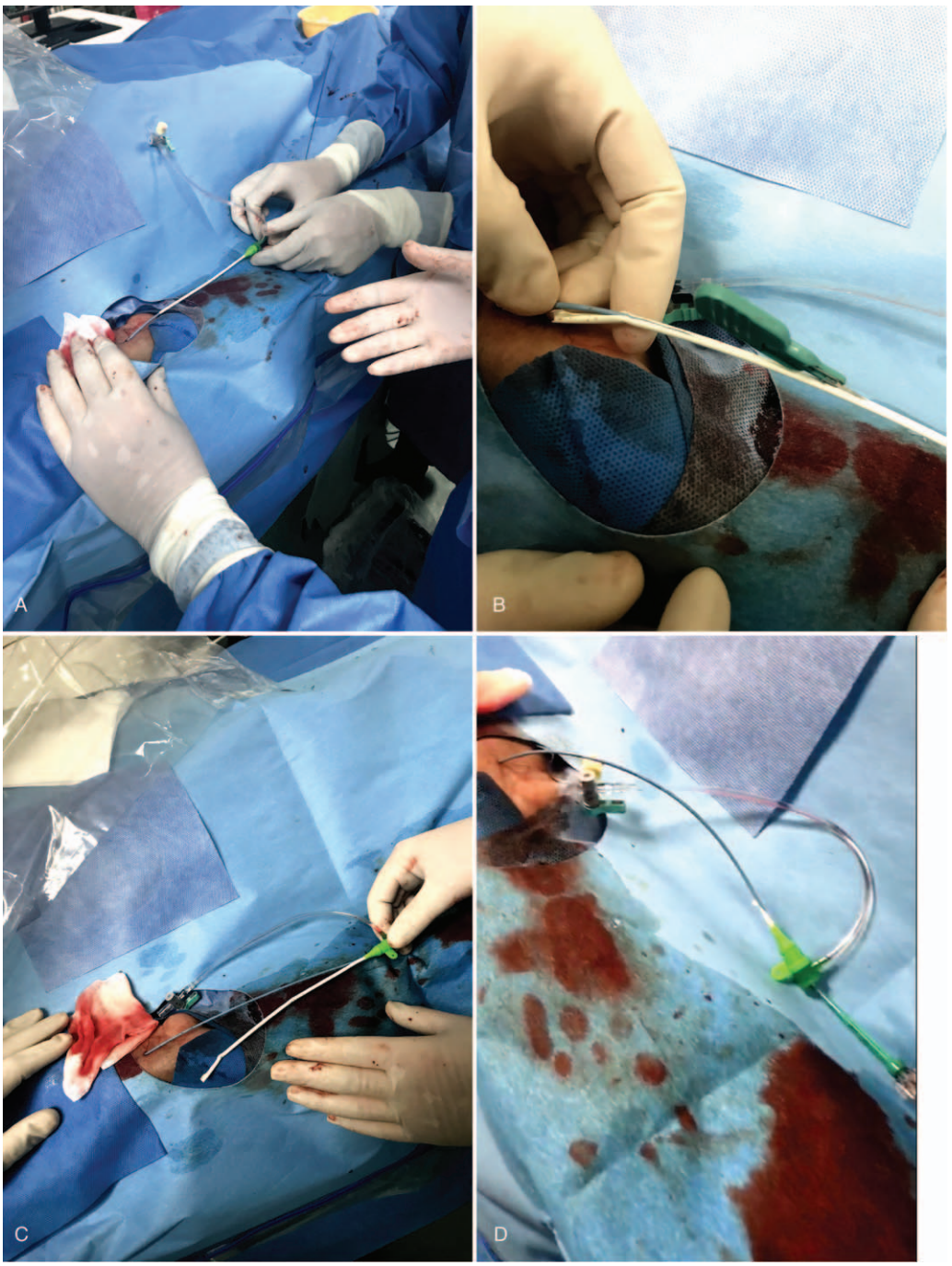

Figure 2. The 5F tube was held and the 6F sheath was withdrawn (panel A). A blade was reversed and used to damage the sheath (panel B). The excess sheath tube was removed (panel C) and the whole system displayed (panel D).

classified nitroglycerin with vasodilators (nitroglycerin and verapamil) given through the sheath. Although RAS enables us to use well-approved intra-arterial vasodilatory combinations[3,12] and a hydrophilic-coated radial sheath,[13] limited RCT data were obtained when measuring superlative treatment for RAS.[14–17]

The sheathless approach was originally used to overcome the limitation of radial artery-sheath size mismatch.[18] Limited RCT data were found for RAS treatment.[19,20] In this case, the transition from sheath to sheathless was based on 2 reasons. First, the technique was proven to be safe.[21–23] The PRAGMATIC research (titled "Prospective Randomized Trial Contrasting to Radial Artery Intimal Hyperplasia Causing a 7F Transradial Sheathless Guide vs a 6F Transradial Sheath/Guide Mix in Coronary Intervention") presented the safety and effectiveness of the sheathless method of 7F to TRA-PCI.[24] A 5F diagnostic catheter was used in the present case, and no artery dissection was observed. No complications occurred after the procedure, indicating the safety of our "sheathless technique." Second, the comparatively small inner lumen diameter of the radial artery

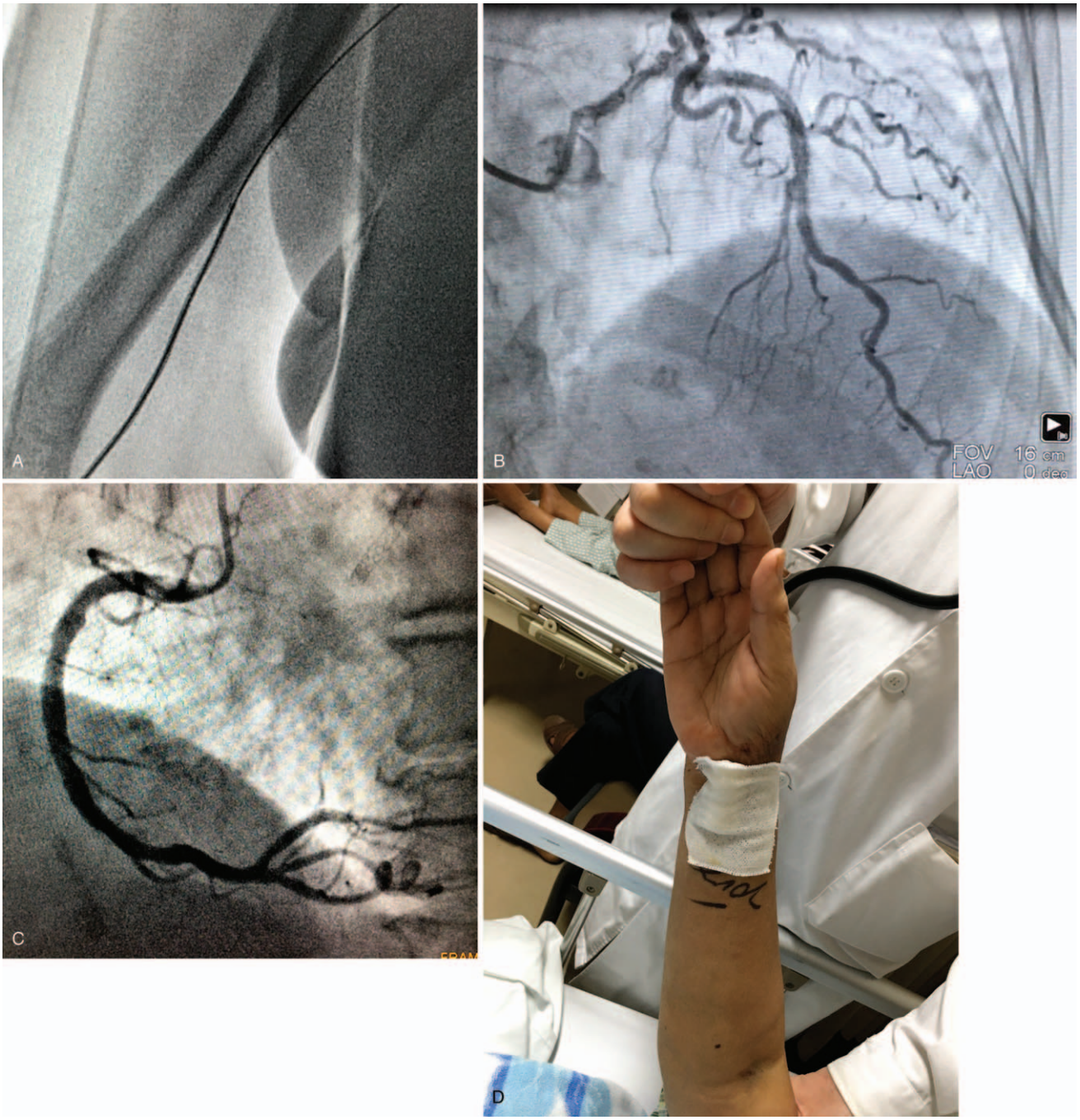

Figure 3. As a last resort effort, although with much difficultly (panel A), the diagnostic catheter was successfully advanced to the ascending aorta enabling left main (panel B) and right coronary (panel C) engagement and angiography. No significant coronary lesion and complications were observed (panel D).

may constrain the greatest scale of the catheter in the progress; therefore, devices and techniques that can be performed by TRA are used. The technique symbolizes an accessible alternative to the accumulation of the lower profile of the sheathless catheter with no hydrophilic coating, which might help the catheter successfully navigate up the ascending aorta. Accordingly, we may conclude that the technique might further encourage the usage of TRA.

However, some limitations must be considered for our case. Although the sheathless technique overcomes the issue of RAS, other medicinal measures cannot be excluded from contributing to great results. Other approaches, such as administration of Rotaglide (Boston Scientific, Natick, Massachusetts) and ViperSlide (Cardiovascular Systems, Inc.), can be utilized to relieve RAS.[16,25] The Rotaglide and ViperSlide compositions are similar, (i.e., olive oil, egg yolk, phospholipids and glycerin).[17] RAS may also be generated by feelings of horror, anxiety, and pain. Conscious sedation can help diminish all factors of decreased spasm and can probably significantly influence transradial cardiac catheterization.[14] However in the present case, although we tried to minimize the patient's tension, no conscious sedation was applied during the procedure.

5. Conclusion

Severe RAS causing TRA failure is frequent in the transradial catheterization procedure. The sheathless technique may be useful in relieving the spasm when other methods fail.

Author contributions

Zaiyong Zhang was a major contributor in writing the manuscript. Qiang Xie performed the angiography and analyzed and interpreted the patient data. All authors read and approved the final manuscript.

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