

Use of ViperSlide Lubricant to Extract Entrapped Sheath

after Severe Radial Artery Spasm during
Coronary Angiography

Erica Fidone, MD
Justin Price, MD
Rajiv Gupta, MD

Radial artery spasm is a known complication of transradial cardiac catheterization. However, severe spasm with sheath entrapment is rare. We describe such a case, and the condition's response to an alternative removal method after conventional efforts failed.

A 68-year-old man presented for coronary angiography. We introduced a 5F sheath into the right radial artery, but, because of severe arterial spasm, we could not aspirate blood from the sheath or retract it. We sedated the patient and waited for the spasm to subside; however, the radial sheath remained entrapped. Nitroglycerin injection enabled blood aspiration and vasodilator injection, but not sheath removal. Finally, we injected ViperSlide lubricant into the sheath for its rapid, easy extraction.

When sedation and vasodilator therapy fail, we recommend using ViperSlide for radial sheath removal before applying nerve block or general anesthesia. (Tex Heart Inst J 2018;45(3):186-7)

Key words: Arterial occlusive diseases/etiology/physiopathology/therapy; cardiac catheterization/adverse effects/methods; device removal/methods; radial artery/physiopathology; risk factors; spasm/therapy; treatment outcome; vascular access devices; vasodilator agents/therapeutic use

From: Department of Medicine (Drs. Fidone and Price), Baylor Scott & White Health, Temple, Texas 76508; and Division of Cardiovascular Disease (Dr. Gupta), VA Central Texas Healthcare, Temple, Texas 76504

Address for reprints:
Erica Fidone, MD, Department of Medicine, Baylor Scott & White Health, 2401 S. 31st St., Temple, TX 76508

E-mail:
Erica.Fidone@bswhealth.org

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Transradial access for diagnostic and therapeutic coronary interventions is typically more popular than transfemoral access because of fewer vascular access-site complications, lower procedural costs, and shorter hospital stays.¹ Radial artery (RA) spasm, a complication of transradial access, occurs in up to 10% of cases, often causing procedural failure and access-site crossover. Rarely, severe RA spasm entraps radial sheaths.² Forcefully removing a sheath can avulse the RA, so this practice should be avoided.³ We describe a case of severe RA spasm with sheath entrapment—refractory to local and systemic vasodilators—and the result after we administered ViperSlide[®] lubricant (Cardiovascular Systems, Inc.).

Case Report

In June 2015, a 68-year-old man presented for coronary angiography, after a nuclear stress test revealed a moderate perfusion defect in the inferolateral territory. His medical history included coronary artery disease and percutaneous coronary intervention (PCI) to the first diagonal artery via a right femoral approach. His RA and palmar circulation were determined to be adequate on the basis of pulse oximetry and a Barbeau classification B waveform display. The patient was moderately sedated with intravenous fentanyl (25 µg), intravenous midazolam (1 mg), and local anesthesia (1% lidocaine). We attained right RA access and readily placed a 5F hydrophilic sheath (Terumo Medical Corporation). The patient reported forearm pain; however, we could not aspirate blood from the sheath to administer vasodilators. The patient's pain increased despite repeat doses of fentanyl and midazolam during multiple extraction attempts. Twenty minutes of sublingual nitroglycerin therapy (800 µg) had minimal effect. We undertook cardiac catheterization via a femoral approach while waiting for the RA spasm to resolve.

We attained right femoral access, engaged the left coronary system with use of a Judkins left 4 catheter (Medtronic), and found a patent diagonal artery stent and 80% stenosis of the proximal left circumflex coronary artery. Notable right-sided findings were chronic total occlusion of the right coronary artery and left-to-right collateral circulation. In the presence of persistent radial sheath entrapment, we delayed PCI and engaged the right subclavian artery despite a tortuous brachiocephalic artery.

The delivery of 0.4 mg of nitroglycerin into the right subclavian artery reduced the RA spasm and enabled blood aspiration from the right RA sheath. However, the sheath would still not retract, despite repeat doses of fentanyl and midazolam and total doses of 5 mg of verapamil, 0.4 mg of nitroglycerin, and 300 µg of nitroprusside. Any pull induced intense forearm pain and substantial mechanical resistance.

Conventional options exhausted, we administered 5 mL of ViperSlide lubricant through the radial sheath—enabling its immediate removal. ViperSlide is an emulsion of soybean oil (10%), egg yolk phospholipids (1.2%), glycerin (2.25%), sodium hydroxide, and water for injection. The right RA puncture was allowed to bleed briefly before manual hemostasis was applied. The patient did well thereafter, and his RA was patent. The total procedural duration was 235 min (fluoroscopy time, 22.6 min), and 54 mL of radiocontrast agent was administered. Approximately one week later, the patient underwent elective placement of a 2.5 × 14-mL Resolute Integrity™ drug-eluting stent (Medtronic) in the left circumflex coronary artery via a right femoral approach.

Discussion

Transradial access, although safer than transfemoral access, has been associated with RA spasm, RA occlusion, nonocclusive RA injury, pseudoaneurysm, arterial perforation, nerve damage, and hand ischemia.² Radial artery spasm causes patients discomfort, makes catheter manipulation difficult, and worsens procedural success rates.¹ The RA's smaller size and muscular tunica media make it more prone to spasm than the femoral artery.² Risk factors for RA spasm include younger age, female sex, low body mass index, smoking, diabetes mellitus, small RA diameter, more than 3 catheter exchanges, use of larger catheters (>6F), and ad hoc PCI. Clinical manifestations include pain during sheath insertion or removal, pain during catheter manipulation, continuous forearm pain, and mechanical resistance to sheath removal.^{1,2}

The use of hydrophilic-coated introducer sheaths has substantially reduced the frequency of RA spasm,² as have optimized local anesthesia and sedation, which modulate the effect of circulating catecholamines on the prominent α_1 -adrenergic receptors within the tunica media. Vasodilator combinations of nitroglycerin and calcium channel blockers can have an almost immediate effect.² Typically, therapy for confirmed RA spasm includes additional doses of a spasmolytic cocktail in conjunction with repeat doses of analgesics and sedatives; this decreases sympathetic tone and encourages vascular relaxation.

Few data are available on interventions to relieve RA spasm complicated by sheath entrapment after pharma-

cotherapy has failed. A noninvasive technique reportedly relieved entrapment by inducing local ischemia and subsequent flow-mediated vasodilation by means of transient sphygmomanometer-induced brachial artery occlusion.³ The use of propofol, general anesthesia, or nerve block to decrease neurogenic influences compounding RA spasm can be a final option for removing entrapped hardware.

Our case indicates the usefulness of ViperSlide as an adjuvant to local and systemic vasodilators for radial sheath extraction. ViperSlide is designed to reduce the friction between the flexible drive shaft of the DIAMONDBACK 360® Coronary Orbital Atherectomy System and the ViperWire™ advance guidewire (Cardiovascular Systems). In our patient, ViperSlide sufficiently lubricated the arterial wall to enable sheath removal.

Repanas and colleagues⁴ first described using ViperSlide to free a trapped radial sheath after a radiation shield hit a patient's right forearm and induced severe RA spasm. ViperSlide is available to most cardiac catheterization laboratories and is intended for intra-arterial administration. When conventional sedation and vasodilator therapy fail, we recommend using ViperSlide to ameliorate radial sheath entrapment before resorting to nerve block or general anesthesia.

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