Intractable Spasm in a Hypoplastic Brachioradial Artery During Coronary Angiography: A Last Chance Before Surgery

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ABSTRACT

For the past several years coronary angiography through radial artery has been preferred vascular access over femoral artery due to the favorable outcomes. However radial access has also rare drawbacks. One of the main complications of radial approach is vascular spasm. Although radial spasm can easily be resolved with various intervention, rarely it may be intractable in particular anatomic variations. These patients might be needed advanced treatment methods to overcome vasospasm. In this paper we report an intractable spasm in a hypoplastic radial artery during angiography which could only be resolved by neuraxial blockage after failure of conventional treatments.

Key Words: Coronary angiography; radial artery; radial artery variations; radial spasm.

Koroner Anjiyografi Esnasında Hipoplastik Brakiyoradiyal Arterde Gelişen Dirençli Spazm: Cerrahiden Önce Son Şans

ÖZ

Son birkaç yıldır yüz güldüren sonuçlarından dolayı koroner anjiyografi işlemlerinde radiyal arter femoral artere göre tercih edilen yaklaşım olmuştur. Fakat radiyal arterin de nadir dezavantajları bulunmaktadır. Radiyal yaklaşımın en temel komplikasyonlarından biri spazmdır. Her ne kadar radiyal spazm değişik müdahalelerle düzelebilse de bazı anatomik varyasyon durumunda dirençli olabilmektedir. Bu hastalarda spazmın düzelebilmesi için daha ileri yöntemlere başvurulmaktadır. Bu yazıda anjiyografi esnasında konvansiyonel tedaviye rağmen dirençli spazm gelişen hipoplastik brakiyoradiyal arterin nöroaksiller blokaj ile çözülmesi sunulmuştur.

Anahtar Kelimeler: Koroner anjiyografi; radiyal arter; radiyal arter varyasyonları; radiyal spazm.

INTRODUCTION

Given the favorable safety and efficacy outcomes radial artery is the recommended means of vascular access over femoral artery regarding coronary angiography. Despite many advantageous, radial approaches has few shortcomings. One of the most common complication of radial access encountered during coronary angiography is vasospasm. Radial vasospasm usually resolved by conventional treatments such as vasodilators, heat application, high pressure cuff technique and sedation. However, it can be intractable in some conditions in particular anatomic variations. As such these patients may be needed advanced treatment to overcome vasospasm. In this paper we report an intractable hypoplastic radial artery spasm which could only be resolved by neuraxial blockage after failure of medication and general anesthesia.

CASE REPORT

Twenty-six-year-old male admitted to the emergency department with a chest pain. His history was irrelevant. On his physical examination, cardiac sounds were normal. His blood pressure was 130/80 mmHg and pulse rate was 83/min. Electrocardiogram showed sinus rhythm without clear ST-T segment changes. Troponin value was 0.6 ng/mL (normal range 0.038-0.08 ng/mL). Other laboratory parameters were normal. Patient was hospitalized in

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coronary care unit. He underwent coronary angiography to rule out coronary artery disease. Angiography was planned to perform from right radial access. Allen test was positive. After subcutaneous administration of 3 cc of 1% lidocaine, 6 Fr sheath was introduced through radial artery. Then 5 mg verapamil, 200 mcg nitroglycerin and 5000 U heparin was administrated from sheath. Given the absence of 5 Fr or lower size of catheter, 6 Fr Judkins right 4.0 catheter was inserted through sheath. Catheter easily engaged right coronary ostium. Angiogram showed normal right coronary artery (Figure 1a). While pulling right Judkins catheter back to sheath it entrapped inside axillary artery and patient was feeling pain. We administrated increasing dose of nitroglycerine and verapamil through radial sheath. In addition local subcutaneous application of lidocaine and nitroglycerine was unsuccessful. Also, forearm was covered with heat compress. Furthermore blood pressure cuff was applied on upper arm with increased suprasystolic pressure for 10 minutes despite these applications, spasm was not relieved. Patient underwent deep anesthesia by application of 5 mg midazolam and 100 mcg fentanyl without intubation. However, catheter couldn't be retrieved. Then the procedure was carried out via femoral access. 6 Fr sheath was introduced from right femoral artery. 6 Fr Judkins left diagnostic catheter was advanced through femoral sheath. After cannulation of left main coronary artery, left coronary arteries were demonstrated to be normal (Figure 1b). Then the catheter was directed to right subclavian artery. Right upper extremity angiogram showed intact brachial artery. However, it was demonstrated that catheter entrapped in brachioradial artery originated from upper part of brachial artery (Figure 2a). Since patient was unresponsive to vasodilators and sedatives, he was intubated. Nevertheless, catheter was still stuck in accessory radial artery. As a last resort axillary nerve blockage was applied. Once axillary artery flow was demonstrated, 24-gauge stimulation needle advanced in-plane over skin with an angle of 45 degree. When the needle was seen by ultrasound, 10 cc %0.250 15 mL bupivacaine and 15 mL 1% lidocaine was applied each three separate points, radial ulnar and median nerve root , around axillary with a total

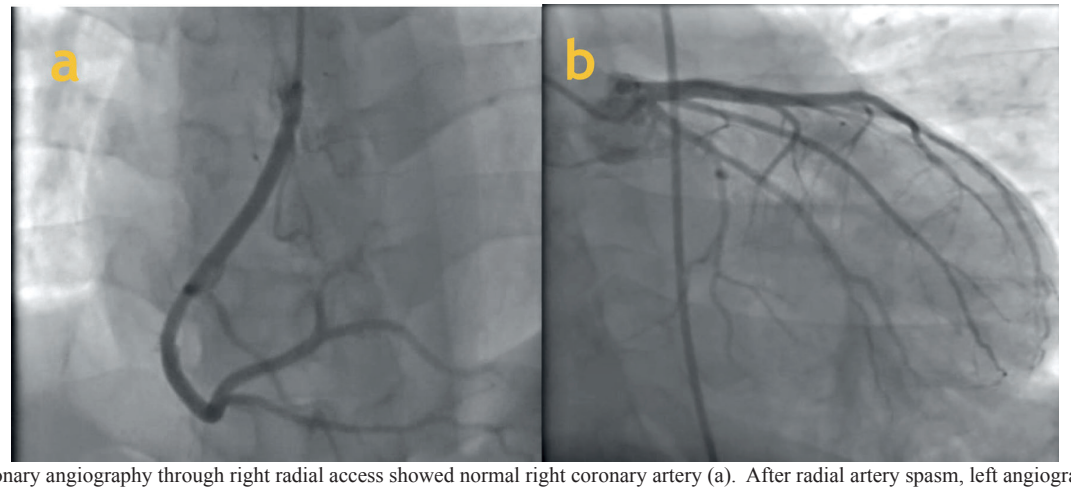

Figure 1. Coronary angiography through right radial access showed normal right coronary artery (a). After radial artery spasm, left angiogram through right femoral artery showed normal left coronary system (b).

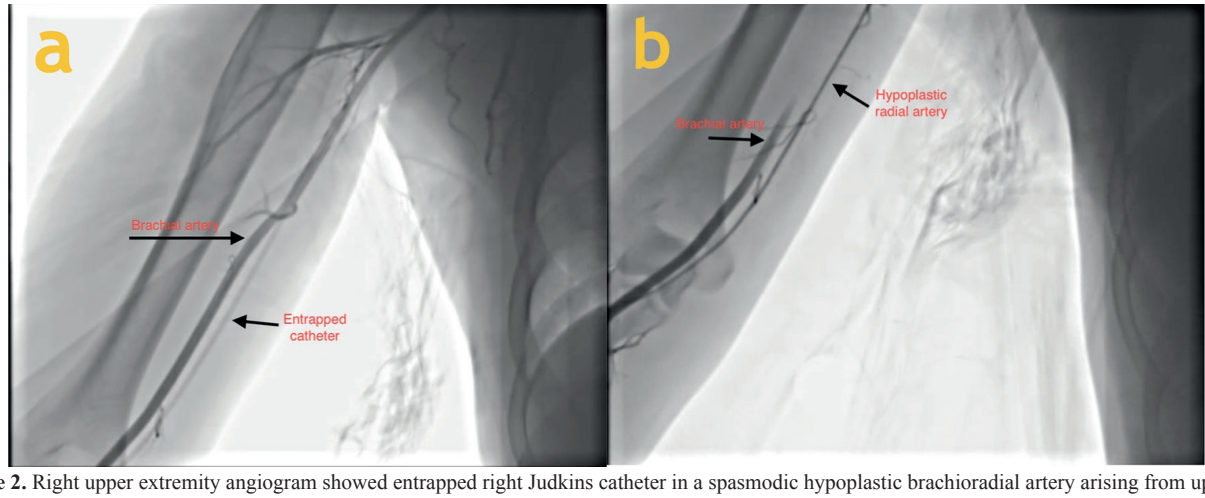

Figure 2. Right upper extremity angiogram showed entrapped right Judkins catheter in a spasmodic hypoplastic brachioradial artery arising from upper brachial artery (a).Hypoplastic brachioradial artery was shown near to brachial artery upon retrieval of catheter (b).

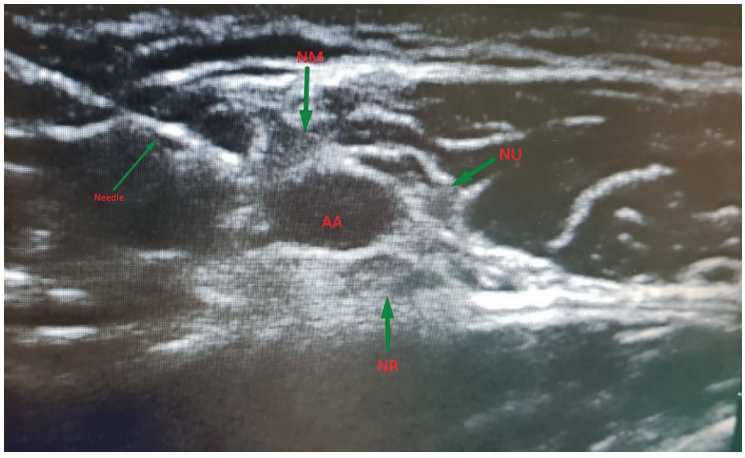

Figure 3. This image described the axillary nerve blockage. Once axillary artery flow was demonstrated, 24-gauge stimulation needle advanced in-plane over skin with an angle of 45 degree. When the needle was seen by ultrasound, 10 cc %0.250 15 mL bupivacaine and 15 mL 1% lidocaine was applied each three separate points, radial ulnar and median nerve root, around axillary with a total amount of 30 mL anesthetic solution (AA: Axillary artery, NM: Nervus medianus, NR: Nervus radialis, NU: Nervus UUlnaris).

amount of 30 mL anesthetic solution (Figure 3). Eventually catheter was able to be retrieved 15 minutes later. Last upper extremity angiogram showed hypoplastic brachioradial artery arising from upper brachial artery (Figure 2b). Patient was transferred back to the intensive care unit during weaning period. Radial pulse was normal. He was discharged from hospital uneventfully.

DISCUSSION

Radial artery is more convenient than femoral artery in terms of access site complications. As such coronary angiography through radial access shortens hospital stays with favorable procedural outcomes. Nevertheless, radial approach has few hallmarks that may challenge coronary angiography such as spasm, occlusion and anatomic variation. Radial artery inclines to vasospasm because of muscularity and alfa adrenoceptor innervation. Female gender, small body size, being younger, diabetes mellitus, multiple radial puncture, operator inexperience, large sheath size, use multiple catheter and long duration of procedure are well known risk factors for radial spam. Besides, it has been previously shown that some certain anatomic variations of radial artery can be a predictor of vasospasm. These are tortuosity, abnormal radial artery origin and radioulnar loop[1]. In this case hypoplastic brachioradial artery was originated from above the brachial artery made it more susceptible to vasospasm. We believed that 6 Fr diagnostic catheter which was relatively oversized compared to short-sized vessel lumen lead to vascular trauma and trigger vasospasm.

It is rational to take preventive measures to avoid spasm. Preprocedural anxiolytics, sedation, adequate analgesia, hydrophilic sheaths and intraarterial vasodilators are used before catheter insertion[2]. In case of spasm, intraarterial and sublingual nitroglycerin, intraarterial verapamil, and heat application over forearm can be used as a first attempt. Despite these treatments, some spasms may be resistant and need anesthesia. Opioids, benzodiazepines are the commonly used anesthetics to relief vasospasm. In rare cases radial spasm can be intractable to vasodilators and anesthetics. General anesthesia is considered as a last resort in these patient groups. In our case radial artery resistant to the conventional vasodilators, sedatives, even general anesthesia. As a last resort axillary nerve blockage was applied and 15 minutes later, we could successfully retrieve catheter.

Considering abundant alfa receptor innervation from postganglionic sympathetic stimulation, radial artery tends to vasospasm more than any other artery due to sympathetic activation. Hence radial artery may well response to sympatholytic treatments. Postganglionic nerve blockage is rarely used to treat catheter induced radial vasospasm. Although stellate ganglion blockage has been used in coronary artery bypass surgery before harvesting radial artery in order to reduce spasm and increase flow radial flow[3]. To our knowledge postganglionic nerve blockage was first described in radial catheterization by Bhakta and Zaheer et al. They reported two cases with severe radial artery spasm after insertion of radial arterial line[4]. Spasm was effectively treated by ultrasound guided radial nerve blockage[4]. Also Cochet et al. used axillary nerve blockage in a patient with severe radial artery spasm during angiography[5]. To best our knowledge this is the first case with hypoplastic brachioradial artery and with severe spasm which could be resolved by axillary nerve blockage during angiography. Given the anticoagulant treatment is usually administrated after radial cannulation, axillary nerve blockage is considered as a relative contraindication for the patients under anticoagulant treatment. Therefor it should

be applied by experienced operators under ultrasonography guidance. Although axillary nerve blockage is as a convenient and safe procedure, bleeding or hematoma, infection, nerve injury, inadvertent intravascular injection, myotoxicity and local anesthetic systemic injury can rarely be occur. Surgical should be reserved as a last option since it requires cardiovascular equipment, endarterectomy, preprocedural preparation and postprocedural care. Therefore, surgery tends to more morbidity than axillary nerve blockage[6].

If radial angiogram would have been acquired to visualize the radial anatomy before catheter insertion, we might have avoided spasm[7].

CONCLUSION

Despite preventive measures, radial spasm can be encountered during coronary angiography. Some patients with anatomic variations may be resistant to the conventional treatments. After failure of conventional and advanced treatments, neuro axial nerve blockage can be choice as a bail out strategy.

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