CASE REPORT

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Seven-year follow-up of endovascular treatment of iatrogenic brachioradial artery injury complicating percutaneous coronary intervention: a case report

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ABSTRACT

The radial artery has been used increasingly for percutaneous coronary intervention because of its safety and feasible access route. Nevertheless, transradial complications are possible because of the variation in radial artery anatomy. We experienced a case of the brachioradial artery injury secondary to catheterization, presenting as hypovolemic shock. A 76-year-old woman presented at our emergency department complaining of effort-induced angina. Coronary angiography via the right radial artery showed critical stenosis in the middle of the left anterior descending coronary artery. After wiring into this vessel, balloon angioplasty using a 6-Fr Judkin left guiding catheter was performed with the deployment of the zotarolimus-eluting stent. There was difficulty in negotiating the guidewire and balloons in that resistance was experienced while passing the catheter in the upper arm. Therefore, retrograde radial arteriography was performed to determine any injury to radial artery. This showed contrast extravasation in the brachioradial artery. Initially, manual compression was tried. However, 2 hours later, the patient developed cold sweating and went into a stupor. Laboratory findings showed a decline in hemoglobin, leading to suspicion of hemorrhagic shock. We applied over 30 minutes of balloon inflation, but this was ineffective. While surgical repair was not available, a 6.0 × 50 mm Viabahn stent was placed over the axillary artery. Subsequent angiography showed no further leakage or occlusion of the brachioradial artery. The postprocedural period was uneventful, and the patient was discharged with dual antiplatelet agents. At a 7-year clinical follow-up, the patient was free from limb ischemia symptoms.

Keywords: radial artery, anomalies, injury, stents

Abbreviations:
BRA: brachioradial artery
PCI: percutaneous coronary intervention

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INTRODUCTION

The radial artery has been used increasingly for percutaneous coronary intervention (PCI) because of its safety and feasible access route.[1] Nevertheless, transradial complications are possible because of the variation in radial artery anatomy. The brachioradial artery (BRA) has a high origin of the radial artery proximal to the elbow from either the brachial, or less frequently, the axillary artery.[2] Arterial injury secondary to coronary catheter placement might occur at any point through the arterial system, and injury of BRA could be dangerous because of incessant bleeding. Herein, we present a case of the BRA injury secondary to catheterization in a 76-year-old woman who underwent transradial PCI, with a favorable clinical outcome. Written informed consent was obtained from the patient for publication of this case report, which was approved by the Institutional Review Board of the Chosun University Hospital (CHOSUN 2022-04-033).

CASE PRESENTATION

A 76-year-old woman presented at our emergency department complaining of effort induced angina. Findings of 12-lead electrocardiography were unremarkable, but cardiac enzyme levels were increased. The serum creatine kinase – myocardial band isoenzyme fraction was elevated at 8.79 ng/mL (normal range 0–4.88 ng/mL) and the level of troponin I was also high, at 1.72

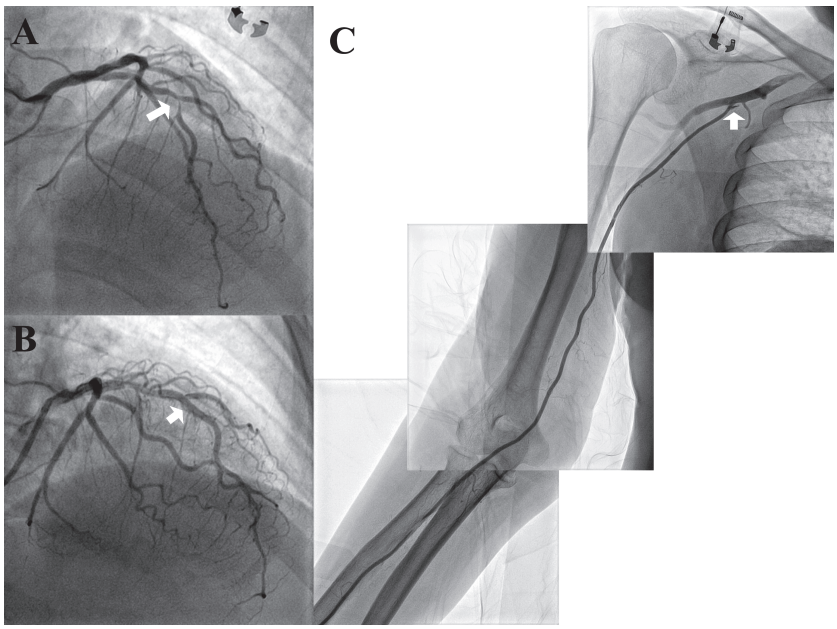

Fig. 1 Percutaneous coronary intervention via the right radial artery

Fig. 1A: Coronary angiography (anteroposterior view) showing critical stenosis in the middle left anterior descending coronary artery (white arrow).

Fig. 1B: A 2.75 × 18 mm zotalimus-eluting stent was deployed in this lesion (white arrow) (right anterior oblique cranial view).

Fig. 1C: Retrograde radial artery angiography showing the contrast extravasations (white arrow) from the high origin of the radial artery in relation to the upper third of the humerus.

ng/mL (normal range 0–0.016 ng/mL). Coronary angiography via the right radial artery using 6-Fr sheath showed critical stenosis in the middle of the left anterior descending coronary artery (Figure 1A). After wiring into this vessel, balloon angioplasty using a 6-Fr Judkin left guiding catheter was performed with a 2.5 mm balloon, followed by the deployment of a 2.75 × 18 mm zotalimus-eluting stent (Figure 1B).

There was difficulty in negotiating the guidewire and balloons in that resistance was experienced while passing the catheter in upper arm. Therefore, retrograde radial arteriography was performed to determine any injury of artery. This showed contrast extravasations in the high origin of the radial artery in relation the upper third of the humerus (Figure 1C). Initially, manual compression was tried. However, 2 hours later, the patient developed cold sweating and went into a stupor. Subsequently, her blood pressure decreased to 70/40 mmHg. 12 lead electrocardiography showed no ST-T changes and portable echocardiography showed no evidence of pericardial effusion. Laboratory findings showed a decline in hemoglobin from 13.3 to 10.2 g/dL, leading to suspicion of hemorrhagic shock. Despite aggressive attempts at resuscitation with intravenous fluid and blood transfusions, the patient remained hypotensive. Angiography of the right axillary artery identified continued extravasation of contrast media from the origin of the BRA (Figure 2A, 2B). We applied over 30 minutes of balloon inflation, but this was ineffective. While surgical repair was not available, a 6.0 × 50 mm self-expandable Viabahn covered stent (W.L.Gore & Associates Inc, USA) was placed over the injury site (Figure 2C). A 6.0 mm non-compliable balloon was inflated through the stent to ensure complete sealing of the arterial segment. Subsequent angiography showed no evidence of further leakage or occlusion of the BRA (Figure 2D).

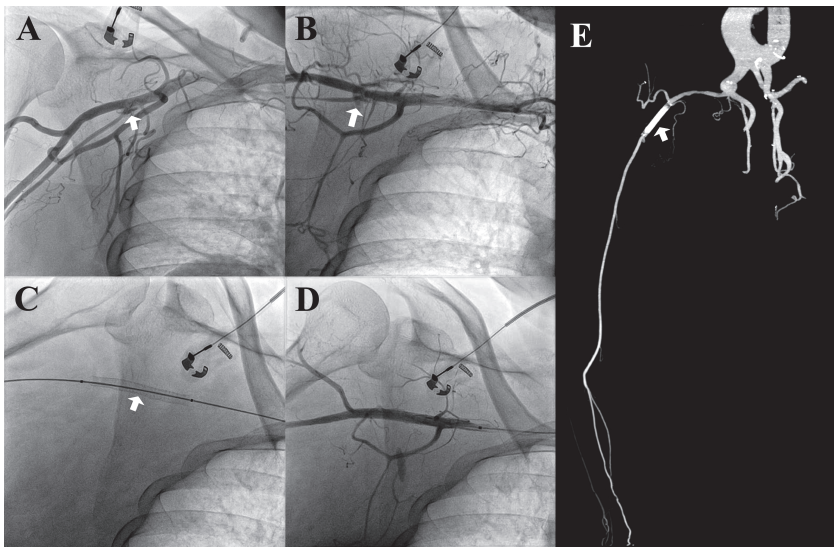

Fig. 2 Endovascular stenting with covered stents in the axillary artery

Fig. 2A, 2B: Angiography of the axillary artery showing continued contrast extravasation from the origin of brachioradial artery (white arrows).

Fig. 2C: A 6 × 50 mm self-expandable Viabahn covered stent was placed over the injury site (white arrow).

Fig. 2D: Subsequent angiography showing no evidence of further contrast leakage or occlusion of the brachioradial artery.

Fig. 2E: Computed tomographic angiography 7 years later revealed luminal patency (white arrow) of the right axillary artery, and a faint image of brachioradial artery.

The patient was returned to the ward with no further complications. Fortunately, no limb ischemia was observed. The right arm was well perfused and there were no neurological deficits. The postprocedural period was uneventful, and the patient was discharged with dual antiplatelet agents (Aspirin + Clopidogrel). The dual antiplatelet therapy was maintained for one year, and after that, only single antiplatelet therapy (Aspirin) was continued. At a 7-year clinical follow-up, the patient was free from limb ischemia symptoms. Computed tomography showed luminal patency of the right axillary artery, and faint image of the BRA (Figure 2E).

DISCUSSION

Here, we present a case of the BRA injury secondary to catheterization in a 76-year-old woman who underwent transradial PCI. The patient subsequently developed hypovolemic shock because of incessant bleeding. Despite massive intravenous fluid and blood transfusions, endovascular stenting with covered stents in the axillary artery was applied, which led to occlusion of the BRA. Fortunately, the patient has been free from limb ischemia symptoms over 7 years subsequently.

The radial artery is one of the terminal branches of the brachial artery arising in the cubital fossa below the bend of the elbow. However, it can display a high origin from the brachial artery or less frequently from the axillary artery.[3] The term 'brachioradial artery' is conventionally used for the high origin of the radial artery. It often forms an anastomosis with the normal brachial artery in the cubital fossa. Uncommonly, there was no such anastomosis in our case. The BRA has a risk for developing vascular complications during transradial PCI, which could increase the risk of spasm, dissection, and perforation because its small size (over 85% being <3 mm in diameter).[4]

Injury of the BRA arising from the axillary artery can cause hemodynamic collapse because of incessant bleeding. We initially noted this potentially lethal complication via retrograde radial arteriography, but simply applied manual compression, which led to catastrophic results such as hypovolemic shock. Traditionally, open surgical repair of an axillary artery injury is considered the standard approach, but this can be difficult for anatomic reasons, with consequent limb- and life-threatening complications.[5] High rates of morbidity and mortality are associated with complex surgical exposure and repair of the axillary artery, which poses a risk of collateral injury to the surrounding neurovascular structures. In this case of hypovolemic shock, despite massive intravenous fluid and blood transfusions without a vascular surgeon's backup, we deployed endovascular stenting with covered stents in the axillary artery, which led to occlusion of the BRA. In most cases, radial artery occlusion can be performed for injury to the radial artery in the forearm without adverse sequelae.[6] Radial artery occlusion could not impact functional outcomes, with angiographic studies on the hands showing that the digital vascular supply is always preserved during occlusive radial access.[7] However, there are limited data on the long-term outcomes of the BRA occlusion. In addition, the long-term viability of covered stents in the axillary artery remains unknown. As of a 7-year clinical follow-up, the patient has been free from limb ischemia symptoms, and luminal patency of the stent in the right axillary artery and a faint image of the BRA have been seen on the computed tomography angiography. Therefore, graft stenting in the axillary artery as described in this case might be an option, when surgical repair is not available.

CONCLUSION

The brachioradial artery is at risk for developing vascular complications during transradial PCI. Given the vascular resistance experienced in this case, retrograde radial arteriography was helpful in planning an appropriate strategy. It is essential that clinicians should be prepared for such eventualities and implement strategies by which these rare complications can be overcome. Also, injury to the brachioradial artery might be a life-threatening complication. In the present case, manual compression was ineffective, so urgent intervention was required to prevent excess hemorrhage. Given this type of emergency situation, endovascular stenting might be an effective rescue therapy when surgical repair is not available.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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