Usefulness of continuous compression using TR Band™ for radial arteriovenous fistula following trans-radial intervention

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ABSTRACT

Arteriovenous fistula (AVF) after trans-radial catheterization is an extremely rare complication. A 61-year-old man experienced a painful swelling in the left radial punctured site. The findings of vascular ultrasound and angiography led to a diagnosis of an iatrogenic radial AVF. We performed continuous compression using a hemostatic band for 24 h after which the radial AVF completely disappeared without vessel occlusion, and no relapse occurred. Eight cases of catheterization-induced radial AVF have been mentioned in the literature, but the treatment has not been noninvasive in any case. This is the first report of an iatrogenic radial AVF that was noninvasively repaired using continuous low-pressure compression with a hemostatic band.

<Learning objective: Arteriovenous fistula (AVF) after trans-radial catheterization is a rare complication. The literature reports only 8 cases of catheterization-induced radial AVF and no patient has been cured noninvasively. This is the first report of an iatrogenic radial AVF that was repaired noninvasively. We believe that continuous low-pressure compression using a hemostatic band is an effective therapeutic option for this complication.>

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Introduction

The trans-radial approach for cardiac catheterization has the advantage of a lower incidence of local vascular complications than the femoral approach [1,2]. Radial arteriovenous fistula (AVF) is a rare complication associated with the trans-radial approach, which generally requires surgical repair or close observation. To our knowledge, the present case report is the first to report an iatrogenic AVF that was completely repaired using a noninvasive procedure.

Case report

A 61-year-old man was admitted to our emergency department with sudden continuous chest pain. Electrocardiography showed ST depression in the II, III, and aVF leads. In addition, echocardiography showed hypokinesis in the postero-lateral left ventricular wall, and blood examination showed elevated levels of creatine kinase and troponin T. On the basis of these findings, the patient was diagnosed with acute coronary syndrome (ACS), and emergency coronary angiography (CAG) was performed via the right radial artery using a 6-Fr sheath system. An abrupt occlusion was seen in the left circumflex coronary artery (LCX) (#13: 100%) and severe stenosis was found in the right coronary artery (RCA) (#3: 99%) and left anterior descending coronary artery (LAD) (#7: 90%). Percutaneous coronary intervention (PCI) was immediately performed for the culprit LCX lesion. After cardiac rehabilitation, a second PCI was performed on the 14th day via the left radial artery using the 6-Fr sheath system for the stenosis in the LAD. However, on the 20th day, the patient complained of a painful swelling in the left radial puncture site. The site presented a continuous bruit, and the vascular ultrasound showed a radial AVF with accelerated blood flow (1.9 m/s). On the 21st day, PCI was performed via the right radial artery for the RCA, and a subsequent left brachial angiography confirmed a left radial AVF,
which had probably been caused by the trans-radial PCI conducted on the 14th day (Fig. 1a).

Continuous compression was performed using TR Band™ (TERUMO Corp. Tokyo, Japan; Fig. 2), a hemostasis device for trans-radial catheterization. The cuff was placed over the area of the AVF, and it was inflated with 10 mL of air, whereby the cuff pressure reached about 70 mmHg. It was ensured that the distal radial artery was palpable and there was no murmur near the radial AVF during compression. After compression for 24 h, the bruit could not be heard, and vascular ultrasound showed that the radial AVF had completely disappeared without vessel occlusion. Follow-up angiography 7 months later showed no AVF recurrence in the left radial artery (Fig. 1b).

Discussion

PCI via the trans-radial approach is now more popular in Japan than in Western countries. In our hospital, 843 trans-radial interventions (62.54%) were performed among 1358 PCI procedures from 2008 to 2012, and the present case was the only one in which radial AVF occurred after the procedure. While treating this patient, we did not experience any problems related to the puncture, and the pressure of the hemostatic band was adequate to prevent any bleeding. Further, the patient was able to rest his wrist after PCI, although it is possible that the band had shifted slightly from the puncture site during compression.

In order to repair an AVF by compression, it is important to interrupt blood flow toward the AVF, but it is not necessary to cut off the blood flow in the artery. The pressure on the radial AVF varied in each case; therefore, it is important to confirm the disappearance of bruit during compression.

Compared to the trans-femoral approach, the trans-radial approach is associated with greater patient satisfaction [3] and fewer vascular complications [1–3]. In the RIVAL study, which included 7021 patients with ACS undergoing intervention, 5 (0.14%) of the 3514 patients who underwent trans-femoral PCI had AVF, while none of the 3507 patients who underwent trans-radial PCI did [3]. Another report showed that only 9 (0.08%) of the 10676 patients who underwent trans-radial PCI developed AVF [4].

We identified 8 case reports [5–10] of iatrogenic radial AVF that provided detailed clinical outcomes (Table 1): 5 of these patients [5–7] underwent operation, while 2 [8,9] received endovascular treatment (such as implantation of a covered stent or balloon-assisted percutaneous embolization), and 1 patient [10] was conservatively observed. We assumed that the TR Band™ used to treat our patient completely cut off the blood stream from the radial artery to the cephalic vein, leading to AVF occlusion.

Unfortunately, we were unable to ascertain the mechanism of radial AVF development in the present case. Nonetheless, our experience suggests that continuous low-pressure compression with a hemostatic band is an effective therapeutic alternative for radial AVF and should be the first-line treatment for this complication.

<table>
<thead>
<tr>
<th>Case</th>
<th>Year</th>
<th>Authors</th>
<th>Age/sex</th>
<th>Symptom and sign</th>
<th>Treatment</th>
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<td>1</td>
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<td>Venous dilation and palpable thrill</td>
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<td>2007</td>
<td>Spence et al.</td>
<td>61/M</td>
<td>Painless pulsatile mass</td>
<td>Surgical repair</td>
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<td>3</td>
<td>2007</td>
<td>Spence et al.</td>
<td>59/M</td>
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Conflict of interest

The authors declare no conflict of interest associated with this manuscript.

References


