Successful Management of an Iatrogenic Coronary Arteriovenous Fistula Developed during CTO Intervention

Seung-Woon Rha, MD, PhD, FACC, FAHA, FESC, FSCAI, FAPSIC

Cardiovascular Center,
Korea University Guro Hospital
Clinical Information

1. Age/Sex; 75-year / male
2. C.C.; effort chest pain
3. Risk factors
   DM (-), Hypertension (+), Hyperlipidemia (-), Smoking (-)
4. Lab: no specific finding
5. Echo: severe hypokinesia in posterolateral wall with LVEF 50%
**Coronary angiography**

<table>
<thead>
<tr>
<th>LAD &amp; RCA: no stenosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>LCX: CTO at mid-LCX with bridging collaterals grade 1 of short segment</td>
</tr>
<tr>
<td>Approach: Rt Radial a.</td>
</tr>
<tr>
<td>6Fr</td>
</tr>
<tr>
<td>G/C: EBU</td>
</tr>
</tbody>
</table>
Fielder XT™ supported by PROWLER® microcatheter (Cordis) Miracle 6g™ guidewire was passed into obtuse marginal (OM) branch but not into distal–LCX
After Miracle wire was changed into Runthrough wire, Multiple predilation with a 1.5X10 mm ADEMEUS Supercross® and a 2.0X15 mm Sapphire II® was done up to burst pressure.
Stent deployment with a 2.75X24 mm NOBORI™ was performed up to 10 atmospheres during 10 seconds without immediate complication. However, distal LCX branch was still occluded.
We tried continuously to open occluded distal proper vessel. Attempt to pass across target lesion with FielderXT guidewire was tried. Finally, we thought FielderXT guidewire successfully passed across into true lumen of distal LCX. And then, sequential ballooning with a 1.5X10mm Suppercross® and 2.0X15mm Sapphire® was done.
Cineangiogram showed the formation of an arteriovenous fistula arising from the distal LCX artery draining into coronary sinus via the posterior vein of left ventricle (PVLV) with side branches.
Beginning of disaster? or not?

Fortunately, vital sign was stable and patient didn’t complain of chest pain.
In this situation, what is the best option?

1. Balloon occlusion and wait?
2. Coiling?
3. Graft stenting?
4. Surgery?
5. Just observation?

* Please tell me your choice!
My option was Graft stent deployment

In order to seal off the fistula, a 3.0X19mm polytetrafluoroethylene (PTFE)-covered stent (Graftmaster, Abbott) was advanced and positioned in bifurcated site of the distal LCX and OM branch.
Subsequently, a 2.75X24mm Nobori stent balloon was positioned inside the covered stent and inflated to 14 atm.
iatrogenic AV fistula
### Increased Coronary Perforation in the New Device Era

**Incidence, Classification,**

- **Study number:** 12900
- **Ellis type I, II, III, IIIICS**
- **CS; coronary spilling**

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Extraluminal crater without extravasation (Fig 1)</td>
</tr>
<tr>
<td>II</td>
<td>Pericardial or myocardial blush without contrast jet extravasation</td>
</tr>
<tr>
<td>III</td>
<td>Extravasation through frank ($\geq 1$ mm) perforation (Fig 2)</td>
</tr>
<tr>
<td>Cavity spilling</td>
<td>Perforation into an anatomic cavity chamber, coronary sinus, etc</td>
</tr>
</tbody>
</table>

**Circulation 1994;90:2725**

**Key Words** • angioplasty • revascularization • surgery
### Table 5. In-Hospital Clinical Outcome for Patients With Perforation

<table>
<thead>
<tr>
<th>Perforation Type</th>
<th>n</th>
<th>Death, %</th>
<th>Emerg CABG, %</th>
<th>QMI, %</th>
<th>Tamponade, %</th>
<th>NQMI, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>13</td>
<td>0</td>
<td>15</td>
<td>0</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>II</td>
<td>31</td>
<td>0</td>
<td>10</td>
<td>0</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>IIICS</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>III</td>
<td>16</td>
<td>19</td>
<td>63</td>
<td>15</td>
<td>63</td>
<td>36</td>
</tr>
</tbody>
</table>

#### Device type

- Balloon angioplasty: 14/9080 (0.1%; 0.1-0.1%)  
  - I: 3, II: 5, IIICS: 2, III: 4
- Directional atherectomy: 12/1715 (0.7%; 0.7-0.7%)  
  - I: 3, II: 7, IIICS: 0, III: 2
- Excimer laser-I: 10/529 (1.9%; 0.8-3.0%)  
  - I: 3, II: 4, IIICS: 0, III: 3
- Excimer laser-II: 7/371 (1.9%; 0.5-3.3%)  
  - I: 0, II: 7, IIICS: 0, III: 0
- Rotablator: 10/771 (1.3%; 0.5-2.1%)  
  - I: 3, II: 4, IIICS: 0, III: 3
- TEC: 9/434 (2.1%; 0.8-3.4%)  
  - I: 1, II: 4, IIICS: 0, III: 4

*Circulation 1994;90:2725*
**Iatrogenic coronary AV fistula (1)**

- Extremely rare complication of PCI
- Almostly, communications between the coronary arteries and the **cardiac chambers** such as the right ventricle, and less commonly, the left ventricle

*J Invasive Cardiol 2002;14(1):41–43
J Invasive Cardiol 2003;15(12):729–731*
Iatrogenic coronary AV fistula (2)

- During 2000–2010,
  - There are a few published series of iatrogenic coronary AV fistula to cardiac vein that developed following PCI; several case series have been reported.
  - Coil embolization, Covered stent
  - Observation => spontaneous resolution

Cardiac vein anatomy

CS: Coronary sinus
GCV: great cardiac vein
PVLV: posterior vein of left ventricle

JACC 2006;48:1832–8
Upto date, the intraprocedural management of a iatrogenic coronary AV fistula resulting from PCI is not established due to very rare incidence.

Case by case..
Conclusion

In our case,

- AV fistula size was big
- There were large amount of the shunt flow
- Already balloon dilation was performed following guidewire penetration.

➤ My rationale for graft stenting

1) Chance of spontaneous closure will not be easy.
2) Worried about future hemodynamic burden “At least no harm” to patient