Endovascular Management of Isolated Iliac Artery Aneurysm (IAA)

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Purpose

Isolated iliac artery aneurysms (IAA) are relatively uncommon and represent 2% to 7% of all intra-abdominal aneurysms.(1-3) Despite their rarity, several reports have suggested that isolated iliac artery aneurysms have a high risk of rupture, with a high associated mortality rate of up to 80%.(4-5) Open surgical repair with prosthetic graft placement is the gold standard treatment for iliac artery aneurysms. The aim of this study was to evaluate the effectiveness of endovascular management of isolated IAA.

Methods and Materials

Between 2008 and 2011, 31 patients who underwent endovascular treatment for isolated IAA were retrospectively analyzed. All patients were assessed by contrast-enhanced computed tomography. The mean aneurysm size was 43 mm (range: 30-71 mm). The age ranged from 37 to 87 years old (mean: 70.0 years). All the patients were considered high operative risk, due to advanced age and/or significant co-morbidities. Therefore, endovascular treatment was favored.

Procedure

Isolated IAAs were treated in one of three different ways depending on the anatomical and pathologic features of isolated IAA: 1) infrarenal aortic stent-graft placement with limb extension where the length of the proximal neck is less than 2 cm, 2) stent-graft placement for isolated iliac artery coverage, 3) embolization with a coil and a vascular plug combined with femoral-femoral bypass grafting in mycotic aneurysm.

Peri-interventional heparin (5,000 IU) was given intra-arterially. Post-interventional anticoagulation was continued with heparin (1000 to 1200 IU/h IV, activated partial thromboplastin time 60 to 80 seconds) for 24 to 48 hours. Excluder (W. L. Gore and Associates, Flagstaff, AZ, USA; n=20), AneuRx (Medtronic, Minneapolis, MN, USA; n=7), or Endurant (Medtronic Inc, Santa Rosa, CA, USA; n=3) bifurcated stent-grafts were implanted. Deployed stent-grafts were subsequently dilated with a 33-mm Equalizer occlusion balloon catheter (Boston Scientific, Natick, MA, USA). Embolization of the internal iliac artery was performed when necessary with Amplatzer vascular plugs (AGA Medical Corporation, Plymouth, MN, USA) or Nester (Cook Inc., Bloomington, IN, USA) coils. When embolization of both internal iliac arteries was needed, each internal iliac artery was embolized separately with a one week interval.
Follow-up assessment

Patients were recommended to undergo CECT initially at one month post-procedure, and then annually thereafter if there were no remarkable abnormalities. If CECT revealed endoleak or other associated abnormalities at one month follow-up, three and six months follow-up CTs were performed.

Results

Patient demographics and co-morbidities are listed in Table 1.

### Patient characteristics

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<tr>
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<th>n (%)</th>
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<tr>
<td>Total patients</td>
<td>31 (100)</td>
</tr>
<tr>
<td>Men</td>
<td>26 (81.0)</td>
</tr>
<tr>
<td>Women</td>
<td>5 (19.0)</td>
</tr>
<tr>
<td>Age range (yr)</td>
<td>37-86</td>
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<tr>
<td>Mean age (yr)</td>
<td>70.0 ± 10.1</td>
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<tr>
<td>Cigarette smoking</td>
<td>9 (29.0)</td>
</tr>
<tr>
<td>Hypertension</td>
<td>12 (38.7)</td>
</tr>
<tr>
<td>Malignancy</td>
<td>6 (19.4)</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>5 (16.1)</td>
</tr>
<tr>
<td>Ischemic heart disease</td>
<td>3 (9.7)</td>
</tr>
<tr>
<td>Hyperlipidemia</td>
<td>2 (6.5)</td>
</tr>
<tr>
<td>Previous aortic surgery</td>
<td>1 (3.2)</td>
</tr>
<tr>
<td>Chronic renal disease</td>
<td>1 (3.2)</td>
</tr>
</tbody>
</table>

**Symptoms**

<table>
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<tr>
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<th>n (%)</th>
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<tbody>
<tr>
<td>Asymptomatic</td>
<td>22 (71.0)</td>
</tr>
<tr>
<td>Abdominal Pain</td>
<td>4 (12.9)</td>
</tr>
<tr>
<td>Claudication</td>
<td>3 (9.7)</td>
</tr>
<tr>
<td>Leg edema</td>
<td>1 (3.2)</td>
</tr>
<tr>
<td>Palpable mass</td>
<td>1 (3.2)</td>
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Table 1: Pre-procedure patient characteristics

Common iliac artery involvement was seen in 28 patients. Ten (35.7%) of those patients also had an internal IAA. Three patients had an isolated internal IAA. Technical success was achieved in all patients. Infrarenal stent-graft placement was performed in 25 patients (Fig. 1).

Fig. 1: A 69-year old male with the right common iliac artery aneurysm. 1A. Three-dimensional reconstruction image reveals 3.2 cm size of the right common iliac artery aneurysm (arrow) with less than 2cm length of the proximal neck. 1B. Follow-up CT scan after infrarenal bifurcated stent-graft demonstrate complete exclusion of the isolated iliac artery aneurysm.

References: Department of Radiology, Severance Hospital, Severance Hospital, Yonsei University College of Medicine/ Korea 2011

Stent-graft placement for coverage of the only iliac artery was performed in five patients. Three of them underwent ipsilateral access, and Remaining two underwent contralateral access since patients had more than 5cm size of isolated internal IAA with wide proximal necks of common iliac artery as large as 16mm, so 18mm diameter of the stent-graft
(Excluder) had to be placed inversely to cover the ecstatic neck of the common iliac artery with pull through technique (Fig 2,3,4).

**Fig. 2**: A 71-year old male with 50 mm size of the right internal iliac artery aneurysm. Fig.2A-B. CT scan and the left anterior oblique view of aortography reveals large internal iliac artery aneurysm (arrow) on the right side.

**References**: Department of Radiology, Severance Hospital, Severance Hospital, Yonsei University College of Medicine/ Korea 2011
**Fig. 3**: Stent-graft (Excluder, 16x18mm, 10cm in length) is placed inversely with pull-through technique via contralateral access. Multiple coils (arrows) are employed to embolize the distal internal iliac artery.

**References**: Department of Radiology, Severance Hospital, Severance Hospital, Yonsei University College of Medicine/ Korea 2011
Fig. 4: Fig.4A-B, Completion angiography and follow-up CT show complete exclusion of the aneurysm without endoleak.

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One patient, who had a mycotic aneurysm of the right common iliac artery underwent coil embolization of the ipsilateral common iliac artery with concurrent femoral-femoral bypass graft. Five of the 31 patients (16.1%) with stent grafts had Type II endoleaks at the time of the last imaging study, one of those patients underwent percutaneous embolization with glue. None of the patients showed major procedure-related complications.

Images for this section:
Fig. 1: A 69-year old male with the right common iliac artery aneurysm. 1A. Three-dimensional reconstruction image reveals 3.2 cm size of the right common iliac artery aneurysm (arrow) with less than 2cm length of the proximal neck. 1B. Follow-up CT scan after infrarenal bifurcated stent-graft demonstrate complete exclusion of the isolated iliac artery aneurysm.
Fig. 2: A 71-year old male with 50 mm size of the right internal iliac artery aneurysm. Fig.2A-B. CT scan and the left anterior oblique view of aortography reveals large internal iliac artery aneurysm (arrow) on the right side.
**Fig. 3:** Stent-graft (Excluder, 16x18mm, 10cm in length) is placing inversely with pull-through technique via contralateral access. Multiple coils (arrows) are employed to embolize the distal internal iliac artery.

**Fig. 4:** Fig.4A-B, Completion angiography and follow-up CT show complete exclusion of the aneurysm without endoleak.
Conclusion

Isolated iliac artery aneurysm (IAA) is a rare condition that is treated aggressively because of the high risk of rupture. Current recommendations are to treat these lesions when the diameters reach 3 to 3.5 cm because rupture carries reported mortality rates as high as 70%. (2,5,6,7) It is generally agreed upon that the most common cause of isolated IAA is arteriosclerosis. Other causes include trauma, infection, dissection, excessive athletic effort, para-anastomotic graft failure, and connective tissue disorders such as Marfan Syndrome and Ehlers-Danlos Syndrome.(8)

Although, open surgical repair with prosthetic graft placement is the gold standard treatment for iliac artery aneurysms currently, the endovascular technique carries a number of potential advantages, as it avoids general anesthesia and aortic clamping, reduces operative blood loss and transfusion requirements, shortens hospital stays, and limits the overall physiological stress associated with conventional open surgery.

After undergoing stent-graft insertion or coil embolization, patients may experience post-implantation syndrome or post-embolization syndrome, consisting of low-grade fever, abdominal pain, mild leukocytosis, and elevation of the C-reactive protein level (9,10). These syndromes are usually self-limiting and resolve within 1 week without specialized treatment.

Pre-procedural imaging is essential in evaluating patient eligibility for endovascular treatment and planning the intervention. The proximal necks, distal necks, and body of the aneurysm as well as the device delivery route should be assessed prior to endovascular treatment. CECT is the most effective diagnostic tool, providing exact information regarding the presence, location, diameter, and extension of the aneurysm.

Percutaneous exclusion of iliac artery aneurysms by implantation of endovascular stent-graft is feasible and safe with various techniques depending on the anatomical and pathologic features of the isolated IAA.

References


Personal Information