Hypogastric Artery Preservation during Endovascular Aortic Aneurysm Repair: Is It Important?

Peter H. Lin, MD, Aaron Y. Chen, and Alok Vij, BS

Endovascular repair of aortoiliac artery aneurysm is a safe and effective treatment strategy. Selective hypogastric artery embolization with coils may be necessary to allow the endograft to anchor in the aneurysm-free external iliac artery, thereby eliminating hypogastric endoleak into the aortoiliac aneurysm. Considerable controversy exists regarding the safety of intentional occlusion of the hypogastric artery. Proximal occlusion of a hypogastric artery with embolic coils typically produces little or no clinical symptoms due to well-collateralized pelvic arterial networks. On the other hand, significant complications, such as colonic ischemia, spinal cord paralysis, buttock claudication, or erectile dysfunction are well-recognized adverse events after hypogastric artery embolization. This article examines the natural history of hypogastric artery embolization as well as clinical data regarding the safety and complications following this procedure. Clinical studies regarding risk factors that might contribute to ischemic complication following hypogastric artery embolization are presented. Lastly, treatment strategies to preserve the hypogastric artery thereby obviating the need for hypogastric artery embolization are discussed.

E N D O VASCULAR AORTIC ANEURYSM repair (EVAR) has been widely accepted as a safe treatment strategy in patients with aortoiliac artery aneurysm, particularly those who are at high risk for a conventional operation. When the aortoiliac aneurysm extends distally to the hypogastric artery, selective hypogastric artery embolization with coils may become necessary to allow the endograft to anchor in the aneurysm-free external iliac artery, thereby eliminating hypogastric endoleak into the aortoiliac aneurysm.

Considerable controversy exists regarding the safety of intentional occlusion of the hypogastric artery. Proximal occlusion of a hypogastric artery with embolic coils typically produces little or no clinical symptoms due to well-collateralized pelvic arterial networks. On the other hand, many patients experience profound morbidity following acute hypogastric artery embolization. Numerous studies have suggested that unilateral hypogastric artery embolization can often be performed without significant risk of complication as long as the pelvic circulation is maintained by the contralateral hypogastric collateral vessels. In contrast, bilateral hypogastric artery embolization can lead to a variety of pelvic ischemic symptoms, with buttock claudication and colonic ischemia being two common examples.

This article examines the natural history of hypogastric artery embolization as well as clinical data about the safety and complications after this procedure. Clinical studies regarding risk factors that might contribute to ischemic complication following hypogastric artery embolization are discussed. Lastly, treatment strategies to preserve the hypogastric artery during endovascular aortoiliac aneurysm repair are presented.

Anatomic Consideration and Clinical Implications of Hypogastric Artery Occlusion in Aortoiliac Aneurysm Repair

The hypogastric arteries provide critical blood flow to the pelvic organs and buttock muscles. These vessels represent a major inflow source of circulation to many gastrointestinal and genitourinary structures, such as the sigmoid colon, rectum, ovary, uterus, and scrotum. Because significant cross-pelvic collateral systems exist between bilateral hypogastric arteries, operative ligation of one hypogastric artery with
preservation of the contralateral hypogastric artery is usually well-tolerated and without significant adverse clinical sequelae. Similarly, ipsilateral hypogastric artery embolization with a patent contralateral hypogastric artery is generally well-tolerated in most patients. However, occlusion of bilateral hypogastric arteries, either by means of operative ligation, endovascular embolization, or natural progression of atherosclerotic disease, can lead to significant clinical consequences. These adverse sequelae were brought to clinical investigative scrutiny during the past decade because, in part, of the common practice of hypogastric artery embolization during endovascular treatment of aortoiliac aneurysm repair.1-3,6,7,9-11 Many clinical reports have cited the devastating consequences of pelvic ischemic complications following hypogastric artery embolization, which include colonic ischemia, buttock claudication, bladder dysfunction, sacral decubitus ulcer, impotence, or even scrotal skin sloughing.1-3,6,7,9-12

Controversies undoubtedly exist about the incidence or significance of pelvic ischemic complication following hypogastric artery occlusion. While operative ligation of the hypogastric artery was common practice in pelvic trauma or obstetric emergency surgery during the past 5 decades, the clinical implication of pelvic ischemia following hypogastric occlusion did not receive focused attention until the past decade. In fact, a closer analysis of the literature regarding pelvic ischemic complications following hypogastric occlusion either from operative ligation or endovascular embolization demonstrates a contrasting degree of clinical implication. Clinical studies of pelvic ischemia after hypogastric artery ligation in trauma or obstetric emergencies noted that such complications were relatively uncommon following operative interventions.1,13,14 By contrast, numerous clinical reports have underscored the devastating sequelae of pelvic ischemia following endovascular embolization of hypogastric artery during aortoiliac stent-graft repair, particularly with bilateral hypogastric artery embolization.1-3,6,7,9-12

Several factors may account for the difference in pelvic ischemia between operative ligation and endovascular occlusion of the hypogastric artery. The lack of normal rich pelvic collateral vessels in elderly patients with atherosclerotic aneurysmal disease may increase the risk of pelvic ischemia after hypogastric artery embolization.15 Moreover, the incisional pain associated with an open laparotomy, along with reduced postoperative mobility, can present a diagnostic challenge for both physicians and patients to recognize an underlying buttck claudication symptom. In addition, operative ligation of the hypogastric artery and selective hypogastric artery embolization have rather distinctive features that might account for the increased ischemic complication in the latter approach. Operative ligation of the hypogastric artery is performed in the proximal segment of the artery, which permits collateral network formation in the distal segment of the hypogastric artery. In contrast, catheter-directed coil embolization of the hypogastric artery may lead to formation of minute fragments of thrombus because of the presence of foreign bodies. Propagation of these small thrombi into the capillary beds may prevent adequate collateral vessel formation at the precapillary level, which may worsen the pelvic ischemia, particularly in patients with underlying atherosclerotic disease. As a result, irreversible tissue damage can occur when the terminal capillary blood flow is compromised.

### Literature Review of Pelvic Complications Following Hypogastric Artery Embolization

Pelvic ischemic complications as a result of hypogastric occlusion are well-described in the literature, with buttock claudication and colonic ischemia the most common sequelae.1,2,4,6,7,9,11,12,16 Additionally, less common complications include spinal cord ischemia, gluteal compartment syndrome, bladder dysfunction, decubitus ulcer, and genital ulceration.1,2,4,6,7,9,11,12,16 Table 1 lists a summary of 21 published reports regarding hypogastric embolization for endovascular aortoiliac artery aneurysm repair.2-4,6-9,11,12,16-27 It is noteworthy that 9 of these 22 articles were retrospective reviews.9,17,18,20,22,23,26-28 Among them, five studies based their findings on telephone interviews, where follow-up information was not available from clinical charts. Additionally, not all patients from these studies were contacted by telephone.9,22,23,26,28 In three of nine studies, no indication was given whether the data was gathered prospectively or retrospectively.3,19,25 while one study based their results on both retrospective and prospective methods of data collection.2 There have been five published studies which based on their data collection using prospective inquiries regarding specific symptoms of pelvic ischemia.8,12,16,21,24 Similarly, there were five studies that reported the outcomes of unilateral hypogastric artery embolizations.8,17,20,25,27 Among these, one reported a series of unilateral coil embolization,8 three compared unilateral hypogastric occlusion by analyzing either coil embolization versus other endovascular methodologies,17,25,27 and one analyzed the outcomes of unilateral embolization with coil placement in either the proximal or distal segment of the hypogastric artery.20 This literature review also includes studies that compared coil embolization versus noncoiling interventional techniques, and the results of the coiled hypogastric artery embolization were included in the analysis. There were 15 studies that included patients undergoing both unilateral and bilateral embolizations.3,4,7-9,11,12,16,18,19,21-24,26 There were two studies that contained reports of solely bilateral embolizations.2,12 and only one study was conducted in a prospective manner.12

Regarding the complication of buttock claudication, this is a frequent adverse consequence following bilateral hypogastric embolization, with incidences ranging from 1.6% to 56%.2-4,6-9,11,12,16-27 Overall incidence of this complication based on these reported articles was 28% (192 patients of overall 686 patients). Table 1 summarizes studies that provided details regarding complications of buttock claudication and erectile dysfunction. The incidence of buttock claudication was 28% (198 of 706 patients) in patients undergoing unilateral embolization and 42% (43 of 102 patients) in patients under-
going bilateral hypogastric embolizations. While bilateral hip or buttock claudication remains a debilitating condition, a majority of patients who suffered from this complication showed symptom stabilization without further intervention. Patients with unilateral buttock claudication generally can tolerate this condition with gradual exercise regimens to improve their symptoms.

Regarding the complication of erectile dysfunction, there were only seven articles that provided details of new onset of erectile dysfunction following coil embolization of the hypogastric artery. There was one additional article that reported a new onset of post-EVAR erectile dysfunction, but the data were obtained by telephone interviews with only some of the patients in the study. Overall, these studies demonstrated that the incidence of new-onset erectile dysfunction was 17% (38 of 225 patients). When analyzing the laterality of hypogastric artery embolization as a variable of erectile dysfunction, these studies revealed the incidence of erectile dysfunction was 19% (29 of 152 patients) after unilateral embolization. In contrast, the incidence of erectile dysfunction following bilateral hypogastric artery embolization was 24% (17 of 70 patients).

A less frequent complication following hypogastric embolization is colonic ischemia, which is a well-recognized adverse event following open aortic surgery. With endovascular stent-graft placement for aortoiliac artery aneurysm, the inferior mesenteric artery is routinely covered by the endograft. Additionally, embolization of either unilateral or bilateral hypogastric arteries undoubtedly increases the risk of ischemic colitis after endograft placement. Loss of one or both hypogastric arteries can sacrifice critical collateral circulation because antegrade inferior mesenteric arterial flow is no longer patent because of endograft coverage in the aortic aneurysm. The overall incidence of this complication, based on available literature, is 3.4%.6,7,9,12,16-21

Another devastating but rare consequence of hypogastric artery embolization is spinal cord ischemia, which can manifest as paralysis. Because the hypogastric artery provides collateral flow to the iliolumbar arterial networks, compromise of the hypogastric artery may contribute to spinal cord ischemia. Spinal cord ischemia is a well-recognized complication following interruption of hypogastric and lumbar sacral medullary artery flow in open aortoiliac aneurysm surgery. In a large series of open repairs reported by Gloviczki and colleagues, there was a 0.3% incidence of ischemic injury to the spinal cord or lumbosacral plexus after aortic surgery for both occlusive disease and aneurysmal disease.32 These researchers recommended gentle handling to prevent embolization, avoidance of hypotension and prolonged supraceliac cross-clamping, and preservation of at least one hypogastric artery to avoid spinal injury.29-32 However, a different study reported that spinal cord ischemia following aortic surgery to be both unpreventable and unpredictable. The overall incidence of spinal cord ischemia following hypogastric embolization is rare, typically <0.1%.2,12,10,21 The risk of spinal cord ischemia is theoretically higher following bilateral hypogastric artery embolization, when compared to unilateral embolization. To avoid this devastating complication, researchers have advocated staged bilateral hypogastric artery embolization rather than

### Table 1: Literature Review of the Patients who Developed Buttock Claudication and/or Erectile Dysfunction Following Hypogastric Artery Embolization

<table>
<thead>
<tr>
<th>First Author (year)</th>
<th>No. of Patients</th>
<th>Claudication</th>
<th>Erectile Dysfunction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cynamon (2000)</td>
<td>34</td>
<td>13 (40)</td>
<td>NA</td>
</tr>
<tr>
<td>Razavi (2000)</td>
<td>32</td>
<td>9 (28)</td>
<td>2/16 (13)</td>
</tr>
<tr>
<td>Karch (2000)</td>
<td>22</td>
<td>7 (32)</td>
<td>NA</td>
</tr>
<tr>
<td>Criado (2000)</td>
<td>39</td>
<td>5 (13)</td>
<td>NA</td>
</tr>
<tr>
<td>Lee (2000)</td>
<td>27</td>
<td>5 (19)</td>
<td>NA</td>
</tr>
<tr>
<td>Yano (2001)</td>
<td>103</td>
<td>21 (20)</td>
<td>NA</td>
</tr>
<tr>
<td>Lee (2001)</td>
<td>23</td>
<td>9 (39)</td>
<td>NA</td>
</tr>
<tr>
<td>Mehta (2001)</td>
<td>107</td>
<td>17 (16)</td>
<td>7/73 (10)</td>
</tr>
<tr>
<td>Wolpert (2001)</td>
<td>18</td>
<td>8 (44)</td>
<td>NA</td>
</tr>
<tr>
<td>Lyden (2001)</td>
<td>23</td>
<td>7 (30)</td>
<td>NA</td>
</tr>
<tr>
<td>Lin (2002)</td>
<td>12</td>
<td>6 (50)</td>
<td>5/11 (45)</td>
</tr>
<tr>
<td>Rhee (2002)</td>
<td>49</td>
<td>14 (29)</td>
<td>NA</td>
</tr>
<tr>
<td>Wyers (2002)</td>
<td>11</td>
<td>5 (45)</td>
<td>NA</td>
</tr>
<tr>
<td>Engelke (2002)</td>
<td>16</td>
<td>4 (25)</td>
<td>NA</td>
</tr>
<tr>
<td>Kritpracha (2003)</td>
<td>20</td>
<td>9 (45)</td>
<td>NA</td>
</tr>
<tr>
<td>Tefera (2004)</td>
<td>13</td>
<td>4 (31)</td>
<td>NA</td>
</tr>
<tr>
<td>Arko (2004)</td>
<td>12</td>
<td>6 (50)</td>
<td>NA</td>
</tr>
<tr>
<td>Farahmand (2008)</td>
<td>101</td>
<td>51 (50)</td>
<td>19/101 (20)</td>
</tr>
<tr>
<td>Rayt (2008)</td>
<td>29</td>
<td>16 (55)</td>
<td>5/29 (17)</td>
</tr>
</tbody>
</table>

Abbreviation: NA, not available.
simultaneous bilateral embolization, as the former treatment approach may lead to better tolerance and greater collateral formation to avoid ischemic complication.

**Pelvic Hemodynamic Alterations of Hypogastric Artery Embolization**

The hemodynamic consequence after hypogastric embolization for endovascular aortoiliac artery aneurysm repair was assessed in a prospective clinical study in which 12 patients underwent preoperative and postoperative penile-brachial-index (PBI) and pulse-volume recording assessment. The implication of pelvic flow adaptation following hypogastric artery embolization, as assessed by penile artery blood pressure, was analyzed with occurrence of pelvic ischemic complications.

In this prospective study, the incidence rates of erectile dysfunction and claudication were 45% and 50%, respectively, which were relatively high rates compared with several contemporary reports. The study found that patients with bilateral hypogastric artery embolization were more likely to have pelvic ischemic complications develop and, correspondingly, had a greater reduction in PBI when compared with those who underwent unilateral hypogastric artery embolization. Specifically, mean reductions in PBI after unilateral and bilateral hypogastric artery embolization were 13% and 39% (P < .05), respectively. Erectile dysfunction occurred in three patients for unilateral hypogastric artery embolization (38%) and in two patients for bilateral hypogastric artery embolization (50%), with an overall PBI reduction of 36% (P < .01). Hip and buttock claudication occurred in four patients for unilateral hypogastric artery embolization (50%) and in two patients for bilateral hypogastric artery embolization (50%), with an overall PBI reduction of 18% (P < .05). Taken altogether, those in whom claudication symptoms or erectile dysfunction developed after either unilateral or bilateral hypogastric artery embolization had a significant reduction in postoperative PBI, and thigh brachial or ankle brachial indices remained unchanged.

The association between penile blood flow reduction and erectile dysfunction has been previously noted by Queral and colleagues, who evaluated pelvic hemodynamics by measuring penile blood pressure after aortoiliac reconstruction. They reported that patients with postoperative increase in penile pressures were more likely to regain erectile capability. Conversely, patients with diminished penile pressure after aortoiliac operation either had a new onset of impotence develop or never regained erectile function.

It is noteworthy that this study further analyzed the role of profunda femoral artery with regard to subsequent pelvic ischemia after hypogastric artery embolization. The finding from this study clearly underscored the importance of profunda femoral artery as a source of collateral flow to the pelvic circulation. The authors found that patients with a diseased profunda femoral artery (>50% stenosis) were more likely to have pelvic ischemic complications develop after hypogastric artery embolization than those without significant disease in the profunda femoral artery. Understandably, the hypogastric artery receives a rich network of collateral connections, both cranially and caudally, from the inferior mesenteric artery via the rectal arterial axis and the profunda femoral artery via the circumflex arterial axis, respectively. However, the placement of an aortic endograft uniformly occludes the origin of the inferior mesenteric artery. When unilateral hypogastric artery embolization is performed in endovascular aortic repair, the pelvic collaterals are primarily relied on the circumflex arterial axis of the common artery and profunda femoral artery distally. Other clinical studies have similarly underscored the importance of pelvic collateral flow following hypogastric artery interruption. Ilipoulos and colleagues evaluated the pressure changes in the pelvic circulation by clamping the hypogastric artery and showed that the ipsilateral circumflex branches of common artery and profunda femoral artery provide greater collateral circulation than the contralateral hypogastric artery. Clinical studies by Flanigan et al and Pierce et al have similarly shown the importance of circumflex branches of the common artery and profunda femoral artery in maintaining pelvic flow and preserving sexual function in patients with hypogastric occlusion after aortoiliac reconstruction.

Based on the findings of this prospective hypogastric embolization study, the authors noted that patients with diseased profunda femoral arteries are at risk of developing pelvic ischemia after hypogastric artery embolization. The authors recommended a concomitant profundaplasty at the time of aortic endografting to improve pelvic collateral flow and reduce pelvic ischemia in this subset of patients with hypogastric artery embolization.

**Risk Factor Analysis of Complications Following Hypogastric Artery Embolization**

Several recent studies have analyzed potential risk factors of pelvic ischemic complication following hypogastric artery embolization. Farahmand and colleagues performed a retrospective analysis of their experience in 96 patients who underwent hypogastric artery embolization. While confirming that endovascular hypogastric artery occlusion is not benign, the authors reported that buttock claudication was observed in 50% of cases. This complication lasted ≥6 months in 34% of these cases and was severe in 7% of cases. When analyzing potential predictive factors that might be contributory to long-term buttock claudication, the authors noted that younger age (P < .03) and left ventricular dysfunction (P < .01) were significant based on univariate analysis. The authors postulated that such findings were logical because young patients are more active and more prone to suffer from claudication, while older patients may not be active enough to declare symptoms. It is noteworthy that younger patients were more prone to suffer lasting claudication. Additional analysis showed that patients with left ventricular dysfunction were 4.5 times more likely to develop persistent claudi-
cation. This may due to the fact that low cardiac outflow may negatively impact the pelvic circulation when unilateral hypogastric artery is embolized. Interestingly, patients with diabetes had a lower rate of buttock claudication. While the reasons for this finding were unclear, the authors speculated that this subgroup of patients were less physically active. Based on the findings of this study, the authors recommended that age and low cardiac function should be taken into account when hypogastric artery embolization is considered during endovascular aneurysm repair.7

Yano et al similarly analyzed risk factors associated with complications following hypogastric artery embolization.3 In their series of 103 patients who underwent hypogastric embolization, the authors assessed various angiographic risk factors that contributed to pelvic ischemic complications. The study identified three conditions on preoperative angiograms that made the development of pelvic ischemia more likely, which included >70% stenosis of the origin of the contralateral hypogastric artery, absence of filling of three or more named hypogastric branches, and disease or absence of ascending branches from the femoral artery. The authors cautioned hypogastric artery embolization in patients with these angiographic features, as pelvic ischemic complications including colonic ischemia represented potential adverse outcomes.3

In a separate study that analyzed the cross-pelvic circulation in patients undergoing hypogastric embolization, Maldonado and colleagues reported that circumflex branches of the ipsilateral external iliac and femoral arteries contributed more to the pelvic collateral circulation than the contralateral internal iliac artery.30 The authors reported that pelvic ischemic complications often resulted from atheroembolization despite preservation of contralateral hypogastric arterial circulation.

Recent data have emerged to suggest that hypogastric artery embolization may not be necessary in endovascular treatment of aortoiliac artery aneurysms.25,27,37 In three recent studies, the hypogastric artery origin was covered with the stent graft without prior hypogastric embolization. With a total combined series of 55 patients, there were no postoperative endoleaks related to the hypogastric artery in any of the patients from these studies.23,27,37 In these collective experiences, buttock claudication occurred in 0 to 27%, with a calculated combined rate of 14.5% (8 of 55). This outcome compares favorably with previous published rates for buttock claudication following unilateral hypogastric embolization, with incidences ranging from 16.1% to 40.6%.6,16,19,22,24 However, if the origin of the hypogastric artery is to be occluded by a stent graft, this may preclude any subsequent endovascular treatment option should an endoleak occur. In the event that a hypogastric-related endoleak occurred, which is associated with increasing aneurysm sac dimension, the only treatment would be operative ligation of the hypogastric artery.

Therapeutic Strategies to Preserve the Hypogastric Artery

Taking all the available literature on hypogastric artery embolization into account, all authors would uniformly agree that pelvic ischemia can be a devastating complication following hypogastric artery embolization. Furthermore, most studies emphasized the high incidence of pelvic ischemia following bilateral hypogastric artery embolization. The importance of maintaining pelvic circulation is critical in preventing pelvic ischemic complications and ensuring patient safety during endovascular aortoiliac aneurysm repair. Several approaches have been described to preserve hypogastric artery flow in lieu of coil embolization.38-40 When dealing with an aneurysm that involves the common iliac artery, one technique to avoid hypogastric artery embolization is to surgically band the common iliac artery aneurysm.40 This can be accomplished by a retroperitoneal approach in which the common artery aneurysm is encircled and banded circumferentially by positioning an intraluminal angioplasty balloon catheter to adequately ensure the common iliac artery diameter following banding. This allowed the stent graft to be positioned adequately in the banded common iliac artery and maintained the hypogastric artery circulation.40 Another approach is to translocate the iliac artery bifurcation by transposing the hypogastric artery to the external iliac artery.17,38,39,41 Numerous reports have noted favorable outcomes following hypogastric artery bypass, with avoidance of pelvic ischemic complication.2,7,38,39,41 Other authors have reported a hybrid approach of placing an external iliac artery to internal iliac artery endograft combined with a contralateral aorto-uniiliac stent-graft placement with femorofemoral bypass.42,43 This treatment option ensures that at least one hypogastric artery circulation can be maintained by the external iliaco-internal iliac artery stent-graft placement.

One potential treatment strategy that enables the preservation of the hypogastric artery circulation while excluding the adjacent aortoiliac artery aneurysm is the use of hypogastric artery branched stent graft. This treatment approach can obviate the need for hypogastric artery embolization while preserving an antegrade flow to the pelvic circulation. The first hypogastric branched stent graft was constructed from a bifurcated endovascular Zenith AAA device (Cook Europe, Bjaeverskov, Denmark).44 Subsequent device modification led to the hypogastric branched device fitted within an indwelling catheter preloaded with a 0.035” guide wire (Fig 1). The device is introduced and oriented under fluoroscopic guidance with the aid of the radiopaque markers. The delivery sheath is withdrawn, exposing the tip of the preloaded catheter. The preloaded 0.035” guide wire was then exchanged for a 0.018” guide wire, which is snared from the contralateral side to create a through-and-through access. The introducer sheath is then withdrawn further in order to release the hypogastric branched stent graft. A separate guiding sheath is passed into the hypogastric branch from the contralateral side over the through-and-through guide wire. Through this sheath, the hypogastric artery is catheterized with a hydrophilic guide wire. Next, a balloon-expandable stent graft is used to extend into the hypogastric artery, which completes the deployment of the hypogastric artery branched stent graft (Figs 2 and 3).

The hypogastric branched stent graft represents an exciting treatment strategy on the horizon, which can obviate the
need for hypogastric embolization while preserving either unilateral or bilateral hypogastric artery flow to the pelvis. While results from several clinical series demonstrated the feasibility of this endovascular technology, these studies were conducted for clinical investigative intent as the device has yet to be approved by the US Food and Drug Administration. Additional multicenter studies are currently underway to provide long-term device efficacy.

**Conclusion**

Hypogastric artery embolization during endovascular aorto-iliac aneurysm repair is not a benign procedure, as it can lead to numerous pelvic ischemic complications. While buttck claudication and erectile dysfunction are more common examples of pelvic ischemia, other devastating adverse events, such as spinal cord ischemia, can lead to life-long
debilitation. Current literature advocates avoidance of bilateral hypogastric artery embolization if possible. The heightened awareness of pelvic ischemic complications has led to various endovascular techniques and strategies for hypogastric artery preservation during endovascular aortoiliac aneurysm repair. Future availability of branched stent-graft technology to preserve hypogastric artery flow may obviate the need for hypogastric artery embolization, which may avoid potential pelvic ischemic complication and enhance procedural safety for patients undergoing endovascular repair of aortoiliac aneurysms.

References

Figure 3 (A) A preoperative angiogram demonstrated a large aortoiliac artery aneurysm involving the left common iliac artery (long arrow). (B) Following the successful deployment of an iliac branched stent-graft, the aortoiliac aneurysm is excluded while the left hypogastric artery perfusion is maintained (short arrow).