Global Perspectives on the Value of Internal Iliac Artery Preservation

Expert vascular surgeons share international experiences with iliac branch devices and the value of preservation.

PARTICIPANTS

Michael Neale, MM (USyd), MBBS (UNSW), FRACS
Consultant Vascular Surgeon
Northern Sydney Vascular
North Shore Private and
Royal North Shore Hospitals
Sydney, Australia
Dr. Neale has stated that he has no financial interests related to this article.

Jorge Fernández Noya, MD
Vascular Surgery Department
University Clinical Hospital
Santiago de Compostela, Spain
Dr. Fernández Noya has disclosed that he is a consultant and proctor to Gore & Associates and a proctor to Cook Medical.

Darren B. Schneider, MD
Associate Professor of Surgery
Weill Cornell Medical College
Chief, Vascular and Endovascular Surgery
Weill Cornell Medicine/New York-Presbyterian Hospital
New York, New York
Prof. Schneider has disclosed that he is a consultant to Gore & Associates and Medtronic and receives contracted research grants from Gore & Associates and Cook Medical.

Literature has shown an increased risk of complications when internal iliac flow is not preserved during common iliac artery aneurysm repair. What impact do these complications have on patient quality of life (QOL) when they occur?

Prof. Schneider: Although life-threatening complications (such as colonic ischemia and spinal cord ischemia) rarely occur after coil embolization of the hypogastric artery during endovascular aneurysm repair (EVAR), buttock claudication and erectile dysfunction are quite common. Multiple studies have reported rates of buttock claudication of up to 50% and rates of erectile dysfunction up to 25% after EVAR using hypogastric artery "coil-and-cover" techniques. The incidence of these complications is even higher when both hypogastric arteries are sacrificed. Although not life-threatening complications, buttock claudication and erectile dysfunction can have a major impact on patient QOL that should neither be minimized nor ignored.

Dr. Neale: The complications of buttock claudication, erectile dysfunction, and colonic ischemia will affect different patient groups differently. It is, of course, desirable to avoid colonic ischemia in all patients, as development of this complication (depending on severity) will increase risk of bacterial translocation, early stent-graft infection, or need for urgent surgery with the possibility of major morbidity (particularly in a high-risk, elderly patient cohort), the QOL impact of a possible stoma, and potential for further surgery for stoma reversal if required/possible. Risk for colonic ischemia is partly determined by the anatomical situation prior to stent-graft implantation (ie, patency of the internal mammary artery and number of patent internal iliac arteries [IIAs]), and this may affect both risk to the patient and QOL outcomes.

Erectile dysfunction and buttock claudication are perhaps of less concern, depending on the patient's preoperative state. Elderly patients with pre-existing impotence and limited mobility are less likely to suffer any significant effect on QOL because they are unlikely to be functionally/symptomatically different postoperatively (again, particularly if contralateral IIA patency is maintained). Younger patients, however, who are potent and active preoperatively will find a significantly greater decrease in QOL if either impotence or buttock claudication were to develop postoperatively.

Dr. Fernández Noya: We know that when we perform unilateral occlusion of the IIA to deal with ectatic iliac arteries, the risk of complications (buttock claudication, sexual dysfunction, or more nefarious complications such as spinal or bowel ischemia) increases from 12% up to 37%, so it seems that the preservation of the IIA is reasonable. Occlusion of both IIAs can be even worse, however, because in these cases, the risk of colonic and spinal ischemia is increased, with a significant increase in

morbidity and mortality. Therefore, it seems mandatory to preserve at least one IIA.

Buttock claudication and erectile impotence obviously make the QOL worse for these patients. These complications are usually poorly tolerated, mainly in the younger patients, due to the limitations in daily lifestyle, sometimes for their entire lives, and this should be explained to the patients before the procedures.

Before iliac branch devices were available in your region, what steps were taken to mitigate these risks? What were the pros/cons of these methods of iliac preservation?

Prof. Schneider: As of February 2016, iliac branch devices were not yet commercially available in the United States, but hopefully, they will be very soon. Consequently, a variety of endovascular methods have been used (and still are) to preserve hypogastric artery perfusion. Although these methods can be effective in mitigating the risk of developing pelvic ischemic complications, many involve off-label use of commercially available devices (for chimney/snorkel and trifurcated graft techniques) or use of physician-modified endografts. Oftentimes, brachial artery access is needed for delivery of stent-grafts into the hypogastric arteries, adding additional procedural complexity and risks. There are also anatomic limitations that may preclude the use of certain techniques, such as a requirement for a long common iliac artery (CIA) length to be able to perform the trifurcated endografts technique. Moreover, chimney/snorkel and trifurcated graft techniques may have increased risks of endoleak from gutters, component separation, and limb occlusions.

Open surgical repair is also still used, although with decreasing frequency, to preserve hypogastric artery perfusion in patients with aortoiliac aneurysms. This may involve a hybrid approach with an external iliac–to–internal iliac bypass and EVAR or a completely open surgical aneurysm repair. Although open repair may have better durability than EVAR, the obvious downside is the increased risk of morbidity and mortality associated with open versus endovascular repairs. Open repair itself also has associated risks of colonic ischemia and sexual dysfunction due to autonomic sympathetic nerve injury that may make endovascular therapy with iliac preservation a more attractive alternative.

Dr. Fernández Noya: At the beginning of the EVAR era, I think that the most common approach was the coil-and-cover technique with the placement of some form of occlusion in the internal iliac and then extended down into the external iliac. Due to some of the complications seen with internal iliac occlusion, we started to change our approach by trying to preserve the internal iliacs. We began using the "bell-bottom" technique, which is a technically easy approach, but has a high rate of endoleaks at follow-up due to early device failure because we are landing the graft in an unhealthy area.

After the initial experience and the publications from Lobato et al,[1] we began using parallel grafting techniques to preserve the internal iliacs. The advantage of this approach is that the material needed is usually in our daily armamentarium, but some disadvantages are that we don't have long-term follow-up, potential compression of parallel grafts, and brachial/axillary access increases the risk of thrombosis and potentially stroke.

Dr. Neale: Iliac branch devices have been available for many years now in Australia, before concepts such as chimneys and snorkels were even considered. Prior to their availability, if there was considerable concern for major morbidity related to IIA occlusion, most surgeons would have considered this a reason for open abdominal aortic aneurysm repair with surgical preservation of at least one IIA. The obvious disadvantage of this is increased complexity for open repair and increased morbidity/mortality with the open procedure. The advantage, of course, is a good long-term outcome. If endovascular repair were preferred, then patency of the contralateral IIA would have been considered the main deciding factor.

If a good contralateral IIA were to be maintained, then the risk of major morbidity (colonic ischemia) would be deemed very low. Buttock claudication on the side of occlusion would be quite likely and accepted early, recognizing that many would improve (although not always completely) over approximately 3 months. If there was no improvement, consideration could then be given to further surgical reconstruction with external iliac artery (EIA)-IIA bypass (this is rarely considered at the time of initial repair in the presence of a patent contralateral IIA).

Prior to branch devices, if the contralateral IIA was occluded or the CIA was unsuitable as a landing zone bilaterally, then this may have been cause for open repair. In some patients, EIA-IIA bypass at the same time as EVAR has been utilized. This is considered a lesser procedure than formal open repair, as the EIA-IIA bypass can be done through an extraperitoneal approach in the appropriate iliac fossa. However, this would generally only be done unilaterally. If preservation of both IIAs was preferred, open repair would have been the most likely solution, although with higher morbidity/mortality associated with the procedure. The other approach early on was simply "flaring" into a dilated CIA with custom flared limbs or the use of large-diameter cuffs to extend a limb. The obvious concern here was late failure of these flared devices due to ongoing aneurysmal dilatation.

How has the iliac aneurysm treatment paradigm shifted since iliac branch devices became available in your region? If there has been a significant shift, how quickly did the transition from embolization to preservation occur? What do you feel were the key reasons for this change?

Dr. Fernández Noya: Since iliac branch devices became available, we have changed our daily practice in these patients. Our first option is to try to maintain the patency of both internal iliacs, even in the cases when we need to use bilateral devices. The transition was quick and smooth, because if you have experience with EVAR, there isn't a long learning curve to use iliac branch devices safely. I think that the branch iliac technique is technically less challenging than the parallel stent-graft techniques, and for these reasons, we shifted our practice.

We started our experience using the COOK® ZENITH® Iliac Branch Device, with good results. As vascular surgeons, we always sought to preserve the arterial patency, and at the beginning of our practice with the branch devices, we had some technical limitations, especially in the angulated anatomies. We switched to using the GORE® EXCLUDER® Iliac Branch Endoprosthesis,* and we now feel comfortable and secure treating our patients, even those who present with the most challenging cases (angulated or bilateral), because the device is easy to use, conformable, low profile, and specifically designed for the iliac anatomy.

Dr. Neale: Iliac branch devices became available in Australia after fenestration technology. Most Australian surgeons therefore became comfortable with complex endovascular techniques very early. The transition to adding iliac branch devices into the armamentarium of Australian surgeons was relatively easy and taken up quite early. The fact that much of the early experience and development of these devices occurred in Australia (along with fenestrated technology) meant that Australian surgeons had good early exposure to these concepts. Being a country with a relatively small population and limited numbers of vascular surgeons, the training and uptake of these techniques among the vascular surgical community was also quite rapid. However, in the early experience, most surgeons would initially have considered branch devices mainly where the contralateral IIA was already occluded or in a situation where it was required to occlude one and preserve the other.

As experience increased, however, preservation of both IIAs, where possible, was quite quickly accepted by many as the best possible option, recognizing that not all IIAs can be preserved (either due to anatomy or IIA aneurysms). The increase in availability of more branch devices has increased the number of cases where IIA preservation can be performed due to different characteristics of different devices.

Prof. Schneider: A paradigm shift has not yet taken place in the United States because we have not had access to iliac branch devices, but I do predict that a real paradigm shift is coming. Recognizing the significant impact of buttock claudication and erectile dysfunction on patient QOL, some physicians have adopted various techniques for iliac preservation into their practice. That being said, many physicians in the United States still treat aortoiliac aneurysms with traditional coil-and-cover techniques. I expect that to change once iliac branch devices become commercially available in the United States.

This paradigm shift will be driven by a growing appreciation for the frequency and negative effects of pelvic ischemic complications after EVAR with hypogastric artery coil-and-cover techniques on patient QOL. Once iliac branch devices are available and more physicians become comfortable with the technology, I predict that it will become the preferred approach in the United States. Given the choice, most patients will opt for treatment with an iliac branch device or seek out a physician who offers the technology. Although there may be some increased cost associated with use of iliac branch devices, it will likely be offset by the costs associated with the alternative endovascular techniques (coils and added stent-graft components), as well as the beneficial impact on patient outcomes.

How would you describe the "value of preservation" based on your experience with the various iliac aneurysm treatment options?

Dr. Neale: In early experience with stent-grafts using IIA embolization and extension to the EIA, it was generally believed that the risk of colonic ischemia was low (as long as one IIA remained patent) and that buttock claudication/erectile dysfunction was a reasonable trade-off for the morbidity of open repair (particularly in the older patient group). These risks, however, were less acceptable in a younger patient population, leading to decisions to undergo open repair rather than EVAR in those patients in whom it was considered unacceptable (especially risks of erectile dysfunction in younger men). The options for preservation of IIA flow (either unilateral or even bilateral) have therefore considerably changed the management options, particularly in the younger patient cohort, allowing the benefits of minimally invasive repair in a group of patients who would potentially have been subjected to higher risks.

As time has gone on, good long-term outcomes have been seen with these devices, and it is now generally considered reasonable to attempt preservation of all IIAs wherever possible, particularly in the younger population. The overall procedural risk is reduced compared to open surgery, as well as the risks of adverse outcomes such

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as colonic ischemia, erectile dysfunction, and buttock claudication, thereby maintaining QOL of the patient.

With an increase in the number of available devices, more patients can be treated in this way. As more patients are treated with IIA preservation, the ease with which these procedures can generally be performed becomes apparent, with minimal increase in operating time or risk utilizing these techniques. Ultimately, this reduces the likelihood for secondary interventions due to complications of the procedure or late failures, as can be seen with suboptimal procedures without IIA preservation (such as IIA embolization or "flared" limbs). Although these may seem like simpler options in the short term, they are more likely to lead to more complex repairs at a later date. Early IIA preservation with branched devices therefore becomes preferable, confirming the value of preservation.

Prof. Schneider: I have had patients come back with complaints of buttock claudication after hypogastric artery coil embolization, and for a significant number of patients, this is a very bothersome and persistent problem that affects them on a daily basis. To avoid this complication, I have tried to preserve hypogastric artery perfusion whenever appropriate, and I have tried most of the described iliac aneurysm treatment options. I have also been fortunate to have access to iliac branch devices through clinical trials, and these are valuable devices that can improve the way we treat patients with iliac aneurysms. Importantly, when we successfully preserve pelvic perfusion during EVAR, patients do not get buttock claudication or other pelvic ischemia complications.

All of the various treatment options to preserve pelvic perfusion can be used to successfully treat iliac aneurysms and to prevent ischemic complications. The availability of dedicated iliac branch device systems can make the treatment simpler and safer and, hopefully, with even better long-term outcomes. Of course, the treatment of each patient should be individualized, taking into account patient age, lifestyle, sexual function, and anatomy. Traditional coil-and-cover approaches may still be appropriate for some elderly patients who are sedentary or who have pre-existing erectile dysfunction and have poor anatomy for an iliac branch device. However, the majority of patients with suitable anatomy are best served by pelvic preservation with an iliac branch device. In my opinion, preservation of pelvic perfusion should be one of the primary goals during treatment of aortoiliac aneurysms with EVAR.

Dr. Fernández Noya: Our goal is to preserve arterial patency in the vast majority of our procedures. At the beginning of our EVAR experience, we had some important complications due to internal iliac occlusion, even in the staged procedures. These complications were typically observed in the first hours after the procedure but we were usually satisfied with the initial outcome. Initially, the patients were really happy because the procedure went well without complications. However, at short-term follow-up, "minor complications" (eg, buttock claudication and sexual dysfunction) were observed when they came back to our office, and they were not so happy because their QOL was worse after the procedure, and these symptoms can last a lifetime in up to 50% of these patients.

QOL is actually one of the more important items in the follow-up of our patients. If QOL diminishes after our procedures, we can't be satisfied. For this reason, we must always try to preserve or improve patients' QOL using all the tools in our armamentarium. ■

1. Lobato AC. Sandwich technique for aortoiliac aneurysms extending to the internal iliac artery or isolated common/internal iliac artery aneurysms: a new endovascular approach to preserve pelvic circulation. J Endovasc Ther. 2011;18:106-111.