

Retrograde iliac artery bleeding after coverage during endovascular repair of abdominal aortic aneurysms

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Introduction

Endovascular Aneurysm Repair Imaging protocol

Endovascular aneurysm repair (EVAR) is a well-established treatment for abdominal aortic aneurysms. Large randomized trials have conclusively documented the safety and efficacy of this procedure. EVAR has numerous benefits over open surgery, most notably lower perioperative mortality, reduced length of ICU utilization and hospital stay, shorter procedure times, and long-term safety¹⁻⁴.

When does the internal iliac artery need to be covered?

Appropriate landing zones for the proximal and distal parts of the stent graft are mandatory for appropriate sealing of the aneurysm to prevent Type I endoleaks (blood flow around graft ends into aneurysm sac). For most cases, the common iliac artery (CIA) is the ideal landing zone, preserving flow to both internal iliac artery (IIA) and external iliac artery (EIA)³.

Certain types of cases, such as aortoiliac aneurysms, lack a suitable CIA landing zone. Here the iliac limb of the stent graft must be extended into the EIA, thus covering the IIA origin⁵. Previous investigations on IIA occlusion report the possibility of symptoms such as buttock claudication, pelvic and colonic ischemia, and sexual dysfunction⁶⁻¹⁰.

Rationale for coverage vs. embolization

Traditionally, in aneurysm cases where the stent graft must be landed in the EIA, the IIA is first sacrificed by embolization⁵. This prevents retrograde perfusion of the IIA origin, thereby preventing subsequent type II endoleak and post-repair aneurysm dilation and rupture. However, this approach is complex and cannot be employed in patients with tortuous iliac artery anatomy. Furthermore, this technique results in embolization of distal IIA branches, leading to worse clinical ischemic outcomes⁸⁻¹⁰.

There is mounting evidence that IIA coverage without prior embolization, may be a superior alternative. It is technically simpler and more cost effective, with low risk of type II endoleak and better clinical outcomes. Further reports showcase spontaneous thrombosis of the proximal IIA after coverage by stent graft, which has the additional benefit of preserving more collateral flow.

Purpose

The present study aimed to determine the presence of type II endoleak from the IIA after coverage during EVAR, without embolization.

Images

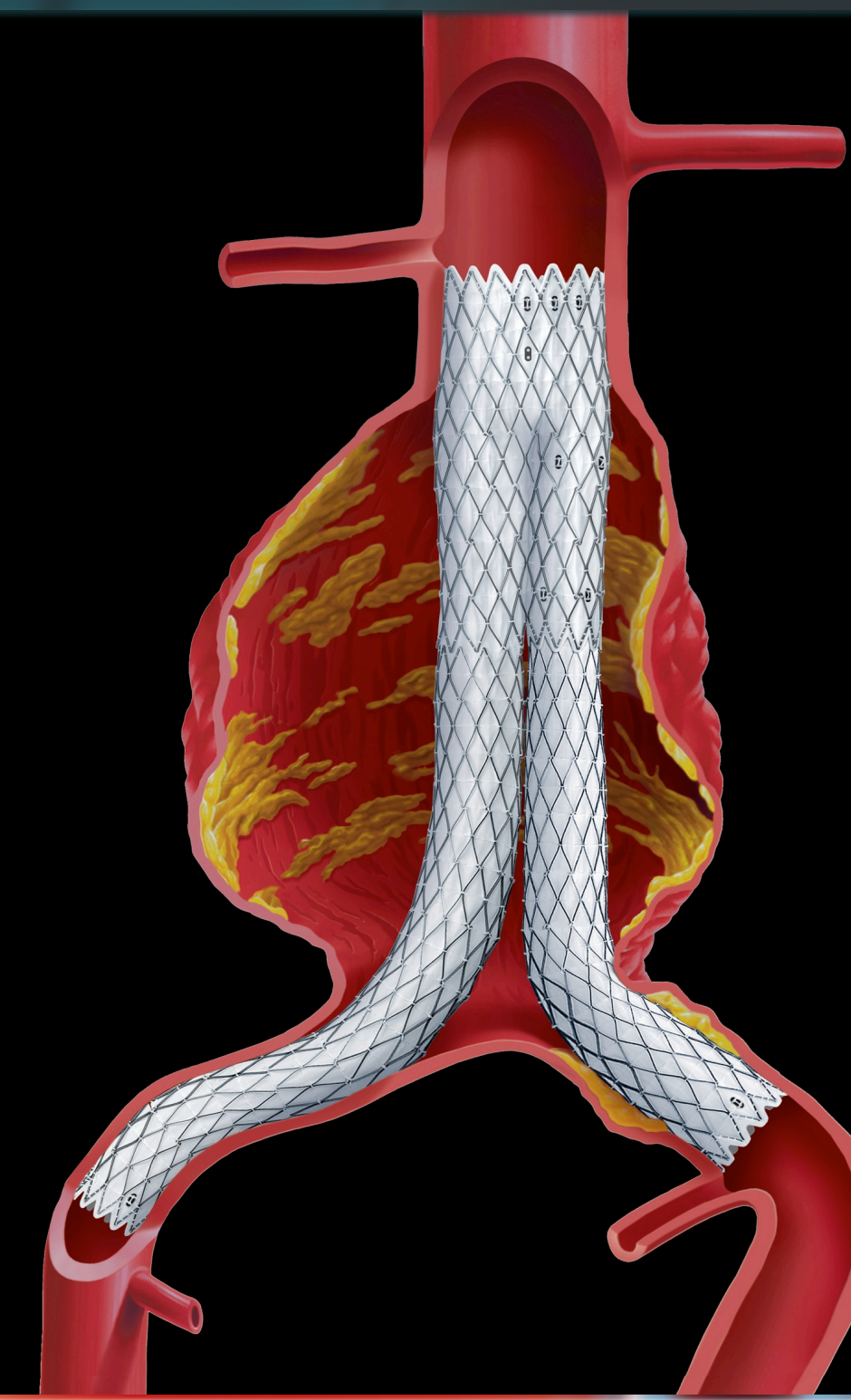


Figure 1: Artist's rendering of bifurcated EVAR device.

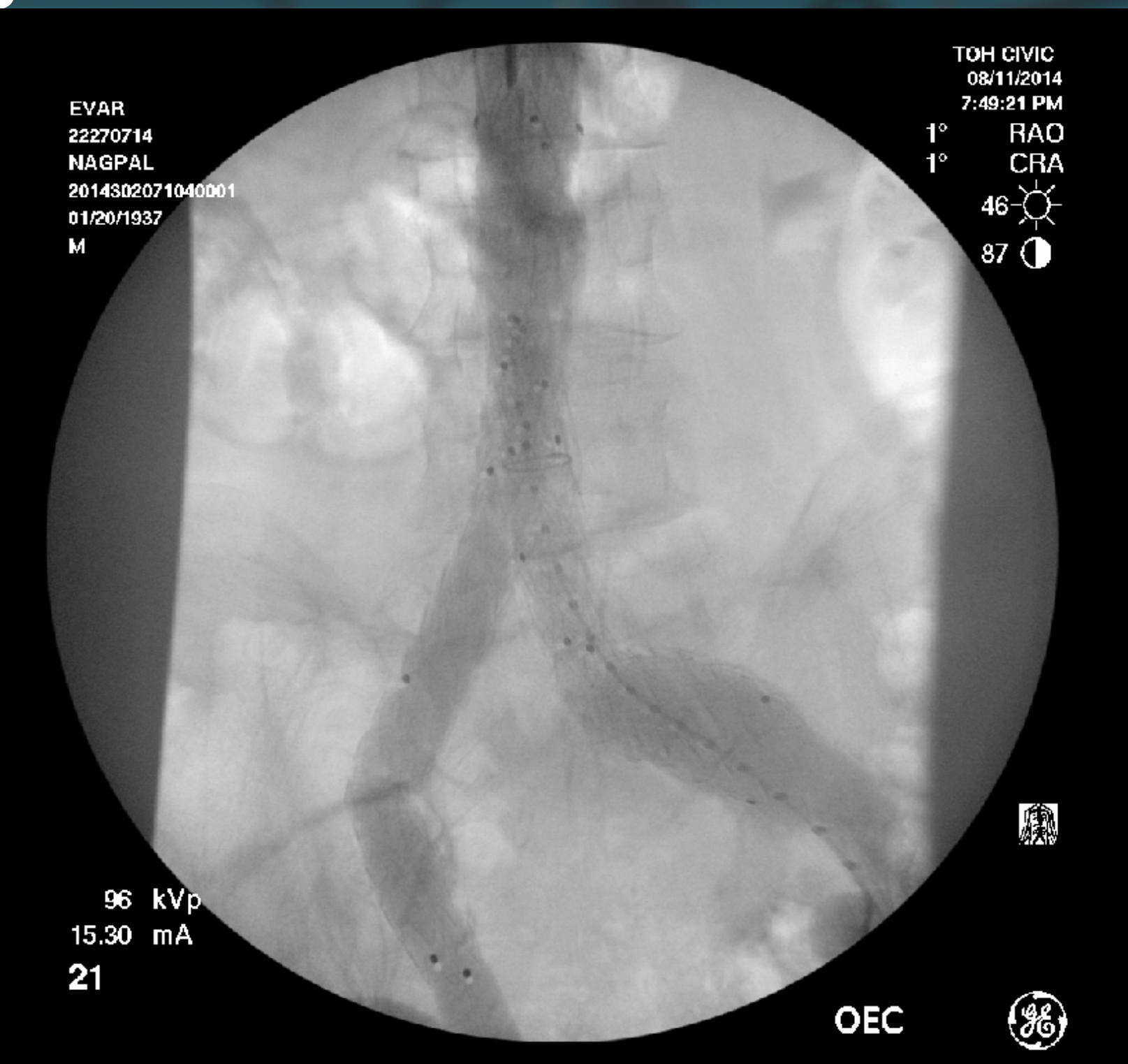


Figure 2: Digital subtraction angiographic image of left IIA coverage during EVAR.

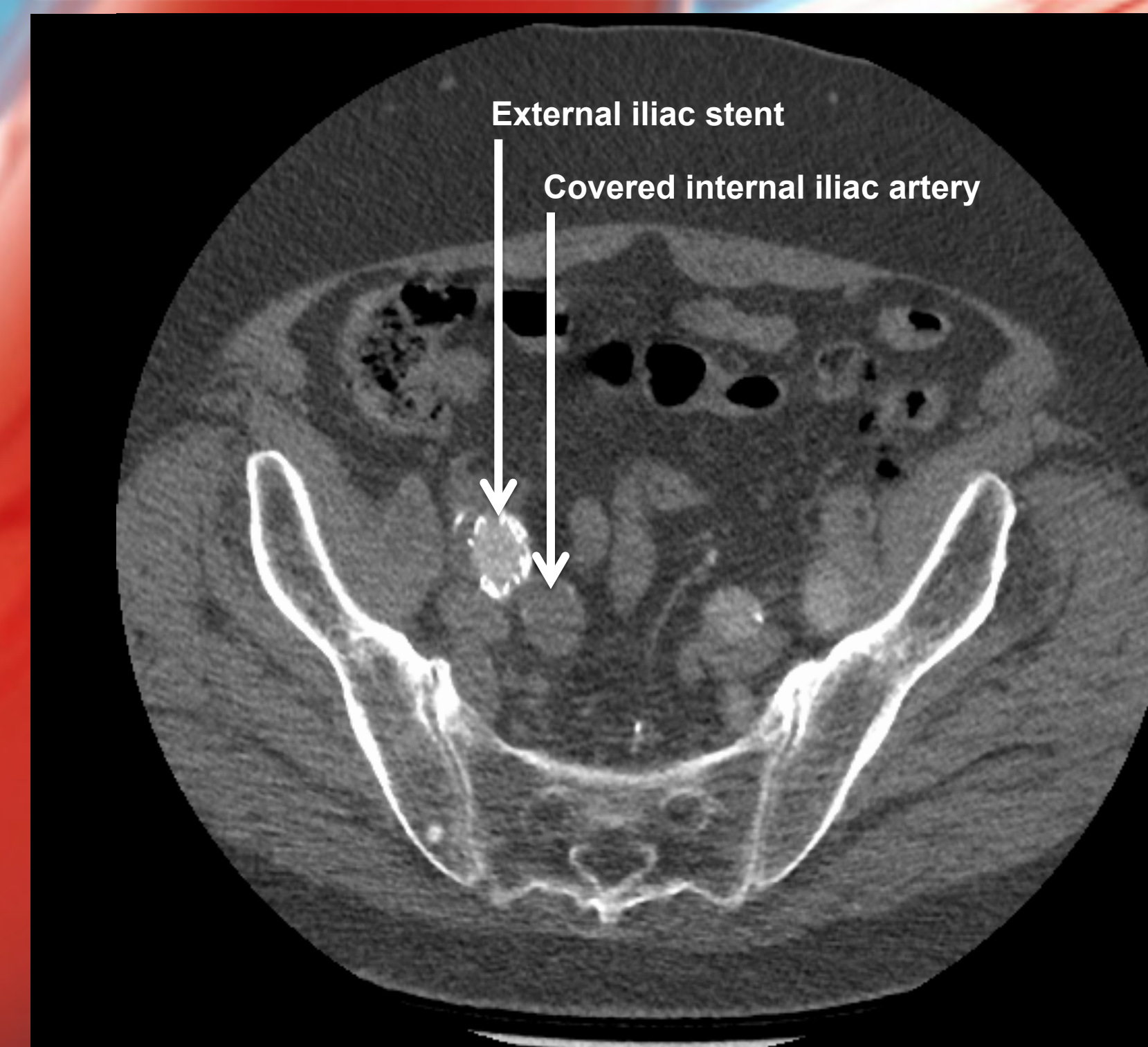


Figure 3: Contrast enhanced CT illustrating right IIA coverage by stent graft.



Figure 4: 3D reconstructed volume-rendered CT-image of EVAR with left IIA coverage.

Methods

Research Methods

Following ethics approval from the Ottawa Hospital Research Institute, 362 EVARs performed at the Ottawa Hospital from October 2004 to August 2014 were retrospectively reviewed.

Inclusion criteria: aortoiliac, CIA or IIA aneurysms treated by EVAR with IIA coverage, without embolization.

Exclusion: previous IIA embolization IIA, pre-existing ipsilateral IIA origin occlusion or rupture.

Twenty-one patients met the inclusion criteria. Case notes, pre- and post-operative imaging and radiological reports were reviewed.

Imaging protocol

The imaging protocol comprised:

- Arterial contrast enhanced computed tomography (CT) scan within 6 weeks of surgery.

- Post-operative contrast enhanced CT examination at 1 month, 6 months, 1 year, and annually thereafter, unless otherwise required.
- Axial images were obtained from the diaphragm to the pubic symphysis.

Preoperative Planning, Selection for IIA coverage, and endovascular procedure

Aneurysms were monitored by ultrasound until they reached the critical size for repair (ex. >5.5cm for aortic aneurysms), at which point CT angiography was performed.

Suitability for IIA preservation was then considered. The IIA was covered if CIA diameter was >2cm and the EIA had an adequate landing zone – minimum of 10-15mm in the proximal EIA to allow 15-20% oversizing of the stent graft into this vessel.

Endovascular stent placement was performed in an operating room with a C-arm x-ray image intensifier. Stents were supplied by Cook, Medtronic.

Results

IIA coverage was successful in 100% of cases; seals were achieved at both proximal and distal ends of the stent graft.

None of the patients suffered type II endoleak from the corresponding covered IIA, as indicated by intra-operative completion angiography, as well as by postoperative contrast-enhanced CT scans performed at 1 month, 6 months, 1 year, and annually thereafter.

Follow-up was ranged from 6 months to 8 years. No patients were lost to follow-up. In the peri-operative period and subsequent clinical follow-up no severe pelvic ischemic complications - such as bowel ischemia, buttock muscle necrosis, or spinal cord ischemia - were observed.

Discussion and Conclusion

EVAR is becoming the treatment of choice for patients with abdominal aneurysms. The evolution of endografts and increased operator experience has enabled the application of this technique in treatment of patients with less favourable anatomy¹⁻⁴.

The goal of the procedure is aneurysm exclusion without endoleak, and preservation of the pelvic circulation. To this end, patients with aneurysmal distal landing zone in the CIA represent a therapeutic challenge. The stent graft must be extended into the EIA to exclude the aneurysm completely and prevent type I endoleaks, consequently excluding the IIA and creating the risk of pelvic ischemia⁸⁻¹⁰.

The optimal management of IIA in aortoiliac aneurysms remains controversial. Techniques developed to maintain IIA patency, such as the use of bifurcated devices, are associated with increased operative and radiation time, contrast use, and cost¹³⁻¹⁵. Embolization of the IIA, while successfully able to prevent type II endoleaks, is associated with increased symptoms of pelvic ischemia⁸⁻¹⁰.

The results of this study demonstrate that coverage of the IIA without embolization is a successful and safe alternative to embolization in the endovascular repair of aortoiliac aneurysms where the graft limb must be extended into the EIA. Perioperative reports demonstrate no manifestations of pelvic ischemia, including buttock claudication, spinal cord ischemia, sexual dysfunction, ischemic colitis, or gluteal necrosis.

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