Prophylactic Intraoperative Embolization of Abdominal Aortic Aneurysm Sacs Using *N*-Butyl Cyanoacrylate/Lipiodol/Ethanol Mixture with Proximal Neck Aortic Balloon Occlusion during Endovascular Abdominal Aortic Repair

Motoki Nakai, MD, PhD, Akira Ikoma, MD, PhD, Morio Sato, MD, PhD, Hirotatsu Sato, MD, Yoshiharu Nishimura, MD, PhD, and Yoshitaka Okamura, MD, PhD

ABSTRACT

Purpose: To determine the feasibility of prophylactic intraoperative abdominal aortic aneurysm (AAA) sac embolization using a mixture of *N*-butyl cyanoacrylate/Lipiodol/ethanol (NLE) with proximal neck aortic balloon occlusion during endovascular aneurysm repair (EVAR) to prevent the occurrence of endoleak and aneurysm sac expansion.

Materials and Methods: Prophylactic intraoperative AAA sac embolization was performed in 24 patients with an infrarenal neck angulation $> 60^\circ$ (n = 16) or AAA sac diameter > 60 mm (n = 17). AAA sac pressure was continuously measured with a 3-F catheter inserted into the AAA sac. The systolic sac pressure index (SPI) was calculated as the ratio of systolic AAA sac pressure to the simultaneously measured systolic aortic pressure, and was measured with and without proximal neck aortic balloon occlusion. The aneurysm sac was embolized with NLE during proximal neck aortic balloon occlusion immediately after EVAR. Endoleak and AAA sac diameter were evaluated by enhanced computed tomography and subtraction magnetic resonance imaging at 6 months and yearly after EVAR.

Results: Mean SPIs after EVAR with and without proximal neck aortic balloon occlusion were 0.36 and 0.57, respectively. There were no adverse events related to intraoperative sac embolization. Follow-up imaging (mean, 12.1 mo) revealed three minor endoleaks (12.5%) and no aneurysm sac expansion.

Conclusions: Prophylactic intraoperative sac embolization with NLE during proximal neck aortic balloon occlusion was safe and feasible and may reduce endoleaks and prevent sac expansion after EVAR in patients with unfavorable anatomic factors.

ABBREVIATIONS

AAA = abdominal aortic aneurysm, AKA = Adamkiewicz artery, EVAR = endovascular aneurysm repair, IFU = instructions for use, IMA = inferior mesenteric artery, NBCA = *N*-butyl cyanoacrylate, NLE = *N*-butyl cyanoacrylate/Lipiodol/ethanol, SPI = systolic sac pressure index

Endovascular aneurysm repair (EVAR) has become the standard treatment for abdominal aortic aneurysms (AAAs), superseding open surgery in anatomically suitable patients. However, endoleaks and aneurysm sac expansion are significant problems after EVAR. Type II endoleaks often spontaneously disappear, but 10%–25% remain (1–3). Secondary interventions, such as transcatheter embolization, are generally required to treat endoleaks accompanied by AAA sac expansion because of the risk of AAA rupture (4–6). It was reported that

From the Departments of Radiology (M.N., A.I., M.S., H.S) and Thoracic and Cardiovascular Surgery (Y.N., Y.O.), Wakayama Medical University, 811-1 Kimiidera, Wakayamashi, Wakayama 641-8510, Japan. Received October 4, 2015; final revision received and accepted March 19, 2016. **Address correspondence to** M.N.; E-mail: momonga@wakayama-med.ac.jp

None of the authors have identified a conflict of interest.

© SIR, 2016

J Vasc Interv Radiol 2016; 27:954–960

http://dx.doi.org/10.1016/j.jvir.2016.03.037

the presence of an endoleak and an infrarenal neck angulation of ≥ 60° were risk factors for AAA sac expansion and that a large AAA size was an independent risk factor for clinical failure or the need for re-intervention (7,8). We also reported (9) that the significant and independent predictors of sac expansion after EVAR were the presence of an endoleak, AAA sac diameter ≥ 60 mm, and infrarenal neck angulation > 60° based on the results of a multivariate analysis.

Intraoperative AAA sac embolization during EVAR was reported to prevent endoleaks (10). However, outflow of liquid embolic materials from the sac to aortic branches is a risk associated with this procedure. We hypothesized that proximal neck aortic balloon occlusion during sac embolization could allow the injection of liquid embolic materials without outflow from the sac. A mixture of *N*-butyl cyanoacrylate (NBCA; B. Braun, Melsungen, Germany) with Lipiodol (Guerbet, Villepinte, France) and ethanol (ie, NBCA/Lipiodol/ethanol; NLE) may be a safe and feasible embolic material because NLE forms large droplets or long threads with a paste-like appearance in blood (11–14). Intraoperative sac embolization with NLE during proximal neck aortic balloon occlusion was attempted with the expectation of preventing endoleaks and thereby preventing sac enlargement in patients with unfavorable anatomic features.

The purpose of the present study was to determine the feasibility of prophylactic intraoperative AAA sac embolization using NLE with proximal neck aortic balloon occlusion during EVAR to prevent the occurrence of endoleak and aneurysm sac expansion in patients with anatomic factors unfavorable for EVAR.

MATERIALS AND METHODS

This clinical study was performed with the approval of our institutional ethics committee. We explained to the patients that prophylactic intraoperative AAA sac embolization with NLE during EVAR was primarily performed as a clinical measure to prevent endoleaks and AAA sac enlargement after EVAR in patients with unfavorable anatomic factors, and was secondarily performed as part of a clinical investigation. All patients gave written informed consent to participate in the study.

Patients with AAA with (*i*) infrarenal neck angulation > 60° or (*ii*) AAA sac diameter > 60 mm were eligible for prophylactic intraoperative AAA sac embolization with NLE immediately after EVAR. We excluded patients with renal insufficiency, patients with large thrombi (≥ 2 mm thick) covering more than 50% of the circumference of the sealing zones, and patients with a short angulated neck of < 10 mm. A total of 24 patients (16 male and eight female) underwent prophylactic intraoperative AAA sac embolization with NLE during elective EVAR between December 2013 and April 2015. The mean age, AAA diameter, and infrarenal neck angulation were 78.1 years, 62.5 mm, and 64.2°, respectively. The characteristics of these patients and their AAAs are listed in **Table 1**. Three stent grafts were used: the EXCLUDER AAA endoprosthesis (W.L. Gore & Associates, Flagstaff, Arizona; n = 14), Zenith AAA endovascular graft (Cook, Bloomington, Indiana; n = 3), and Endurant AAA stent-graft system (Medtronic, Minneapolis, Minnesota; n = 7). The instructions-for-use (IFU) criteria for EVAR were as follows: proximal neck length ≥ 15 mm (≥ 10 mm for Endurant stent graft), suprarenal neck angulation ≤ 45°, infrarenal neck angulation ≤ 60°, proximal neck diameter ≥ 18 mm and ≤ 32 mm, and no large thrombi in the sealing zone. Eight patients met the IFU criteria. The other 16 patients underwent EVAR without meeting the IFU criteria because they were not suitable candidates for open repair as a result of the presence of comorbidities, a "hostile abdomen" such as a history of multiple open surgeries or extensive peritonitis, unsuitability for general anesthesia, or a high risk of rupture. We used the EXCLUDER endoprosthesis in patients with suprarenal neck angulation > 45°, the Endurant stent graft in cases of a proximal neck was < 15 mm, and the Zenith stent graft in all other patients. We did not attempt to identify the Adamkiewicz artery (AKA) on computed tomographic (CT) angiography before EVAR.

EVAR Procedure

Before EVAR, all patients underwent contrast-enhanced CT with a multidetector CT scanner (LightSpeed VCT 64-slice CT; GE Healthcare, Little Chalfont, United Kingdom). The maximum aneurysm diameter, proximal neck diameter, proximal neck length, and neck angulation were measured with a workstation (Aquarius iNtuition viewer; TeraRecon, San Mateo, California)

Table 1. Patient Characteristics (N = 24)

Characteristic	Value
Sex (M/F)	16/8
Mean age ± SD (y)	78.1 ± 7.0
Stent-graft type	
Zenith	3
EXCLUDER	14
Endurant	7
Proximal neck diameter (mm)	21.9 ± 4.1
Proximal neck length (mm)	26.5 ± 12.7
Supra-renal neck angulation (°)	42.7 ± 29.6
Infrarenal neck angulation (°)	64.2 ± 23.2
AAA diameter (mm)	62.5 ± 8.2

Note–Values are presented as mean ± standard deviation where applicable.
AAA = abdominal aortic aneurysm; SD = standard deviation.

Download English Version:

https://daneshyari.com/en/article/4237069

Download Persian Version:

https://daneshyari.com/article/4237069

Daneshyari.com