“In favor of Ch-EVAR and Endoanchor-EVAR and How they’ve emerged as highly useful Rx options…”

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DISCLOSURE:
Medtronic: Consulting, Sales Training
“In favor of CHF-EVAR and Endoanchor-EVAR and how they’ve emerged as highly useful Rx options…”
“In favor of Ch-EVAR and Endoanchor-EVAR and How they’ve emerged as highly useful Rx options…”
“FEVAR is and will always be superior to Ch-EVAR for the short neck”
“FEVAR is and will always be superior to Ch-EVAR for the short neck”

- All JR and Short-Neck AAA anatomies
- Access to/Availability of Fenestrated Grafts
- Required technical skills and sufficient ongoing experience
- Overall ability to manage such a resource-intensive procedure
Analytics: Perfect World vs Real World
ANATOMICAL FEVAR EXCLUSIONS

- Significant occlusive disease, tortuosity, or calcification
- Proximal neck <4 mm, or >15 mm in length unless otherwise compromised to preclude seal
- Proximal neck, measured outer wall to outer wall on a sectional CT image >31 mm or <19 mm in diameter
- Proximal neck angulated >45° relative to the long axis of the aneurysm
- Immediate suprarenal neck angulated >45° relative to the immediate infrarenal neck
- Proximal neck diameter change over the length of the proximal seal zone >4 mm
- Proximal seal site with circumferential thrombus/atheroma above the renal arteries
- Iliac artery diameter, measured inner wall to inner wall on a sectional CT image <7.5 mm at any point along access length (before deployment)
- Ipsilateral iliac artery fixation site diameter, measured inner wall to inner wall on a sectional CT image <9.0 mm before deployment
- Iliac artery diameter, measured outer wall to outer wall on a sectional CT image >21 mm at distal fixation site
- Iliac artery distal fixation site <30 mm in length
- Inability to maintain at least one patent hypogastric artery
- Renal artery stenosis >50%
- Nonbifurcated segment of any artery to be stented <15 mm in length
- Unsuitable arterial anatomy
Short-neck and Juxtarenal AAA:

Neck length <10 mm

“5-20% of AAAs”
✓ Small or borderline small AAA (<6cm) = NO REPAIR!
✓ Patient fit for major surgery = Must consider OR!
Open repair of juxtarenal aortic aneurysms (JAA) remains a safe option in the era of fenestrated endografts

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In conclusion, contemporary open repair of JAA in the era of evolving fenestrated endograft technology is safe, effective, and durable, even in patients with multiple cardiovascular risk factors. Renal and pulmonary complications can potentially be reduced by minimizing operative and renal ischemia times. Male patients over 78 with diabetes, hypertension, and previous myocardial infarction are at higher risk of cardiac complications. Identification of patients with a combination of these anatomic and physiologic factors predicting cardiac, renal and pulmonary complications may help define a subgroup of patients who would benefit from fenestrated endograft technology.
Medically Unfit or High-Risk for OR:

- **F-EVAR** when anatomy suitable and adequate resources available (skills, equipment, imaging)

- **Ch-EVAR** when anatomy unsuitable for F-EVAR or when FEVAR-required resources lacking
✅ Urgent repair:

- Ch-EVAR (perhaps F-EVAR if you are a WC Fenestrator)

- with short neck present, may consider S-EVAR + adjuncts (EndoAnchors, Palmaz stent)
The PROTAGORAS study to evaluate the performance of the Endurant stent graft for patients with pararenal pathologic processes treated by the chimney/snorkel endovascular technique

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Conclusions: Standard use of the Endurant abdominal device for ch-EVAR in >120 patients is associated with high technical success, significant aneurysm sac regression, and low incidence of secondary procedures after 2-year radiologic follow-up. These results will give significant impetus to device selection, facilitating the standardization of technique. (J Vasc Surg 2016;63:1-7.)
Collected World Experience About the Performance of the Snorkel/Chimney Endovascular Technique in the Treatment of Complex Aortic Pathologies

The PERICLES Registry

Konstantinos P. Donas, MD,* Jason T. Lee, MD,† Mario Lachat, MD,‡ Giovanni Torsello, MD, PhD,§ and Frank J. Veith, MD,¶ on behalf of the PERICLES investigators

Objectives: We sought to analyze the collected worldwide experience with use of snorkel/chimney endovascular aneurysm repair (EVAR) for complex abdominal aneurysm treatment.

Background: EVAR has largely replaced open surgery worldwide for anatomically suitable aortic aneurysms. Lack of availability of fenestrated and branched devices has encouraged an alternative strategy utilizing parallel or snorkel/chimney grafts (ch-EVAR).

Methods: Clinical and radiographic information was retrospectively reviewed and analyzed on 517 patients treated by ch-EVAR from 2008 to 2014 by prearranged dedicated and documented protocols.

Results: A total of 119 patients in US centers and 398 in European centers were treated during the study period. US centers preferentially used Zenith stent-grafts (54.2%) and European centers Endurant stent-grafts (62.2%) for the main body component. Overall 898 chimney grafts (49.2% balloon expandable, 39.0% self-expanding covered stents, and 11.2% balloon expandable bare metal stents) were placed in 692 renal arteries, 156 superior mesenteric arteries (SMA), and 59 celiac arteries. At a mean follow-up of 17.1 months (range: 1–70 months), primary patency was 94%, with secondary patency of 95.3%. Overall survival of patients in this high-risk cohort for open repair at latest follow-up was 79%.

Conclusions: This global experience represents the largest series in the ch-EVAR literature and demonstrates comparable outcomes to those in published reports of branched-fenestrated devices, suggesting the appropriateness of both clinical applicability and the need for continued careful surveillance. These results support ch-EVAR as a valid off-the-shelf and immediately available alternative in the treatment of complex abdominal EVAR and provide impetus for the standardization of these techniques globally.

Keywords: abdominal aortic aneurysm, endovascular, fenestrated, thoracoabdominal, vascular


The snorkel/chimney technique is an endovascular therapeutic modality for branch revascularization in complex aortic pathologies that has gained increasing popularity since the first publications in 2003 and 2007.2,3 These techniques have emerged from the basic idea of creating a “snorkel/chimney” conduit from available off-the-shelf devices deployed into target visceral branches from a parallel course adjacent to the main intra-aortic stent-graft. Initially proposed as a bailout technique for inadvertent coverage or emergent situations, these techniques have since been employed electively in juxta- or pararenal cases with the goal to preserve or restore normal blood flow into the involved branch or branches.2,3

The current body of published literature on snorkel/chimney endovascular aneurysm repair (ch-EVAR) consists mainly of case reports and single center series with limited numbers of patients and follow-up. Furthermore, the majority of patients were being treated for a wide variety of aortic pathologies using nonstandardized off-the-shelf devices and follow-up protocols. As a result, critics of the snorkel/chimney approach as a mainstream strategy claim that it remains difficult to obtain a clear picture of ch-EVAR outcomes and its potential applications. With fenestrated/branched solutions being slowly approved by the Food and Drug Administration as a purpose-specific and on-label solution to complex EVAR, concerns with ch-EVAR regarding overall technical success, gutter-related type I endoleaks, chimney stent patency, long-term renal dysfunction, and ch-EVAR durability make this approach an off-debatable treatment strategy. The purpose of this study was to collect and analyze a large sample of the worldwide experience with ch-EVAR from centers with significant experience and standardized protocols for operative strategy and follow-up to provide the latest evidence regarding this treatment option for complex abdominal aortic aneurysms.

METHODS

The study was conducted to evaluate the performance of the chimney technique for the treatment of Complex aortic pathologies.
FIGURE 1. Overall survival rate of the patients treated with snorkel/chimney techniques at latest follow-up.

FIGURE 2. Kaplan-Meier estimates showing the patency of snorkel/chimney grafts at latest follow-up.
CONCLUSIONS

We present the largest collection to date of the snorkel/chimney EVAR strategy for the treatment of juxtarenal and pararenal pathology. Technical success, early mortality, survival, freedom from aneurysm-related death, midterm branch patency and durability, endoleaks, and secondary interventions are all reported and are comparable with published results from series of fenestrated grafts. We, therefore, believe that this parallel graft strategy should be in the armamentarium of surgeon treating complex aortic lesions, because it provides an immediate off-the-shelf solution that is safe, effective, and durable in the midterm. We view this strategy as complementary to fenestrated and branched devices, with numerous advantages and disadvantages depending on the anatomy and presentation of the patient with a complex aneurysm. Although close attention to technical details, device selection, and careful planning to create a sufficient seal zone of at least 20 mm is necessary to achieve good outcomes, the present results indicate that snorkel/chimney EVAR and other parallel graft techniques are a viable treatment method that deserves further study and wider usage.
Meta-Analysis of Chimney vs Fenestrated Endovascular Aneurysm Repair for Complex Aortic Aneurysms

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1.87) and aneurysm-related mortality (4.8% vs 4.4%; OR=0.64; 95% CI: 0.23, 1.76). **Conclusion:** Both CHEVAR and FEVAR are safe and effective in treating complex aortic aneurysms, with numerous advantages and limitations depending on the anatomy and clinical presentation of the patient. Both should remain in the armamentarium of physicians treating complex aortic aneurysms.

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**Key words:** abdominal aortic aneurysm, aneurysm repair, stent graft
Comparison of fenestrated endovascular aneurysm repair and chimney graft techniques for pararenal aortic aneurysm

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Conclusions: In this limited retrospective series, short-term and midterm results of f-EVAR and c-EVAR were not statistically different. c-EVAR could be an attractive option for patients not suitable for f-EVAR. (J Vasc Surg 2014;60:31-9.)
Fenestrated and Chimney Technique for Juxtarenal Aortic Aneurysm: A Systematic Review and Pooled Data Analysis

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Juxtarenal aortic aneurysms (JAA) account for approximately 15% of abdominal aortic aneurysms. Fenestrated endovascular aneurysm repair (FEVAR) and chimney endovascular aneurysm repair (CH-EVAR) are both effective methods to treat JAAs, but the comparative effectiveness of these treatment modalities is unclear. We searched the PubMed, Medline, Embase, and Cochrane databases to identify English language articles published between January 2005 and September 2013 on management of JAA with fenestrated and chimney techniques to conduct a systematic review to compare outcomes of patients with juxtarenal aortic aneurysm (JAA) treated with the two techniques. We compared nine F-EVAR cohort studies including 542 JAA patients and 8 CH-EVAR cohorts with 158 JAA patients regarding techniques success rates, 30-day mortality, late mortality, endoleak events and secondary intervention rates. The results of this systematic review indicate that both fenestrated and chimney techniques are attractive options for JAAs treatment with encouraging early and mid-term outcomes.
STANDARDIZING CARE
For patients with juxtarenal aneurysms with short infrarenal necks in an off-the-shelf option

Standardized use of the Endurant™ II stent graft for ChEVAR demonstrated (N=128):¹

- 100% technical success
- New onset Type Ia Endoleaks: 1.6%
- Primary patency of chimney grafts: 95.7%
- AAA sac regression/stability: 90.6%
- Freedom from chimney graft-related reinterventions: 93.1%

- The Endurant™ stent graft system can now treat a wider range of patients
- A 12% increase in anatomical applicability is possible with the new ChEVAR with Endurant™ II/IIs stent graft system indication versus the original Endurant™ II/IIs stent graft system¹.
- ChEVAR is a valid off-the-shelf alternative in the treatment of complex EVAR and reinforces the need for standardization of the technique⁰
One-year results of the ANCHOR trial of EndoAnchors for the prevention and treatment of aortic neck complications after endovascular aneurysm repair

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Abstract

Objectives: EndoAnchors have been used to address proximal aortic neck complications including type Ia endoleaks and endograft migration after endovascular aortic aneurysm repair (EVAR).

Methods: The study population included 100 patients with one-year follow-up in the ANCHOR study. A primary cohort (N = 73) comprised patients who underwent EndoAnchor implantation at the time of an initial EVAR and a Revision cohort (N = 27) included patients treated remote from EVAR. A hostile neck was defined for neck length <10 mm, neck diameter >28 mm, angulation >60°, conical configuration or significant mural thrombus or calcium.

Results: Baseline anatomy included neck length of 17 ± 14 mm, diameter of 27 ± 5 mm, and angulation of 35 ± 18°; 83% of patients had hostile necks. Over 18 ± 4 months of clinical follow-up, six patients (6%) underwent aneurysm-related reinterventions. There were no aneurysm ruptures. Over 13 ± 2 months of imaging follow-up, freedom from type Ia endoleak was 95% in the Primary Arm and 77% in the Revision Arm (P = .006). Aneurysm sacs regressed > 5 mm within one year in 45% of the Primary cases and in 25% of the Revisions. Aneurysm expansion > 5 mm occurred in one revision patient.

Conclusion: Despite a high frequency of hostile neck anatomy, proximal neck complications were relatively infrequent after EndoAnchor use.
Freedom from type I endoleak
Matched cohort comparison of endovascular abdominal aortic aneurysm repair with and without EndoAnchors
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CONCLUSIONS
Through 2 years, subjects implanted prophylactically with EndoAnchors were observed with a significantly higher rate of aneurysm sac regression. Subjects exhibiting multiple hostile neck criteria were found to be significantly less likely to exhibit later sac regression; presence of neck thrombus and wide infrarenal necks were also found to inhibit later sac regression in control subjects. Further studies are needed to evaluate the long-term performance of EndoAnchors in hostile neck subjects.
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