Laser In Situ Fenestration makes it easy

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Laser in situ fenestration Disclosures



Medtronic Inc: Consultant & Speakers' Bureau

Lombard Medical: Consultant

Volcano: Consultant



Laser in situ fenestration **Outcomes of TEVAR & LSA revascularization**

From the Southern Association for Vascular Surgery

Subclavian revascularization in the age of thoracic endovascular aortic repair and comparison of outcomes in patients with occlusive disease

Salvatore T. Scali, MD, Catherine K. Chang, MD, Stephen G. Pape, BS, Robert J. Feezor, MD, Scott A. Berceli, MD, PhD, Thomas S. Huber, MD, PhD, and Adam W. Beck, MD, Gainesville, Fla

101 LSA revasc for TEVAR 49% staged / 41% synchronous Urgent / Emergent in 36.6%

OD patients had a variety of indications, including failed stent/arm fatigue, carotid stenosis with concurrent subclavian occlusion, 18%; symptomatic cerebrovascular OD, 13%; redo bypass, 8%; and coronary subclavian steal, 5%. Differences in postoperative stroke and death, primary patency, or freedom from reintervention were not significant. The 30-day postoperative stroke, death, and

30-day outcome

Stroke 8.9%

Death 7.1%

Combined 12.9%

49%; asymptomatic >80% internal carotid stenosis with concurrent subclavian or cular OD, 13%; redo bypass, 8%; and coronary-subclavian steal, 5%. Differen-

Scali ST et al, J Vasc Surg 2013;58:901-9

Hybrid aortic arch repair for complicated type B aortic dissection

Carsten M. Bünger, MD, PhD, a Stephan Kische, MD, Andreas Liebold, MD, PhD, Maximilian Leißner, a Aenne Glass, Wolfgang Schareck, MD, PhD, Hüseyin Ince, MD, PhD, and

Christoph A. Nienaber, MD, PhD, b Rostock, Germany

Objective: This study analyzed the outcome of a combined endovascular and debranching procedure for hybrid aortic arch

Methods: Between February 2006 and August 2012, HAR was performed in 75 consecutive patients, with retrospective analysis of a subgroup of 45 patients who underwent HAR with complicated acute (n = 10), subacute (n = 7), or chronic (n = 28) type B dissection as the underlying disease. Descriptive statistics were computed for continuous and categoric

variables. The interval to death or last follow-up was estimated using the Kaplan-Meier method. Results: The patients were a mean age of 59.9 ± 10.7 years (median, 59.2; range, 35.78 years). Complete supra-aortic debranching was performed in six (13%) in zone 0 (procedure time, 200 minutes; range, 185-365 minutes) and partial debranching in 39 (87%), comprising 16 (36%) in zone 1 (procedure time, 120 minutes; range, 75-250 minutes) and 23 (51%) in zone 2 (procedure time, 91 minutes; range, 70-210 minutes). Technical success was achieved in 86.7% (39 of 45). Thirty-day mortality was 4.4% (two of 45), with an in-hospital mortality of 11.1% (five of 45) as a result of three additional deaths after days 33, 35, and 111. Comparing HAR for type B dissection after complete debranching in six and partial debranching in 39, the overall in-hospital mortality was 67% (four of six) and 2.6% (one of 39), respectively. After a median follow-up of 20.8 months (range, 0.3-70 months), the overall mortality was 13.3% (six of 45), with Kaplan-Meier survival estimate of 85% at 1 year. Stroke rate was 8.8% (four of 45). Paraplegia developed in one patient (2.2%), with complete recovery after spinal drainage. Cardiac complications occurred in three patients (6.7%), pulmonary complications in 10 (22.2%), and renal insufficiency requiring dialysis developed in five (11%). Retrograde dissection occurred in one patient (2.2%) 14 days after complete debranching and zone 0 thoracic endovascular aortic repair, with fatal outcome. No bypass dysfunction was seen during follow-up. The overall early and late endoleak rates were 27% (12 of 44) and 43% (13 of 30), respectively. Eight patients (18%) required reintervention, with freedom of reintervention

ears a viable alternative to conventional aortic arch surgery in patients with Conclusions: HAR in zone 1 leaks remain complications that need to be addressed. Treatment of type B complicated type B dissection bing and thoracic endovascular aortic repair in zone 0, however, is aortic dissection with com associated 2013;5

in hospital outcome

Stroke 8.8% Death

Bunger CM et al, J Vasc Surg 2013;58:1490-6

Laser in situ fenestration Early interest & experience



◆ CASE REPORT

JEVT 2004

In Situ Stent-Graft Fenestration to Preserve the Left Subclavian Artery

Richard G. McWilliams, FRCS, FRCR1; Micheal Murphy, FRCSI, FRCR1; David Hartley, FIR2; Michael M.D. Lawrence-Brown, FRACS3; and Peter L. Harris, MD, FRCS1

¹Royal Liverpool University Hospital, Liverpool, UK. ²Cook R & D, Royal Perth Hospital, Perth, Western Australia. 3Centre for Health Services Research, Department of Public Health, The University of Western Australia, Nedlands, Western Australia.

◆ CASE REPORT

JEVT 2009 1

Endovascular Repair of Acute Traumatic Thoracic Aortic Transection With Laser-Assisted In-Situ Fenestration of a Stent-Graft Covering the Left Subclavian Artery

Erin H. Murphy, MD1; J. Michael Dimaio, MD2; William Dean, MD3; Michael E. Jessen, MD2; and Frank R. Arko, MD1

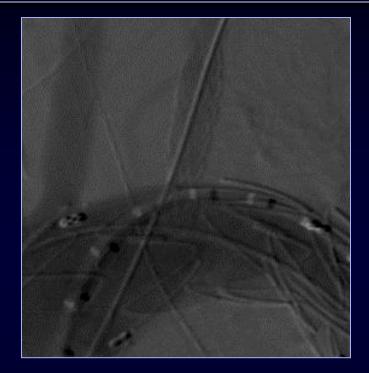
◆ CLINICAL INVESTIGATION

In Situ Laser Fenestration for Revascularization of the Left Subclavian Artery During Emergent Thoracic Endovascular **Aortic Repair**

> Sadaf S. Ahanchi, MD; Babatunde Almaroof, MD; Christopher L. Stout, MD; and Jean M. Panneton, MD

Division of Vascular Surgery at Eastern Virginia Medical School, Norfolk, Virginia, USA.

Division of Vascular Surgery at Eastern Virginia Medical School, Norfolk, Virginia, USA



5/6 successful fenestration (83%) No operative or late mortality No neurologic complication No fenestration related complication

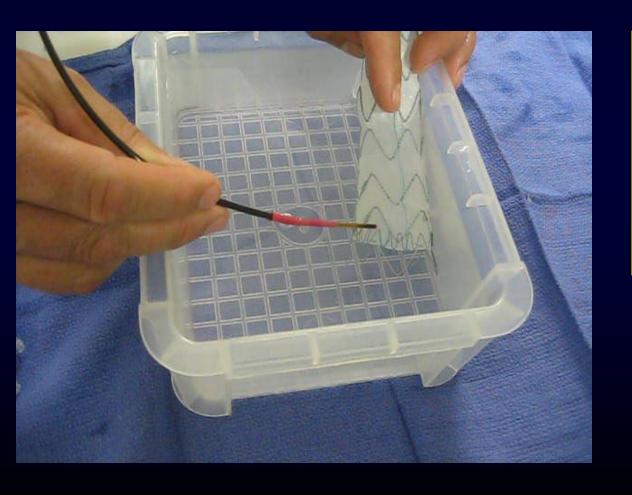
J Endovasc Ther 2012;19:226-30

and Jean M. Panneton, MD

Laser in situ fenestration Required tools



Spectranetics Turbo Elite 2.3-2.5 Laser



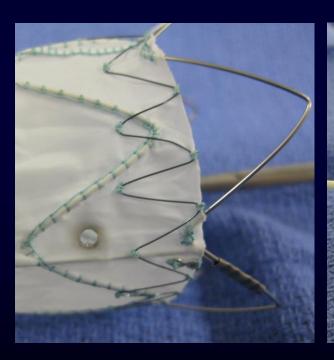
7 Fr Sheath
0.018 Guidewire
0.035 stiff guidewire
Balloon 6 x 40
Atrium iCast 8-10 x 40
Balloon 14 x 20

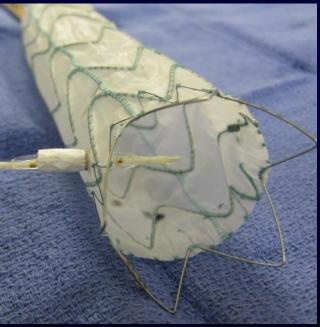
Laser in situ fenestration Ex vivo benchwork

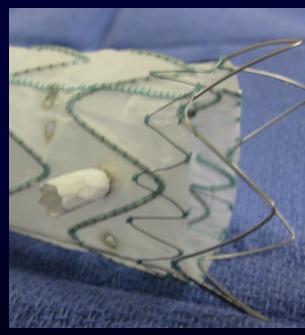


Ex Vivo Laser Fenestration:

Predilation with 6x40 ICast Stent Deployment







Laser in situ fenestration Ex vivo Benchwork with SEM



Diameters of laser	Light microscope	Different magnification		
probes (mm)		50 x	200 x	500 x
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Laser in situ fenestration EVMS Experience



CLINICAL RESEARCH STUDIES

From the Southern Association for Vascular Surgery

In situ laser fenestration during emergent thoracic endovascular aortic repair is an effective method for left subclavian artery revascularization

Richard E. Redlinger Jr, MD, Sadaf S. Ahanchi, MD, and Jean M. Panneton, MD, Norfolk, Va

Background: Retrograde laser fenestration of the left subclavian artery (LSA) during emergent thoracic endovascular aortic repair (TEVAR) uses a relatively simple intraoperative method of endograft modification to revascularize aortic bathologies. This study presents our expanded experience and midterm outcomes of TEVAR with laser fenestration to revascularize the LSA as an alternative to debranching.

Methods: Patients who underwent TEVAR with LSA revascularize the LSA as an alternative to debranching.
through August 2012 were retrospectively reviewed. TEVAR with LSA representation by laser graft fenestration from September 2009
wilmington, Del) endograft over the LSA orifice. Laser catheter fenestration of the graft was performed through
wilmington. Golowed by balloon-expandable covered stent deployment through the fenestration to traverse
formed to assess TEVAR and LSA fenestration patency, endoleak, and aneurysm/dissection exclusion.

Results: TEVAR with laser fenestration was supersefully interested.

Results: TEVAR with laser fenestration was successfully performed in 22 patients (12 men; mean age, 57 years) in an urgent or emergent setting secondary to unremitting symptoms or rupture. Twelve patients had large symptomatic thoracic aortic aneurysms (eight secondary to chronic dissection); four patients had acute symptomatic type B aortic dissection, and six patients had an intramural hematoma or penetrating aortic ulecter, or both. An average of two endografts (range, 1-4) were deployed, LSA-covered stents were 8 to 10 mm in diameter. Mean operatine was 154 ± 9 to 10 mm in the patient of the patient developed postoperative paraplegia. One patient died in the postoperative period, for an in-hospital mortality rate of 4.5%. Two patients died of non-TEVAR-related causes at a mean follow-up of 10 months (range, 1-40 months). Follow-up computed tomography angiography imaging demonstrated a 100% primary patency for the AS stents. One patient had an asymptomatic LSA stent stenosis. Type II endoleaks from the LSA in two patients required endovascular Conclusions.

Conclusions: In situ retrograde laser fenestration is a feasible and effective option for LSA revascularization during TEVAR involving a spectrum of acute thoracic aortic pathology. Laser fenestration provides a rapid, reproducible method of fenestrating the endograft material. The high technical success, low fenestration-related morbidity, and excellent midterm patency support this technique of intraoperative endograft modification. (J Vass Surg 2013;58:1171-7.)

Acute thoracic aortic pathologies that encroach on aortic arch vessels result in inadequate proximal endografi landing zones and classically have mandated traditional open repair or thoracic endovascular aortic repair

From the Division of Vascular Surgery, Eastern Virginia Medical School. Author conflict of interest: Dr Panneton is a consultant and on the Speakers' Bureau for Cook Medical and Meditronic Inc.

Presented at the Thirty-seventh Annual Meeting of the Southern Association for Vascular Surgery, Paradise Island, Bahamas, January 23-26, 2013.

Reprint requests: Jean M. Panneton, MD, Eastern Virginia Medical School, Division of Vascular Surgery, Sentara Heart Hospital, 600 Gresham Dr, Ste 8620, Norfolk, VA 23507 (e-mail: pannetjm@cvms.edu).

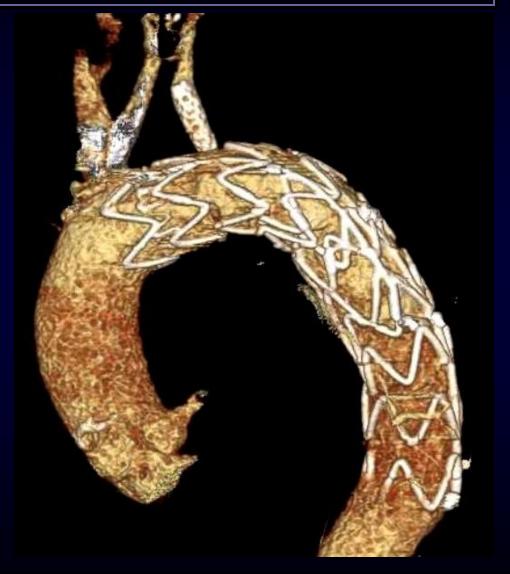
The editors and reviewers of this article have no relevant financial relationships to disclose per the IVS policy that requires reviewers to decline review of any manuscript for which they may have a conflict of interest. 0741-5214/536.00

Copyright © 2013 by the Society for Vascular Surgery http://dx.doi.org/10.1016/j.jvs.2013.04.045 (TEVAR) with coverage of the left subclavian artery (LSA). Conventional open thoracic aortic repair in an urgent or emergent setting has been demonstrated to have mortality rates close to 20% and significant morbidity, including a risk of spinal cord ischemia that can affect 18.6% of patients. ¹⁻² Intentional endograft coverage of the LSA was initially thought to be a viable alternative in this setting to extend the applicability of TEVAR. ³ Unfortunately, expanding experience with intentional LSA coverage without revascularization portends a significantly increased risk of subclavian steal syndrome, arm claudication, vertebral territory stroke, and spinal cord ischemia by climinating collateral blood supply to the spinal cord from the vertebral artery. ^{4,5}

Several options have been described that allow patency of the LSA to be maintained, including elective debranching before TEVAR, the chimney technique by deploying an LSA stent parallel to the thoracic endograft,

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Several options have been described that allow parency of the LSA to be maintained, including elective debranching before TEVAR, the chiamey technique by deploying an LSA stent parallel to the thoracic endograft,

Laser in situ fenestration When it's not easy



The arch anatomy dictates the feasibility

Type III arch

Acute takeoff

Offset take off





- Low Vertebral artery origin
- SCA dissection
- SCA dilatation

Laser in situ fenestration Technique

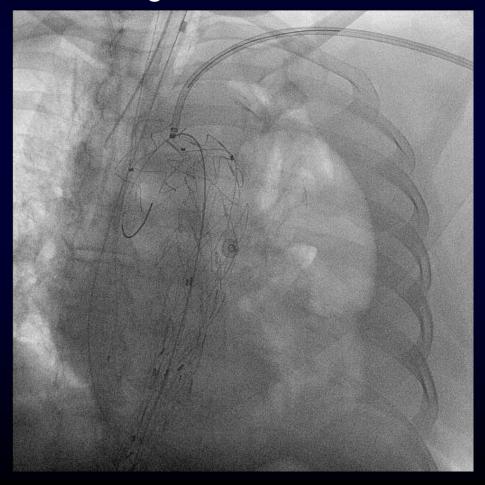


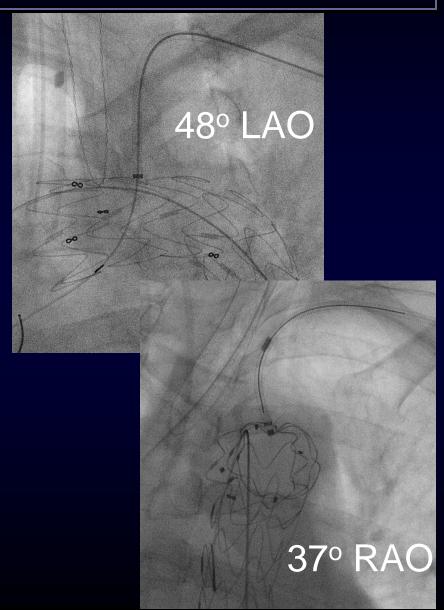
63 yrs old female patient with Ruptured Acute Type B Aortic Dissection

Laser in situ fenestration Technique: Orientation



Post TEVAR deployment Laser positioned at LSA ostium via retrograde brachial access



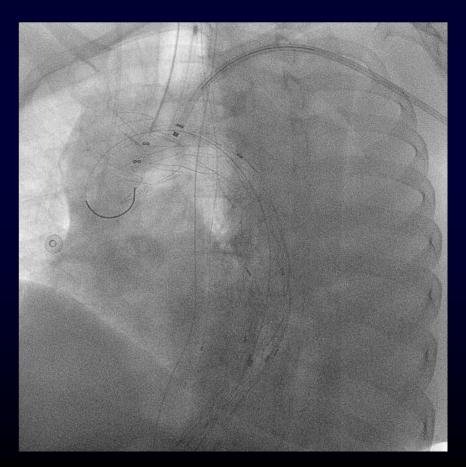


Laser in situ fenestration Technique: Fenestration



Laser activated, advanced into the endograft and guidewire placed in ascending aorta

Over stiff 0.035 guidewire predilation with 6x40 balloon





Laser in situ fenestration Technique: Stenting



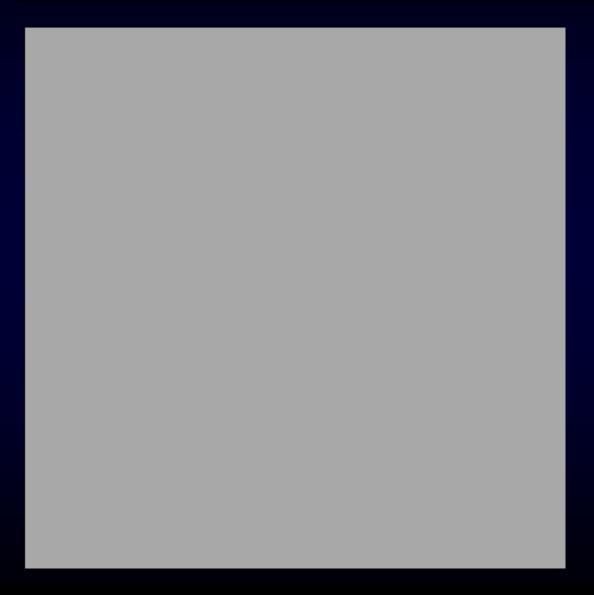
iCast stent positioning



Retrograde angiogram after iCast deployment

Laser in situ fenestration Technique

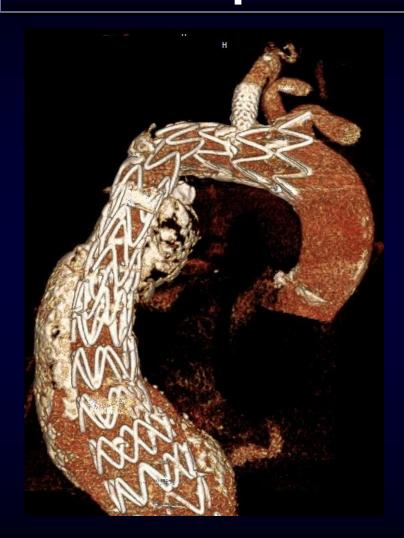




Completion Aortogram

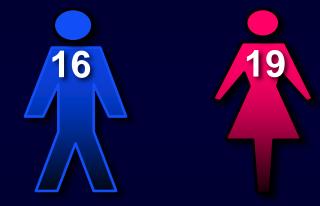
Laser in situ fenestration EVMS experience





July 2009 – October 2013

N = 35 patients



Mean Age of 62 yrs

Aortic Dissection, IMH, BTAI, Thoracic aneurysms or TAAA

Laser in situ fenestration Procedural Data



Variable	n
Number of endografts*	
Number of endograns	
1	9
2	15
3	8
4	3
Percutaneous brachial access	8
iCast Stent (mm)	
8	4
9	4
10	27
Mean OR Time (min)	162±71
Mean Contrast (mL)	134±64

^{*} Patient underwent a total arch fenestration

1 patient with Left CCA fenestration

Laser in situ fenestration Early Outcome



Technical Success: 97.2 % (35 / 36)

One patient converted to a snorkel

Operative Mortality = 5.7% (2/35)

Neurologic Complication:

Stroke: 1 (2.9%) (preop CVA and ruptured IMH)

Paraplegia: 1 (2.9%) (ruptured acute type B)

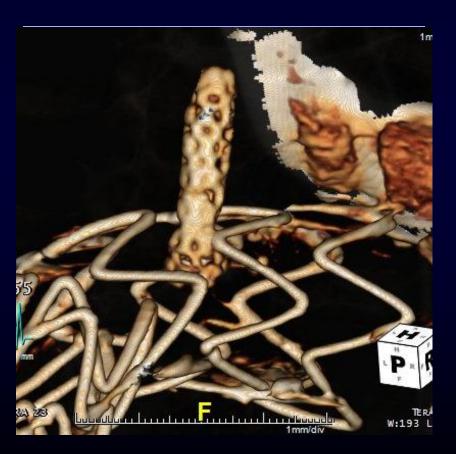
Fenestration related Complication rate = 2 / 35 (5.7%) (arm hematoma evacuation)

Mean Length of Stay = 12 days

Laser in situ fenestration Imaging surveillance



Patients were studied with CTA with TeraRecon



Assess for:

LSA stent patency

LSA stent fracture

Type III endoleak between LSA stent and TEVAR endograft

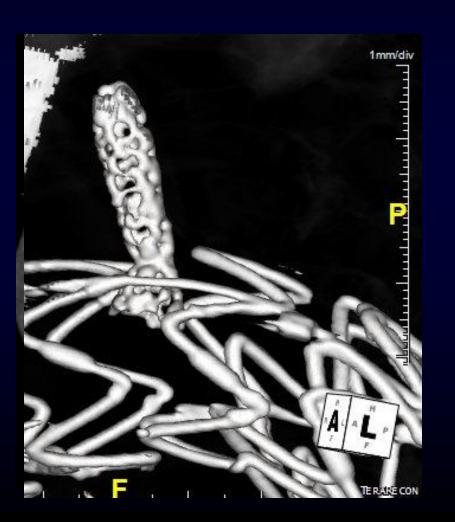
Type Ib endoleak of LSA stent

Type la endoleak

Laser in situ fenestration Imaging surveillance



Mean imaging follow up of 16 months (range 0-60 months)



1 patient @ 5 yrs

3 patients @ 4 yrs

5 patients @ 3 yrs

CTA Findings

- •All LSA Stents are patent with 2 asymptomatic stenosis
- Not identified any stent fracture

Laser in situ fenestration Clinical surveillance



Mean clinical follow up of 23 months (range 1–66 mo)

LSA fenestration related reintervention rate = 7.5%

1 early type Ib endoleak requiring coiling around LSA stent

2 late type Ib endoleaks: LSA distal restenting at 17 & 30 months





Laser in situ fenestration Clinical surveillance



Late Aortic related reintervention rate = 5.4%

1 for type la and lb endoleaks from an innominate fenestration required an open total arch replacement at 1yr

1 for type Ia endoleak required hemiarch debranching with innominate chimney and redo TEVAR, the LSA stent was occluded with Amplatzer plug



Laser in situ fenestration Summary





In Situ Retrograde Laser Fenestration is an innovative and simple technique to revascularize arch vessels during emergent TEVAR in properly selected patients

Imaging surveillance by CTA has documented the durability of this procedure with no stent failure nor any fenestration related type Ia or III endoleak.