Winnipeg Vascular & Endovascular Symposium

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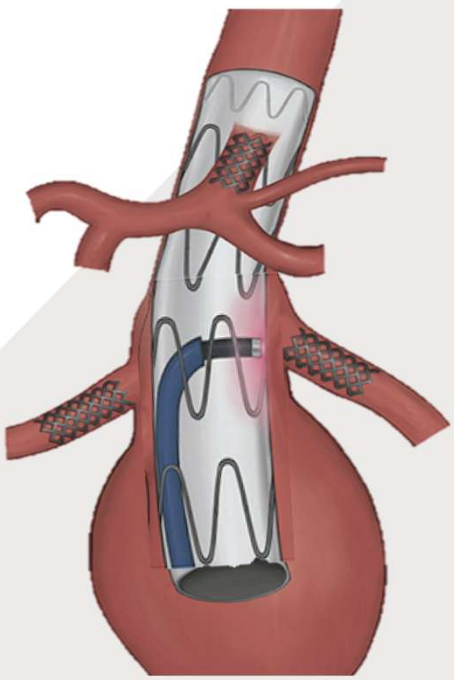

In situ Fenestration
- A Valuable Option -

Pascal Rhéaume
Ville de Québec

Université Laval
Faculté de médecine

Disclosure

- No disclosure
- Off-label technique use of a medical device
- Not an Expert
  - Humble experience
  - Option for very specific cases

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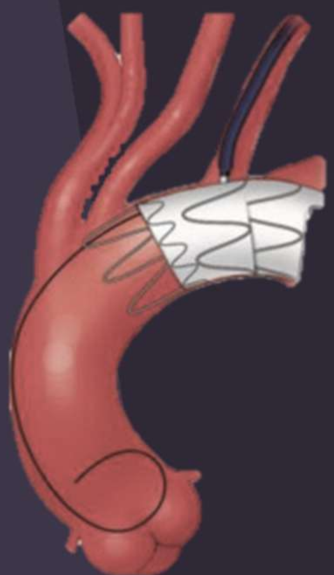
Introduction

In Vitro



Retrograde Fenestration of Endoluminal Grafts From Target Vessels: Feasibility, Technique, and Potential Usage

Richard G. McWilliams, FRCS, FRCR[1]; Shirley J. Fearn, FRCS, PhD[2]; Peter L. Harris, MD, FRCS[1]; David Hartley, FIR[3]; James B. Semmens, MSc, PhD[2]; and Michael M.D. Lawrence-Brown, FRACS[2]

[1]Royal Liverpool University Hospital, Liverpool, England, UK. [2]Centre for Health Services Research, School of Population Health, The University of Western Australia, Nedlands, Western Australia. [3]Department of Vascular Surgery, Royal Perth Hospital, Perth, Western Australia

Purpose: To report initial experiments involving a new method for percutaneous intraprocedural stent-graft fenestration from the target vessel.
Technique: In bench and canine models, the fabric of an implanted Zenith endograft was punctured easily using the stiff end of a coronary 0.014-inch guidewire delivered through the target vessel (e.g., renal or iliac artery). A 20-G cutting needle was passed over the coronary wire to enlarge the puncture site, followed by a cutting balloon to create a fenestration that was of sufficient size to allow deployment of a stent.
Conclusions: In vivo endograft fenestration of a Zenith endograft is feasible. In addition to providing a percutaneous means of intentionally fenestrating a stent-graft from the artery to be perfused, the technique has potential application as a bailout maneuver after inadvertent side branch occlusion. Although the time to achieve successful fenestration in the experimental model was long, refinement may achieve performance times adequate to maintain viability of the end organ.

J Endovasc Ther 2003;10:946–952

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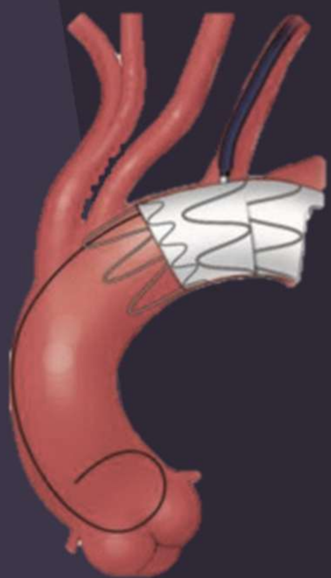
Introduction

First Case



◆ CASE REPORT ◆

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

Richard G. McWilliams, FRCS, FRCR[1]; Micheal Murphy, FRCSI, FRCR[1]; David Hartley, FIR[2]; Michael M.D. Lawrence-Brown, FRACS[3]; and Peter L. Harris, MD, FRCS[1]

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

Purpose: To report our first clinical application of a new technique for in situ fenestration of a thoracic stent-graft.
Case Report: After completing a series of in vitro and in vivo experiments, in situ stent-graft fenestration was employed during endograft repair of a saccular thoracic aortic aneurysm in a 77-year-old woman. Because the stent-graft would have covered the left subclavian artery ostium, a modified Zenith TX1 thoracic stent-graft was deployed then fenestrated transluminally using a guidewire followed by serial cutting balloons, which created a fenestration over the LSA sufficiently large to accommodate a Jomed covered stent on an 8-mm balloon. Completion angiography showed exclusion of the aneurysm and brisk flow into the LSA. Following the procedure, the arm pressures were nearly equal. The 6-month CT scan showed no endoleak and a patent subclavian artery stent.
Conclusions: In situ graft fenestration to preserve the left subclavian artery after deliberate coverage during endovascular repair of a thoracic aortic aneurysm appears feasible in this initial clinical application. There are uncertainties regarding the long-term stability of the fabric tears that are an inherent part of this technique.

J Endovasc Ther 2004;11:170–174

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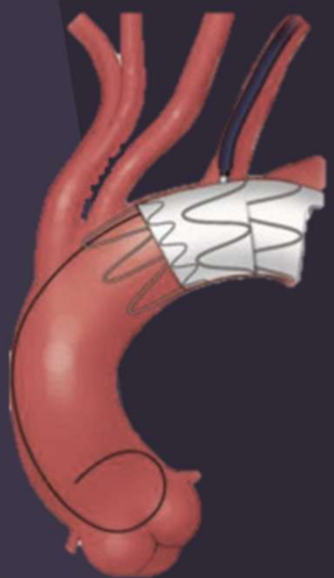
Introduction

Retrograde



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*

CLINICAL RESEARCH · Volume 59, P36-47, August 2019

Multicenter Analysis of Endovascular Aortic Arch In Situ Stent-Graft Fenestrations for Aortic Arch Pathologies

Reinhard Kopp [1] · Yoshiaki Katada [2] · Shunichi Kondo [3] · ... · Wei Guo [9] · Piotr M. Kasprzak [1] for the members of the AARCHIF registry * ... Show more

GENERAL REVIEW · Volume 91, P266-274, April 2023

A Systematic Review of Contemporary Outcomes from Aortic Arch In Situ Laser Fenestration During Thoracic Endovascular Aortic Repair

Shahed Tish [1] · Jo-Ana Chase [2] · Caryn Scoville [3] · Todd R. Vogel [4] · Steven Cheung [4] · Jonathan Bath [4]

Affiliations & Notes   Article Info

CLINICAL RESEARCH · Volume 76, P159-167, October 2021

Laser *in situ* Fenestration in Thoracic Endovascular Aortic Repair: A Single-Center Analysis

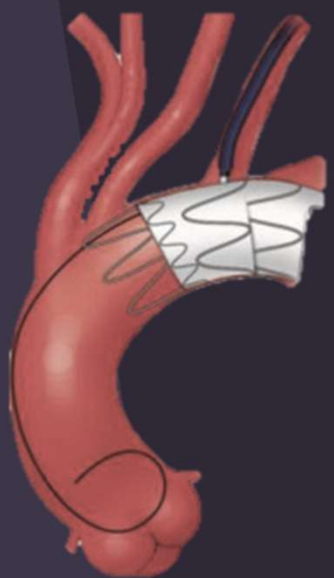
Elizabeth Evans · Ravikumar Veeraswamy · Sanford Zeigler · Mathew Wooster

CHU de Québec Université Laval

Winnipeg Vascular & Endovascular Symposium

Introduction

Retrograde



ANNALS of VASCULAR SURGERY

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GENERAL REVIEW · Volume 91, P266-274, April 2023

A Systematic Review of Contemporary Outcomes from Aortic Arch In Situ Laser Fenestration During Thoracic Endovascular Aortic Repair

Shahed Tish[1] · Jo-Ana Chase[2] · Caryn Scoville[3] · Todd R. Vogel[4] · Steven Cheung[4] · Jonathan Bath[4]

- 8 studies between 2013 and 2021 (440 patients)
- **Technical success : 93.3%**
- **Primary branch patency was 96.6%.**
- Secondary patency rate was 97%.
- Endoleak occurred in 4.8%

In situ laser fenestration is a feasible, safe, and effective approach

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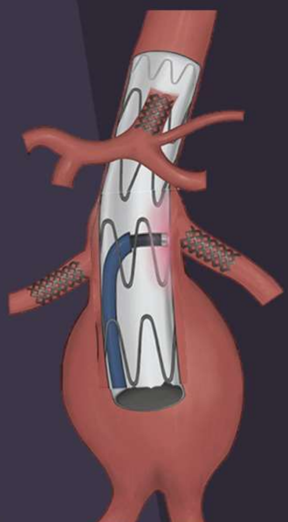
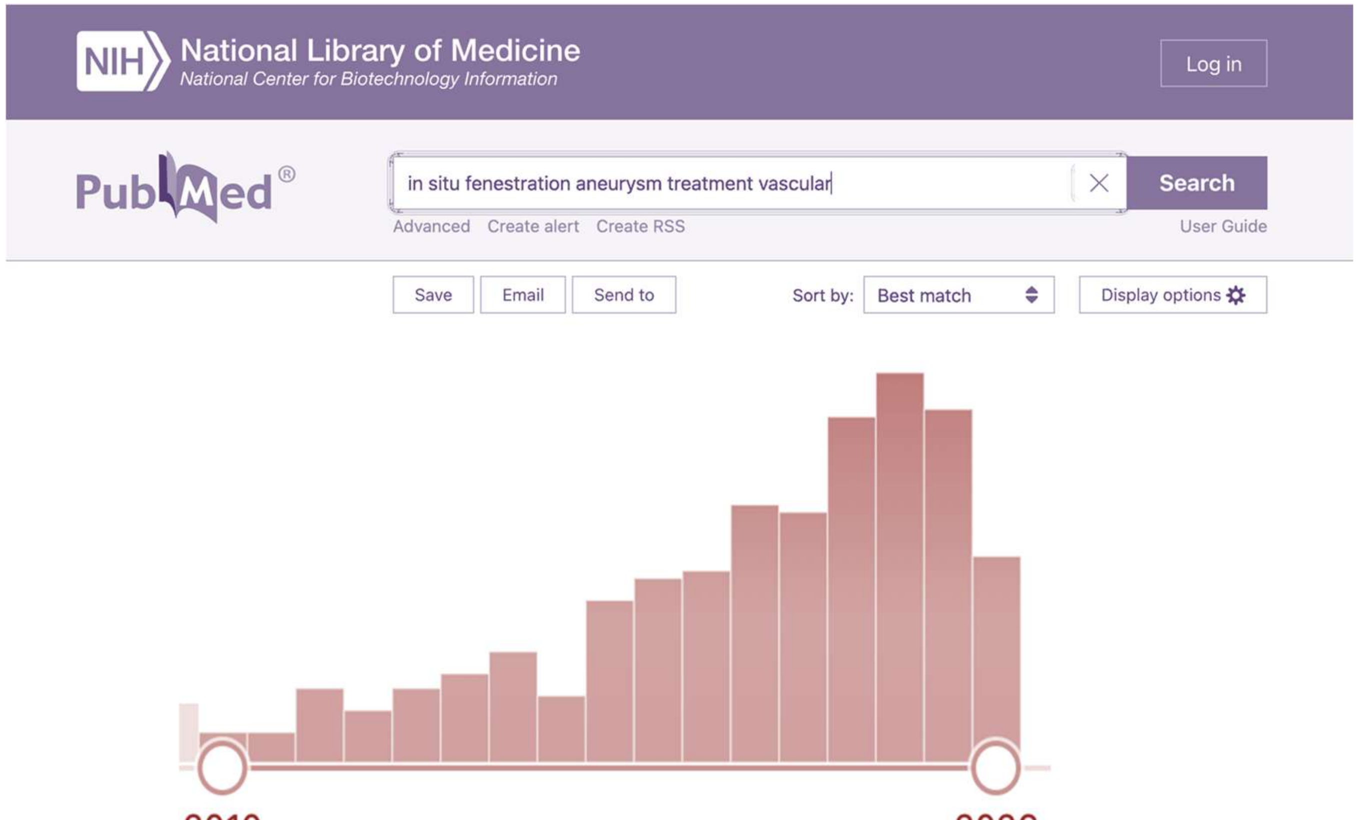
Introduction

Antegrade





ARCH/THORACIC

ABDOMINAL

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CASE

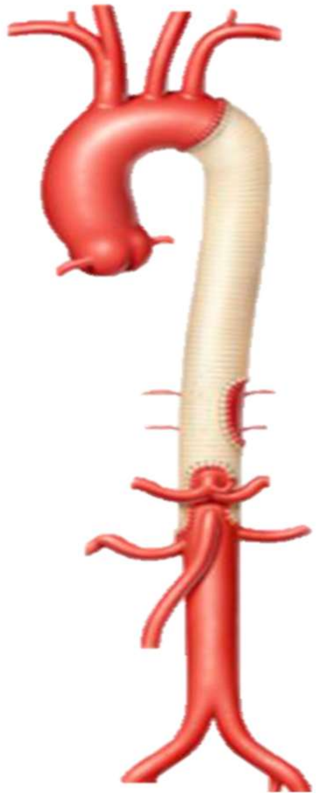
Case Presentation

Clinical Presentation

- **72 yo male**

- **PMH:**
  - HTN – DLP
  - CAD – NSTEMI 2009 – PTCA
  - COPD – FEV1 39%

- **Aortic History**
  - 2003- Ruptured thoracic aneurysm
    Thoracic aortoaortic bypass
    Reimplantation of the celiac trunk
    Reimplantation of intercostals



Clinical Presentation

➢ Presentation

- **Hospitalized** in an outside hospital for 3 weeks
- Shortness of breath – Subacute pulmonary oedema
- Treated accordingly – diuretics
- **Clinical status**
  - Acute renal failure (creatinine 180 µmol/L)

    vs
  - Fluid overload

Case Presentation

Imaging

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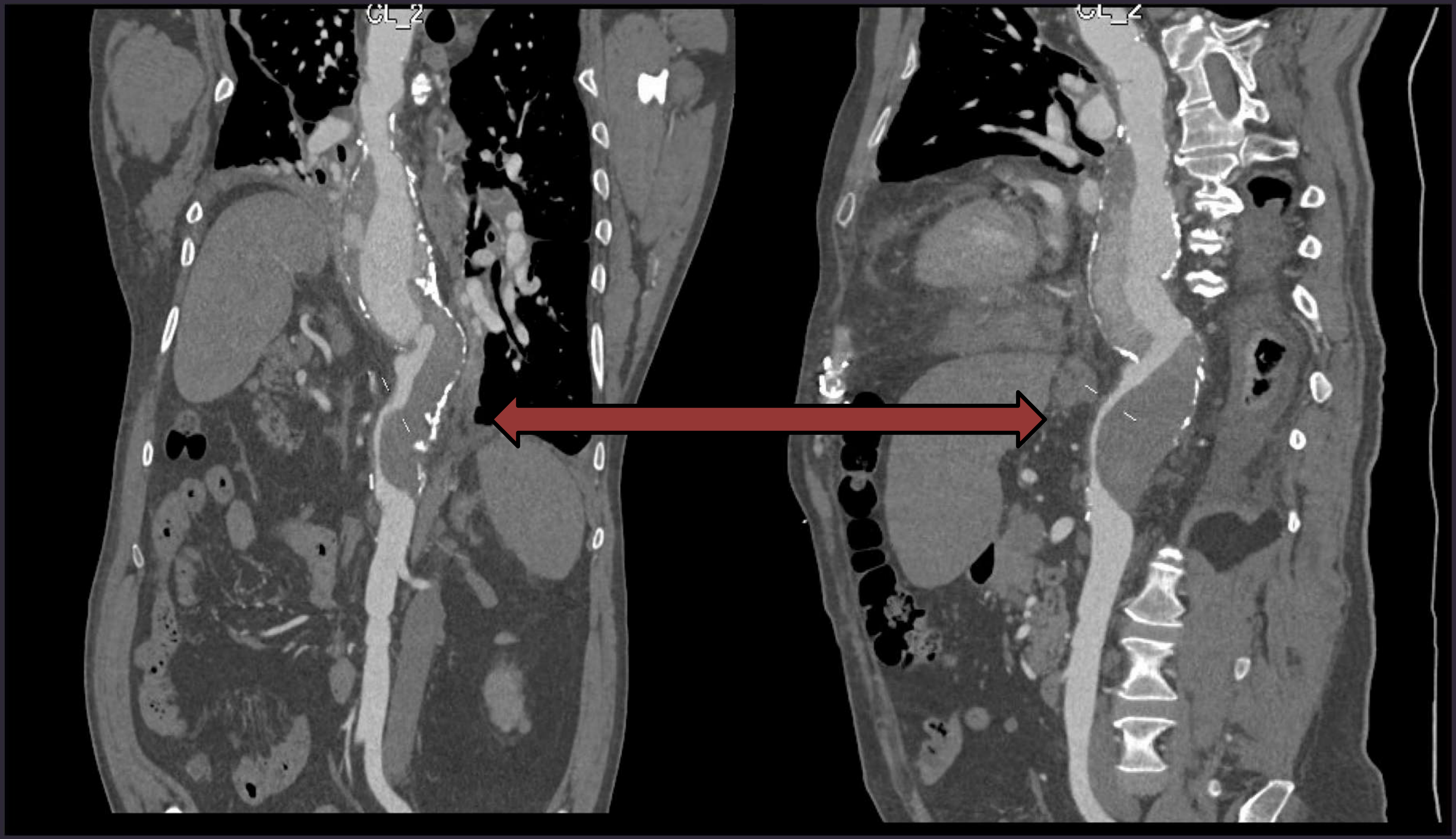
Case Presentation

Imaging



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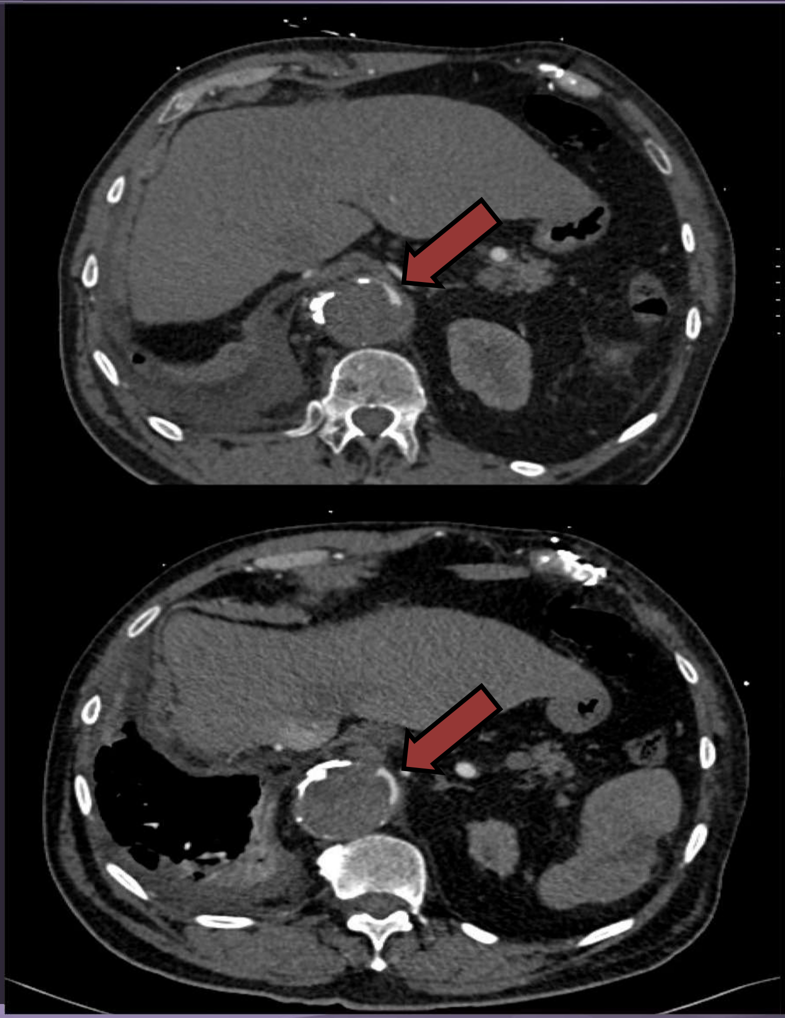
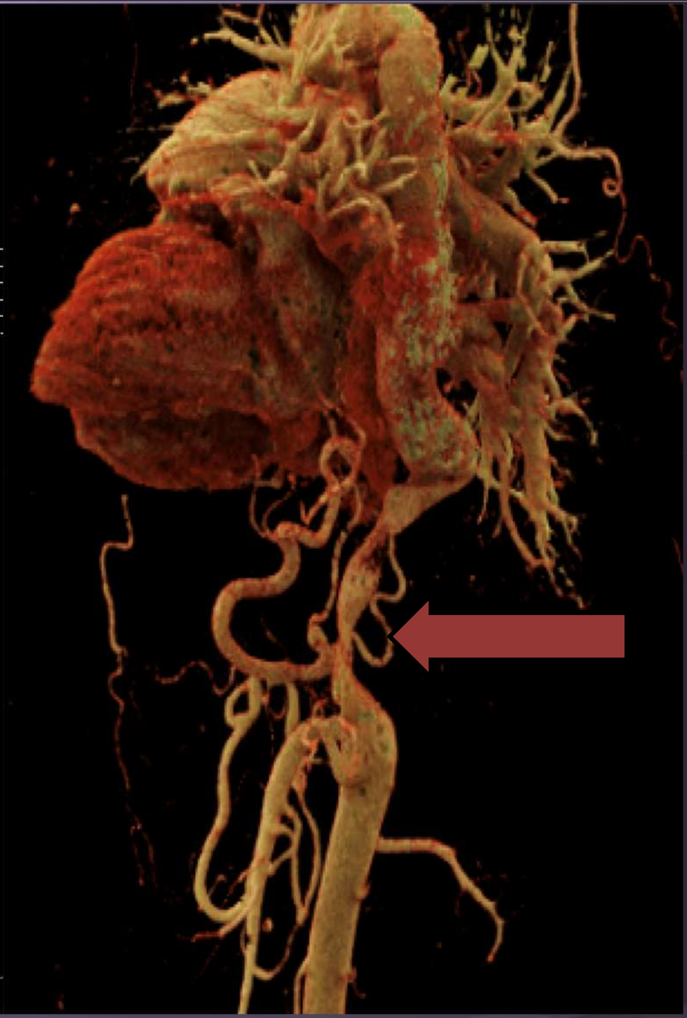
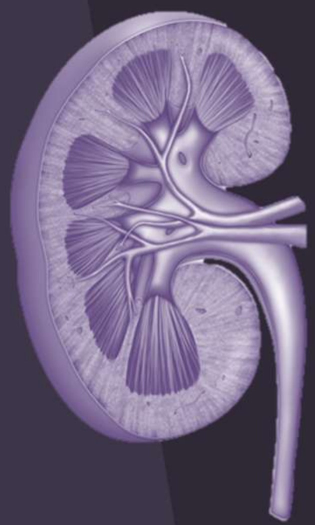
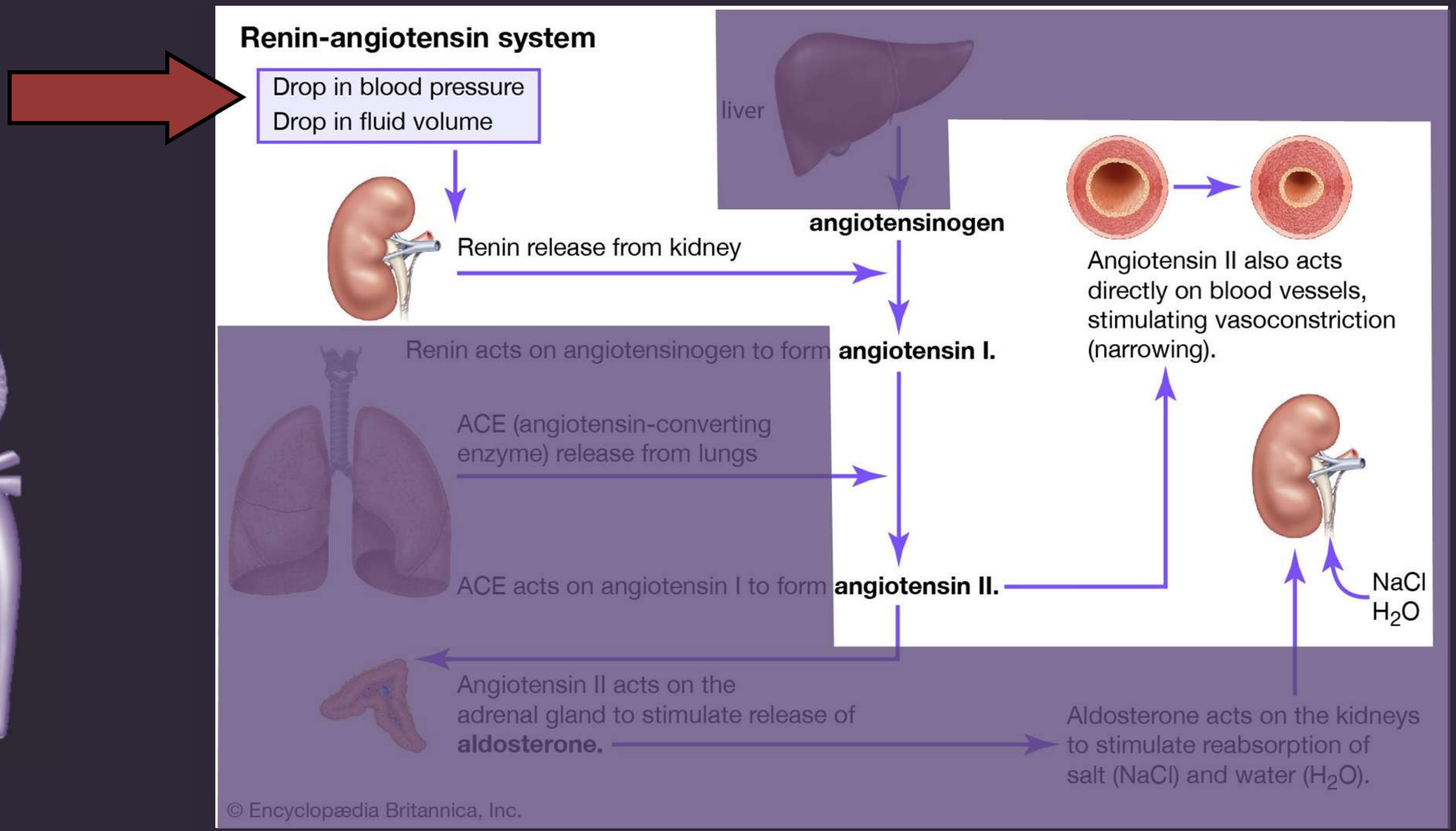
Case Presentation

Imaging

Case Presentation





Decision

➢ **Taking into account:**

- **Comorbidities**
- **Physiological status**
  - Acute Pulmonary oedema
  - Acute renal failure
- **His will to treat any potential reversible cause**

Decision

- Options
  - **Open**
    - Redo Thoracotomy…
    - Axillobifemoral bypass graft
  - **Hybrid**
    - Debranching and TEVAR
  - **Endovascular**
    - Aortic angioplasty with stent (Palmaz)
    - PMEG
    - Chimney graft
    - In situ fenestration

Decision

- Options
  - Open
    - Axillobifemoral bypass graft
    - Axillobifemoral bypass graft
  - Hybrid
    - Debranching and TEVAR
  - **Endovascular**
    - Aortic angioplasty with stent (Palmaz)
    - PMEG
    - Chimney graft
    - **In situ fenestration**

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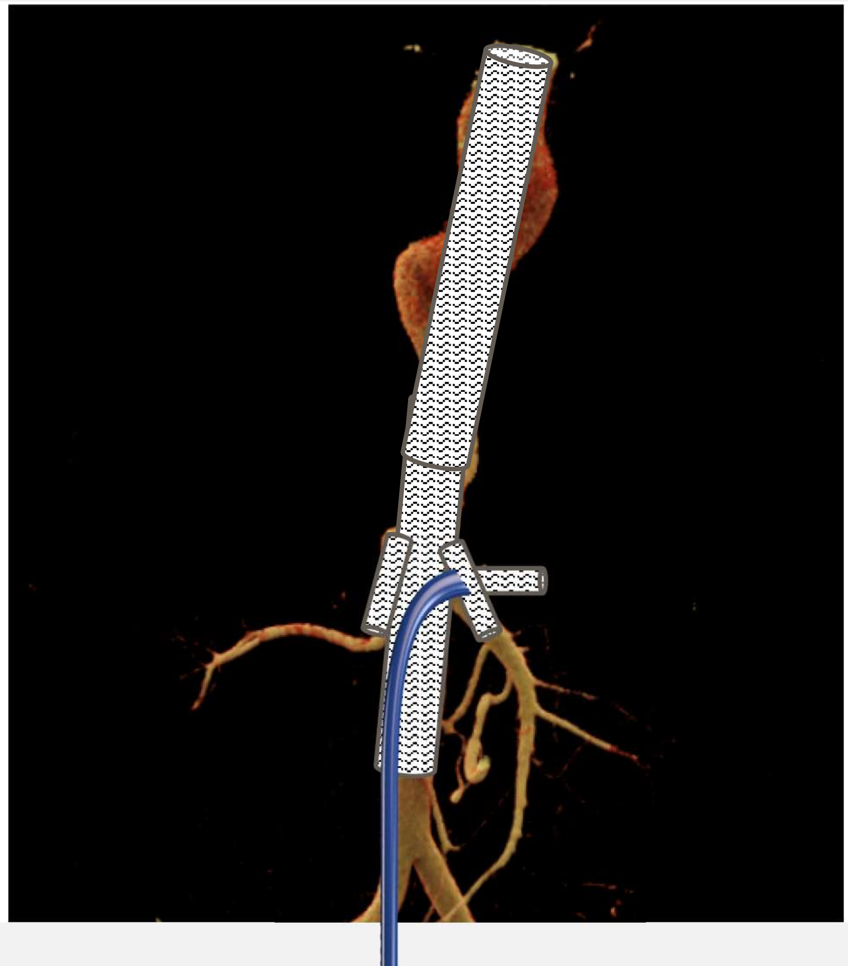
Plan

Decision



TECHNIQUE

Preparation

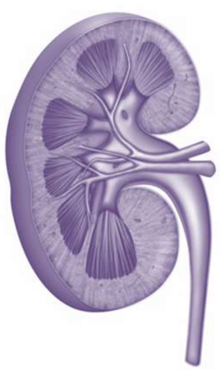
General Considerations

- Access
- Heparine- ACT
- Stack your equipment
- Pre-stenting or not (which stent)
- Fenestration method/device
- Visceral Ischemic time

Preparation

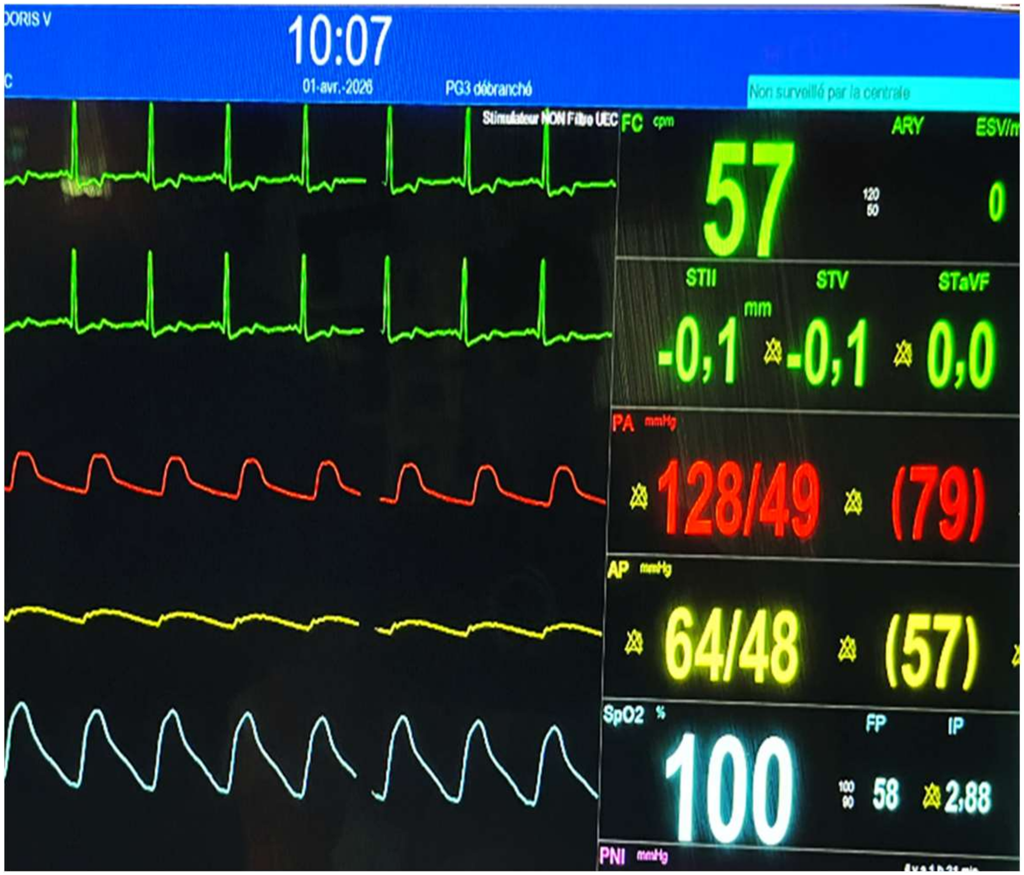
Case

- **Pressure gradient**
  - More than 60mmHg



RADIAL

FEMORAL



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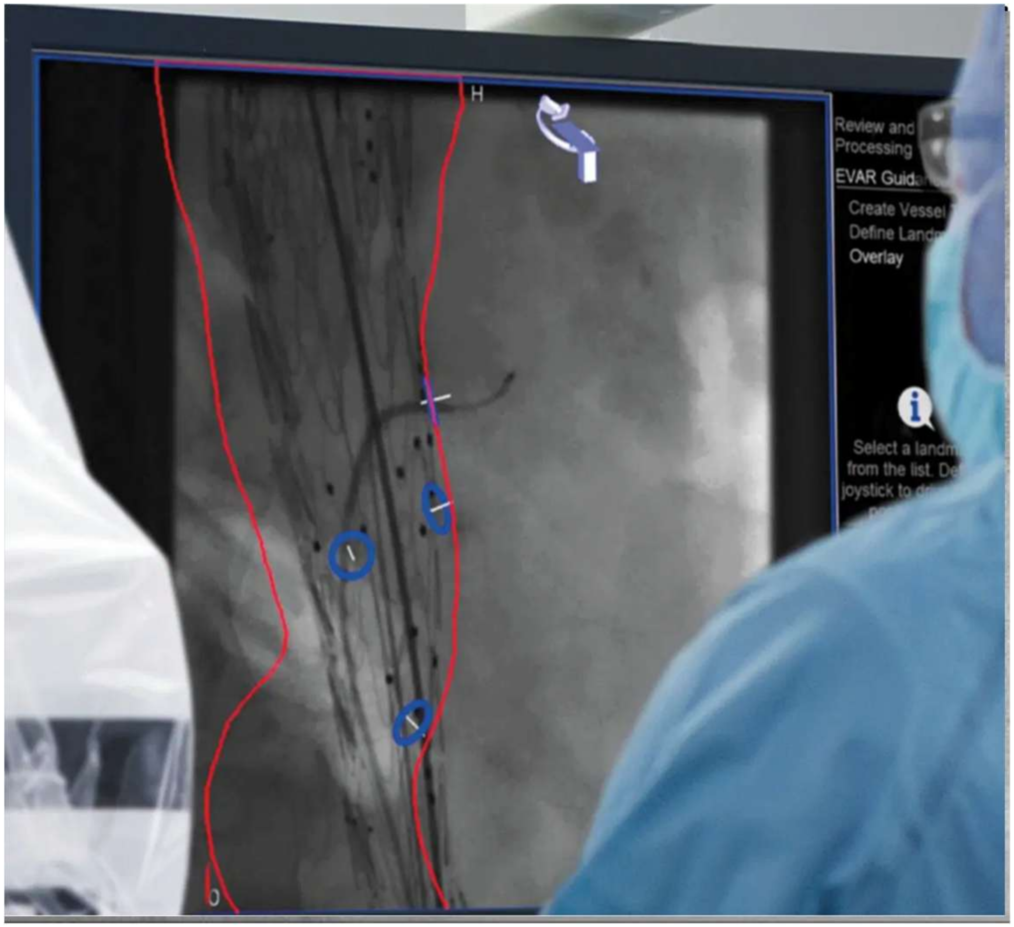
Pre-stenting or not…?

Case

- 3 vessels (SMA, 2 renals)
- « To stent or not to stent"… Vs Fusion
- To stent
  - Steerable sheet
  - Covered stent



Pre-stenting or not…?

Technical Pearl

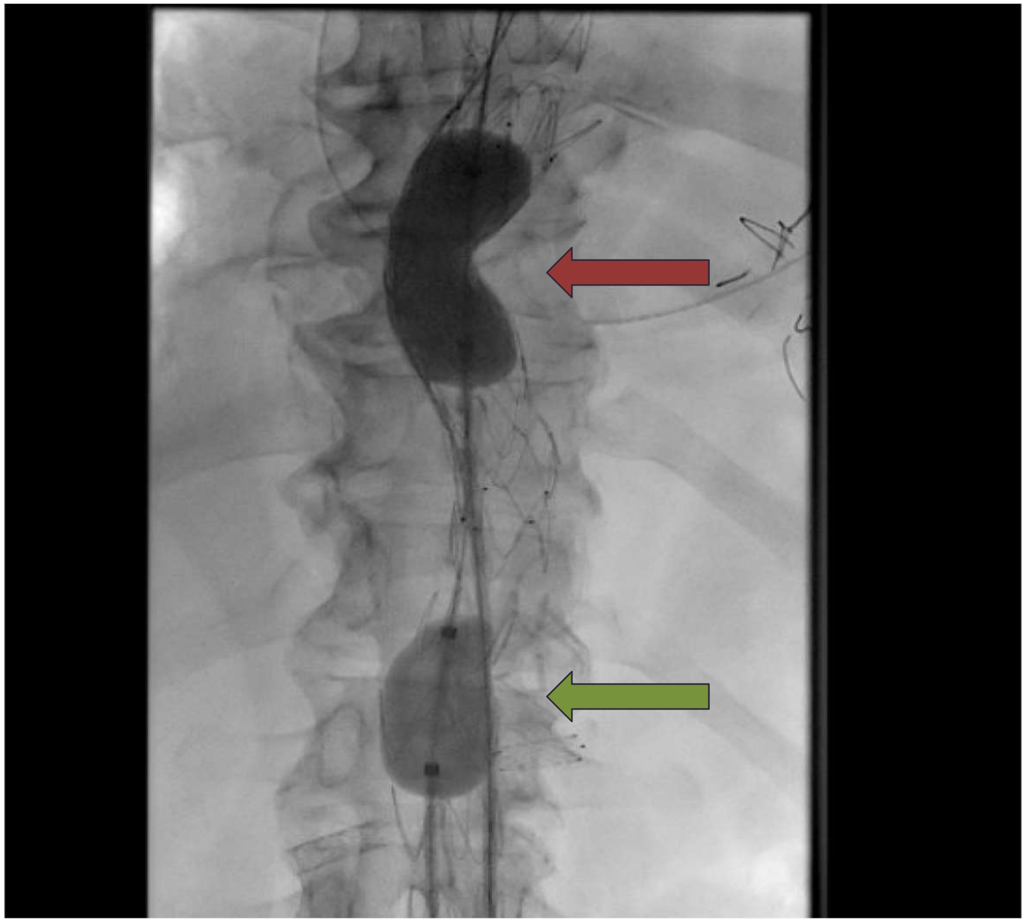
- Covered vs bare-metal stent
- Deployement flush to the aortic wall
- Save the angle position
- Other options
  - Pre-canulation with wire
    - Or sheath with cold perfusion
  - Fusion imaging

Graft Deployment

Case

- TEVAR Deployment
  - From bottom to Top
    - ZTA-28-201
    - ZTA-32-201

- Inflated 2 compliant balloons to avoid embolisation



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In situ Fenestration

Options

MECHANICAL

- **Needle/Wire-Based Fenestration**
  - Sharp needle,
  - Rigid back-end of a 0.014-0.018" guidewire

THERMAL

- **Laser-Assisted Fenestration**
  - Laser abalation cathether emitting energy
- **Radiofrequency (RF) :**
  - Specialized RF wire

In situ Fenestration

Radiofrequency

Laser

WVES Winnipeg Vascular & Endovascular Symposium

In situ Fenestration

	Radiofrequency (RF) Fenestration	Laser In Situ Fenestration (ISLF)
Mechanism	**Electrical energy** Dedicated RF via	**UV Light energy** Excimer or Diode lasers burn/vaporize a hole in fabric.
Equipment	**Portable** Delivered through standard 0.035" catheters,	**Bulkier equipment** Dedicated electrical outlets.
Graft Material	Works best on **polyester** Generally **not compatible** with ePTFE grafts	Compatible with **most grafts**
Fenestration Quality	**Precise, controlled puncture**	**Clean circular fenestrations**
Tools	RF probes or electrified guidewires	Fiber-optic probe
Cost	**Typically between 3,000-3500 CAD ,** Slightly less expensive .	**More expensive** Due to the fiber cost and the investment for the system

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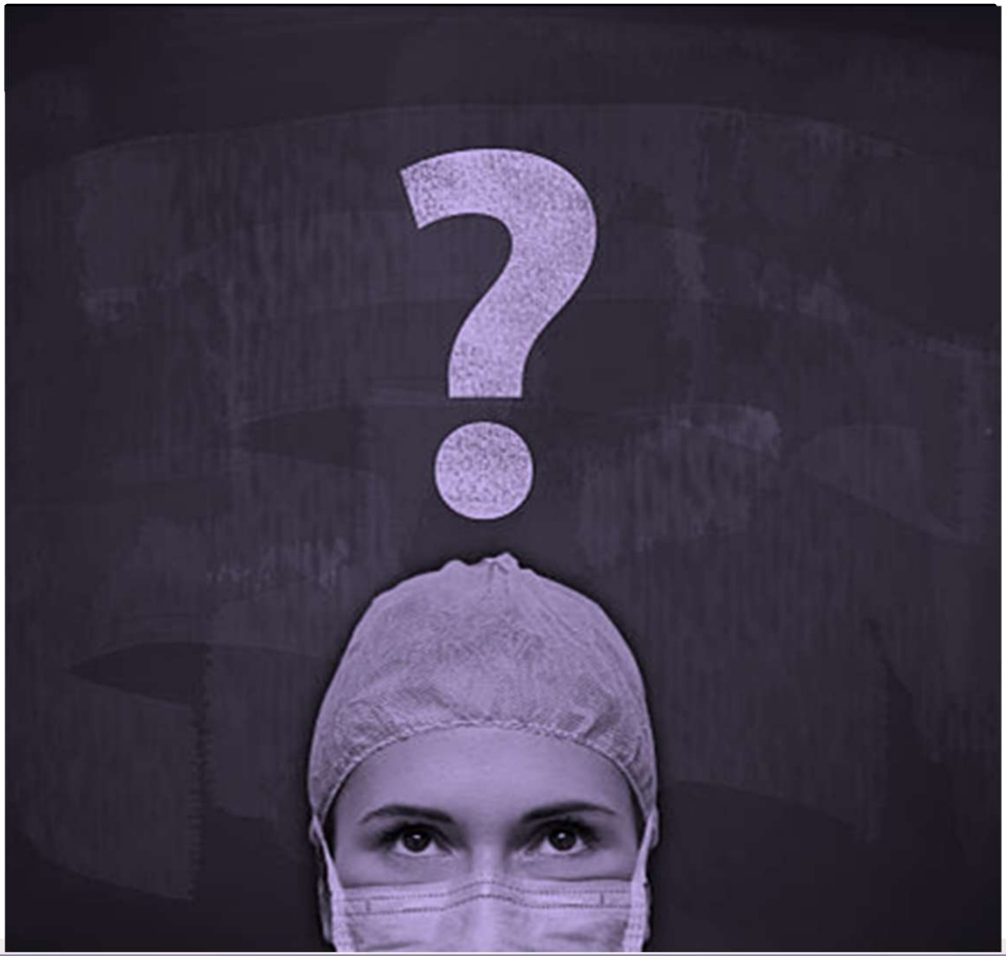
In situ Fenestration



Technical Pearl

- **Which vessel first**
  - Most do the SMA first
  - But
    - Renal ischemic time is less
  - ....

In situ Fenestration

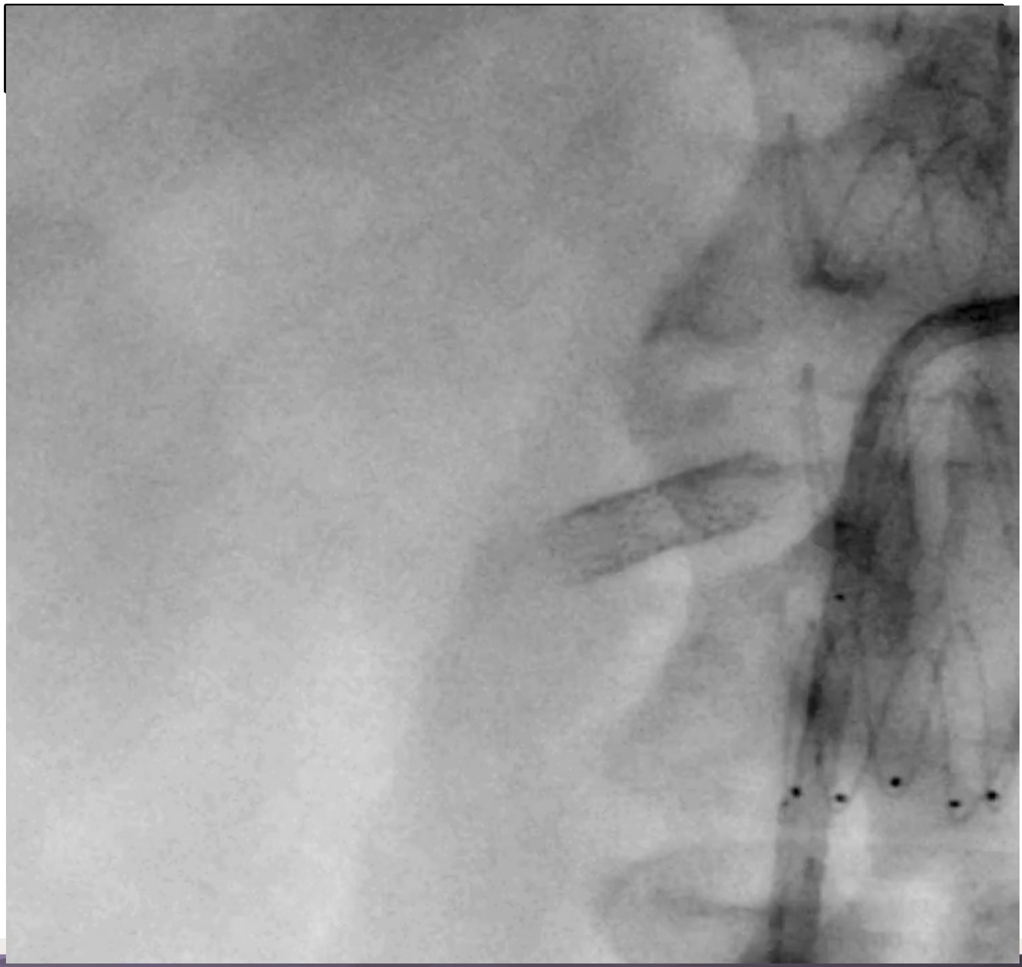
Case

- **Radiofrequency**
- **Positionning**
  - Steerable sheet
  - Catheter and wire
  - 2 views (90 degree angle)

In situ Fenestration

Case

- **Radiofrequency Fenestration**
  - Adequate positionning
  - Good contact wire-fabric
  - Fire…



In situ Fenestration

Options

- **Fenestation**
  - Advance wire
  - Usually catheter will no advance
  - Use 3mm balloon
  - Use balloon to exchange for stiffer wire
  - Progressive dilatation
  - Deployed stent as per fenestration technique
    - Maximum 8 mm

In situ Fenestration

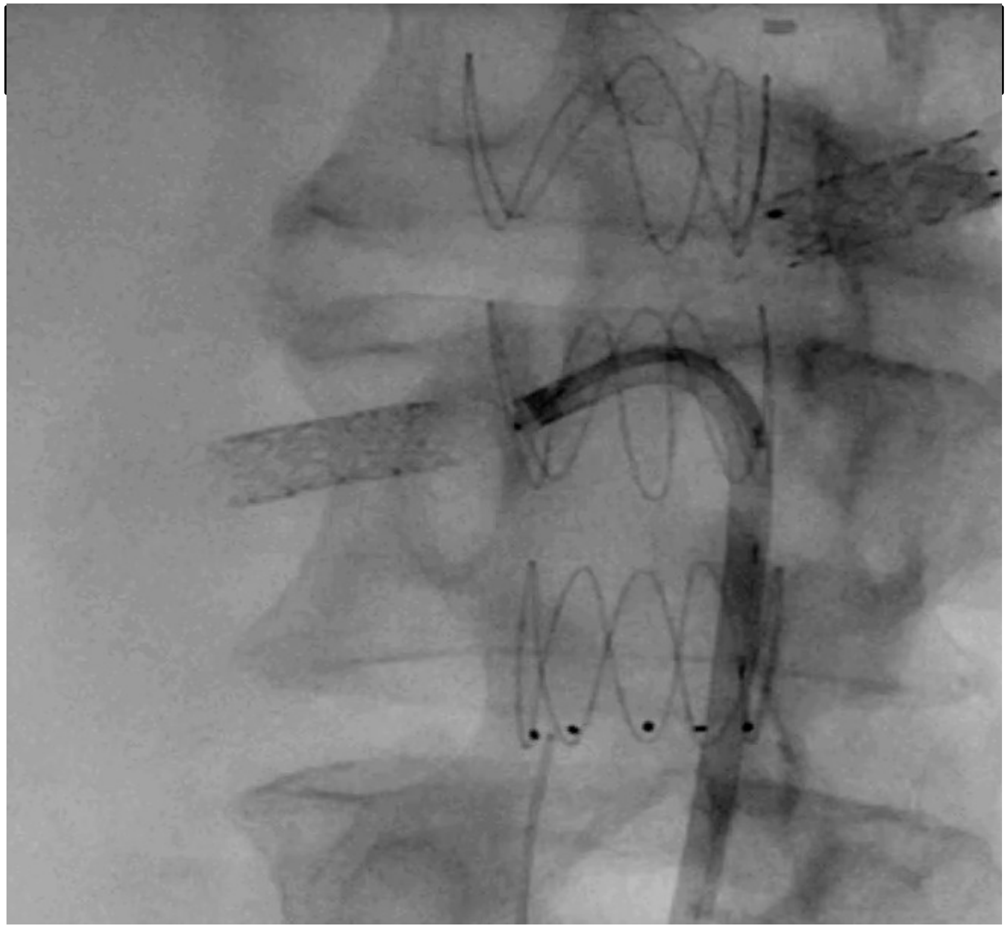
Case

- **Fenestration**
  - **Time 0: deployment of TEVAR**
  - Left renal – 18 minutes
  - Right renal – 32 mins
  - SMA – 47 mins

In situ Fenestration

Case

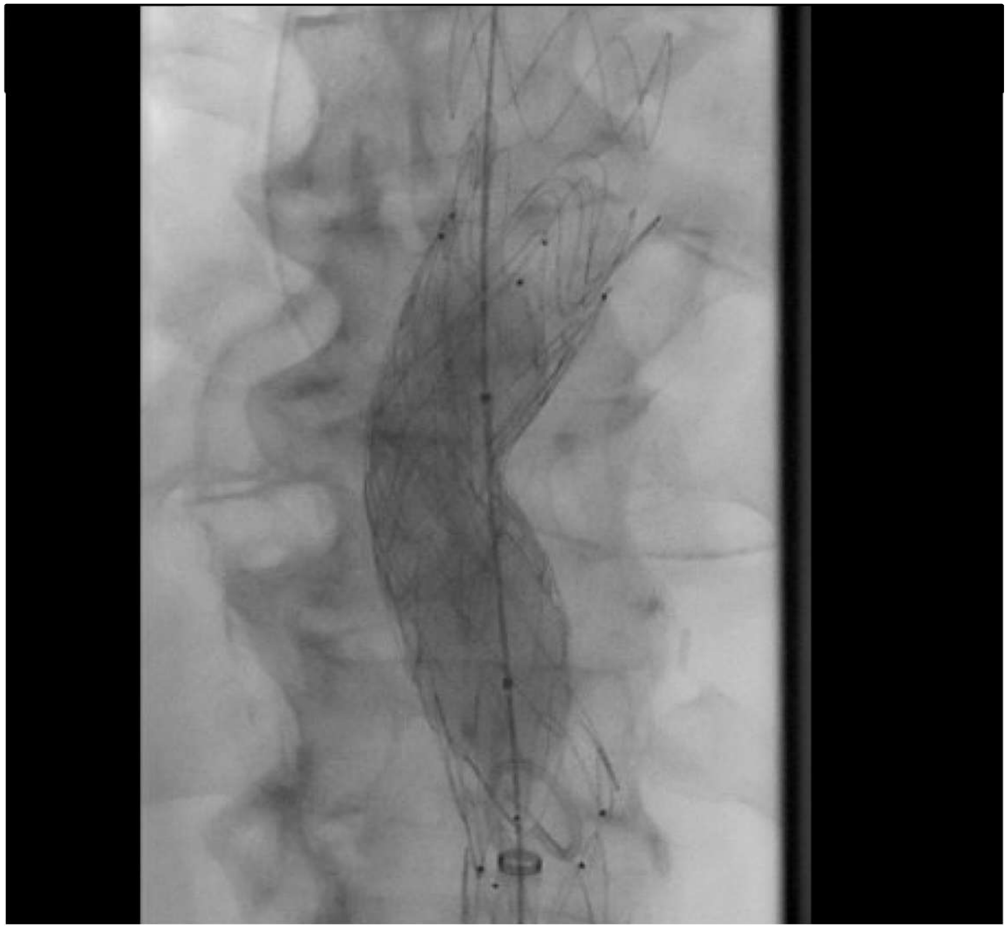
- **Fenestration**
  - Left renal
  - Right renal
  - SMA



In situ Fenestration

Case

- **Residual Gradient**
  - 10-15mmhg



Angiogram

Case

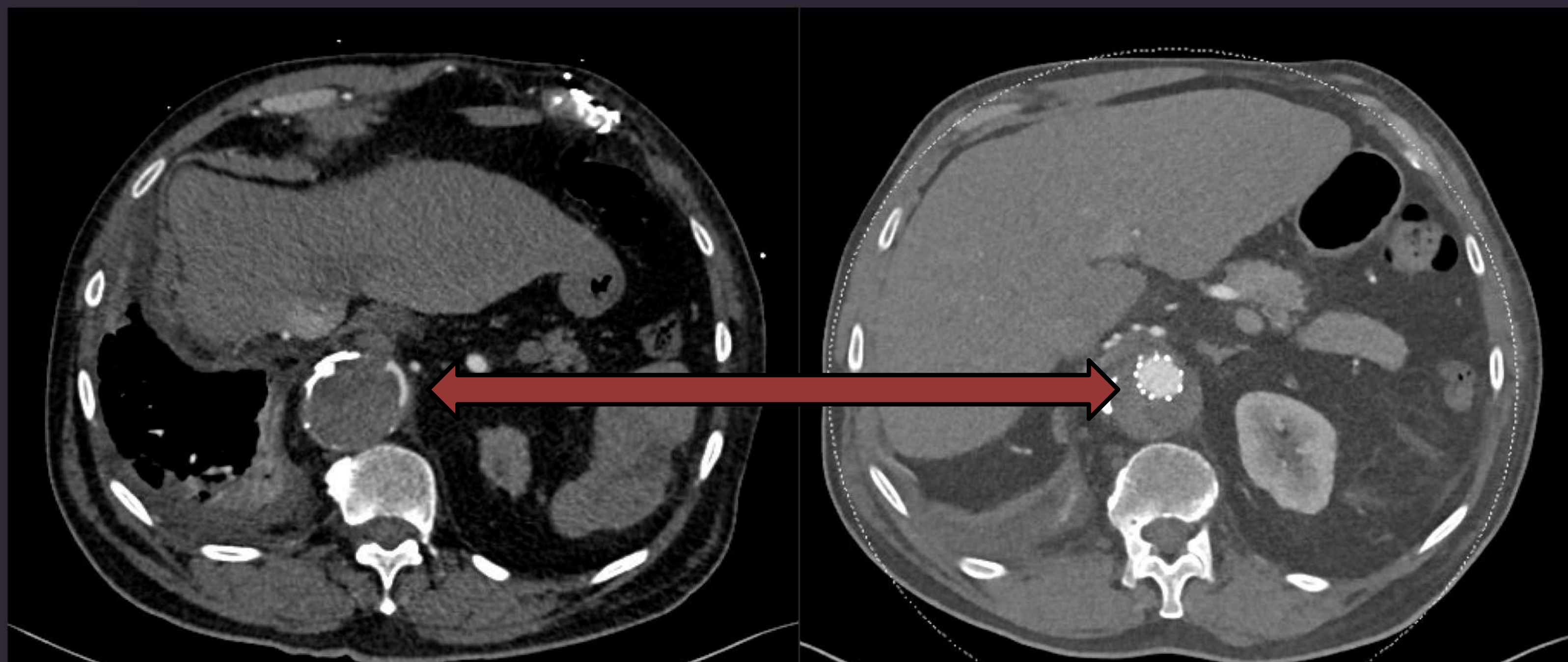
- **Final Angiogram**
  - 3 patent vessels
  - Type 1 A endoleak
    - Added a proximal graft 32mm

Post-op

Imaging

Post-Op

Imaging

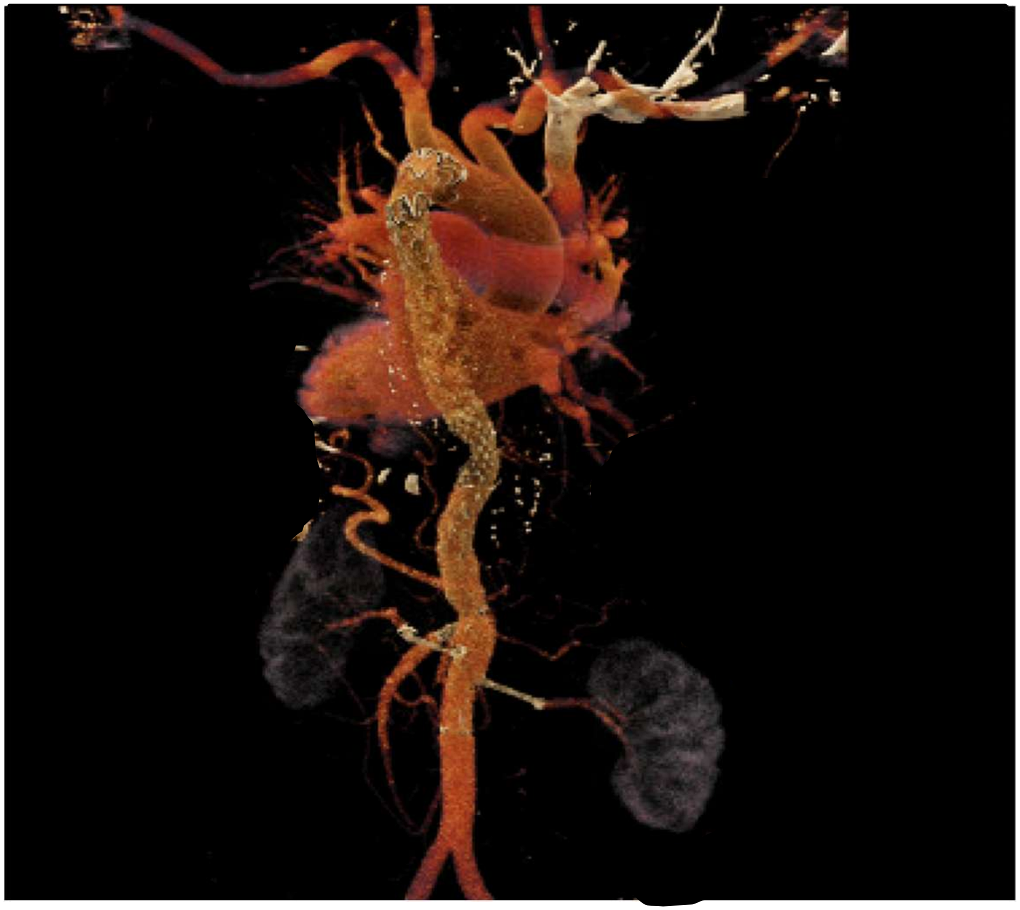


PRE-	POST

Post-Op

POST-OP

- Diuresis 300cc/h for 12 hours
- Creatinine Level
  - 180 to 74 µmol/L over 3 days
- Extubated on POD #1
- Discharged home POD #6



LITERATURE

Discussion

Results

Fenestrated endovascular aortic repair for complex abdominal aortic aneurysms using in situ laser fenestrations

Aslyn E. Mattson, BS,[a] John C. Motta, MD,[b] Eileen de Grandis, MD,[b] *and* W. Anthony Lee, MD,[b] *Boca Raton, FL*

- **Over the past 10 years:** 6 series; 5 case reports

- Total of 132 patients (mostly men) and 322 target vessels
- Indications included
  - Symptomatic thoracoabdominal aortic aneurysms and AAAs,
  - Complex perivisceral AAAs, including reintervention after prior EVAR for type Ia endoleak.

- **Technical success:** 94% to 100%,
- **30-day reintervention rates:** 0% to 67% (most common indication Type Ic or type III endoleak)
- **30-day mortality rates** 0% to 12%

In situ laser fenestration is a feasible option for urgent, complex repair, with early results comparable to physician-modified endografts when custom-made or off-the-shelf devices are unsuitable.

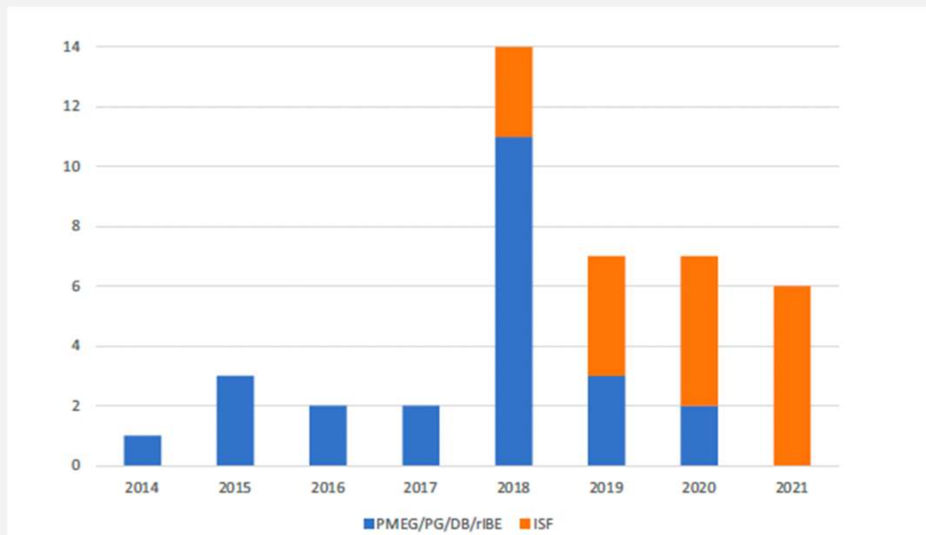
Journal of Vascular Surgery Cases, Innovations and Techniques
February 2026

Discussion

Comparison

Comparative early results of in situ fenestrated endovascular aortic repair and other emergent complex endovascular aortic repair techniques for ruptured suprarenal and thoracoabdominal aortic aneurysms at a regional aortic center

Alyssa J. Pyun, MD, Helen A. Potter, MD, Gregory A. Magee, MD, MSc, Miguel F. Manzur, MD, Fred A. Weaver, MD, MMM, Kenneth R. Ziegler, MD, Jacquelyn K. Paige, MSN, NP, *and* Sukgu M. Han, MD, MS, *Los Angeles, CA*



Journal of Vascular Surgery
October 2022

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Discussion

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Comparative early results of in situ fenestrated endovascular aortic repair and other emergent complex endovascular aortic repair techniques for ruptured suprarenal and thoracoabdominal aortic aneurysms at a regional aortic center

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Los Angeles, CA

- Retrospective review from July 2014 to March 2021
- 42 patients underwent endovascular repair for ruptured SRAAAs and TAAAs
    - 18 of whom underwent ISF repair.

- **In-hospital mortality trended lower in the ISF group** (11% vs 25%, P . .233),
- **Major adverse events did not significantly differ** between the ISF and non-ISF ISF became the most commonly used technique later in the study period.

Conclusion: ISF was associated improve survival and has now become the dominant technique at our center.

Journal of Vascular Surgery
October 2022

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Discussion

Comparison

BASIC SCIENCE RESEARCH · Volume 77, P280-287, November 2021

Experimental Analysis of In Situ Fenestration of Endovascular Stent-Grafts: Comparison between Needle and Laser Puncture

Qinglong Zeng † · Xiang Zhou † · Yunjun He · ... · Ziheng Wu · Hongkun Zhang · Donglin Li ... Show more

- An in vitro study including polyester stent-grafts and ePTFE
- Fenestration by needle and laser followed by gradual dilation

- **Needle**
  - Slit-like with visible cut-off fibers in polyester
  - Circular with clear margins in ePTFE stent-grafts

- **Laser**
  - Squared or elliptical with ragged edges and burned fibers
  - Fabric debris and toxic particles were generated

- After gradual balloon dilation, the final holes showed no evident difference

Conclusions: The primary fenestrations were different between needle and laser puncture. The final fenestrations were similar after gradual balloon dilation.

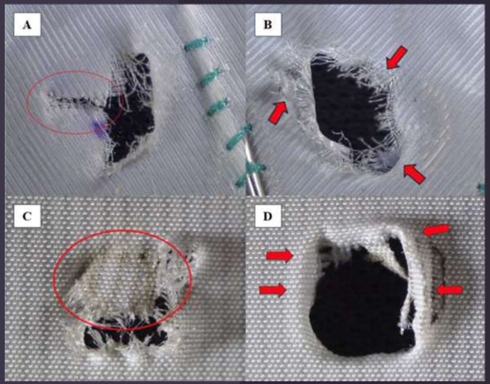
Discussion

Comparison

	Radiofrequency (RF) Fenestration	Laser Fenestration (ISLF)
Initial Hole Size	Smaller, usually creating **1 mm** size fenestrations.	Typically larger, creating **2–3 mm** openings.
Material Compatibility	Effective for **Polyester** **Does not work with ePTFE** stent grafts.	Works well on **Polyester** and **ePTFE.**
Flexibility	Also flexible and handles tortuosity better than mechanical needles.	Highly flexible probes, suitable for **distant or tortuous** anatomies.
Common Equipment	PowerWire radiofrequency guidewire or plasma electrode catheters.	308 nm Excimer Laser or Diode Laser.

Discussion

Bioengineering



Experimental Investigation
JOURNAL OF ENDOVASCULAR THERAPY
Journal of Endovascular Therapy
2024, Vol. 31(1) 126–131

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In Situ Laser Fenestration Technique: Bench-Testing of Aortic Endograft to Guide Clinical Practice

Matthew Joe Grima, MD, PhD[1,2,3], Anders Wanhainen, MD, PhD[1,4], and David Lindström, MD, PhD[1]

Eur J Vasc Endovasc Surg (2018) 56, 68–77

An Experimental Study of Laser *in situ* Fenestration of Current Aortic Endografts

J. Jayet [a,b,c], F. Heim [c,d], M. Coggia [a,b], N. Chakfe [d,e], R. Coscas [a,b,f,*]
[a] Department of Vascular Surgery, Ambroise Paré University Hospital, Assistance Publique — Hôpitaux de Paris (AP-HP), Boulogne-Billancourt, France
[b] Faculté de Médecine Paris-Ile de France-Ouest, UFR des sciences de la santé Simone Veil, Université Versailles Saint-Quentin en Yvelines, Montigny-le-Bretonneux, France
[c] Groupe Européen de Recherche sur les Prothèses Appliquées à la Chirurgie Vasculaire (GEPROVAS), Strasbourg, France
[d] Laboratoire de Physique et Mécanique des Textiles, Mulhouse, France
[e] Department of Vascular Surgery and Kidney Transplantation, Hôpitaux Universitaires de Strasbourg, Université de Strasbourg, Strasbourg, France
[f] UMR 1018, Inserm-Paris11 - CESP, Versailles Saint-Quentin-en-Yvelines University, Paris-Saclay University, Paul Brousse Hospital, Villejuif, France

Journal of Clinical Medicine
MDPI
Article

Mechanical Comparison between Fenestrated Endograft and Physician-Made Fenestrations

Jérémie Jayet [1,2,3,4,*], Jennifer Canonge [1,2,5], Frédéric Heim [2,3], Marc Coggia [1], Nabil Chakfé [2,6] and Raphaël Coscas [1,2,4]

Experimental Investigation
JOURNAL OF ENDOVASCULAR THERAPY
Journal of Endovascular Therapy
2021, Vol. 28(2) 300–308

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DOI: 10.1177/1526602820981980
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Optimal In Situ Fenestration Technique With Laser Perforation and Balloon Dilation for Aortic Stent-Grafts

Jing Lin, PhD[1], Limael E. Rodriguez, MD[2], Mark Nutley, MD, MSc[3], Lu Jun, MSc[1], Ying Mao, BSc[1,4], Niraj Parikh, MD[2], Fanny Alie-Cusson, MD[2], Ze Zhang, PhD[4], Lu Wang, PhD[1], Jean M. Panneton, MD[2], and Robert Guidoin, PhD[4]

Graft Durability and Fatigue after In Situ Fenestration of Endovascular Stent Grafts Using Radiofrequency Puncture and Balloon Dilatation

L.A. Eadie [a], G. Soulez [b], M.W. King [a,c], L.W. Tse [d,*]
[a] College of Textiles, North Carolina State University, Raleigh, NC, USA
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Main Text Article

In Vitro Laser Fenestration of Aortic Stent-Grafts: A Qualitative Analysis Under Scanning Electron Microscope

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Discussion

Bioengineering

1. Endograft Textile Determines Fenestration Behavior

Key engineering determinant

- Fabric density (saturation index) influences penetration resistance and deformation during fenestration.
- Higher-density fabrics require greater penetration energy and exhibit more fiber disruption during dilation.

Fabrics

- PET (woven textile)
  - Advantages: higher tensile strength and predictable yarn architecture
  - Disadvantages: susceptible to fiber fraying and tear propagation
- ePTFE (microporous membrane)
  - Advantages: more homogeneous structure and less yarn-related tearing
  - Disadvantages: lower resistance to radial expansion potential creep deformation

Conclusion

Density of the graft fabric are primary determinants of how the material responds to fenestration, influencing both the energy required for perforation and the degree of structural damage.

Discussion

Bioengineering

2. Fenestration Technique Alters Microstructure

Mechanical puncture
- Fiber displacement - Partial preservation of yarn continuity
- Irregular fenestration geometry

Laser fenestration
- Photothermal ablation - Fiber melting and rupture
- Precise circular fenestration edges

Radiofrequency fenestration
- Resistive heating - Polymer softening
- Wider thermal injury zone compared with laser

Conclusion

While **thermal techniques (laser and RF) allow precise and controlled perforation**, they introduce localized thermal damage to the polymer fibers, potentially affecting long-term structural integrity.

Discussion

Bioengineering

3. Balloon Dilatation Effects

Fenestration creation is only the first step.

Subsequent steps include:

- initial puncture (laser/RF/needle)
- balloon dilatation
- bridging stent deployment

Biomechanical effects:

- cutting balloons produce blade imprints and further fiber rupture.
- dilation generates plastic deformation of the textile network.
- large dilation diameters increase risk of uncontrolled tearing.

Conclusion

Cutting balloon should be avoided and dilatation of no more than 8mm in diameter is suggested

Discussion

Bioengineering

4. Mechanical Strength Is Significantly Reduced

Experimental tensile testing demonstrates:

- approximately 27–34% reduction in graft fabric tensile strength after fenestration.

Mechanism:

- disruption of the load-bearing fiber network
- development of stress concentration around the fenestration

Both mechanical and thermal fenestrations produce measurable weakening of the textile structure.

Conclusion

Fenestration introduces a localized structural defect that **significantly reduces the mechanical strength** of the graft fabric, primarily due to interruption of the load-bearing fiber architecture.

Discussion

Bioengineering

5. Fenestration Enlargement Under Cyclic Loading

Simulated physiologic fatigue testing demonstrates:

- progressive fenestration enlargement during pulsatile loading
- fiber rupture and yarn sliding
- gradual expansion of the fenestration perimeter.

Bench studies have reported fenestration area increases up to three- to five-fold depending on fabric density and dilation techniques.

Mechanism:

- cyclic radial forces
- stent–fabric interaction
- progressive micro-tearing of fibers.

Conclusion

Under physiologic pulsatile loading, **fenestrations behave as fatigue-sensitive regions** of the graft, with **progressive enlargement** driven by cyclic mechanical stresses.

Discussion

Bioengineering

6. Seal and Leakage Depend on the Stent–Fabric Interface

Creation of a fenestration disrupts the hydraulic barrier of the graft membrane.
Seal integrity depends on:

- radial force of the bridging stent
- compression of graft fabric around the stent
- fenestration diameter after balloon dilation
- graft material properties.

Experimental observations suggest that thermal fenestration techniques may increase fabric permeability, particularly in multifilament PET grafts.

Conclusion

After fenestration, **sealing of the branch vessel relies primarily on the mechanical interaction between the bridging stent and the graft fabric**, rather than the intrinsic sealing properties of the graft itself.

Bioengineering

7. Importance of Reinforcement

Commercial fenestrated endografts incorporate:

- nitinol reinforcement rings
- sutured fenestration borders
- reinforced textile patches

Experimental studies demonstrate that reinforcement:

- improves resistance to fabric tearing
- increases pull-out strength of bridging stents
- enhances fatigue durability.

These features compensate for the structural weakening introduced by fenestrations.

Conclusion

Reinforced fenestrations restore mechanical stability at the branch interface, highlighting why **manufacturer-designed fenestrated grafts remain biomechanically superior to in-situ or physician-modified fenestrations.**

Discussion

Bioengineering

Key Engineering Risks of In-Situ Fenestration

- Stress concentration around fenestration
- Fatigue enlargement
- Polymer thermal degradation
- Yarn rupture and fraying
- Seal failure at stent interface
- Long-term fabric creep

These factors are why many authors emphasize that **in-situ fenestration remains biomechanically inferior to purpose-built reinforced fenestrations**

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In Summary

ADVANTAGES	LIMITATIONS
• Readily accessible for urgent cases • No manufacturing delay • Does not require precise alignment • Good short-term results	• Visceral Ischemic time • Requires specialised equipment • Requires pre-placement of marker stent • Long term results? ○ Material fatigue and enlargement

Conclusion

- **Expands endovascular options**
  - In situ fenestration is a feasible technique for juxtarenal, pararenal, and thoracoabdominal aortic aneurysm repair, when standard devices are not suitable.
- **No clearly superior technique**
  - Thermal and mechanical techniques all achieve reliable fenestrations
  - Technique selection should depend on institutional expertise and available resources.
- **High technical success but limited durability data**
  - Published series report high technical success and good short-term outcomes
  - Robust long-term follow-up data remain limited.
- **Bioengineering concerns remain**
  - Fenestration alters graft fabric structure and mechanical integrity
  - The long-term impact on material requires further bioengineering investigation.
- **Current role in practice**
  - In situ fenestration should primarily be considered for urgent/emergent cases or as a bailout technique, while its broader indications continue to be defined.

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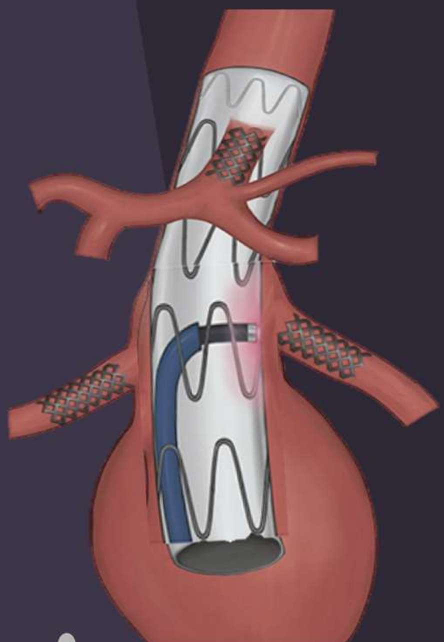

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Thank you