3x-4x vs. 2x FEVAR
Expected Advantages and Potential Risks?

Eric Verhoeven, MD, PhD, Athanasios Katsargyris, MD
Paracelsus Medical University, Nuremberg, Germany
Disclosures

• William Cook Europe/Cook Inc.
  – Research grants & Consulting
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  – Consulting
2x, 3x, or 4x FEVAR
Choice According to Landing Zone
Standard (2x) FEVAR

- Short neck AAA
- Juxtarenal AAA
Complex (3x-4x) FEVAR

- Juxtarenal AAA
- Suprarenal AAA
- (Some type IV TAAA)
Complex FEVAR vs. Standard FEVAR

Theoretical Advantages

• Proximal sealing
  – Longer length
  – Healthier aortic wall

• Long term durability
  – Younger patients
Complex FEVAR vs. Standard FEVAR

Theoretical Limitations

- ↑ Planning complexity
- ↑ Set-up requirements
  - Lateral C-Arm views
- ↑ Procedure complexity
  - Duration, Contrast, Fluoro
- ↑ M&M?
Early versus late experience in fenestrated endovascular repair for abdominal aortic aneurysm

Magnus Sveinsson, MD, a Jonathan Sobocinski, MD, PhD, b Timothy Resch, MD, PhD, a Björn Sonesson, MD, PhD, a Nuno Dias, MD, PhD, a Stéphan Haulon, MD, PhD, b and Thorarinn Kristmundsson, MD, PhD, a Malmö, Sweden; and Lille, France

(J Vasc Surg 2015;61:895-901.)

• 2002-2011, 288 pts (Malmö & Lille)

↑ Complexity of stent-graft design over years
  – No ↑ OR time, M&M
Results of complex aortic stent grafting of abdominal aortic aneurysms stratified according to the proximal landing zone using the Society for Vascular Surgery classification

Sanjay D. Patel, FRCS, Jason Constantinou, FRCS, Dominic Simring, FRACS, Manfred Ramirez, FRCS, Obiekezie Agu, FRCS, Hamish Hamilton, FRCS, and Krassi Ivancev, PhD, London, United Kingdom


• 2008-2013, 150 pts (London)

↑ Complexity of stent-graft design
  – ↑ OR Time, EBL, M&M, Hospital stay
• 2001-2013, 610 pts (Cleveland)
• 3x-4x FEVAR
  – ↑ Branch Reinterventions
  – ↓ Type I Endoleak (1.9% vs 10.4%, P<0.01)

↑ N of Fenestrations to treat same anatomy...
Nuremberg Experience
01/2010-03/2017

• 414 Consecutive pts
  – Short neck, Juxtarenal, Suprarenal AAA
Comparison of outcomes for double fenestrated endovascular aneurysm repair versus triple or quadruple fenestrated endovascular aneurysm repair in the treatment of complex abdominal aortic aneurysms

Athanasios Katsargyris, MD, a Kyriakos Oikonomou, MD, a George Kouvelos, MD, a Hozan Mufty, MD, a Wolfgang Ritter, MD, b and Eric L. G. Verhoeven, MD, PhD, a Nuremberg, Germany

• Standard (2x) FEVAR

vs

• Complex (3x-4x) FEVAR
Stent-graft Design

- **Standard (2x) FEVAR**
  - N=202 (48.8%)

- **Complex (3x-4x) FEVAR**
  - N=212 (51.2%)
Evolution of Stent-graft Design

↑ Use of Complex FEVAR over the years...
Evolution of Sealing Zone

↑ Sealing zone length over the years...
Sealing Zone Length According to Stent-graft Design

- **Standard (2x) FEVAR**
  - Mean: 42 ± 13 mm

- **Complex (3x-4x) FEVAR**
  - Mean: 52 ± 12 mm

(P < 0.001)
Perioperative Outcomes
Technical Success

Overall: N=403/414 (97.3%)

• **Standard (2x) FEVAR**
  - N=198/202 (98%)

• **Complex (3x-4x) FEVAR**
  - N=205/212 (96.7%)

(P=0.6, NS)
Operative Data

Mean Operation Time

- **Standard (2x) FEVAR**
  - 136 ± 47 min

- **Complex (3x-4x) FEVAR**
  - 175 ± 55 min

\[(P<0.05)\]
Operative Data

Mean Fluoroscopy Time

- **Standard (2x) FEVAR**
  - 44 ± 17 min

- **Complex (3x-4x) FEVAR**
  - 56 ± 20 min

(P < 0.05)
Operative Data

Mean Contrast Volume

• **Standard (2x) FEVAR**
  – 141 ± 32 ml

• **Complex (3x-4x) FEVAR**
  – 147 ± 40 ml

(P=0.14, NS)
30-Day Mortality

Overall: N=2/414 (0.5%)

- **Standard (2x) FEVAR**
  - N=1/202 (0.5%)

- **Complex (3x-4x) FEVAR**
  - N=1/212 (0.5%)

(P=1.0, NS)
Major Complications

Overall: N=43/414 (10.4%)

• **Standard (2x) FEVAR**
  – N=19/202 (9.4%)

• **Complex (3x-4x) FEVAR**
  – N=24/212 (11.3%)

(P=0.63, NS)
Estimated Survival

• Standard (2x) FEVAR
  – 95 ± 1.7% at 1 year
  – 83.4 ± 3.6% at 3 years

• Complex (3x-4x) FEVAR
  – 94 ± 2.4% at 1 year
  – 89.4 ± 3.5% at 3 years

P=0.96, NS
Freedom from Reintervention

- **Standard (2x) FEVAR**
  - 97.9 ± 1.2% at 1 year
  - 90.5 ± 3.1% at 3 years

- **Complex (3x-4x) FEVAR**
  - 95.4 ± 2.0% at 1 year
  - 90.1 ± 4.2% at 3 years

P=0.5, NS
Target Vessel Patency

- **Standard (2x) FEVAR**
  - $99.2 \pm 0.4\%$ at 1 year
  - $98.6 \pm 0.6\%$ at 3 years

- **Complex (3x-4x) FEVAR**
  - $98.7 \pm 0.6\%$ at 1 year
  - $98.0 \pm 0.9\%$ at 3 years

$P=0.48$, NS
Conclusions

• Complex FEVAR vs. Standard FEVAR
  – More complex graft planning (not an issue!)
  – ↑ OR & Fluoroscopy Time

but...

Same Perioperative Risk
Take Home Message

• Move up to complex (3x-4x) FEVAR if anatomically necessary...

• It should increase durability of the repair in the long-term...without increasing M&M