
THE 26TH INTERNATIONAL EXPERTS SYMPOSIUM
CRITICAL ISSUES
IN AORTIC ENDOGRAFTING
MARCH 21 & 22 2024
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WHAT SHOULD BE PRIORITIZED IN AN AORTIC COMPLEX PROGRAM

SALA ALMONACIL, VICENTE ANDRÉS
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VALENCIA

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DISCLOSURES:

- Travel Grants
- Lectures

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EVAR

	C-arm 2006-sept 2015 (n: 159)	**HR** Oct 2015-aug 2018 (n: 34)	*p:*
Fluoroscopy Time (min)	26 +/- 16	29 +/- 11	0.33
DAP ($GyCm^2$)	111 +/- 72	264 +/- 183	<0.001
Contrast Volume (mL)	170 +/- 85	89 +/- 49	<0.001

Comparative Study > Ann Vasc Surg. 2020 Nov:69:366-372. doi: 10.1016/j.avsg.2020.05.065. Epub 2020 Jun 3.

Endovascular Infrarenal Aortic Aneurysm Repair Performed in a Hybrid Operating Room Versus Conventional Operating Room Using a C-Arm

Lucia I Martínez [1], Carlos Esteban [2], Clàudia Riera [2], Pere Altés [2], Secundino Llagostera [3]

Affiliations – collapse

Affiliations

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PMID: 32504790 DOI: 10.1016/j.avsg.2020.05.065

Abstract

Background: To compare contrast usage and radiation exposure during endovascular aneurysm repair (EVAR) using mobile C-arm imaging in a conventional operating room (OR) or fixed angiographic equipment in a hybrid OR (HR).

Methods: A retrospective unicenter study from May 2016 to August 2019. All consecutive patients undergoing standard EVAR were included. Patients were divided into 2 groups. Group OR included EVARs performed in a conventional OR with a mobile C-arm (May 2016 to April 2018) and group HR included EVARs performed with a fixed angiographic equipment in an HR (May 2018 to August 2019). Data collected included patient demographics, aneurysm diameter, neck length, radiation dose: median dose-area product (DAP), fluoroscopy time, total operative time, contrast use, and 30-day clinical outcomes.

Results: A total of 77 patients were included in the study (42 patients in group OR and 35 patients in group HR). There was no difference in age, body mass index (BMI), mean aneurysm, and neck length between groups. Patients in the group HR received less contrast volume (108.6 mL [±41.5] vs. 162.5 mL [±52.6]; $P < 0.001$), but higher radiation dose (154 Gy cm^2 [±102.9] vs. 61.5 Gy cm^2 [±42.4]; $P < 0.001$). There were no differences in fluoroscopy time (20.4 min [±8.5] vs. 23.2 min [±12.4]; $P = 0.274$) and total operative time (106.4 [±22.3] vs. 109.4 [±25.8]; $P = 0.798$). No difference was found in terms of 30-day complication rates or operative mortality between groups. DAP was positively correlated with BMI in the group OR (Spearman's rank correlation coefficient r_s, 0.580; $P < 0.001$), but no correlation could be seen in the group HR (r_s, 0.408; $P = 0.028$).

Conclusions: Routine EVAR performed in a hybrid fixed-imaging suite may be associated with less contrast usage, but higher radiation exposure in our center. The significantly higher radiation exposure when the mobile C-arm is replaced by an HR should not be underestimated.

Comparative Study > Ann Vasc Surg. 2020 Oct:68:261-269. doi: 10.1016/j.avsg.2020.04.002. Epub 2020 Apr 10.

Comparing Mobile C-Arm with a Hybrid Operating Room for Imaging in Fenestrated Stent-Graft Endovascular Abdominal Aortic Aneurysm Repair

Ozan Yazar [1], Barend M E Mees [2], An-Lies Provoost [3], Shirley Ketting [3], Michiel W de Haan [4], Geert Willem H Schurink [5]

Affiliations + expand

PMID: 32283306 DOI: 10.1016/j.avsg.2020.04.002

Free article

Abstract

Background: To evaluate the advantages of a hybrid operating room (OR) (group 2) compared with a fluoroscopic mobile C-arm (group 1) during fenestrated stent-graft endovascular aneurysm repair (f-EVAR).

Methods: This single-center study retrospectively analyzed prospectively collected data of consecutive patients treated with f-EVAR for short-necked, juxtarenal, and suprarenal aortic aneurysms between January 2006 and July 2016. Primary end points were technical success and perioperative complications. Secondary end points included 30-day and 1-year mortality as well as target vessel patency.

Results: About 96 patients were treated (85 men; 74.1 ± 6.3 years); 46 patients (48%) belonging to group 1 and 50 (52%) patients belonging to group 2. Technical success was achieved in 92.7% of the procedures (group 1 91.3% vs. group 2 94%, P = 0.72). Significantly more complex interventions were performed in group 2 (n = 38 of 50) compared with group 1 (n = 14 of 46; P < 0.001), in which primarily renal f-EVAR interventions were performed. In group 2, significantly less contrast was used (median 150 mL vs. 100 mL; P < 0.001). The 30-day mortality in group 1 was 9% and 2% in group 2 (P = 0.14), and 1-year survival was also not significantly different between both groups. Target visceral vessel primary patency was significantly higher in group 1 (87.6% vs. 85.5% [P = 0.006] and 83.8% vs. 78.3% [P = 0.03]) at 6 and 12 months, respectively). There was no significant difference in renal artery primary patency at 6 and 12 months.

Conclusions: Immediate and 1-year outcomes after f-EVAR for abdominal aortic aneurysm were comparable using a hybrid OR compared with a mobile C-arm, despite the use of significantly more complex stent grafts in the patients treated in the hybrid OR. The use of a hybrid OR may assist in achieving satisfying results in complex f-EVAR.

Table II. Intraoperative details of f-EVAR

Patient data	Group 1 ($n = 46$)	Group 2 ($n = 50$)	*P*
Median intervention time (min)	173 (140–230)	176 (135–256)	0.94
Median fluoroscopy time (min)	47 (37–67)	46 (27–75)	0.66
Endoleak on completion angiography			
Type I	2	2	0.93
Type II	3	14	*0.006*
Type III	0	1	0.95
Technical success	42 (91)	47 (94)	0.61
Adjunctive procedure	8 (17)	3 (6)	*0.082*
Median dose-area product ($Gy.cm^2$)	116 (74–174)	159 (86–244)	0.16
Median contrast medium volume (mL)	150 (120–195)	100 (79–126)	*0.001*
Intraoperative death	0 (0)	0 (0)	1.0
Intraoperative complications	8 (17)	6 (12)	0.46
Target vessel dissection	3	3	
Target vessel stent crushed	0	2	
Target vessel stent migrated	1	0	
Rupture external iliac artery	2	0	
Occlusion hypogastric artery	1	0	
Malposition stent graft	1	0	
Hemorrhage groin	0	1	
Stent-graft and target vessel stent configurations			
Iliac branched device	2 (4)	0 (0)	0.14
Renal fenestrated stent graft	32 (70)	12 (24)	*0.001*
Complex fenestrated stent graft	14 (30)	38 (76)	*0.001*
Cook Zenith fenestrated stent graft	45	48	
Anaconda fenestrated stent graft	1	2	
Fenestrations	105	136	
0 fenestration	0	1[a]	
1 fenestration	2	2	
2 fenestrations	30	11	
3 fenestrations	13	32	
4 fenestrations	1	4	
Scallops	41	40	
Target vessel stent	110	140	
Atrium Advanta covered stent	102	137	
Balloon-expandable AVE stent	6	0	
Balloon-expandable Genesis stent	2	0	
BeGraft stent	0	2	
Scuba stent	0	1	

J Endovasc Ther. 2021 Jun;28(3):415-424. doi: 10.1177/1526602821996725. Epub 2021 Mar 4.

Impact of Hybrid Operating Rooms on Long-Term Clinical Outcomes Following Fenestrated and Branched Endovascular Aortic Repair

Giovanni Tinelli [1], Marie Bonnet [2], Adrien Hertault [3], Simona Sica [1], Gian Luca Di Tanna [4], Aurélia Bianchini [3], Dominique Fabre [5], Jonathan Sobocinski [2], Stéphan Haulon [5]

Affiliations + expand

PMID: 33660577 DOI: 10.1177/1526602821996725

Abstract

Purpose: Evaluate the impact of hybrid operating room (HOR) guidance on the long-term clinical outcomes following fenestrated and branched endovascular repair (F-BEVAR) for complex aortic aneurysms.

Materials and methods: Prospectively collected registry data were retrospectively analyzed to compare the procedural, short- and long-term outcomes of consecutive F-BEVAR performed from January 2010 to December 2014 under standard mobile C-arm versus hybrid room guidance in a high-volume aortic center.

Results: A total of 262 consecutive patients, including 133 patients treated with a mobile C-arm equipped operating room and 129 with a HOR guidance, were enrolled in this study. Patient radiation exposure and contrast media volume were significantly reduced in the HOR group. Short-term clinical outcomes were improved despite higher case complexity in the HOR group, with no statistical significance. At a median follow-up of 63.3 months (Q1 33.4, Q3 75.9) in the C-arm group, and 44.9 months (Q1 25.1, Q3 53.5, p=0.53) in the HOR group, there was no statistically significant difference in terms of target vessel occlusion and limb occlusion. When the endograft involved 3 or more fenestrations and/or branches (complex F-BEVAR), graft instability (36% vs 25%, p=0.035), reintervention on target vessels (20% vs 11%, p=0.019) and total reintervention rates (24% vs 15%, p=0.032) were significantly reduced in the HOR group. The multivariable Cox regression analysis did not show statistically significant differences for long-term death and aortic-related death between the 2 groups.

Conclusion: Our study suggests that better long-term clinical outcomes could be observed when performing complex F-BEVAR in the latest generation HOR.

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- Motorized C-arm
- 30 kV
- Advanced Active Cooling
- Cone-Beam CT

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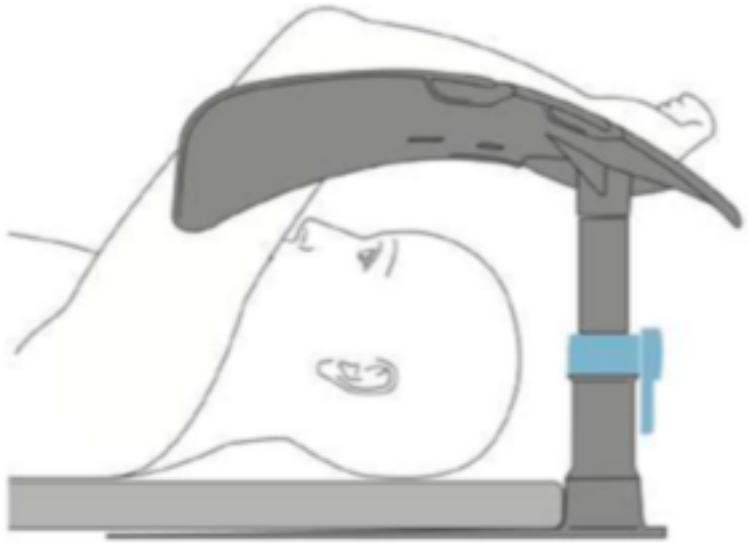

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	F/BEVAR (2020-2024) n: 62		
	Mean	**Min-Máx**	
Operation Time (min)	265	120-480	
Fluoroscopy Time (min)	87	38-207	
DAP ($GyCm^2$)	287	142-827	49 ZFEN (10 preloaded) 10 BEVAR 3 COMBINED
Contrast Volume (mL)	183	87-510	
Lost/damaged TV	4/239 (1.6%)		
AAA-related 30-day mortality	3 (4.9%)		
Branch-instability	4/191 (2.1%)		

F/BEVAR (2020-2024) n: 62

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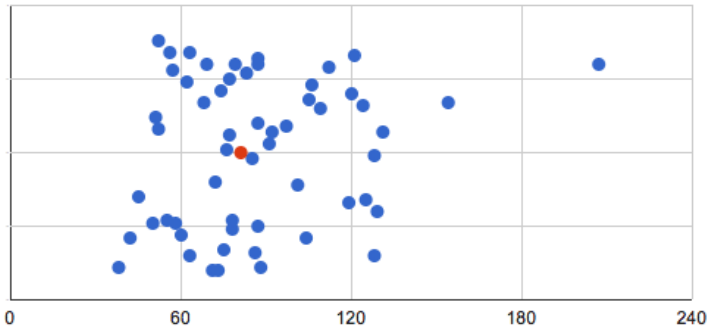
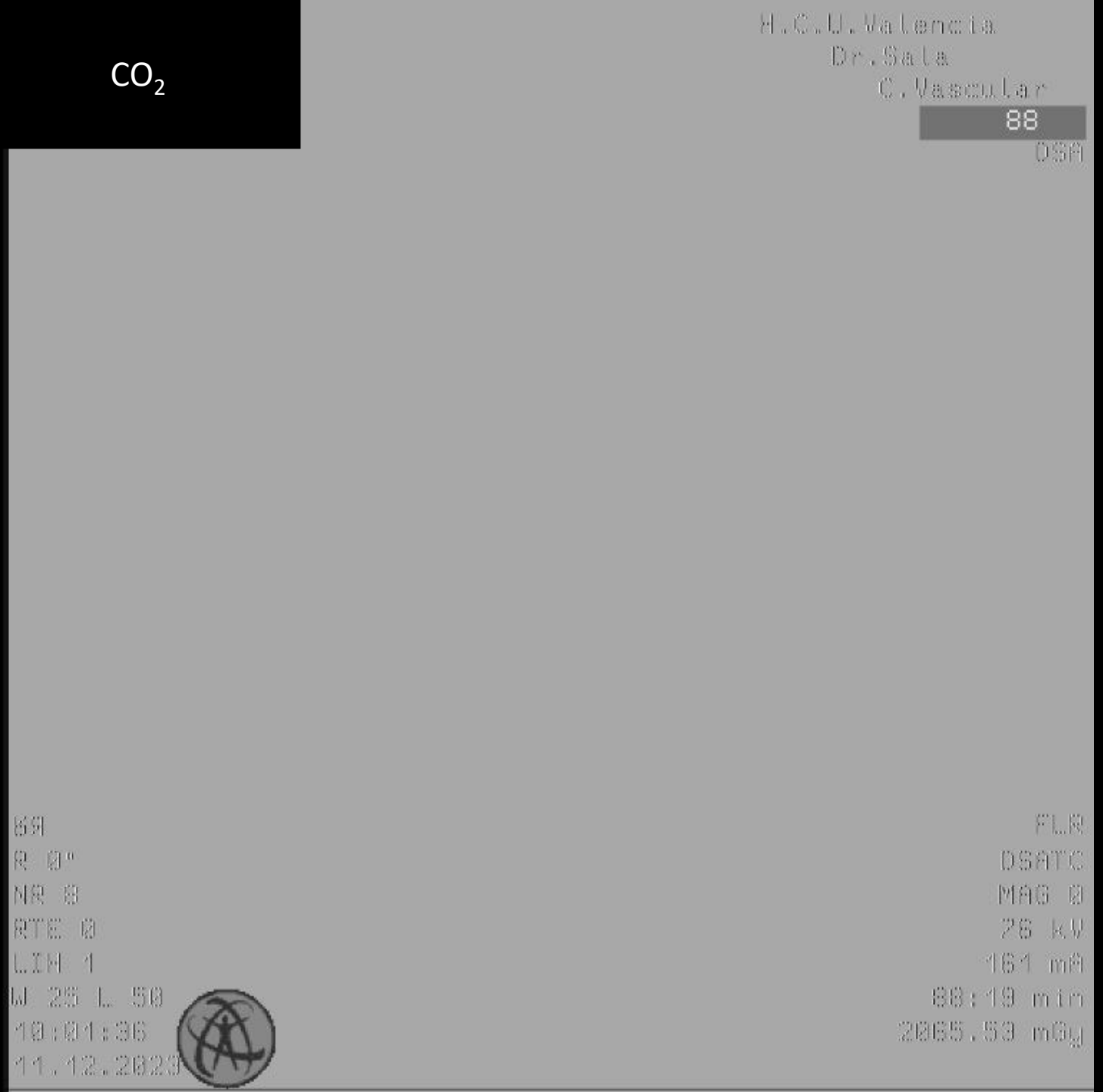


IODINATED
CONTRAST

CO_2

CO_2


H.C.U.Valencia
Dr.Sala
C.Vascular
88
DSA
66
R 0°
NR 8
RTE 0
LIM 1
W 25 L 50
10:01:36
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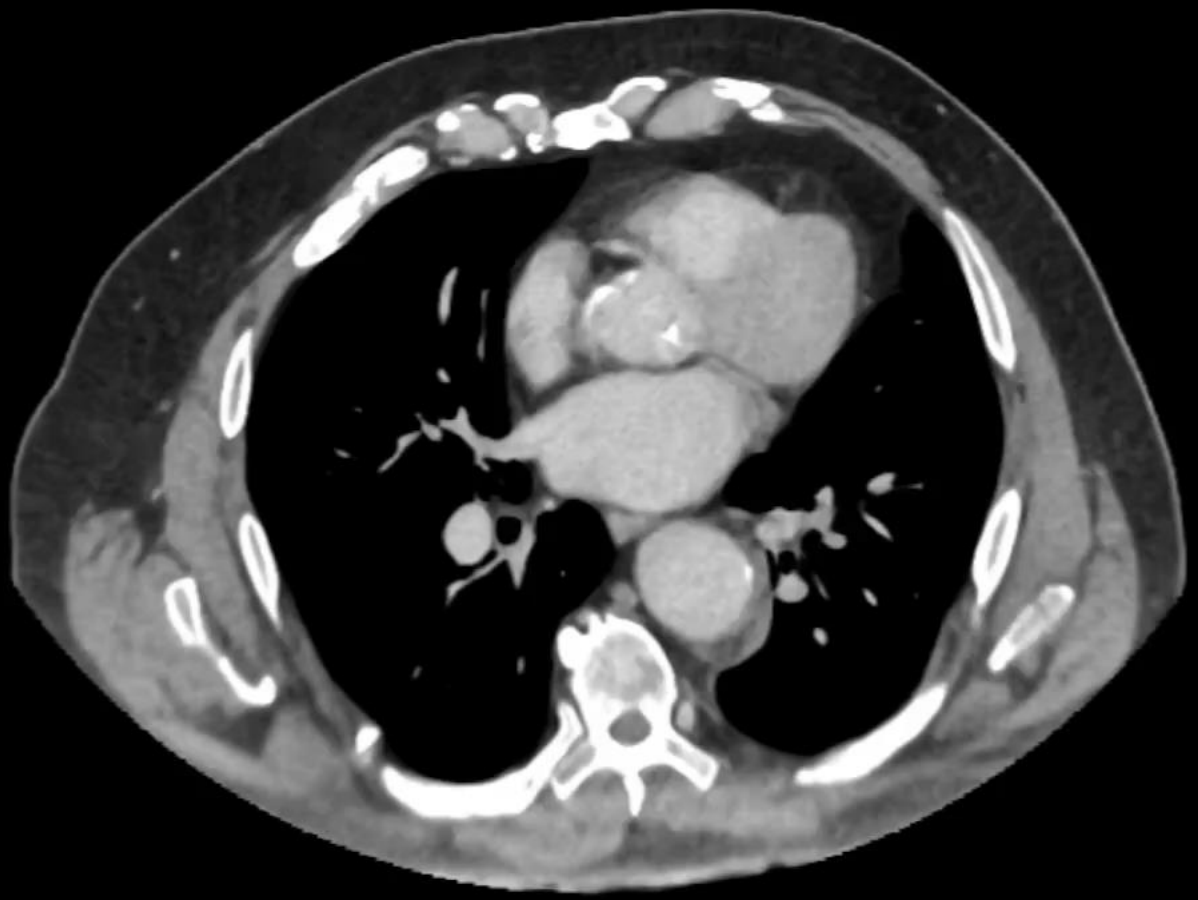
FLR
DSATC
MAG 0
76 kV
161 mA
00:19 min
2065.53 mGy

PDTAA

RUPTURE



Recommendation 119 — New

During endovascular repair of complex abdominal aortic aneurysms, the use of on table cone beam computed tomography imaging for completion control may be considered.

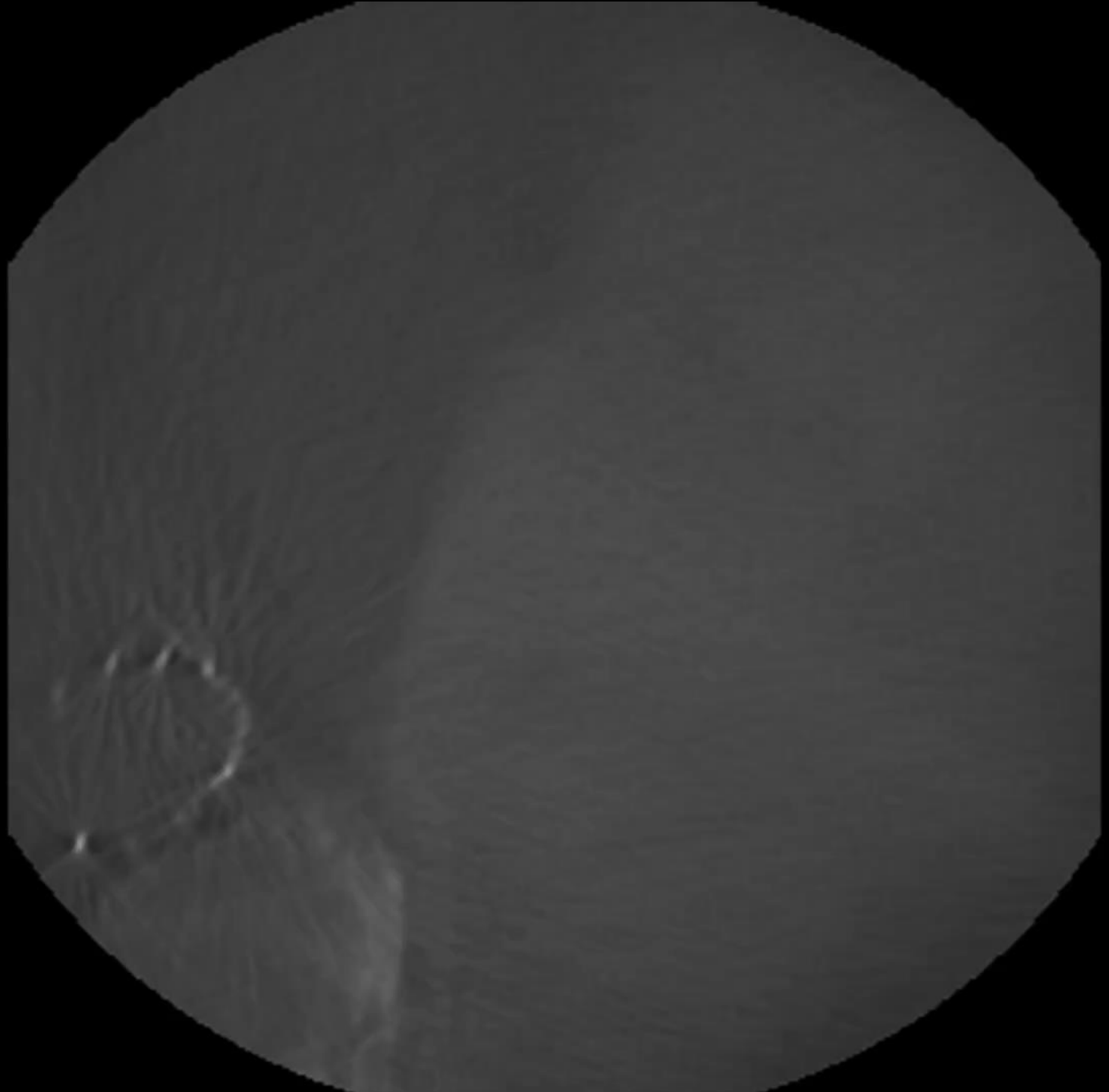
Class	Level	References	ToE
IIb	C	Tenorio *et al.* (2020)[976]	

Recommendation 118 — New

During endovascular aortic repair of complex abdominal aortic aneurysms, the use of intra-operative image fusion should be considered, to reduce radiation exposure, contrast volume, and operating time.

Class	Level	References	ToE
IIa	B	de Ruiter *et al.* (2016),[972] Doelare *et al.* (2021)[974]	

Cone-Beam CT



FUSION IMAGING

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STANDARD

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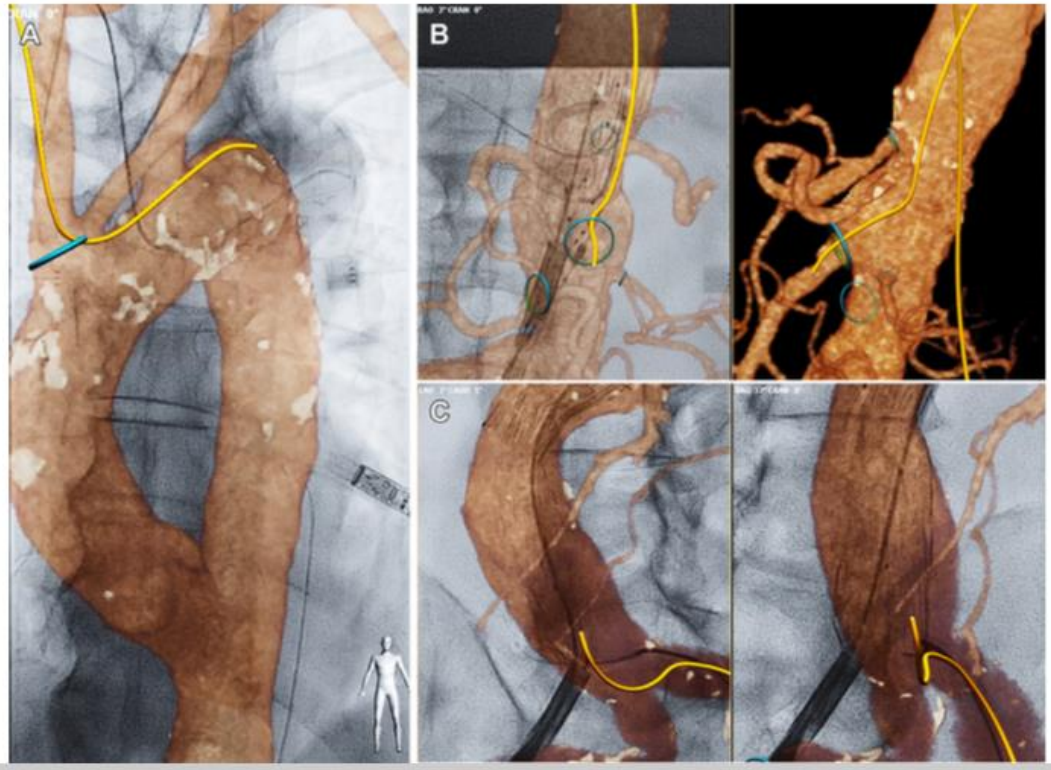


Fig 3. Cannulation with Fiber Optic RealShape (FORS) technology. **A,** Descending aorta. **B,** Target vessels, represented by the superior mesenteric artery. **C,** Contralateral gate.

INTRAOPERATIVE POSITIONING SYSTEM (IOPS)

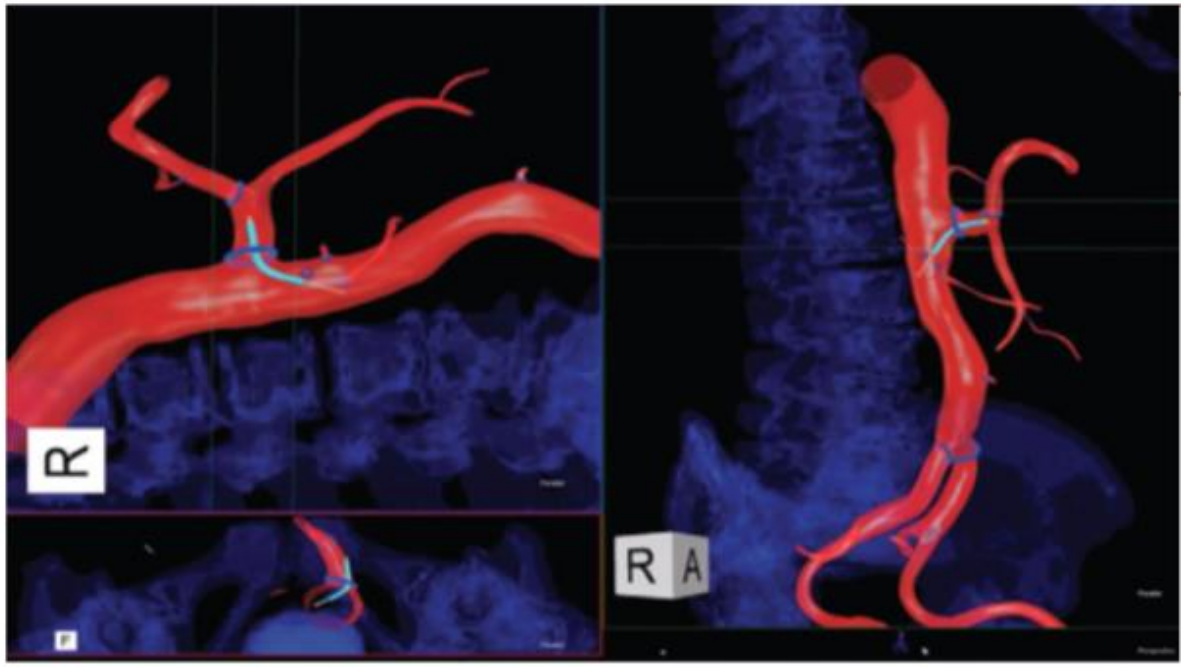
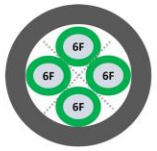
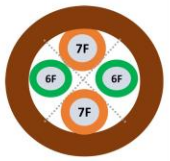
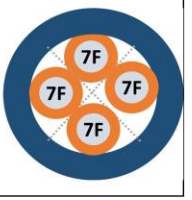


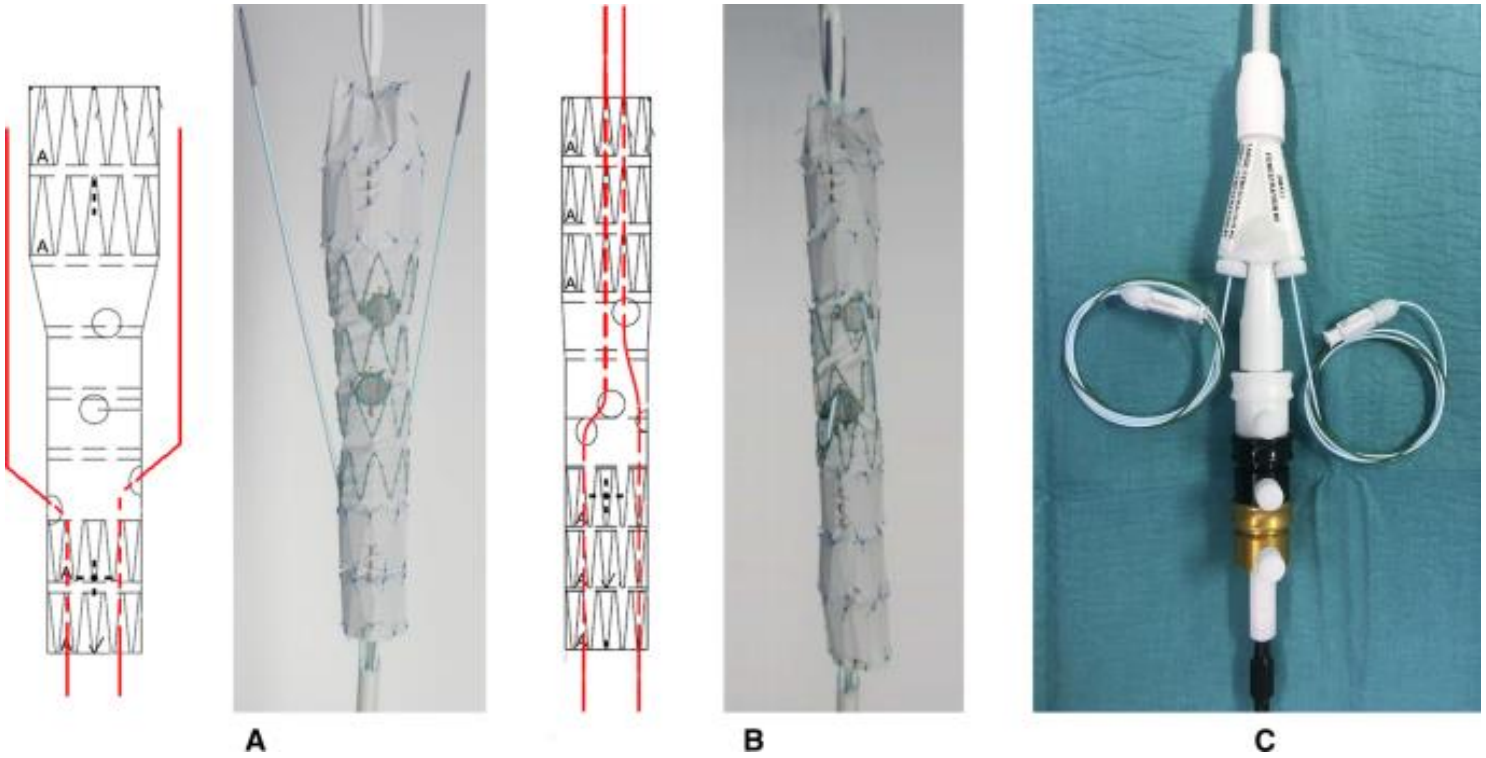
Figure 4. Displaying the interface between the catheter and image.

INTRAOPERATIVE POSITIONING SYSTEM (IOPS) DRAWBACKS

- Wire (FORS Altatrack 120 cm)
- Catheters shape (only Bernstein/Cobra)
- Catheters F aprox 6F (7f Sheath): 4Fen?/Preloaded Mod biport handle?
- Intensifier interferences
- FORS: Only Phillips Angiograph

CONTRALATERAL COOK SHEATH - MINIMUM PROFILE REQUIRED TO FOSTER 6F OR 7F Flexor ANL sheaths within						
SHEATH PROFILE →	14 F	16 F	18 F	20 F	22 F	24F
2 FEN						
3 FEN						
4 FEN						

Gómez Palonés, F.J.



Bertoglio, L., Loschi, D., Grandi, A. *et al.* Early Limb Reperfusion Using Routinely Preloaded Fenestrated Stent-graft Designs for Complex Endovascular Aortic Procedures. *Cardiovasc Intervent Radiol* **43**, 1868–1880 (2020). https://doi.org/10.1007/s00270-020-02596-1

INTRAOPERATIVE POSITIONING SYSTEM (IOPS) DRAWBACKS

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- FORS: Only Phillips Angiograph

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CONCLUSIONS

- COMPLEX EVAR CAN BE DONE WITHOUT HR
- ACCEPTABLE RADIATION DOSES (DPA)
- AVERAGE IODINATED CONTAST USE
- FUSION/CBCT RECOMMENDED, BUT NOT MANDATORY
- IOPS INFANCY