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International congress of the European Society for Cardiovascular and Endovascular Surgery

7th IMAD meeting

Clinical effect of accessory renal artery coverage after endovascular repair of aneurysms in abdominal and thoracoabdominal aorta

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Disclosure

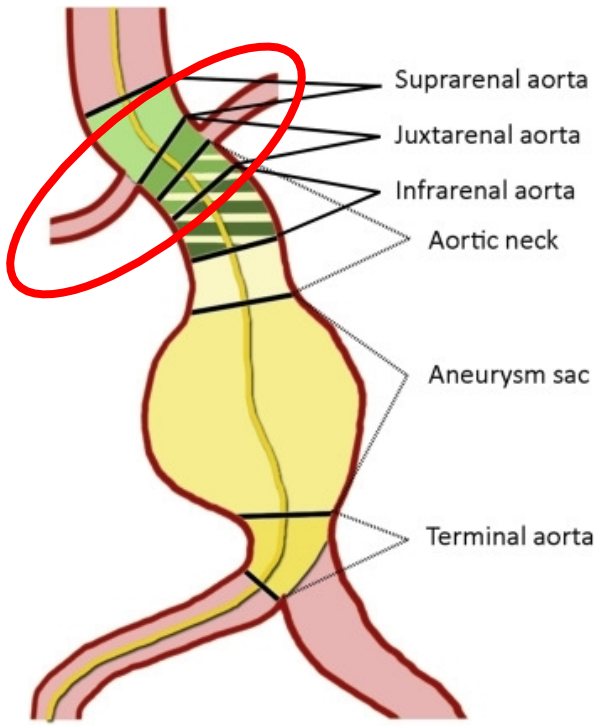
Speaker name: Prof. Athanasios Giannoukas

❑ I have the following potential conflicts of interest to report:

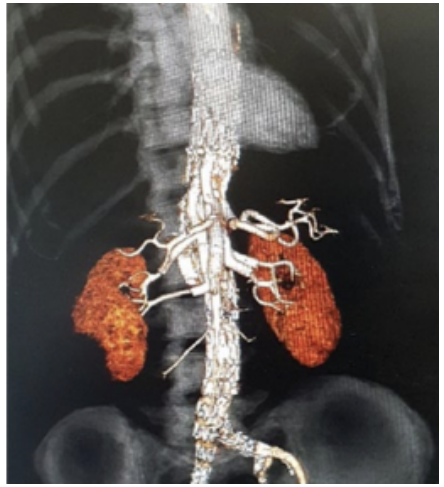
- ❑ Receipt of grants/research support
- ❑ Receipt of honoraria and travel support
- ❑ Participation in a company-sponsored speaker bureau
- ❑ Employment in industry
- ❑ Shareholder in a healthcare company
- ❑ Owner of a healthcare company

☒ I do not have any potential conflict of interest

AAA anatomical characteristics

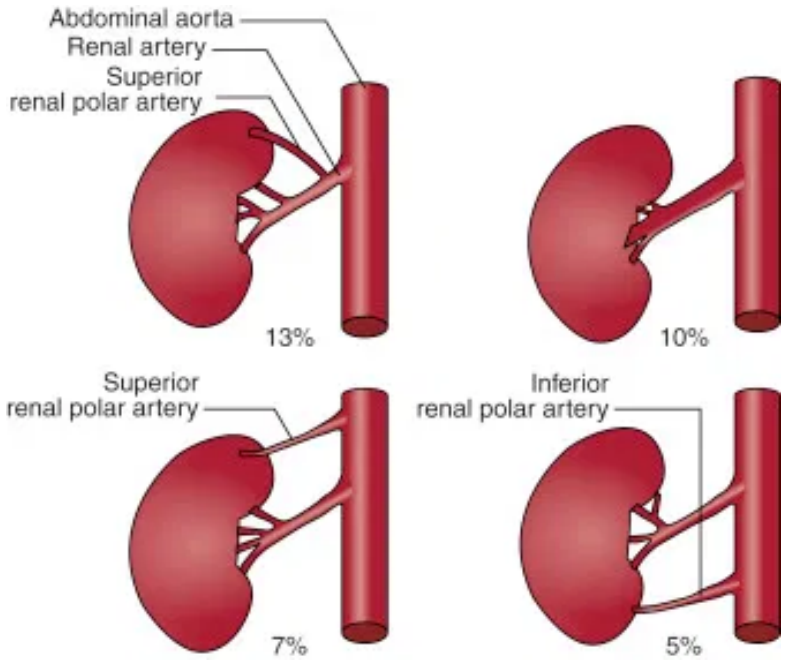


TAAA anatomical characteristics

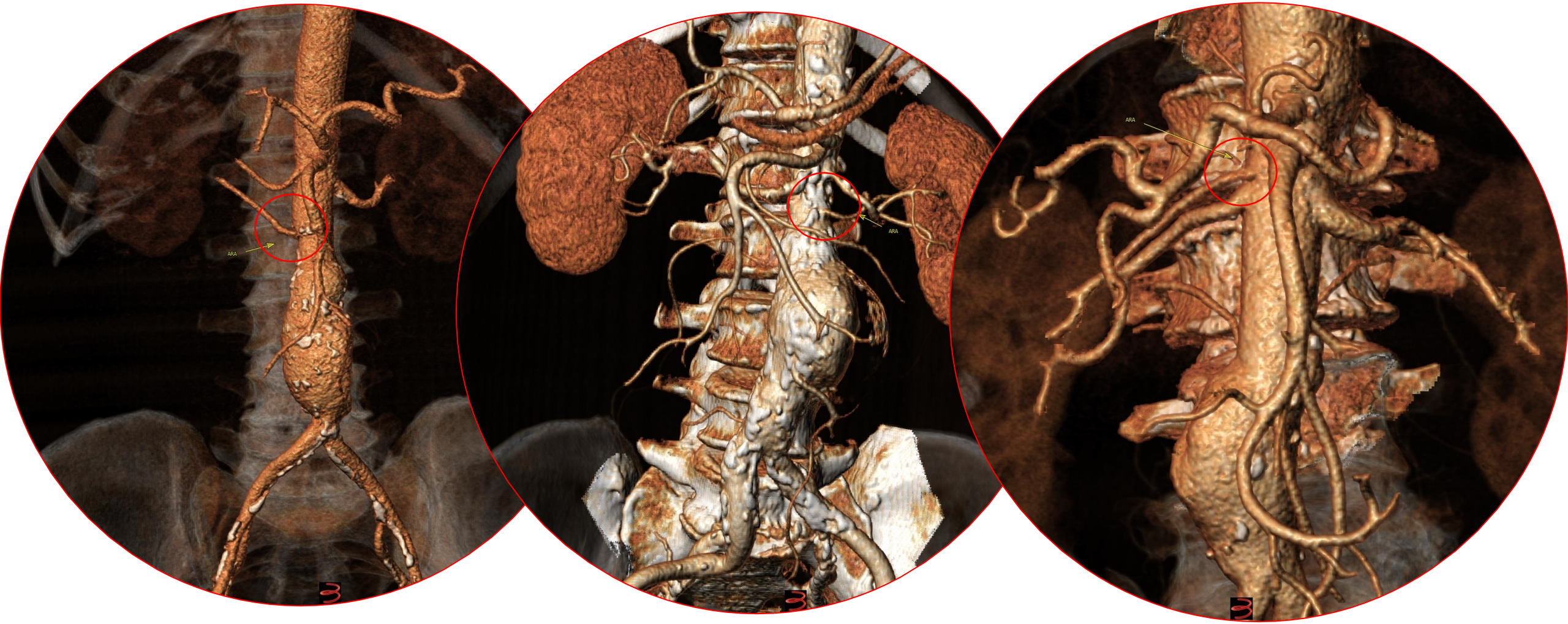


Eleshra A et al. J Endovasc Ther. 2020 Apr;27(2)

ARA variations



Standring S, ed. *Gray's Anatomy* . 40th ed. London: Elsevier; 2009



University of Thessaly

Transfemoral Intraluminal Graft Implantation for Abdominal Aortic Aneurysms

J.C. Parodi, MD*, J.C. Palmaz, MD†, H.D. Barone, PhD, *Buenos Aires, Argentina, and San Antonio, Texas*

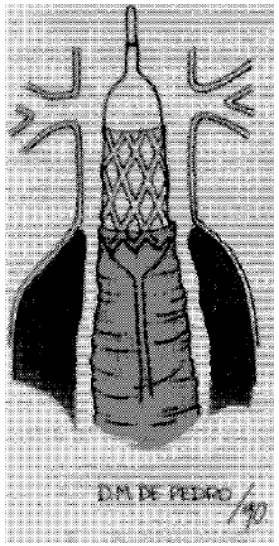
Should patients with challenging anatomy be offered endovascular aneurysm repair?

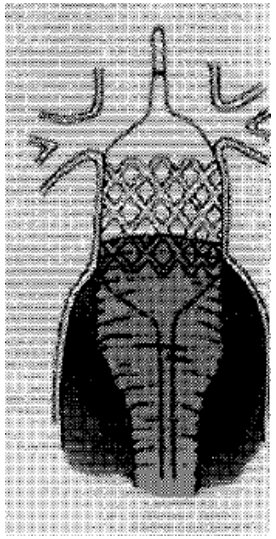
Roy K. Greenberg, MD,[a,b] Daniel Clair, MD,[a] Sunita Srivastava, MD,[a] Guru Bhandari, MS,[a] Adrian Turc, MD,[a] Jennifer Hampton, RN,[a] Matt Popa, BS,[a] Richard Green, MD,[a] and Kenneth Ouriel, MD,[a] *Cleveland, Ohio; and Rochester, NY*

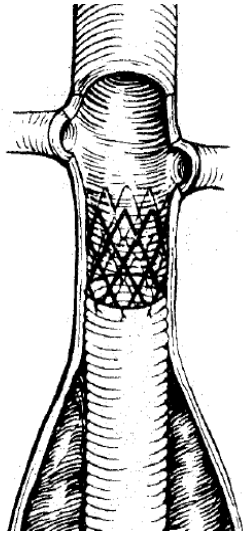
Technical Note

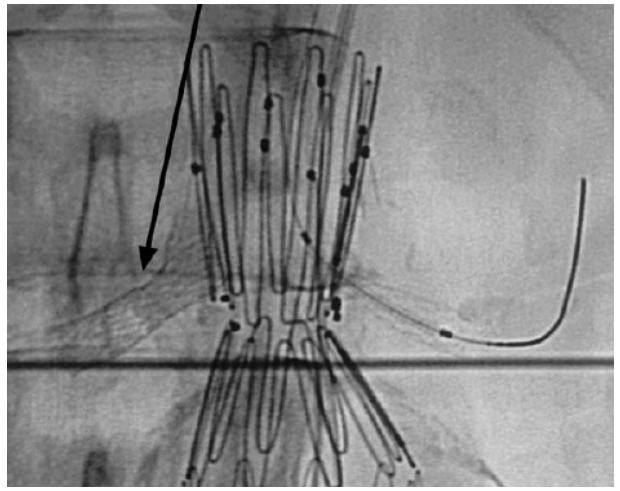
Fenestrated Stent-Grafts for Preserving Visceral Arterial Branches in the Treatment of Abdominal Aortic Aneurysms: Preliminary Experience[1]

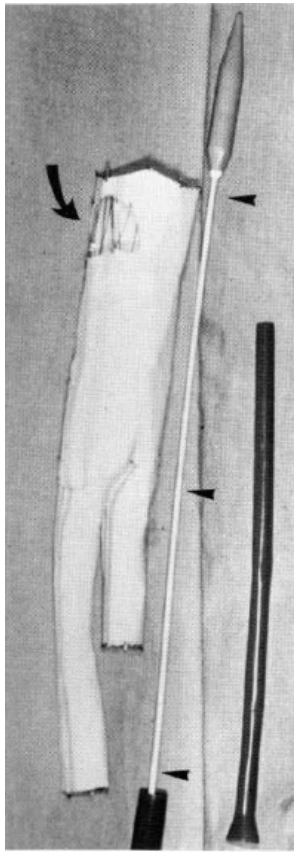
Jae Hyung Park, MD
Jin Wook Chung, MD
In Wook Choo, MD
Sang Joon Kim, MD
Jae Young Lee, MD
Man Chung Han, MD











Several interventions developed to spare ARAs, including fenestrated or chimney endografts

Guidelines for the management of ARA

European Society for Vascular Surgery (ESVS) 2019 Clinical Practice Guidelines on the Management of Abdominal Aorto-iliac Artery Aneurysms

Anders Wanhainen [a,†,*], Fabio Verzini [a,†], Isabelle Van Herzeele [a], Eric Allaire [a], Matthew Bown [a], Tina Cohnert [a], Florian Dick [a], Joost van Herwaarden [a], Christos Karkos [a], Mark Koelemay [a], Tilo Kölbel [a], Ian Loftus [a], Kevin Mani [a], Germano Melissano [a], Janet Powell [a], Zoltán Szeberin [a]

ESVS Guidelines Committee [b], Gert J. de Borst, Nabil Chakfe, Sebastian Debus, Rob Hinchliffe, Stavros Kakkos, Igor Koncar, Philippe Kolh, Jes Lindholdt, Melina de Vega, Frank Vermassen

Document reviewers [c], Martin Björck, Stephen Cheng, Ronald Dalman, Lazar Davidovic, Konstantinos Donas, Jonothan Earnshaw, Hans-Henning Eckstein, Jonathan Golledge, Stephan Haulon, Tara Mastracci, Ross Naylor, Jean-Baptiste Ricco, Hence Verhagen

Recommendation 56	Class	Level	References
Preservation of large accessory renal arteries (>3 mm) or those that supply a significant portion of the kidney (>1/3) may be considered in endovascular aneurysm repair.	IIb	C	[379]

SOCIETY FOR VASCULAR SURGERY® DOCUMENT

The Society for Vascular Surgery practice guidelines on the care of patients with an abdominal aortic aneurysm

Elliot L. Chaikof, MD, PhD,[a] Ronald L. Dalman, MD,[b] Mark K. Eskandari, MD,[c] Benjamin M. Jackson, MD,[d] W. Anthony Lee, MD,[e] M. Ashraf Mansour, MD,[f] Tara M. Mastracci, MD,[g] Matthew Mell, MD,[b] M. Hassan Murad, MD, MPH,[h] Louis L. Nguyen, MD, MBA, MPH,[i] Gustavo S. Oderich, MD,[j] Madhukar S. Patel, MD, MBA, ScM,[a,k] Marc L. Schermerhorn, MD, MPH,[a] *and* Benjamin W. Starnes, MD,[i]

Boston, Mass; Palo Alto, Calif; Chicago, Ill; Philadelphia, Pa; Boca Raton, Fla; Grand Rapids, Mich; London, United Kingdom; Rochester, Minn; and Seattle, Wash

We suggest preservation of accessory renal arteries at the time of EVAR or OSR if the artery is 3 mm or larger in diameter or supplies more than one-third of the renal parenchyma.

Level of recommendation	2 (Weak)
Quality of evidence	C (Low)

Our Experience

2006-2020

- 686 EVAR available for analysis

356 pt with ARA assessment

- 273 (77%) with no ARA

83 (23%) with ARA

- 64 with 1
- 19 with >1

11% (9/83) ARA occlusion during EVAR
(Only 1 developed ARF as LRA occlusion occurred too)

Post- EVAR

ARF: 1%

ARF: 1.2%

ARF: 11%

Journal of Vascular Surgery

Log in

REVIEW ARTICLE | VOLUME 74, ISSUE 6, P2104-2113.E7, DECEMBER 01, 2021

Clinical effect of accessory renal artery coverage after endovascular repair of aneurysms in abdominal and thoracoabdominal aorta

Konstantinos Spanos, MD, MSc, PhD •

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Alexandros G. Brotis, MD, MSc, PhD • ...

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Miltiadis Matsagkas, MD, PhD, FEBVS •

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AIM

Systematic review and meta-analysis to assess the impact of ARA <4mm coverage on renal function in terms of

Acute kidney injury

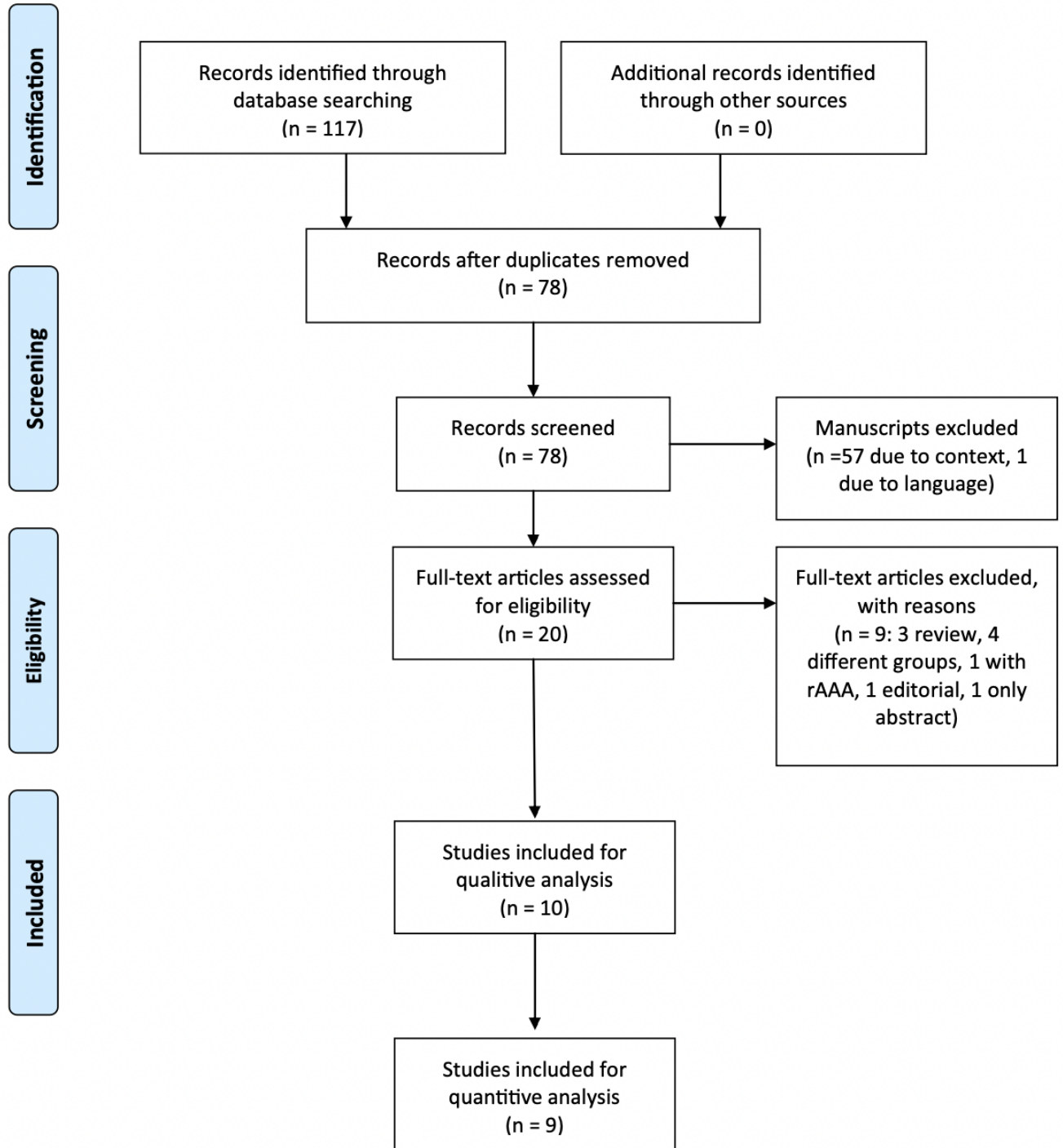
Renal infarcts

Chronic renal failure

Mortality

In patients undergoing standard EVAR or endovascular repair of complex aneurysms

Methods


Identification
Screening
Eligibility
Included
Records identified through database searching (n = 117)
Additional records identified through other sources (n = 0)
Records after duplicates removed (n = 78)
Records screened (n = 78)
Manuscripts excluded (n =57 due to context, 1 due to language)
Full-text articles assessed for eligibility (n = 20)
Full-text articles excluded, with reasons (n = 9: 3 review, 4 different groups, 1 with rAAA, 1 editorial, 1 only abstract)
Studies included for qualitive analysis (n = 10)
Studies included for quantitive analysis (n = 9)

Study details and characteristics

- 1014 patients included
- 302 ARA coverage
  vs
- 712 preservation or no ARA

- **ARA diameter 2.7 – 3.4**

Investigator	Journal	Year	Study period	Study type	Study group/ matching	Patients, No.	Group 1, No.	Group 2, No.	ARA diameter, mm
EVAR									
Kim et al[27]	Ann Vasc Surg	2004	1996-2001	Retrospective	ARA coverage vs preservation	33	21	12	NR
Karmacharya et al[28]	JVS	2006	1998-2003	Retrospective	ARA coverage vs patients without ARA	61	35	26	NR
Greenberg et al[18]	JVS	2012	2004-2010	Retrospective	ARA coverage vs preservation	69	40	29	2.95 vs 2.93
Malgor et al[19]	JVS	2013	1998-2009	Retrospective	ARA coverage vs no ARA (1:1)	84	42	42	NR
Sadeghi-Azandaryani et al[7]	JVS	2017	5 Years	Retrospective	ARA coverage vs no ARA (1:3)	145	43	102	3
Maurer et al[20]	Cardiovasc Intervent Radiol	2019	2003-2013	Retrospective	ARA coverage vs preservation	65	19	46	NR
Salomon du Mont et al[24]	Ann Vasc Surg	2020	2008-2016	Retrospective	ARA coverage vs no ARA or ARA preservation	184	25	159	2.7
Complex aneurysm repair									
Lareyre et al[22]	J Vasc Interv Radiol	2019	2013-2017	Retrospective	ARA coverage vs preservation	76	11	65	3.3
Lareyre et al[12]	Ann Vasc Surg	2019	2010-2017	Retrospective	ARA coverage vs no ARA	43	10	33	3.4
Tenorio et al[21]	JVS	2020	2013-2018	Retrospective	ARA coverage vs preservation and no ARA	254	56	198	2.7 vs 3.4
Total	NA	NA	NA	NA	NA	1014	302	712	NA

Preoperative status, contrast volume and renal function classification

Variable	Intraoperative contrast volume, mL		Preoperative eGFR, mL/min/1.73 m^2		Renal function classification, No.							
					Stage 1	Stage 2	Stage 3	Stage 4	Stage 1	Stage 2	Stage 3	Stage 4
	G1	G2	G1	G2	G1	G1	G1	G1	G2	G2	G2	G2
EVAR												
Kim et al[27]	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Karmacharya et al[28]	NR	NR	67	79	NR	NR	NR	NR	NR	NR	NR	NR
Greenberg et al[18]	109.7	113.6	NR	NR	NR	NR	8	NR	NR	NR	NR	NR
Malgor et al[19]	NR	NR	68	67	5	17	18	NR	5	17	18	NR
Sadeghi-Azandaryani et al[7]	145	135	74	72	9	20	5	0	22	62	18	0
Maurer et al[20]	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Salomon du Mont et al[24]	NR	NR	68.9	72.5	2	13	8	NR	31	88	40	0
Complex aneurysm repair												
Lareyre et al[22]	141	131.5	53	63.3	NR	NR	NR	NR	NR	NR	NR	NR
Lareyre et al[12]	197	135	76	71	NR	NR	NR	NR	NR	NR	NR	NR
Tenorio et al[21]	154	152	65	64	6	28	21	1	20	93	82	3

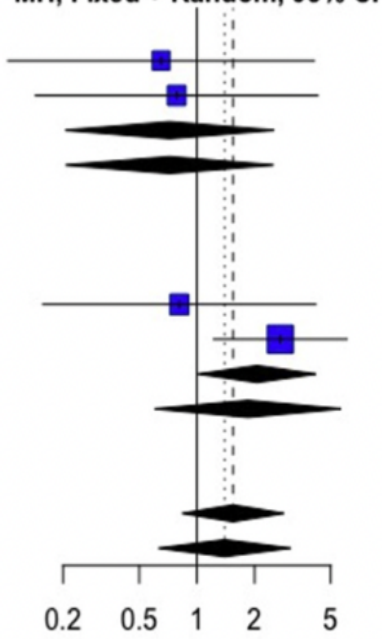
Meta-analysis of AKI incidence between groups 1 and 2 for standard EVAR and complex endovascular aneurysm repair

Early period

In the standard EVAR subgroup, the **risk of AKI** was similar between the two groups (OR, 0.72; 95% CI, 0.21-2.51; I_2=0%)

In the complex aneurysm repair subgroup, the **risk of AKI** was also similar between groups 1 and 2 (OR, 1.85; 95% CI, 0.61-5.64; I_2=42%)

Study or Subgroup	Experimental Events	Experimental Total	Control Events	Control Total	Weight (fixed)	Weight (random)	Odds Ratio MH, Fixed + Random, 95% CI
Type = Standard							
Malgor	2	42	3	42	18.4%	15.5%	0.65 [0.10; 4.10]
Maurer	2	19	6	46	20.2%	17.7%	0.78 [0.14; 4.28]
Total (fixed effect, 95% CI)		61		88	38.6%	--	0.72 [0.21; 2.52]
Total (random effects, 95% CI)						33.2%	0.72 [0.21; 2.51]
Heterogeneity: Tau^2 = 0; Chi^2 = 0.02, df = 1 (P = 0.88); I^2 = 0%							
Type = Complex							
Lareyre	2	11	14	65	21.3%	18.7%	0.81 [0.16; 4.18]
Tenorio	12	56	18	198	40.1%	48.1%	2.73 [1.22; 6.08]
Total (fixed effect, 95% CI)		67		263	61.4%	--	2.06 [1.02; 4.17]
Total (random effects, 95% CI)						66.8%	1.85 [0.61; 5.64]
Heterogeneity: Tau^2 = 0.3099; Chi^2 = 1.71, df = 1 (P = 0.19); I^2 = 42%							
Total (fixed effect, 95% CI)		**128**		**351**	**100.0%**	--	**1.54 [0.84; 2.84]**
Total (random effects, 95% CI)						**100.0%**	**1.40 [0.63; 3.08]**
Heterogeneity: Tau^2 = 0.1724; Chi^2 = 3.99, df = 3 (P = 0.26); I^2 = 25%							



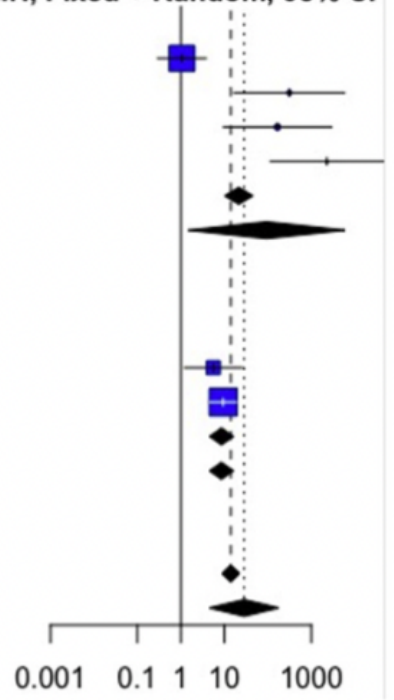
Meta-analysis of renal infarction rate between groups 1 and 2 for standard EVAR and complex endovascular aneurysm repair

Early period

The **risk of renal infarction** in standard EVAR subgroup was higher in group 1 than in group 2 (OR, 93.3; 95% CI, 1.48-5869; I_2=92%)

The **risk of renal infarction** in complex aneurysm subgroup was higher in group 1 than in group 2 (OR, 8.58; 95% CI, 4.59-16.04; I_2=0%)

Study or Subgroup	Experimental Events	Experimental Total	Control Events	Control Total	Weight (fixed)	Weight (random)	Odds Ratio MH, Fixed + Random, 95% CI
Type = Standard							
Karmacharya	7	35	5	26	40.0%	19.3%	1.05 [0.29; 3.77]
Greenberg	34	40	0	29	0.8%	13.8%	313.15 [16.92; 5795.42]
Malgor	28	42	0	42	1.5%	14.0%	167.07 [9.58; 2913.93]
du Mont	25	25	3	159	0.2%	13.5%	2280.43 [114.38; 45466.04]
Total (fixed effect, 95% CI)		142		256	42.5%	--	21.48 [10.27; 44.91]
Total (random effects, 95% CI)						60.6%	93.30 [1.48; 5869.00]
Heterogeneity: Tau^2 = 16.1210; Chi^2 = 35.93, df = 3 (P < 0.01); I^2 = 92%							
Type = Complex							
Lareyre	6	10	7	33	11.4%	18.6%	5.57 [1.22; 25.36]
Tenorio	42	56	48	198	46.2%	20.8%	9.37 [4.72; 18.63]
Total (fixed effect, 95% CI)		66		231	57.5%	--	8.62 [4.62; 16.08]
Total (random effects, 95% CI)						39.4%	8.58 [4.59; 16.04]
Heterogeneity: Tau^2 = 0; Chi^2 = 0.38, df = 1 (P = 0.54); I^2 = 0%							
Total (fixed effect, 95% CI)		**208**		**487**	**100.0%**	**--**	**14.08 [8.92; 22.24]**
Total (random effects, 95% CI)						**100.0%**	**28.44 [4.62; 174.92]**
Heterogeneity: Tau^2 = 4.0170; Chi^2 = 36.92, df = 5 (P < 0.01); I^2 = 86%							



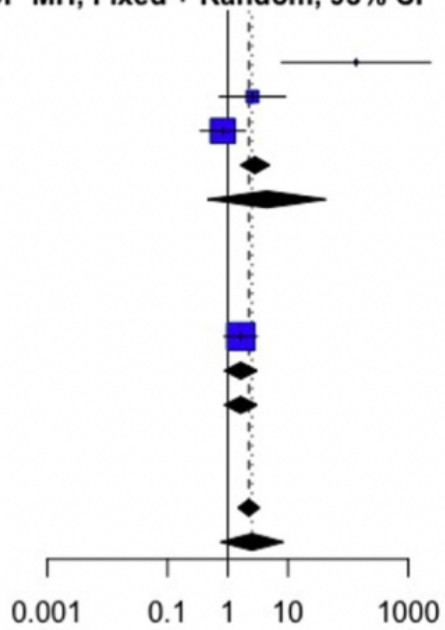
Meta-analysis of chronic renal failure incidence between groups 1 and 2 for standard EVAR and complex endovascular aneurysm repair

Follow up period

In the standard EVAR subgroup, **the risk of CRF** was similar between the groups 1 and 2 (OR, 4.44; 95% CI, 0.46-42.61; I_2=87%)

In the complex aneurysm subgroup, **the risk of CRF** was similar between groups 1 and 2 (OR, 1.64; 95% CI, 0.88- 3.07; I_2=not applicable)

Study or Subgroup	Experimental Events	Experimental Total	Control Events	Control Total	Weight (fixed)	Weight (random)	Odds Ratio MH, Fixed + Random, 95% CI
Type = Standard							
Sadeghi-Azandaryani et al.	17	43	0	102	0.6%	11.8%	135.38 [7.88; 2324.96]
Maurer	6	19	7	46	9.6%	25.6%	2.57 [0.73; 9.05]
du Mont	10	25	71	159	39.7%	30.1%	0.83 [0.35; 1.95]
Total (fixed effect, 95% CI)		87		307	49.9%	--	2.83 [1.63; 4.92]
Total (random effects, 95% CI)						--	67.5% 4.44 [0.46; 42.61]
Heterogeneity: Tau^2 = 3.2447; Chi^2 = 15.01, df = 2 (P < 0.01); I^2 = 87%							
Type = Complex							
Tenorio	21	56	53	198	50.1%	32.5%	1.64 [0.88; 3.07]
Total (fixed effect, 95% CI)		56		198	50.1%	--	1.64 [0.88; 3.07]
Total (random effects, 95% CI)						--	32.5% 1.64 [0.88; 3.07]
Heterogeneity: not applicable							
Total (fixed effect, 95% CI)		**143**		**505**	**100.0%**	**--**	**2.23 [1.48; 3.37]**
Total (random effects, 95% CI)						**--**	**100.0% 2.52 [0.76; 8.33]**
Heterogeneity: Tau^2 = 1.0412; Chi^2 = 14.13, df = 3 (P < 0.01); I^2 = 79%							

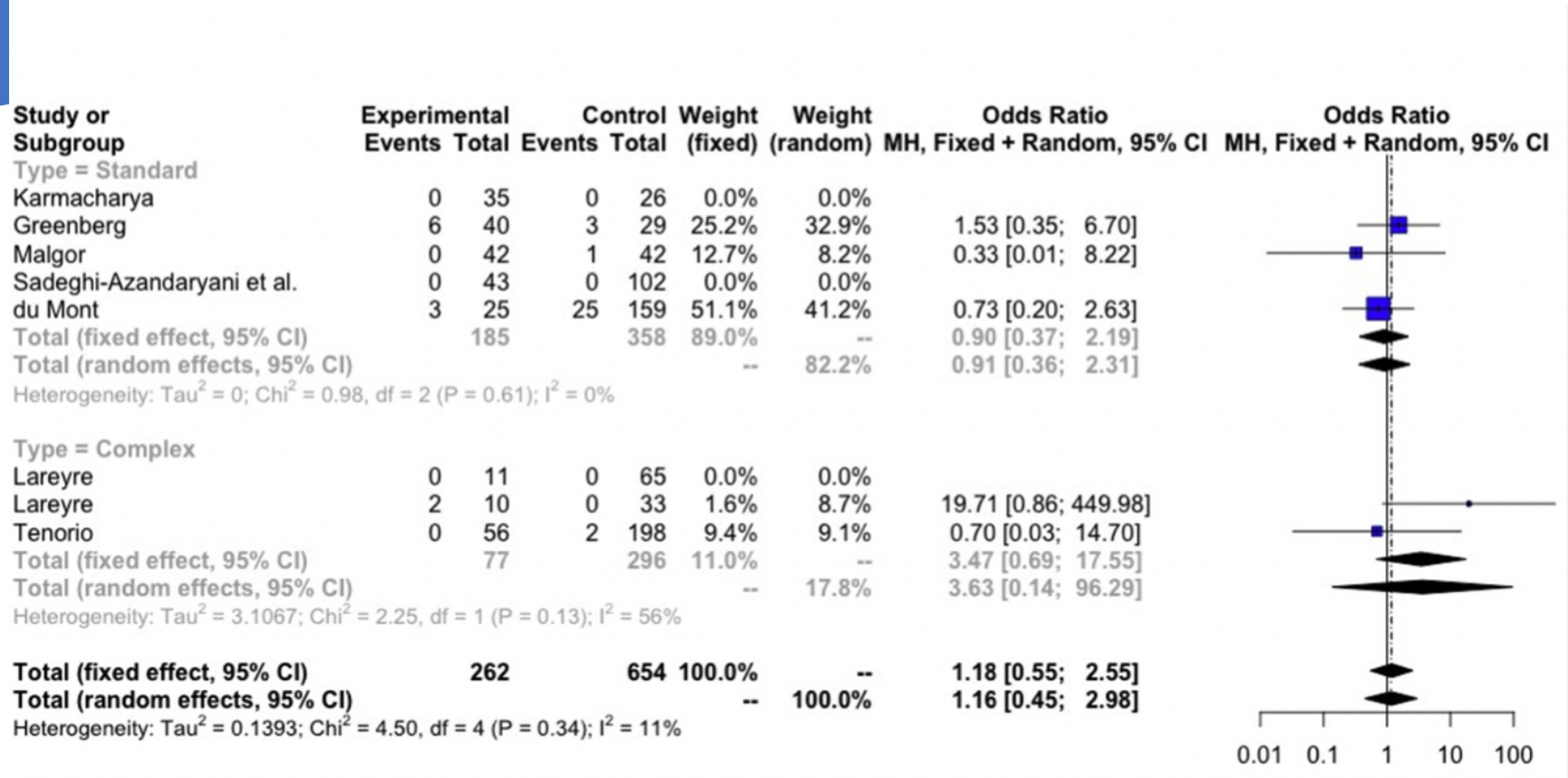


Meta-analysis of mortality rate between groups 1 and group 2 for standard EVAR and complex endo-vascular aneurysm repair

Follow up period

The **mortality rate** in the standard EVAR subgroup was also similar between groups 1 and 2 (OR, 0.91; 95% CI, 0.36-2.31; I_2=0%)

The **mortality rate** in the complex aneurysm subgroup was also similar between groups 1 and 2 (OR, 3.63; 95% CI, 0.14-96.29; I_2=56%)



Conclusion

- **ARA (<4 mm) coverage** in patients undergoing standard EVAR or endovascular repair of complex aneurysms is associated with only an **increased risk of renal infarction**

- **No impact** of ARA **(<4 mm)** coverage was demonstrated on **renal function** and **mortality** in the **early** postoperative and **follow-up** period.

Thank you