



XXI CORSO NAZIONALE DI ULTRASONOLOGIA VASCOLARE
DIAGNOSI E TERAPIA

Bertinoro, 20-22 aprile 2023

Update sul trattamento medico degli aneurismi viscerali

Dr.ssa Francesca Ghirardini

Angiologia - AULSS 1 Dolomiti

Visceral aneurysm

increased imaging



increased frequency of visceral aneurysms diagnosis

Visceral aneurysm

- nei pazienti con aneurisma viscerale è indicato un trattamento medico ?
- che tipo di trattamento medico ?
- è indicato il trattamento interventistico ?

Visceral aneurysm

SOCIETY FOR VASCULAR SURGERY DOCUMENT

The Society for Vascular Surgery clinical practice guidelines on the management of visceral aneurysms



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Vikram S. Kashyap, MD,^d Caron Rockman, MD,^e and M. Hassan Murad, MD,^f *Pittsburgh, Pa; Baltimore, Md;*
Ann Arbor, Mich; Cleveland, Ohio; New York, NY; and Rochester, Minn

Visceral aneurysm: etiology

Table 2. Etiology visceral artery aneurysms (VAA's)

Atherosclerosis	32%
Medial degeneration	24%
Abdominal and surgical trauma	22%
Infectious and inflammatory diseases	10%
Congenital diseases (Marfan, Ehlers-Danlos, hereditary hemorrhagic telangiectasia, Osler-Weber-Rendu disease, Kawasaki, and fibromuscular dysplasia)	
Systemic diseases (juvenile rheumatoid arthritis (Still disease), systemic lupus erythematosus, Hashimoto thyroiditis, and polyarteritis nodosa)	

Visceral aneurysm: etiology

TRUE VISCERAL ANEURYSMS

- degenerative
- atherosclerotic
- other causes: connective tissue diseases, inflammatory and genetic conditions

VISCERAL PSEUDOANEURYSMS

- trauma
- iatrogenic injury
- inflammatory processes
- infection

Visceral aneurysm: diagnosis of etiology

Atherosclerotic

NON Atherosclerotic
NON Inflammatory

NON Atherosclerotic
Inflammatory

Visceral aneurysm: diagnosis of etiology

Atherosclerotic

□ clinical history

□ imaging

NON Atherosclerotic
NON Inflammatory

□ ANCA
□ antineutrophil cytoplasmic antibody

□ CBC, complete blood count

□ CRP, C-reactive protein

□ ESR, erythrocyte sedimentation rate

□ IgG4, immunoglobulin 4

□ LFTs, liver function tests

NON Atherosclerotic
Inflammatory

Atherosclerotic visceral aneurysm

Atherosclerotic visceral aneurysm



Guideline on peripheral
arterial disease

Volume 48 / Supplement 102 / 2019

Lifestyle changes

Smoking Cessation

Anti Diabetic drugs

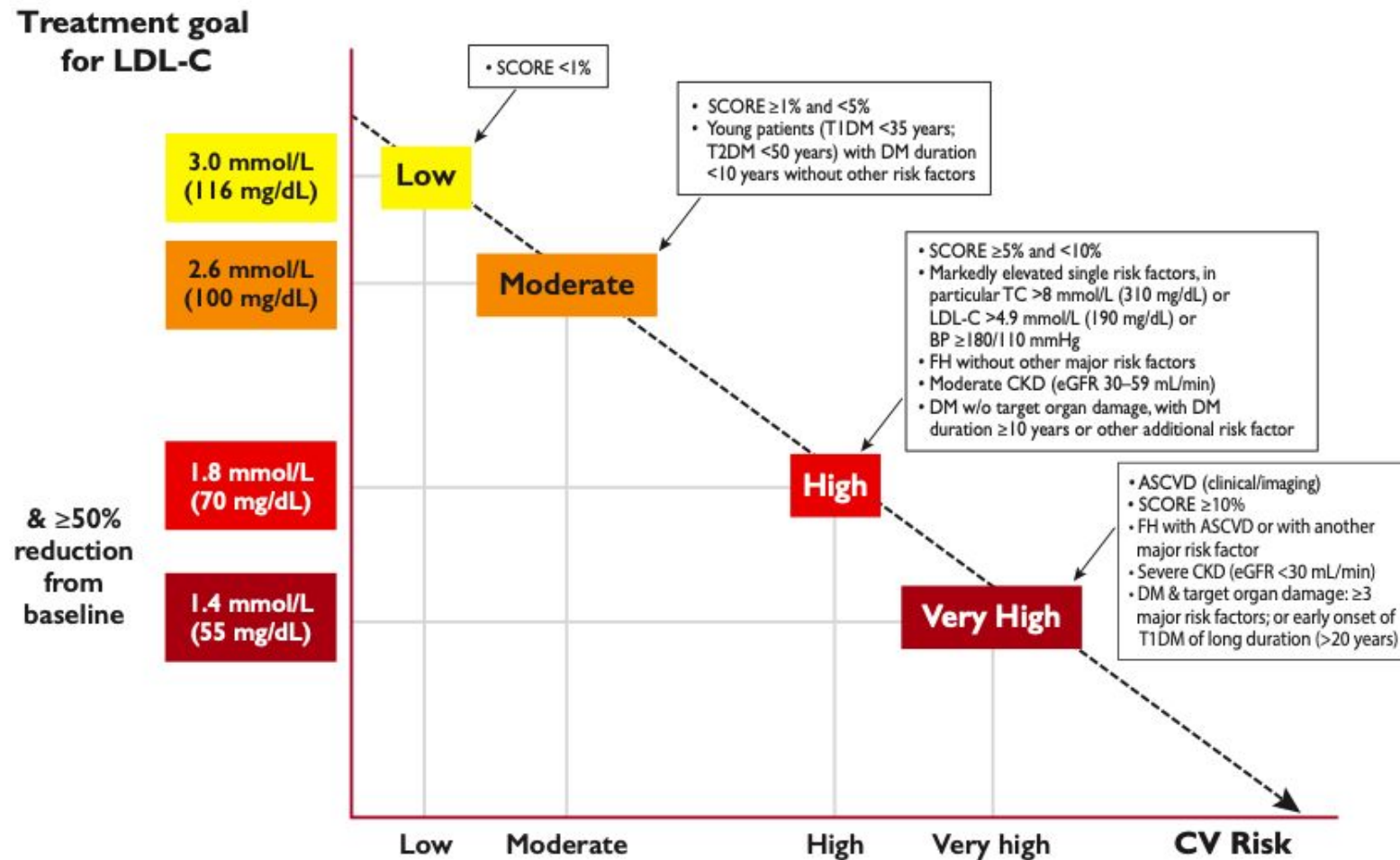
Lipid Lowering drugs

Anti Hypertensive drugs

Antithrombotic drugs

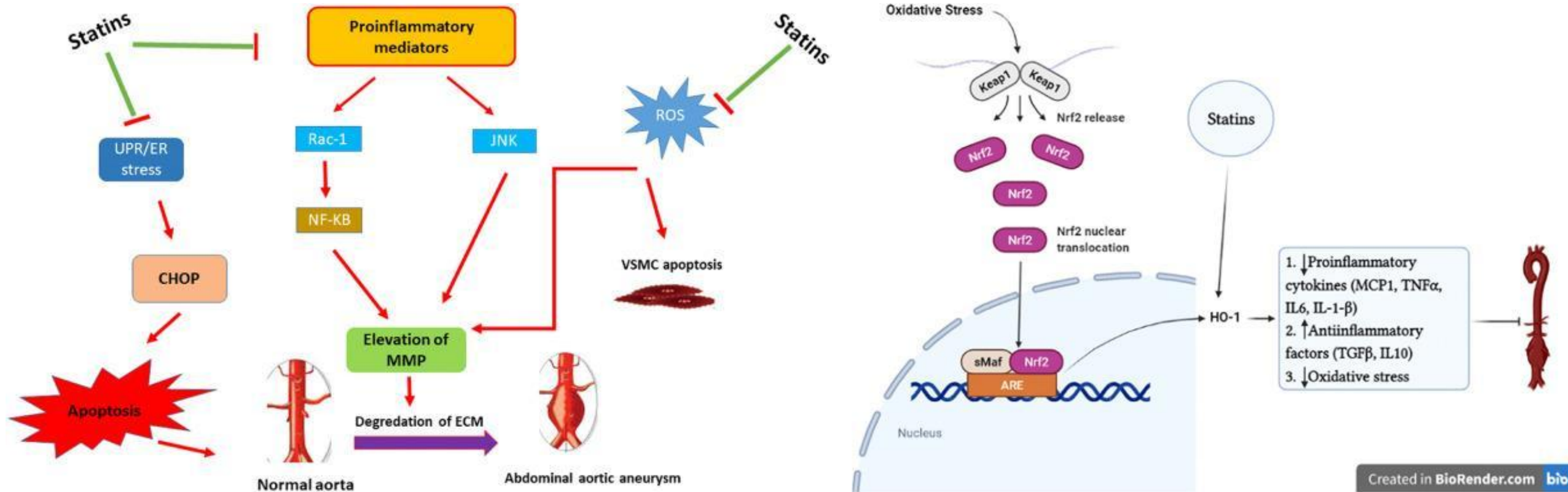
Atherosclerotic visceral aneurysm

Lipid Lowering drugs



Atherosclerotic visceral aneurysm

Lipid Lowering drugs



Atherosclerotic visceral aneurysm

Lipid Lowering drugs

Several studies demonstrated that statins significantly improve peri-operative, as well as long-term morbidity and mortality rates in patients undergoing AAA surgery

AAA different pathogenesis

and after surgery ...

Atherosclerotic visceral aneurysm

Anti Hypertensive drugs

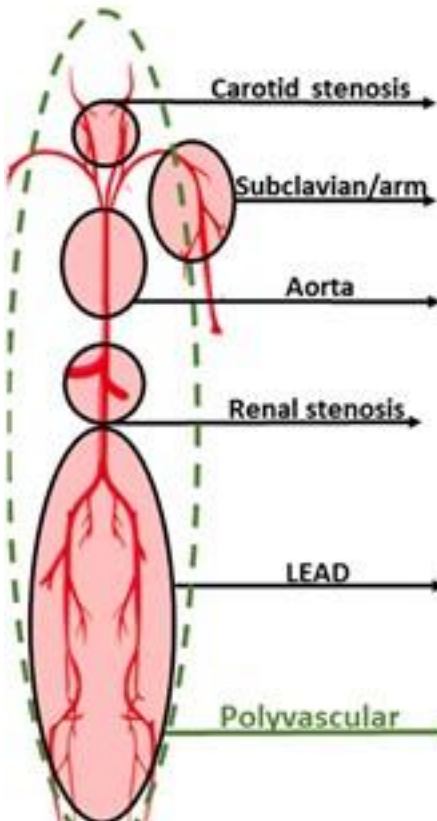
TGF- β signaling is important in vascular wall remodeling and aneurysm formation

ARBs reduce tissue expression of TGF- β and reduce vascular fibrosis

Lindner V. Vascular repair processes mediated by transforming growth factor-beta. Z Kardiol. 2001.

Atherosclerotic visceral aneurysm

Antithrombotic drugs



	Chronic disease (long-term) Default strategy (or alternative) <i>(or if high bleeding risk)</i>		Post-revascularization Period (1-3 months)	
	<u>Symptomatic</u>	<u>Asymptomatic</u>	<u>Surgery</u>	<u>Endovascular</u>
Carotid stenosis	A (or C) <i>A</i>	A (or C) <i>N</i>	A (or C)	A+C
Subclavian/arm	A (or C) <i>A</i>	A (or C) <i>N</i>	A	A+C
Aorta	A (or C) <i>N</i>	A (or N) <i>N</i>	A	A+C
Renal stenosis	A (or C) <i>N</i>	A (or N) <i>N</i>	A	A+C
LEAD	R+A <i>C (or A)</i>	N ^a	R+A <i>C (or A)</i>	R+A±C* (or A+C) <i>C (or A)</i>
Polyvascular	R+A <i>C (or A)</i>			

^aonly if isolated

Abbreviations: A: aspirin; C: Clopidogrel; N: no antithrombotic therapy; R: low-dose rivaroxaban (2.5 mg bid)

NON Atherosclerotic NON Inflammatory

NON Atherosclerotic NON Inflammatory

Medial degeneration

Connective disease

- fibromuscular dysplasia
- segmental arterial mediolysis

Congenital disease

NON Atherosclerotic NON Inflammatory

Clinical Research

Nonatherosclerotic Abdominal Vasculopathies

*Nedaa Skeik, Jonathan R. Hyde, Sydney L. Olson, Christina M. Thaler, Wala Abuatiyeh,
Aisha K. Ahmed, Danielle R. Lyon, Dawn R. Witt, Ross Garberich, and Timothy Sullivan,
Minneapolis, Minnesota*

Ann Vasc Surg. 2019

NON Atherosclerotic NON Inflammatory

Medial degeneration

	All patients (n = 118)	Fibromuscular dysplasia (FMD) (n = 30)	Isolated aneurysm (n = 29)	Median arcuate ligament syndrome (MALS) (n = 18)	Localized vasculitis of gastro- intestinal tract (LVGT) (n = 9)	Isolated dissection (n = 6)	Microscopic polyangiitis and granulomatosis with polyangiitis (MP/GP) (n = 6)	Trauma (n = 5)	Segmental arterial mediolysis (SAM) (n = 5)	Ehlers- Danlos syndrome (EDS) (n = 3)	Takayasu's arteritis (TA) (n = 3)	Polyarteritis nodosa (PAN) (n = 2)	Idiopathic aortitis (n = 1)	Loeys-Dietz syndrome (LDS) (n = 1)
Coil embolization	17 (14.4)	6 (20.0)	7 (24.1)	1 (5.6)	1 (10.0)	0 (0)	0 (0)	0 (0)	1 (20.0)	0 (0)	0 (0)	1 (50.0)	0 (0)	0 (0)
Angioplasty/ stenting	14 (11.9)	5 (16.7)	1 (3.5)	3 (16.7)	0 (0)	2 (33.3)	0 (0)	1 (20.0)	0 (0)	1 (33.3)	1 (33.3)	0 (0)	0 (0)	0 (0)
Anticoagulation	14 (11.9)	5 (16.7)	0 (0)	1 (5.6)	2 (22.2)	1 (16.7)	0 (0)	1 (20.0)	3 (60.0)	1 (33.3)	0 (0)	0 (0)	0 (0)	0 (0)
Open resection/ surgical revascularization	12 (10.2)	4 (13.3)	4 (13.8)	3 (16.7)	0 (0)	0 (0)	0 (0)	1 (20.0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Prednisone	12 (10.2)	0 (0)	0 (0)	0 (0)	4 (44.4)	0 (0)	6 (100)	0 (0)	1 (20.0)	0 (0)	2 (66.7)	1 (50.0)	0 (0)	0 (0)
Splenectomy	6 (5.1)	2 (6.7)	4 (13.8)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Open MAL release	4 (3.4)	0 (0)	0 (0)	4 (22.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Laparoscopic MAL release	3 (2.6)	0 (0)	0 (0)	3 (16.7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Nephrectomy	1 (0.9)	1 (3.33)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Conservative treatment	39 (33.1)	9 (30.0)	16 (55.2)	4 (22.2)	2 (22.2)	3 (50.0)	0 (0)	2 (40.0)	1 (20.0)	1 (33.3)	0 (0)	0 (0)	1 (100)	1 (100)

NON Atherosclerotic NON Inflammatory

Medial degeneration

	All patients (n = 118)	Fibromuscular dysplasia (FMD) (n = 30)	Isolated aneurysm (n = 29)	Median arcuate ligament syndrome (MALS) (n = 18)	Localized vasculitis of gastro- intestinal tract (LVGT) (n = 9)	Isolated dissection (n = 6)	Microscopic polyangiitis and granulomatosis with polyangiitis (MP/GP) (n = 6)	Trauma (n = 5)	Segmental arterial mediolysis (SAM) (n = 5)	Ehlers- Danlos syndrome (EDS) (n = 3)	Takayasu's arteritis (TA) (n = 3)	Polyarteritis nodosa (PAN) (n = 2)	Idiopathic aortitis (n = 1)	Loeys-Dietz syndrome (LDS) (n = 1)
Coil embolization	17 (14.4)	6 (20.0)	7 (24.1)	1 (5.6)	1 (10.0)	0 (0)	0 (0)	0 (0)	1 (20.0)	0 (0)	0 (0)	1 (50.0)	0 (0)	0 (0)
Angioplasty/ stenting	14 (11.9)	5 (16.7)	1 (3.5)	3 (16.7)	0 (0)	2 (33.3)	0 (0)	1 (20.0)	0 (0)	1 (33.3)	1 (33.3)	0 (0)	0 (0)	0 (0)
Anticoagulation	14 (11.9)	5 (16.7)	0 (0)	1 (5.6)	2 (22.2)	1 (16.7)					0 (0)	0 (0)	0 (0)	0 (0)
Open resection/ surgical revascularization	12 (10.2)	4 (13.3)	4 (13.8)	3 (16.7)	0 (0)	0 (0)					0 (0)	0 (0)	0 (0)	0 (0)
Prednisone	12 (10.2)	0 (0)	0 (0)	0 (0)	4 (44.4)	0 (0)					2 (66.7)	1 (50.0)	0 (0)	0 (0)
Splenectomy	6 (5.1)	2 (6.7)	4 (13.8)	0 (0)	0 (0)	0 (0)					0 (0)	0 (0)	0 (0)	0 (0)
Open MAL release	4 (3.4)	0 (0)	0 (0)	4 (22.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Laparoscopic MAL release	3 (2.6)	0 (0)	0 (0)	3 (16.7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Nephrectomy	1 (0.9)	1 (3.33)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Conservative treatment	39 (33.1)	9 (30.0)	16 (55.2)	4 (22.2)	2 (22.2)	3 (50.0)	0 (0)	2 (40.0)	1 (20.0)	1 (33.3)	0 (0)	0 (0)	1 (100)	1 (100)

Conservative treatment

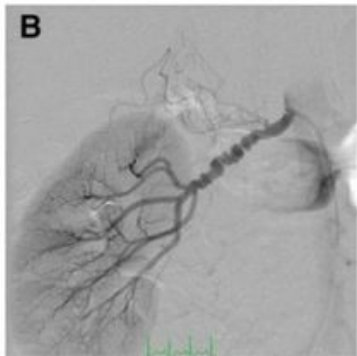
- Smoking cessation
- Pain control
- Follow up

NON Atherosclerotic NON Inflammatory



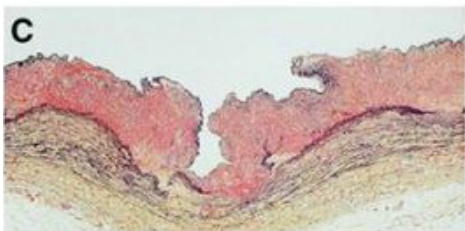
Connective disease

- fibromuscular dysplasia
- segmental arterial mediolysis



TGF- β signaling use of ARBs is reasonable

to reduce the likelihood of platelet adherence to intravascular webs use of **aspirin** is reasonable



Fibromuscular dysplasia: state of the science and critical unanswered questions:
a scientific statement from the American Heart Association

NON Atherosclerotic NON Inflammatory

Renal artery aneurysm

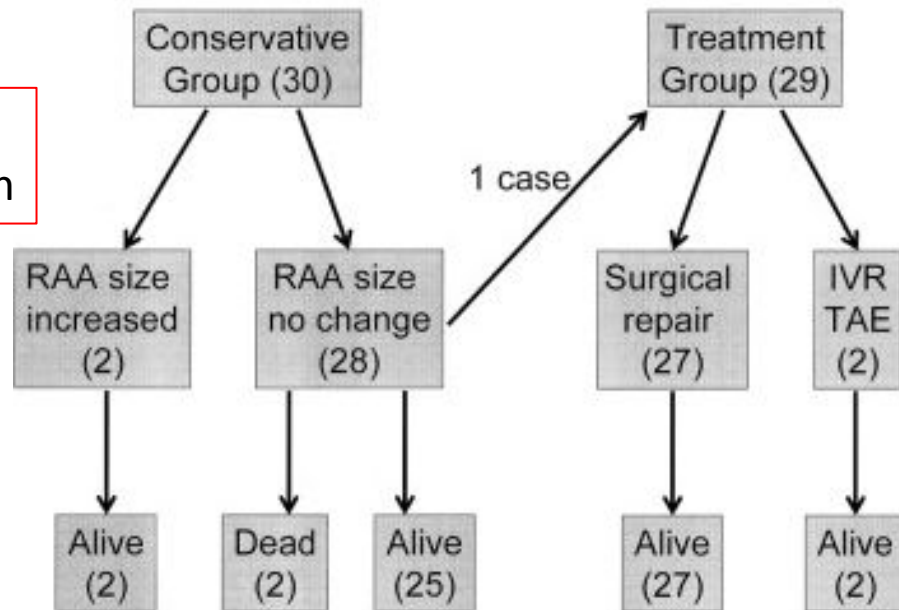
68% FMD

(connective disease)

NON Atherosclerotic NON Inflammatory

Renal artery aneurysm
68% FMD
(connective disease)

control
hypertension

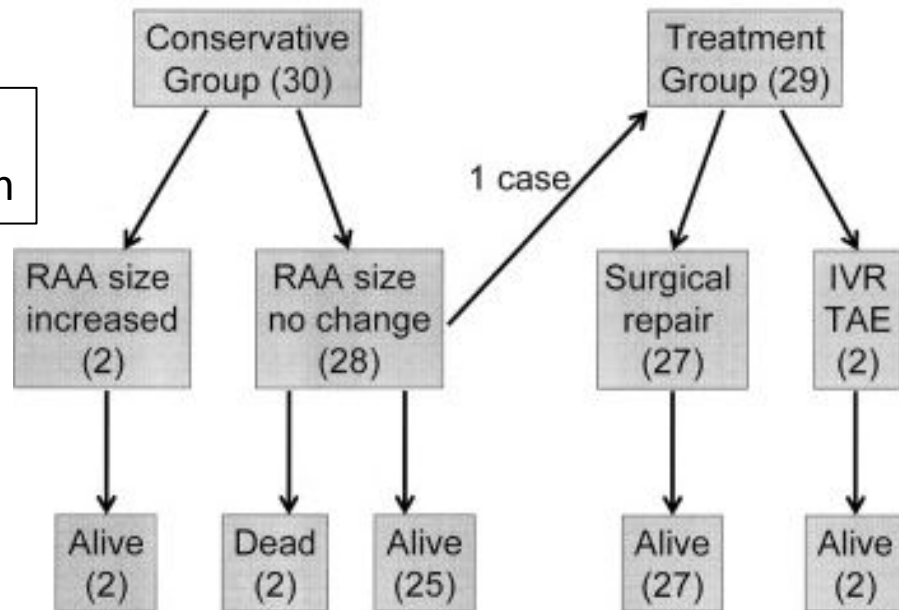


13 mm (10 y)
15 mm (3 y)

NON Atherosclerotic NON Inflammatory

Renal artery aneurysm
68% FMD
(connective disease)

control
hypertension



13 mm (10 y)
15 mm (3 y)

Morita et al. Transplant Proc. 2012

Recommendations for treatment of RAA

	Strength of recommendation	Quality of evidence
3.1 We suggest daily antiplatelet therapy (ie, low-dose aspirin) for patients with RAA.	2 (Weak)	C (Low)

Guidelines on the management of visceral aneurysms SVS, 2020

NON Atherosclerotic NON Inflammatory

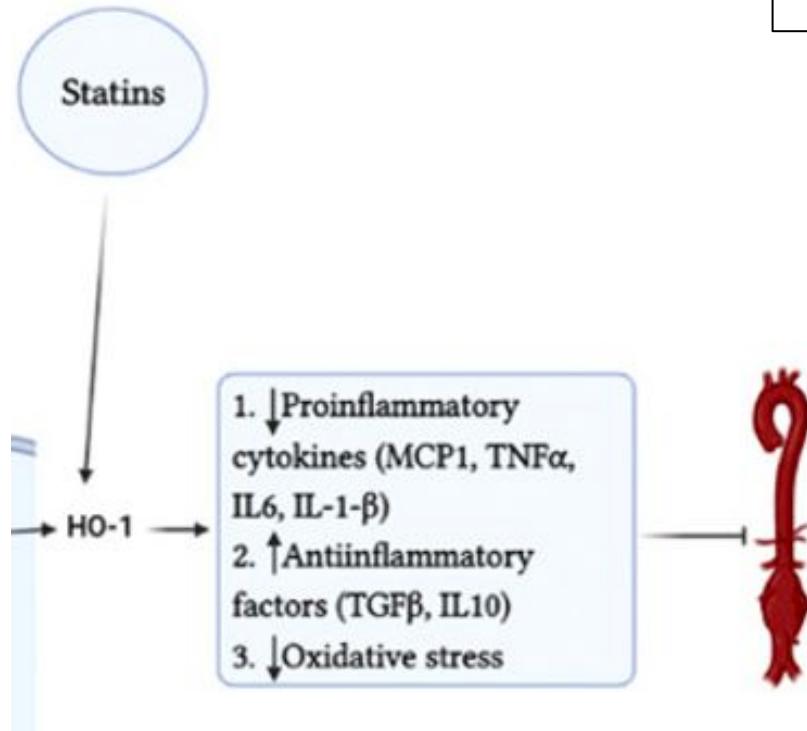
STATINS
 use is controversial

Table 3. Odds of outcomes in statin users and nonusers in secondary analyses.

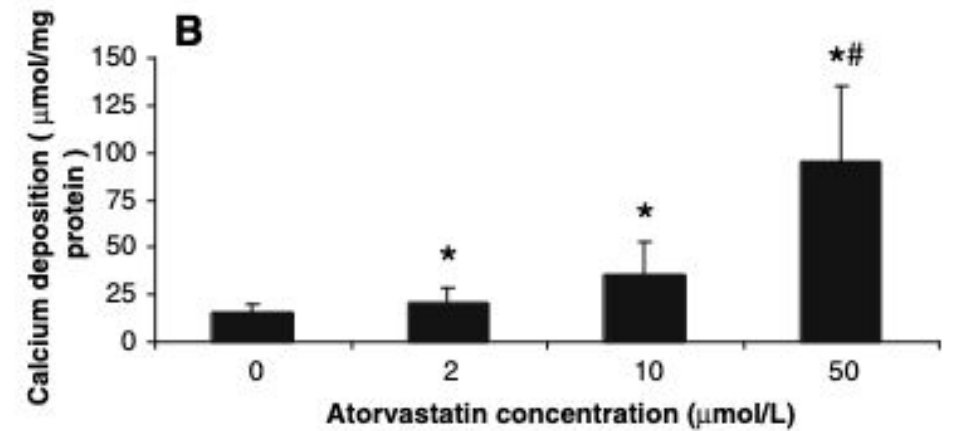
Variable	Nonusers N (%)	Statin users N (%)	PS-adjusted model ^a			Fully adjusted model ^b		
			OR	95% CI	p Value	OR	95% CI	p Value
Basic cohort								
	N = 49545	N = 10910						
Aortic, peripheral, and visceral artery aneurysm	499 (1.0%)	290 (2.7%)	1.15	0.93–1.43	0.21	1.12	0.92–1.38	0.27
Aortic aneurysm repair procedure	26 (0.1%)	13 (0.1%)	0.47	0.18–1.22	0.12	0.52	0.21–1.30	0.16
Basic cohort: high-intensity statin users vs. nonusers								
	N = 49545	N = 2470						
Aortic, peripheral, and visceral artery aneurysm	499 (1.0%)	99 (4.0%)	1.10	0.82–1.49	0.52	1.12	0.83–1.50	0.47
Aortic aneurysm repair procedure	26 (0.1%)	4 (0.2%)	0.32	0.09–1.14	0.08	0.33	0.09–1.18	0.09
Statin users only: high-intensity statin users vs. moderate/low-intensity statin users								
	Moderate/ low-intensity N = 8440	High-intensity N = 2470						
Aortic, peripheral, and visceral artery aneurysm	191 (2.3%)	99 (4.0%)	1.76	1.37–2.25	<0.0001	1.48	1.14–1.92	0.003
Aortic aneurysm repair procedure	9 (0.1%)	4 (0.2%)	1.49	0.46–4.85	0.51	1.20	0.36–4.00	0.77

Visceral aneurysm: medical therapy

STATINS
use is controversial



Hosseini et al. Eur J Pharm Sci. 2022

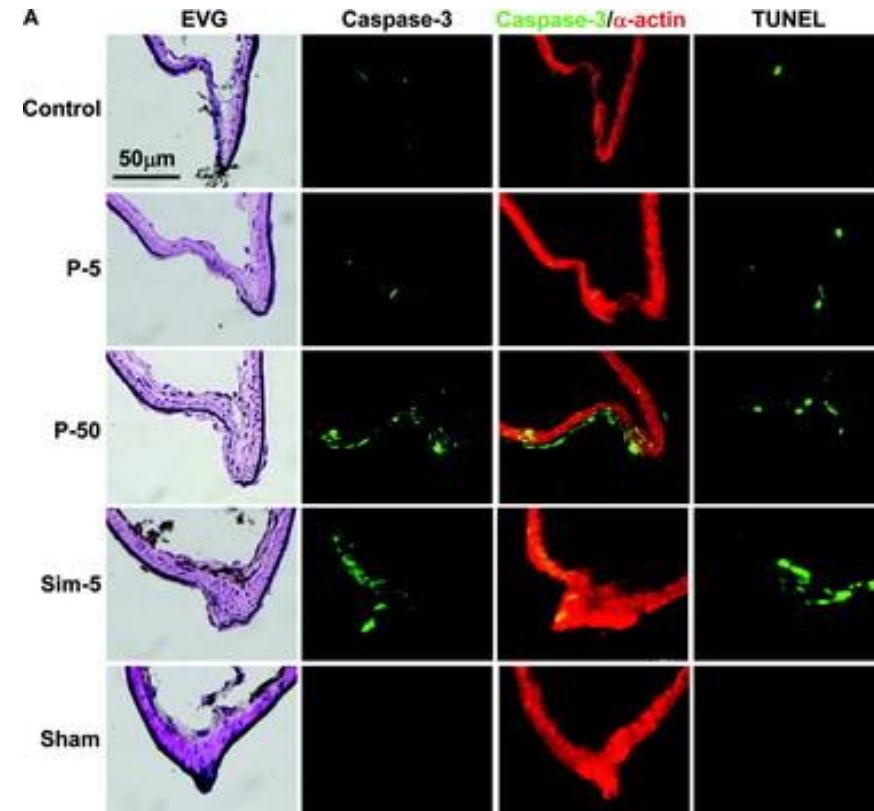
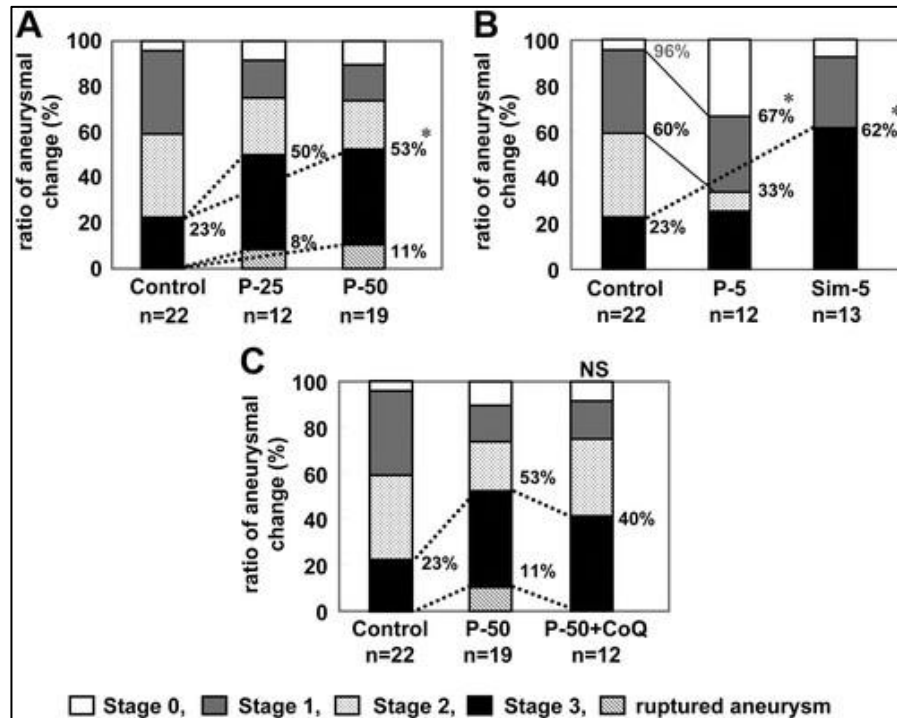


Trion et al. Mol Cell Biochem. 2008

Visceral aneurysm: medical therapy

STATINS
use is controversial

Statins promote the growth of experimentally induced cerebral aneurysms in estrogen-deficient rats



NON Atherosclerotic INFLAMMATORY

NON Atherosclerotic INFLAMMATORY

- ❖ Behçet's syndrome
- ❖ Takayasu arteritis
- ❖ juvenile rheumatoid arthritis (Still disease)
- ❖ systemic lupus erythematosus
- ❖ Hashimoto thyroiditis
- ❖ polyarteritis nodosa

medical management of vasculitis
involves controlling inflammatory process
with the use of steroids or other
immunosuppressants

Tech Vasc Interv Radiol. 2015 Managing mesenteric vasculitis
Intern Emerg Med. 2019 Vascular Behçet's syndrome: an update
Cardiol Young. 2018 Takayasu arteritis in paediatrics

Visceral aneurysm: medical therapy after intervention

Visceral aneurysm: medical therapy after intervention

Atherosclerosis



Guideline on peripheral
arterial disease

Volume 48 / Supplement 102 / 2019

NON Atherosclerotic
NON Inflammatory

- Control hypertension (ARBs)
- Smoking cessation
- Follow up

NON Atherosclerotic
Inflammatory

controlling inflammatory process with the use of steroids or other immunosuppressants in pre and post intervention

Visceral aneurysm: medical therapy after intervention

Antithrombotic
therapy

Open surgery

Endovascular

No indication

Single center data
evaluate type of device

- J Biol Regul Homeost Agents. 2021
- Abdom Radiol (NY). 2020
- J Neurointerv Surg. 2020
- Diagn Interv Radiol. 2019
- Semin Vasc Surg. 2013
- Am Surg. 2020
- Acta Radiol. 2013

Medical therapy of visceral aneurysm

- Aneurisma viscerale **aterosclerotico**: BMT
- Aneurisma viscerale **non aterosclerotico non infiammatorio**: ottimizzazione della terapia antipertensiva, astensione dal fumo.
In caso di patologia del tessuto connettivo può essere considerata la terapia antiaggregante.
- Aneurisma viscerale **non aterosclerotico infiammatorio**: ottimizzare il controllo del processo infiammatorio con l'uso di steroidi e/o immunosoppressori.

Medical therapy of visceral aneurysm after intervention

- Aneurisma viscerale **aterosclerotico**: BMT
- Aneurisma viscerale **non aterosclerotico non infiammatorio**: terapia antipertensiva, astensione dal fumo e terapia antiaggregante considerata per patologia del connettivo.
- Aneurisma viscerale **non aterosclerotico infiammatorio**: ottimizzare il controllo del processo infiammatorio con l'uso di steroidi e/o immunosoppressori.
- Aneurisma viscerale **trattato per via ENDOVASCOLARE**: considerare terapia antiaggregante a breve o lungo termine in base al tipo di device utilizzato.

