Role of Statins after Endovascular Repair of Abdominal Aortic Aneurysms: A Nationwide Population-Based Study

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Supplementary Figures and Tables

Supplemental Table S1. Definition of outcomes

	Definition
Cardiovascular mortality	Death due to I00-99
Reintervention	EVAR or OSAR after 3 months of index intervention
Myocardial infarction	Coronary stent placement and admission with I21, I22, or I25.2
Systemic embolism	At least two different days of hospital visits (outpatient) or admission with I74 or N28.0
Major bleeding	At least two different days of hospital visits (outpatient) or admission with I60-62, K25-28 (subcodes 0-2 and 4-6 only), K920-K922, K625, I850, I983 or D62
Stroke	Brain CT, MRI, or MRA and admission with I60-64 (I60-62, hemorrhagic; I63, ischemic stroke)

EVAR, endovascular aneurysm repair; OSAR, open surgical aneurysm repair; CT, computed tomography; MRI, magnetic resonance imaging; MRA, magnetic resonance angiography.

Supplemental Table S2. Baseline characteristics according to pre-EVAR statin use

	Pre-EVAR statin user (n = 3,386)	Pre-EVAR statin nonuser (n = 5,507)	p-value*
Age (years ± SD)	72.9 ± 7.7	73.0 ± 8.8	0.295
Sex (male, n (%))	2,810 (83.0)	4,631 (84.1)	0.171
MPRS	6.6 ± 6.0	6.1 ± 5.8	<0.001
Low risk	1,138 (33.6)	2,071 (37.6)	
Intermediate risk	1,569 (46.3)	2,555 (46.4)	
High risk	679 (20.1)	881 (16.0)	
Comorbidities			
Hypertension	2,994 (88.4)	3,939 (71.5)	<0.001
Diabetes mellitus	830 (24.5)	775 (14.1)	<0.001
Heart failure	732 (21.6)	722 (13.1)	<0.001
Ischemic heart disease	1,873 (55.3)	1,859 (33.8)	<0.001
Myocardial infarction	480 (14.2)	314 (5.7)	<0.001
Atrial fibrillation	295 (8.7)	365 (6.6)	<0.001
COPD	420 (12.4)	724 (13.1)	0.310
Peripheral artery disease	503 (14.9)	770 (14.0)	0.254
Chronic kidney disease	86 (2.5)	116 (2.1)	0.183
Cerebrovascular disease	971 (28.7)	1,144 (20.8)	<0.001

EVAR, endovascular aneurysm repair; SD, standard deviation; MPRS, Medicare perioperative risk score; COPD, chronic obstructive pulmonary disease.
*p-value by conditional logistic regression model

Supplemental Table S3. Risks of outcomes according to pre-EVAR statin use in the whole population

	pre-EVAR statin user (n = 3,386)		pre-EVAR statin nonuser (n = 5,507)		Adjusted HR[†]	95% CI	p-value
	No. of events	Incidence rate[*]	No. of events	Incidence rate[*]			
30-day mortality	89	2.7	150	2.8	1.06	(0.80 – 1.40)	0.682
Overall mortality	1,067	84.4	2,115	100.7	0.83	(0.77 – 0.90)	<.001
Cardiovascular mortality	101	8.0	219	10.4	0.65	(0.51 – 0.83)	<0.001
Reintervention	240	19.8	428	21.3	0.91	(0.77 – 1.07)	0.258
Myocardial infarction	66	5.3	102	4.9	1.03	(0.74 – 1.43)	0.863
Major bleeding	111	8.9	169	8.1	1.07	(0.83 – 1.38)	0.610
Any stroke	480	41.0	739	37.7	0.93	(0.88 – 1.05)	0.235
Hemorrhagic stroke	114	9.1	210	10.1	0.85	(0.67 – 1.08)	0.192
Ischemic stroke	375	31.6	535	27.0	0.99	(0.86 – 1.14)	0.882

EVAR, endovascular aneurysm repair; HR, hazard ratio; CI, confidence interval.

[*]Incidence rates are per 1,000 person-years, except for 30-day mortality (per 100 person-month).

[†]Adjusted by age, sex, presence of hypertension, diabetes, heart failure, ischemic heart disease, atrial fibrillation, peripheral artery disease, chronic kidney disease, and cerebrovascular disease.

Supplemental Table S4. Risk of outcomes according to pre- and post-EVAR statin use

	No. of subjects*	No. of events	Incidence rate (PPY)	Unadjusted HR (95% CI)	*P*†	Adjusted HR‡ (95% CI)	*P*†
All-cause mortality							
Pre and post nonuser	3084	1178	95.9	1 (Ref.)		1 (Ref.)	
Pre nonuser but post user	2228	742	87.5	0.92 (0.83-1.00)	0.057	0.99 (0.90–1.09)	0.846
Pre user but post nonuser	514	153	74.5	0.78 (0.66-0.92)	0.004	0.79 (0.67–0.94)	0.008
Pre and post user	2767	809	77.3	0.81 (0.74-0.88)	<.001	0.83 (0.76–0.91)	<.001
Cardiovascular death							
Pre and post nonuser	3084	122	9.9	1 (Ref.)		1 (Ref.)	
Pre nonuser but post user	2228	75	8.8	0.90 (0.67-1.20)	0.458	0.96 (0.72–1.28)	0.778
Pre user but post nonuser	514	20	9.7	0.99 (0.62-1.59)	0.960	0.85 (0.53–1.38)	0.518
Pre and post user	2767	75	7.2	0.73 (0.55-0.97)	0.030	0.64 (0.47–0.86)	0.004
Reintervention							
Pre and post nonuser	3084	241	20.5	1 (Ref.)		1 (Ref.)	
Pre nonuser but post user	2228	187	23.2	1.15 (0.95-1.39)	0.148	1.15 (0.95–1.39)	0.167

Pre user but post nonuser	514	35	17.8	0.88 (0.62-1.26)	0.494	0.88 (0.61–1.26)	0.475
Pre and post user	2766	204	20.4	1.02 (0.84-1.22)	0.874	0.98 (0.80–1.19)	0.811
Myocardial infarction							
Pre and post nonuser	3084	64	5.3	1 (Ref.)		1 (Ref.)	
Pre nonuser but post user	2224	34	4.1	0.77 (0.50-1.16)	0.206	0.78 (0.51–1.19)	0.253
Pre user but post nonuser	514	16	7.9	1.49 (0.86-2.58)	0.153	1.46 (0.84–2.55)	0.181
Pre and post user	2767	49	4.7	0.89 (0.61-1.29)	0.539	0.87 (0.59–1.28)	0.469
Major bleeding							
Pre and post nonuser	3084	105	8.6	1 (Ref.)		1 (Ref.)	
Pre nonuser but post user	2228	64	7.6	0.87 (0.64-1.19)	0.389	0.94 (0.69–1.29)	0.704
Pre user but post nonuser	514	15	7.4	0.85 (0.49-1.46)	0.553	0.88 (0.51–1.52)	0.656
Pre and post user	2767	96	9.3	1.07 (0.81-1.41)	0.656	1.08 (0.80–1.44)	0.622
Any stroke							
Pre and post nonuser	3025	364	31.8	1 (Ref.)		1 (Ref.)	
Pre nonuser but post user	2178	255	32.1	1.00 (0.85-1.18)	0.977	1.05 (0.89–1.23)	0.573
Pre user but post nonuser	508	70	37.1	1.16 (0.90-1.50)	0.253	1.02 (0.79–1.32)	0.892

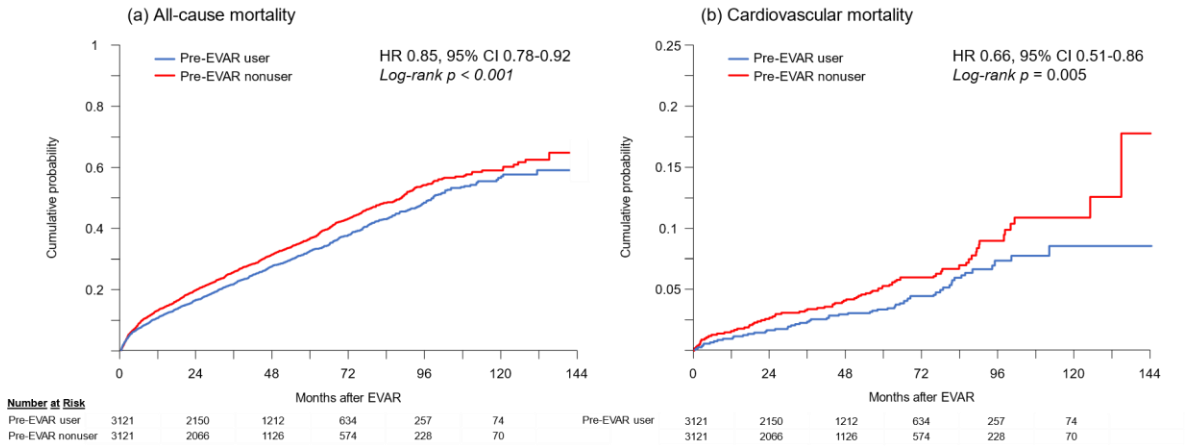
Pre and post user	2702	335	34.6	1.08 (0.93-1.25)	0.323	0.98 (0.84–1.14)	0.786
Hemorrhagic stroke							
Pre and post nonuser	3071	106	8.7	1 (Ref.)		1 (Ref.)	
Pre nonuser but post user	2222	82	9.8	1.11 (0.83-1.48)	0.479	1.15 (0.86–1.54)	0.335
Pre user but post nonuser	514	18	8.9	1.01 (0.61-1.67)	0.961	0.98 (0.59–1.62)	0.934
Pre and post user	2758	87	8.4	0.95 (0.72-1.27)	0.748	0.95 (0.71–1.28)	0.753
Ischemic stroke							
Pre and post nonuser	3040	267	23.1	1 (Ref.)		1 (Ref.)	
Pre nonuser but post user	2186	178	22.1	0.95 (0.79-1.15)	0.607	1.01 (0.83–1.22)	0.936
Pre user but post nonuser	508	53	27.5	1.19 (0.89-1.60)	0.251	1.03 (0.77–1.39)	0.838
Pre and post user	2713	258	26.3	1.13 (0.95-1.34)	0.172	1.02 (0.85–1.22)	0.852

PPY, per 1,000 person-years; HR, hazard ratio; Ref., reference; COPD, chronic obstructive pulmonary disease; PAD, peripheral artery disease; CKD, chronic kidney disease.

[†]p-value by Cox proportional hazards model

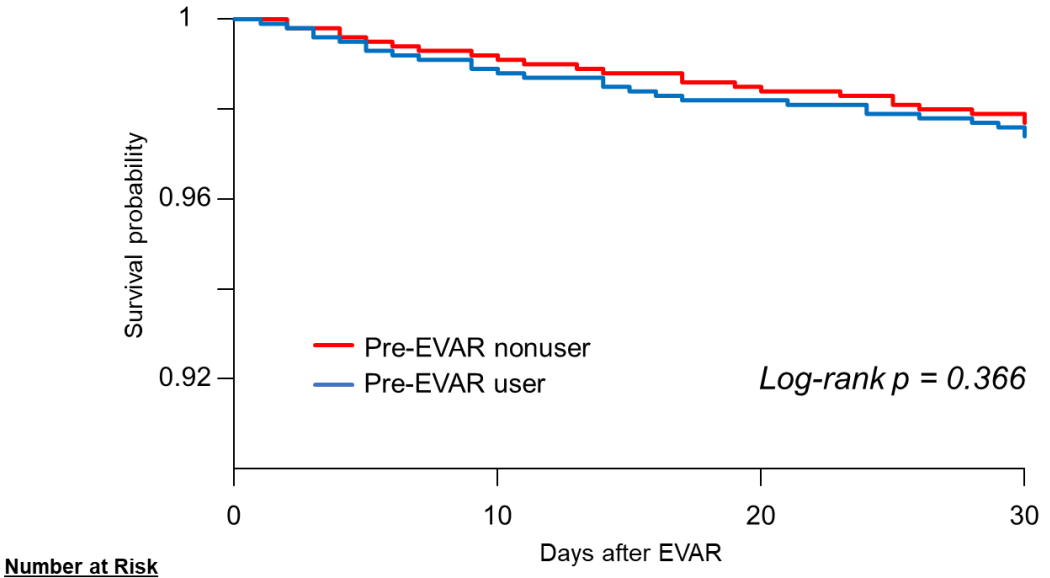
[‡] Adjusted by age, sex, presence of hypertension, diabetes, heart failure, ischemic heart disease, atrial fibrillation, peripheral artery disease, chronic kidney disease, and cerebrovascular disease.

Supplemental Figure S1. Kaplan-Meier curve for (a) all-cause mortality, (b) cardiovascular mortality according to pre-EVAR statin use (PS-matched population)



EVAR, endovascular repair; PS, propensity score.

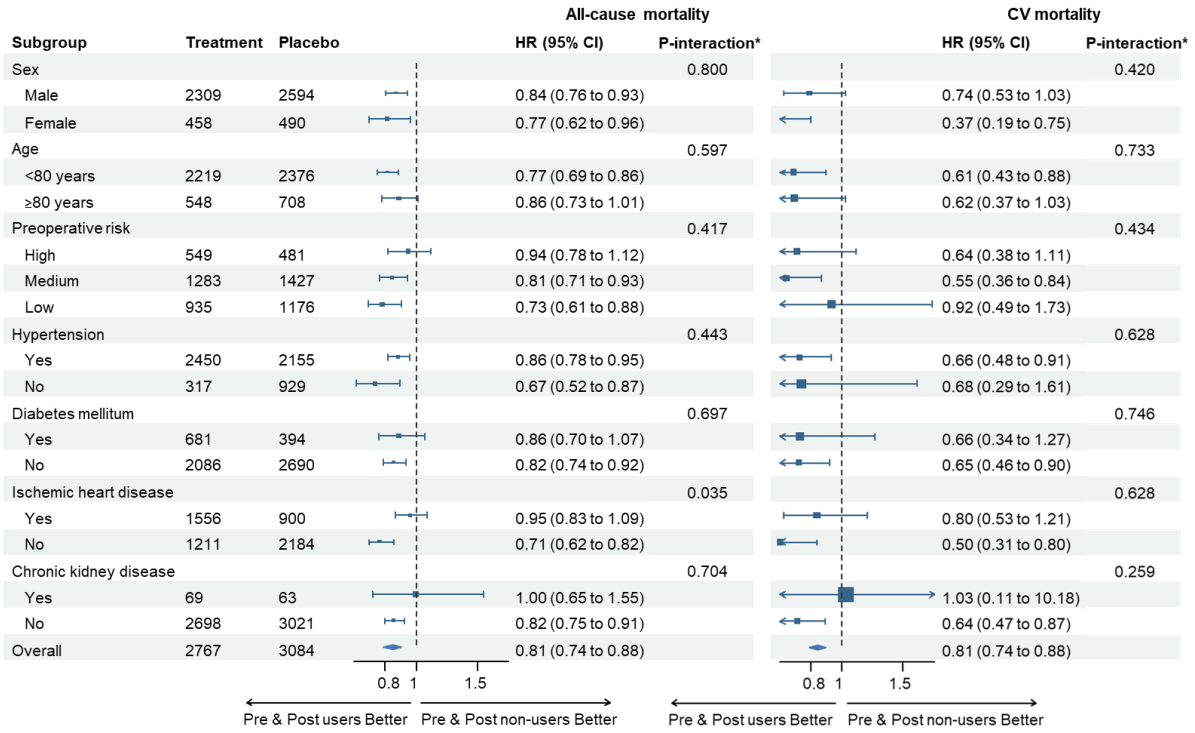
Supplemental Figure S2. Kaplan-Meier curve for 30-day mortality according to pre-EVAR statin use



Number at Risk				
Pre-EVAR user	3121	3088	3064	3045
Pre-EVAR nonuser	3121	3096	3073	3054

EVAR, endovascular aneurysm repair

Supplemental Figure S3. Subgroup analysis for all-cause mortality and cardiovascular mortality according to persistent statin use



CV, cardiovascular; HR, hazard ratio.

*P-values were adjusted to account for multiple testing using the Benjamini-Hochberg method.