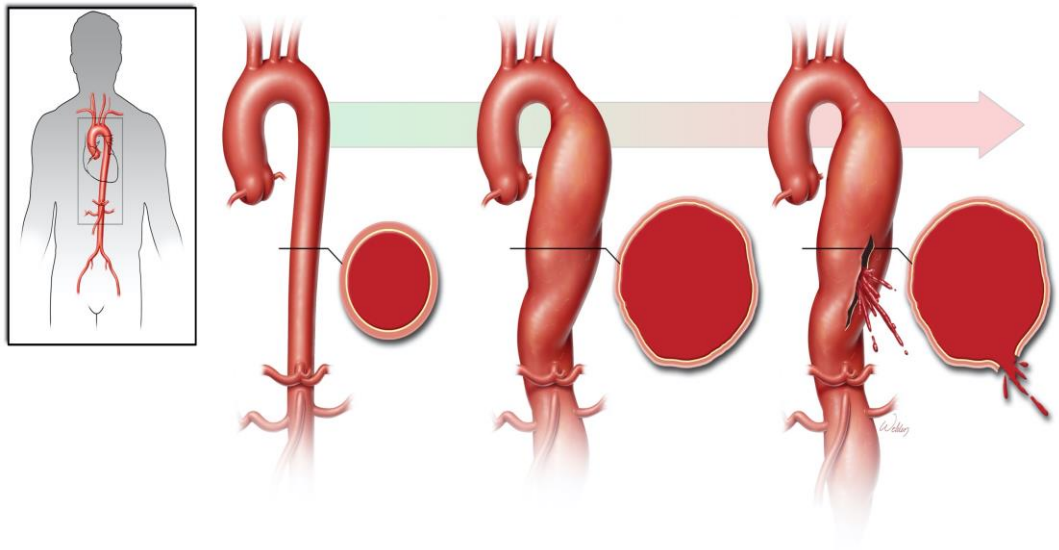
The Association Between Smoking and Early Outcomes in Open Thoracoabdominal Aortic Aneurysm Repair

Robert T. Seniors III, M.D.; Samantha Xu, MPH; Lynna Nguyen, R.N.; Veronica A. Glover, Ph.D; Ginger Etheridge, BBs; Susan Y. Green, MPH; Subhasis Chatterjee, M.D.; Marc R. Moon, M.D.; Scott A. LeMaire, M.D.; Joseph S. Coselli, M.D.

Background

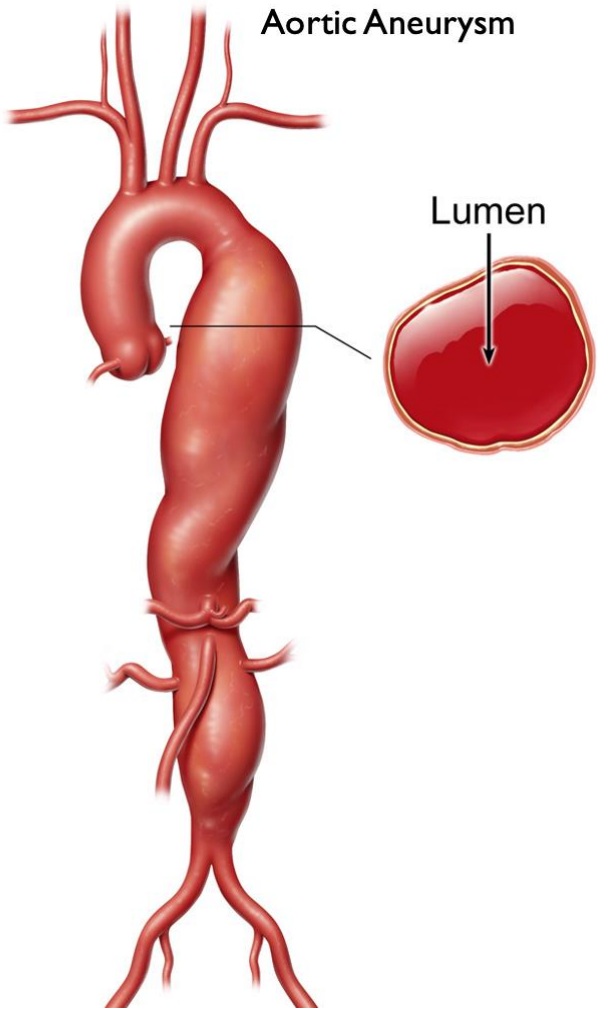
- Tobacco use is a known risk factor for abdominal aortic aneurysms (AAA); its role in the formation of thoracoabdominal aortic aneurysms (TAAA) is thought to be one of significance
- The frequency and description of early outcomes associated with open TAAA repairs in patients who currently smoke or were former smokers has not been fully characterized



Peterson L, Schweitzer G, Simone A, Zielke T, et al. The Effect of Smoking Status on Perioperative Morbidity and Mortality after Open and Endovascular Abdominal Aortic Aneurysm Repair. Ann Vasc Surg. 2023 Jan;88:373-384

Objectives

- We aimed to identify differences in early operative outcomes between patients with or without a history of smoking undergoing open TAAA repair.
- Our hypothesis was patients currently smoking would have increased early morbidity after TAAA repair



Methods

- Retrospective analysis of patients undergoing elective open TAAA repairs (1986-2023) at a single practice
- Exclusion: Non-elective repairs and patients with unknown smoking status
- 2,825 patients were included in our analysis after meeting the inclusion criteria
- Patients were stratified by self-reported smoking history
  - Current smokers: 746 (26.4%)
  - Former smokers: 1530 (54.2%)
  - Never smokers: 549 (19.4%)
- Univariate analysis was conducted to detect differences between the three cohorts

Definitions

- **Current smoking** was defined as having smoked tobacco products within 4 weeks of surgery
- **Former smoking** was defined as cessation from smoking tobacco products for ≥ 4 weeks prior to surgery
- **Pulmonary complications** comprised a broad spectrum of complications including patients with respiratory failure and those necessitating tracheostomy
- **Paraplegia or paraparesis** was defined as persistent if present at time of early death or hospital discharge
- **Adverse event** was defined as a composite of operative death or persistent renal failure requiring hemodialysis, stroke, paraplegia, or paraparesis

Patient Characteristics

- Current smokers presented with the highest incidence of aneurysm without dissection
- Current and former smokers experienced higher rates of risk factors associated with TAAAs

Variable	All (n=2825)	Never Smoked (n=549)	Former Smoker (n=1530)	Current Smoker (n=746)	P
Age, y	67 [59-73]	58 [44-70]	68 [62-74]	68 [62-72]	<.001
Male	1809 (64.0)	352 (64.1)	1036 (67.7)	421 (56.4)	<.001
Heritable aortopathy	304 (10.8)	153 (27.9)	112 (7.3)	39 (5.2)	<.001
Aneurysm without dissection	1835 (65.0)	182 (33.2)	1055 (69.0)	598 (80.2)	<.001
Hypertension	2446 (86.6)	455 (82.9)	1352 (88.4)	639 (85.7)	<.004
Hyperlipidemia	951 (33.7)	146 (26.6)	600 (39.2)	205 (27.5)	<.001

Data are shown n (%) or median [Q1-Q3].

Patient Characteristics

- A higher incidence of atherosclerotic disease exist in patients with a history of smoking
- As expected, higher rates of COPD were present in the smoking groups

Variable	All (n=2825)	Never Smoked (n=549)	Former Smoker (n=1530)	Current Smoker (n=746)	P
CAD	1001 (35.4)	126 (23.0)	597 (39.0)	278 (37.3)	<.001
CVD	499 (17.7)	62 (11.3)	140 (18.8)	140 (18.8)	<.001
Peripheral vascular disease	723 (25.6)	72 (13.1)	447 (29.2)	204 (27.3)	<.001
COPD	1353 (47.9)	69 (12.6)	811 (53.0)	473 (63.4)	<.001

Data are shown n (%) or median [Q1-Q3]
CAD = coronary artery disease; CVD = cerebrovascular disease;
COPD = chronic obstructive pulmonary disease.

Results: Operative Details

- Aortic clamp times were longer in the never smoker cohort in comparison to former and current smokers
- It is possible that longer aortic clamp times are related to a larger proportion of never smokers receiving extent I and II operations
- Never smokers more frequently received adjuncts during their operation

Variable	All (n=2825)	Never Smoked (n=549)	Former Smoker (n=1530)	Current Smoker (n=746)	P
Aortic clamp time, min	52 [39-68]	58 [45-77]	50 [38-66]	50 [37-64]	<.001
Extent of Repair					
Extent I	737 (26.1)	183 (33.3)	396 (25.8)	158 (21.2)	<.001
Extent II	989 (35.0)	210 (38.3)	520 (34.0)	259 (34.7)	.2
Extent III	551 (19.5)	85 (15.5)	309 (20.2)	157 (21.0)	.03
Extent IV	548 (19.4)	71 (12.9)	305 (19.9)	172 (23.1)	<.001
Adjuncts					
Cerebrospinal fluid drainage	1408 (49.8)	360 (65.6)	779 (50.9)	269 (36.1)	<.001
Left heart bypass	1353 (47.9)	337 (61.4)	722 (47.2)	294 (39.4)	<.001

Data are shown n (%) or median [Q1-Q3]

Results: Three-Way Comparison of Early Outcomes

- Current and former smokers were more likely to experience adverse events
- Higher incidence of post operative complications in current/former smokers in comparison to never smokers
- Among never smokers, postoperative persistent paraplegia was rare
  - Only 1/549 (0.2%)

Variable	All (n=2825)	Never Smoked (n=549)	Former Smoker (n=1530)	Current Smoker (n=746)	P
Operative death	199 (7.0)	27 (4.9)	117 (7.6)	55 (7.4)	.1
Adverse event	377 (13.3)	53 (9.7)	223 (14.6)	101 (13.5)	.01
Persistent stroke	70 (2.5)	7 (1.3)	44 (2.9)	19 (2.5)	.1
Persistent paraplegia	69 (2.4)	1 (0.2)	39 (2.5)	29 (3.9)	<.001
Acute renal dysfunction	347 (12.3)	47 (8.6)	212 (13.9)	88 (11.8)	.005
Pulmonary complication	987 (34.9)	167 (30.4)	542 (35.4)	278 (37.3)	.03

Data are shown n (%) or median [Q1-Q3]

Results: Two-Way Comparison of Early Outcomes

- With additional 2-way analysis specific to former smokers vs current smokers, few significant differences were seen between groups

Variable	Former Smoker (n=1530)	Current Smoker (n=746)	P
Operative death	172 (7.6)	117 (7.6)	.9
Adverse event	223 (14.6)	101 (13.5)	.5
Persistent stroke	44 (2.9)	19 (2.5)	.7
Persistent paraplegia	39 (2.5)	29 (3.9)	.1
Acute renal dysfunction	212 (13.9)	88 (11.8)	.2
Pulmonary complication	542 (35.4)	278 (37.3)	.4

Data are shown n (%) or median [Q1-Q3]

Conclusion

- Current and former smokers presented with higher rates of medical comorbidities associated with morbidity and mortality in open TAAA repair
- Never smoking patients had the best outcomes; current and former smoking patients had worse outcomes which were comparable.
- Further analysis and studies are needed to delineate differences between current and former smokers and the role of smoking cessation
- The duration of smoking cessation and its effects on operative outcomes in TAAA repair is an area of active interest.
- Patients should be encouraged at smoking cessation upon diagnosis of a TAAA.