Smoking and TAVR

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Smoking has long been associated with early onset and rapid progression of cardiovascular disease.[1] Degenerative aortic stenosis (AS) is caused by mechanical and inflammatory factors; early in the disease it shares some similar pathological pathways to atherosclerosis where mechanical damage and endothelial injury is followed by lipid deposition, inflammatory cell infiltration, fibrosis, and calcification.[2,3] Smoking is a dose-dependent risk factor for AS and has been associated with an increased rate of its progression.[4,5] Smoking is also a cause of various comorbidities that increase the risk of treatment for aortic valve disease.

In this issue of the *Journal of the American Heart Association* (*JAHA*), Qintar and colleagues use the Society of Thoracic Surgeons/American College of Cardiology Transcatheter Valve Therapies Registry to describe differences in smokers and nonsmokers undergoing transcatheter aortic valve replacement (TAVR) for aortic stenosis (AS).[6] The results of the current analysis are important and offer new insights into this population of patients. Smokers were younger and had a higher burden of both cardiovascular and noncardiovascular disease. While they had lower Society of Thoracic Surgeons predicted risk of mortality scores, smokers had other significant factors associated with surgical risk not captured by their Society of Thoracic Surgeons score (eg, a porcelain aorta). Moreover, smokers were more likely to require alternative, nontransfemoral TAVR access, because of increased peripheral artery disease. Although in-hospital mortality was not lower in nonsmokers in the unadjusted analysis, it was lower in the adjusted analysis. Surprisingly, the higher mortality in smokers at 1 year was no longer significant once adjustments were made for baseline characteristics. The authors suggest that the younger age of smokers helps gives them a survival advantage in the periprocedural period, but in the long term this advantage is eroded by smoking's associated comorbidities.

There remains concern about the impact of smoking on the potential for accelerated valve degeneration or increased rate of hypo-attenuated leaflet thickening. Smoking has been associated with a prothrombotic state because of impairment of fibrinolysis, which may influence the rate of hypo-attenuated leaflet thickening[7]; however, there was no difference in the rate of smoking history in patients with and without hypo-attenuated leaflet thickening in 2 TAVR registries.[8] Interestingly, in the current study, there is a small increase in early postoperative gradient in smokers, despite lower preoperative baseline left ventricular ejection fraction. Longer-term echocardiographic data in smokers who continue to smoke post-TAVR will be critical to ascertain whether this modifiable risk factor leads to accelerated structural valve deterioration.

This current analysis is the largest of its type evaluating the impact of smoking and TAVR performed to date, and the results broadly support those of 2 recently published smaller series.[9,10] The concept of the "smokers' paradox" has been reported in myocardial infarction, where smokers had lower mortality rates after ST-segment–elevation myocardial infarction.[11] Though this result is mostly driven by their younger age at the time of event, other potential mechanisms included increased responsiveness of smokers to antiplatelet medications by induction of various cytochrome P450 enzymes.[12] While smoking has not led to increased mortality in surgical aortic valve replacement, it does likely contribute to increased pulmonary complications and long-term mortality.[13–15] The benefits of smoking cessation in the months before pulmonary resection, but not other types of surgery, have been demonstrated.[16,17]

There remain many outstanding questions regarding the impact of preoperative smoking on patients with severe AS. This analysis does not clarify the reason why smokers undergoing TAVR presented at a younger age. Does smoking cause an earlier presentation of AS or were smokers less likely to be accepted for surgical intervention and treated by TAVR? It is likely that both mechanisms contribute to the younger age of smokers undergoing TAVR. The current

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analysis does not report the rate of vascular complications in either group, which may be expected to be higher in smokers because of the increased proportion of patients with peripheral artery disease. There are no data as to whether smokers are less likely to have nonthoracic alternative access options, such as transcaval, subclavian, or carotid TAVR. Lastly, the importance (and efficacy) of smoking cessation strategies before and after TAVR, and their influence on long-term structural valve deterioration, remain unclear.

The Heart Team must recognize the importance of smoking as a risk factor for long-term prognosis after TAVR. The impact of smoking cessation strategies before and/or after TAVR has not been investigated, but may become more relevant once TAVR is approved for low-risk patients who are expected to live longer than the cohort of patients reported in this analysis of the Society of Thoracic Surgeons/American College of Cardiology Transcatheter Valve Therapies Registry.

Disclosures

Dr Thourani is an advisor and performs research for Abbott Vascular, Boston Scientific, Edwards Lifesciences, Gore Vascular, and Jenavalve. Dr Edelman has no disclosures to report.

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