

COPILLOT Bleedback Control Valve (Abbott Vascular, Santa Clara, California) to avoid unwanted bleeding.

In our experience, there has been decreased undesired blood loss over the years as we have learned how to best manage the hemostatic valve to minimize, but not completely eliminate, bleeding. It would be of interest to see the periprocedural bleeding trend over time in the reported pooled analysis. Potential improvement in the device delivery technology can reduce the risk of periprocedural bleeding further, and lead to improved bleeding profile of the WATCHMAN device compared with warfarin therapy.

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Pre-Disposing and Precipitating Factors in Men With Spontaneous Coronary Artery Dissection



Spontaneous coronary artery dissection (SCAD) is an infrequent but important cause of myocardial infarction (MI) in younger women. The underlying cause, presentation, and natural history of SCAD in women are increasingly being described because >90% of cases affect women. However, SCAD in men is poorly described (1). We sought to assess the pre-disposing/precipitating factors, presenting characteristics, and outcomes in men compared with women with SCAD.

Patients with nonatherosclerotic SCAD prospectively followed at Vancouver General Hospital were

included in this study. All patients provided informed consent for our SCAD registries approved by the University of British Columbia Institutional Review Board. We compared the clinical characteristics and outcomes of men versus women with SCAD.

Patient data were obtained from a combination of patient interviews, hospital records, and patient-completed questionnaires. Coronary angiograms were reviewed by 2 experienced cardiologists for SCAD diagnosis and classification as described previously (1,2). We collected baseline cardiovascular risks, medications, hospital presentations, electrocardiography changes, in-hospital events, angiographic, and noninvasive imaging characteristics. Precipitating factors before the index event were identified by history and questionnaire, and included significant emotional stress and intense physical activities (categorized into aerobic or isometric), use of hormonal therapy, or other potential precipitating stressors (e.g., retching, vomiting, straining with bowel movement, sympathomimetic drugs). Assessment of predisposing arteriopathies included screening for fibromuscular dysplasia (FMD) (catheter-angiography or noninvasive imaging of renal, iliac, and cerebrovascular arteries), and history/questionnaire screening for other etiologies. In-hospital and follow-up cardiovascular events (all-cause mortality, stroke, recurrent MI, cardiogenic shock, congestive heart failure, ventricular arrhythmia, and repeat revascularization) were recorded.

Continuous variables were summarized as mean \pm SD, and categorical variables as frequency and percentage. Comparisons between groups for categorical data were made with chi-square or Fisher exact tests, and continuous data using Student *t* test. Statistical analyses were performed with SPSS software (IBM SPSS version 23, Armonk, New York).

Among our 288 SCAD cohort, 25 were men (8.7%). Baseline characteristics are described in Table 1. Men presenting with SCAD were younger than women (48.6 ± 9.8 vs. 52.3 ± 9.2 years of age, $p = 0.05$). All presented with MI; 7 of 25 (28%) men and 73 of 263 (27.8%) women had ST-segment elevation MI. In men, multivessel SCAD was observed in 4 (16.0%), and the majority involved the left anterior descending artery or branches (16 of 25, 64.0%), and less frequently, the circumflex artery or branches (9 of 25, 36.0%), or right coronary artery or branches (2 of 25, 8.0%). These were not significantly different from women. The majority were treated conservatively, only 4 of 25 (16.0%) men and 38 of 263 (14.4%) women underwent revascularization ($p = 0.77$).

A precipitating factor preceding SCAD was reported in 72% of men, which consisted of isometric exertion in

TABLE 1 Clinical Characteristics of Men and Women With SCAD

| | Men (n = 25) | Women (n = 263) | p Value |
|-------------------------|-----------------|--------------------|---------|
| Age, yrs | 48.6 ± 9.8 | 52.3 ± 9.2 | 0.05 |
| Hypertension | 10 (40.0) | 87 (33.1) | 0.51 |
| Dyslipidemia | 6 (24.0) | 53 (20.2) | 0.61 |
| Diabetes mellitus | 1 (4.0) | 8 (3.0) | 0.56 |
| Current smoker | 5 (20.0) | 32 (12.2) | 0.34 |
| Migraines | 8 (32.0) | 100 (38.0) | 0.67 |
| Precipitating factors | | | |
| Isometric exertion | 11 (44.0) | 41 (15.6) | 0.004 |
| Lifting >50 lbs | 7 (28.0) | 15 (5.7) | <0.001 |
| Emotional stressor | 6 (24.0) | 144 (54.8) | 0.005 |
| Severe illness | 1 (4.0) | 0 | 0.09 |
| Recreational drugs | 2 (8.0) | 0 | 0.007 |
| Fibromuscular dysplasia | 12 (48.0) | 191 (72.8) | 0.01 |
| Renal | 7 (28.0) | 130 (49.3) | 0.04 |
| Iliofemoral | 5 (20.8) | 100 (38.2) | 0.08 |
| Carotid/vertebral | 3 (15.0) | 75 (34.7) | 0.10 |

Values are mean ± SD or n (%).
SCAD = spontaneous coronary artery dissection.

11 of 25 (44.0%) (7 of 25 lifted >50 lbs) and emotional stressors in 6 of 25 (24.0%). In women, there was lower frequency of isometric exertion (41 of 263, 15.6%; $p = 0.004$), but higher emotional stressors (144 of 263, 54.8%; $p = 0.005$), compared with men. Other precipitating factors in men included recreational drug use in 2, and severe illness in 1 (septic shock). In terms of predisposing arteriopathy, the incidence of FMD was lower in men (12 of 25, 48%) compared with women (191 of 263, 72.8%; $p = 0.01$). Only 4 (16.0%) men were considered to have idiopathic SCAD.

Mean duration of follow-up was 3.9 ± 3.8 years, during which 4 men had recurrent MI, and 1 died of septic shock from ulcerative colitis. There was no difference in overall cardiovascular events: 16.0% (4 of 25) in men, and 19.4% (51 of 263) in women ($p = 0.80$).

In this study, we compared the clinical characteristics, predisposing/precipitating factors, and cardiovascular outcomes of men versus women with SCAD. We observed that men with SCAD were younger, and episodes were more likely associated with isometric exercise but they had lower incidence of FMD and emotional stressors compared with women.

We previously reported a strong association between SCAD and extracoronary FMD, and postulated that the presence of coronary FMD was an important risk factor contributing to SCAD (3). Even though FMD predominantly affects women in >90% of cases (similar to the predilection of SCAD in women), we surprisingly also observed a high proportion of men with SCAD with concomitant FMD. Indeed, approximately one-half of men with SCAD have FMD, which

is much higher than the general male population (rare, estimated <0.5%) (4). This again points to the importance of elucidating the underlying etiologic link between FMD and SCAD. Proportionally fewer men with SCAD have FMD compared with women, and we suspect this is due to the other important competing risk factor of intense exercise in men.

Indeed, 44% of men reported isometric exertion preceding their SCAD. The majority of these involved lifting heavy weights >50 lb (e.g., lifting armoire, pulling tree trunk off the ground, workouts in gymnasiums). Because not all men who perform intense lifting develop SCAD, additional predisposing risks in these men are suspected that may compound the arterial shear stress induced by intense isometric exertion. Perhaps different techniques of breathing-through while lifting or avoiding “bearing-down” Valsalva-type actions may reduce arterial shear stress during such isometric activities; however, this is unproven. Aside from FMD, there could also be other predisposing arteriopathies, such as connective tissue disorders or systemic inflammatory disease, which increase susceptibility to dissections during arterial shear stress. In our cohort of men, 52% had FMD or ulcerative colitis as potential predisposing arteriopathy.

These findings may have important implications. Men who had intense isometric exercises as a precipitant for their SCAD should probably avoid such activities in the future. We advise our male SCAD patients to avoid lifting >50 lbs, although it is not proven that such avoidance will diminish the risk of recurrent SCAD. Men with SCAD should also be routinely screened for FMD. Further studies to evaluate the presence of FMD and subsequent risk of cardiovascular events are warranted.

Men with SCAD have different predisposing and precipitating factors compared with women, with approximately one-half having FMD and one-half with preceding isometric exercises. Further studies should address if changes in physical activities or the presence of FMD in men could affect future cardiovascular events.

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