The Talk Test as a Measure of Exertional Ischemia

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The simple recommendation to be able to converse comfortably during exercise, the Talk Test, has been shown to be associated with intensities within accepted guidelines for exercise training and very close to the intensity associated with the ventilatory threshold. In view of data demonstrating that the ventilatory threshold often precedes the electrocardiographic ischemic threshold (≥1 mm ST segment depression), it may be that the Talk Test is an effective way to avoid myocardial ischemia during exercise training. The authors studied 19 patients with electrocardiographic ST segment changes and hemodynamic abnormalities consistent with exertional ischemia during incremental exercise testing. The authors compared responses during exercise using the Talk Test (positive=I can still speak comfortably, equivocal=I'm not sure I can speak comfortably, negative=I can't speak comfortably) vs. the minute-by-minute electrocardiographic response to determine the first evidence of ischemia, as defined by heart rate, rate pressure product, and exercise time. Heart rate, rate pressure product, and exercise time at the last positive stage of the Talk Test (112 bpm, 17.9 bpm × mm Hg × 10^{-3}, and 2.63 minute) were significantly different than during the equivocal (123 bpm, 20.9 bpm × mm Hg × 10^{-3}, and 4.05 minute) and negative (138 bpm, 24.4 bpm × mm Hg × 10^{-3}, and 5.58 minute) stages. The responses during the equivocal stage of the Talk Test were not significantly different than those at the first evidence of ischemia (123 bpm, 20.7 bpm × mm Hg × 10^{-3}, and 4.16 minute). During the positive stage of the Talk Test, with 16 of 19 patients below the heart rate, rate pressure product, and exercise time at the first evidence of ischemia, all measures were significantly less than at the first evidence of ischemia. The authors conclude that when patients are able to speak comfortably, they are unlikely to have exertional ischemia. Exercise prescription based on the simple advice to be able to converse comfortably may contribute to the safety of exercise training.

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Patients with cardiovascular disease are encouraged to exercise as part of a therapeutic strategy that includes invasive and/or pharmacologic anti-ischemic therapy together with lifestyle and/or pharmacologic therapy to modify risk factors. As part of this strategy, exercise training has been shown to be associated with improved functional outcomes.[1–3] Individualized exercise prescription to foster these outcomes is based on the frequency, intensity, duration, and type of exercise,[4] with intensity being widely recognized as the most difficult element to prescribe.

Although exercise training is generally quite safe, complications associated with exercise occur most often during intense exercise or when the ischemic threshold is violated.[5] Since anginal

symptoms are a late feature of the ischemic cascade, it is possible for patients to be profoundly ischemic during exercise without recognizing their potential risk.[6,7] With this in mind, there is general agreement that patients with coronary artery disease should exercise below their threshold for myocardial ischemia.[4,8,9] Further, since electrocardiographic evidence of myocardial ischemia is also a late feature of the ischemic cascade,[6] the intensity of exercise is usually recommended to be at a heart rate (HR) ~10 bpm below the first electrocardiographic evidence of myocardial ischemia.[1,4]

Because HR targets for avoiding ischemia cannot always be established in patients with exertional ischemia, subjective methods may be valuable for determining appropriate exercise training intensity. One method for determining exercise intensity is the Talk Test. Exercising at the intensity associated with the Talk Test has been demonstrated to correlate with objective physiologic markers of exercise intensity. Dehart-Beverley et al.[10] demonstrated that active college-aged persons who were able to talk comfortably while exercising were below the exercise intensity associated with the ventilatory threshold. Voelker et al.[11] and Recalde et al.[12] have presented data extending Dehart-Beverley's observations to patients with clinically stable cardiovascular disease, and recreational level athletes, respectively.

Meyer et al.[13] have demonstrated that the ventilatory threshold often precedes the electrocardiographic ischemic threshold in patients with cardiovascular disease. Evidence supporting this finding is available in studies demonstrating that changes in ventricular function are associated with both ventilatory[14,15] and blood lactate[16] markers of the anaerobic threshold. Considering the above results, we speculated that if the Talk Test could function as a surrogate of the ventilatory threshold, then perhaps the Talk Test could serve as an effective strategy for favorably impacting the safety of exercise training. Accordingly, the purpose of this study was to examine the relationship between the Talk Test and electrocardiographic evidence of the threshold for myocardial ischemia in patients with cardiovascular disease.

Methods

Participants in this study came from patients referred by their personal physicians for graded exercise testing at Franciscan Skemp Healthcare (FSH)—Mayo Medical System in La Crosse, WI. The study received approval from the Institutional Review Board for the Protection of Human Subjects of the University of Wisconsin-La Crosse and of FSH. Eighty-three patients volunteered and provided informed consent. Patients underwent graded exercise testing under the supervision of an attending physician using the Bruce treadmill protocol.

Table I. Descriptive Characteristics of Study Subjects

Descriptor	Mean±SD
Age (y)	58.7±10.1
Predicted METs achieved	7.6±1.8
Percent predicted METs achieved	82.4±4.7
Maximum heart rate (bpm)	150±16.4
Percent predicted max heart rate achieved	93±10.1
Maximum ST depression (mm)	2.1±0.9
Number of leads with significant ST depression	4.7±1.9
Height (cm)	
Women	157.2±11.9
Men	174.1±12.9
Weight (kg)	
Women	77.1±14.8
Men	90.5±16.6
Body mass index (kg/m^2)	
Women	31.8±8.8
Men	29.1±4.5

MET=metabolic equivalent

Table II. Reasons for Referral

Reason	No. of Subjects	%
Chest discomfort	12	63.2
Preoperative	2	10.5
Dyspnea	2	10.5
Dizziness/syncope	2	10.5
Palpitations	1	5.3
Screening for coronary artery disease	0	0

Consistent with our previous studies,[11,12] patients were asked to recite the "Pledge of Allegiance" (a 31-word paragraph familiar to most people in America) every 2 minutes during the exercise test. After each recitation they were asked, "Can you speak comfortably?" The following three answers were possible and were recorded as such: "yes" (Positive Talk Test), "I'm not sure" (Equivocal Talk Test), or "no" (Negative Talk Test). Twelve lead electrocardiograms were recorded every minute during the exercise test. Blood pressure and HR measurements were recorded according to conventional clinical guidelines.[17] The rate-pressure product (RPP) was calculated as bpm × mm Hg × 10^{-3}. Exercise capacity was estimated based on protocol specific regression equations.[18]

Nineteen of the patients had electrocardiographic changes consistent with myocardial ischemia (≥1 mm of horizontal or downsloping ST-segment depression 0.8 milliseconds after the J-point). Each of these patients also had an abnormal (e.g.,

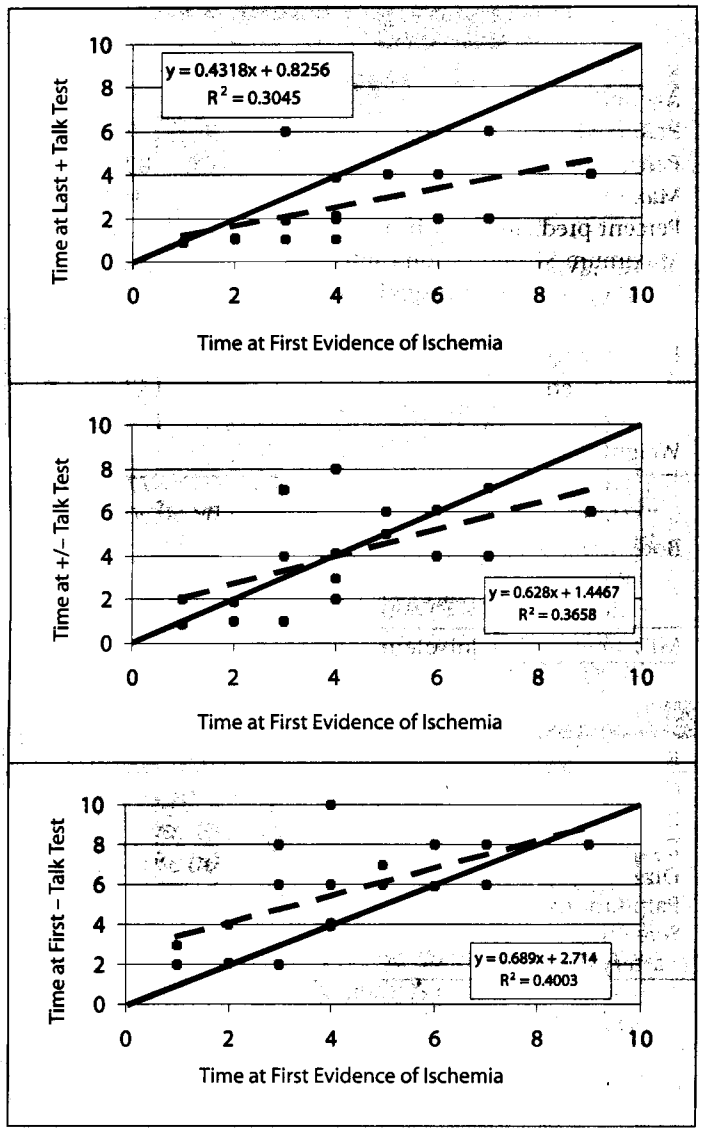

Figure 1. Scatter plot of the time during the exercise protocol at the first electrocardiographic evidence of myocardial ischemia compared with the time at the last positive (+), equivocal (+/–), and negative (–) stages of the Talk Test. Note that with three exceptions, electrocardiographic evidence of ischemia is always evident later than the last positive stage of the Talk Test.

moderate risk) score on the Duke Index,[19] and 11 of 19 additionally had either chronotropic incompetence or abnormalities (<12 bpm from peak exercise 1 minute postexercise) of HR recovery.[19] These 19 (11 men, 8 women) patients became the subjects of the study. Six of the 19 patients had objective evidence of coronary artery disease on the basis of prior documented myocardial infarction or catheterization findings. Descriptive, clinical, and medication characteristics of the subjects are presented in Tables I and II. Medical therapy was unremarkable, and the continuation or discontinuation of medical therapy was dictated by the attending physician. Their exercise electrocardiograms were reviewed by an investigator blinded to the Talk Test results, and the time at which they first began to demonstrate any ST segment depression was identified along with the corresponding HR and RPP. These values were compared with the last time the patients could still talk comfortably (Positive Talk Test), the first time they were not entirely sure about speaking (Equivocal Talk Test), and the first time that speaking was definitely not comfortable (Negative Talk Test), using the corresponding HR and RPP. When ST segment changes occurred between measurements of the Talk Test, reasonable interpolations were made to identify the first occurence. Mean values for time, HR, and RPP at the three markers of the Talk Test and at the first evidence of myocardial ischemia were analyzed using repeated measures analysis of variance with a Tukey post hoc procedure completed as justified by the analysis of variance. Statistical significance was achieved when $p \leq 0.05$.

Results

All exercise tests were accomplished without complications. The reasons for terminating exercise were: chest pain, n=6; dyspnea, n=3; and fatigue, n=10. It is important to recognize that the loss of the ability to speak comfortably is not functionally equivalent to dyspnea. Virtually every person who performs incremental exercise will eventually reach the Negative Talk Test without ever having the inappropriate breathlessness associated with dyspnea. The three patients who stopped exercise because of dyspnea had all reached the Negative Talk Test before their breathlessness led them to the termination of the test. The exercise time, HR, and RPP at the last Positive Talk Test were significantly lower than the time, HR, and RPP at the first electrocardiographic evidence of myocardial ischemia. The time, HR, and RPP at the Negative Talk Test was significantly greater than the time, HR, and RPP at the first electrocardiographic evidence of ischemia (Table III).

The relationship between the time, HR, and RPP at which the first electrocardiographic evidence of ischemia was observed and the time of the respective stages of the Talk Test are presented in Figures 1–3. Generally, there was a good relationship, with 16 of 19 subjects having a lesser time at the last positive stage of the Talk Test than at the first evidence of ischemia. This same number of subjects had lower HR and RPP at the last positive stage of the Talk Test as compared with the HR and RPP at the first evidence of ischemia.

Discussion

The results of this study suggest that when patients are able to speak comfortably, they are unlikely to have electrocardiographic evidence of myocardial ischemia. The last positive stage of the Talk Test preceded the ischemic threshold in 84% of the subjects. The last positive stage of the Talk Test was also substantially similar to the exercise intensity corresponding to an HR 10 bpm below the first electrocardiographic evidence of ischemia. If one assumes that earlier findings[10–12] showing the Talk Test to be a surrogate of the ventilatory threshold are valid, then the present data agrees with the observations of Meyer et al.,[13] who reported that the ventilatory threshold often precedes the ischemic threshold. Accordingly, the present data suggest that the Talk Test may be a useful technique for helping patients to avoid myocardial ischemia during exercise training.

Both the American College of Sports Medicine[4,9] and the American Association of Cardiovascular and Pulmonary Rehabilitation[8] recommend that exercise intensity for patients with cardiovascular disease should be above a minimal level to produce a training effect, yet below the intensity (usually defined as relative HR or relative metabolic rate) that causes abnormal signs or symptoms. However, these guidelines may have limitations for clinical populations that demonstrate exertional myocardial ischemia. Patients without recent exercise test results or on medications that alter the hemodynamic response to exercise may not be able to use normal prescriptive guidelines. The Rating of Perceived Exertion (RPE) has been shown to be highly useful in gauging exercise intensity in clinical populations.[1,4,8,9] However, to our knowledge, there are no data demonstrating a quantitative relationship between the RPE and the onset of exertional ischemia. RPEs were not included in the formal analysis of the present data, and not all patients gave RPEs during their exercise test. However, in the 15 of 19 patients who used the RPE scale, the average rating for the last positive stage of the Talk Test was 11.2, with a range of 8–13. This finding is in substantial agreement with the findings of Dehart-Beverly et al.,[10] Voelker et al.,[11] and Recalde et al.[12]

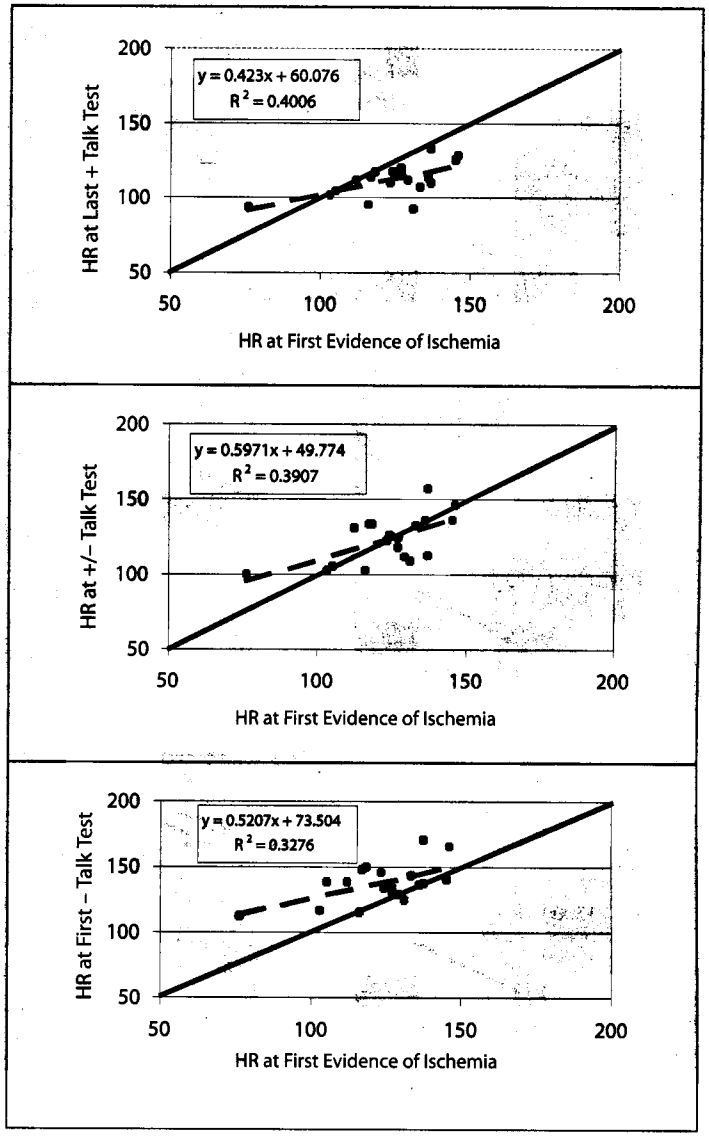

Figure 2. Scatter plot of the heart rates (HR) at the first electrocardiographic evidence of myocardial ischemia compared with the HR at the last positive (+), equivocal (+/–), and negative (–) stages of the Talk Test. Note that the HR at the last positive stage of the Talk Test is generally less than the HR at the first evidence of ischemia.

Table III. Mean ± SD for Outcome Variables

Marker	Time (min)	HR (bpm)	Rate Pressure Product
TT+	2.63±1.67	112.2±11.1	17.9±3.5
TT+/–	4.05±2.18	123.4±15.9	20.9±4.4
TT–	5.58±2.34	137.7±15.1	24.4±4.2
Ischemia	4.16±2.14	123.3±16.7	20.7±4.1
Ischemia–10 bpm	3.21±1.75	113.3±16.6	19.0±4.3

HR=heart rate; TT+=Positive Talk Test; TT+/–=Equivocal Talk Test; TT–=Negative Talk Test

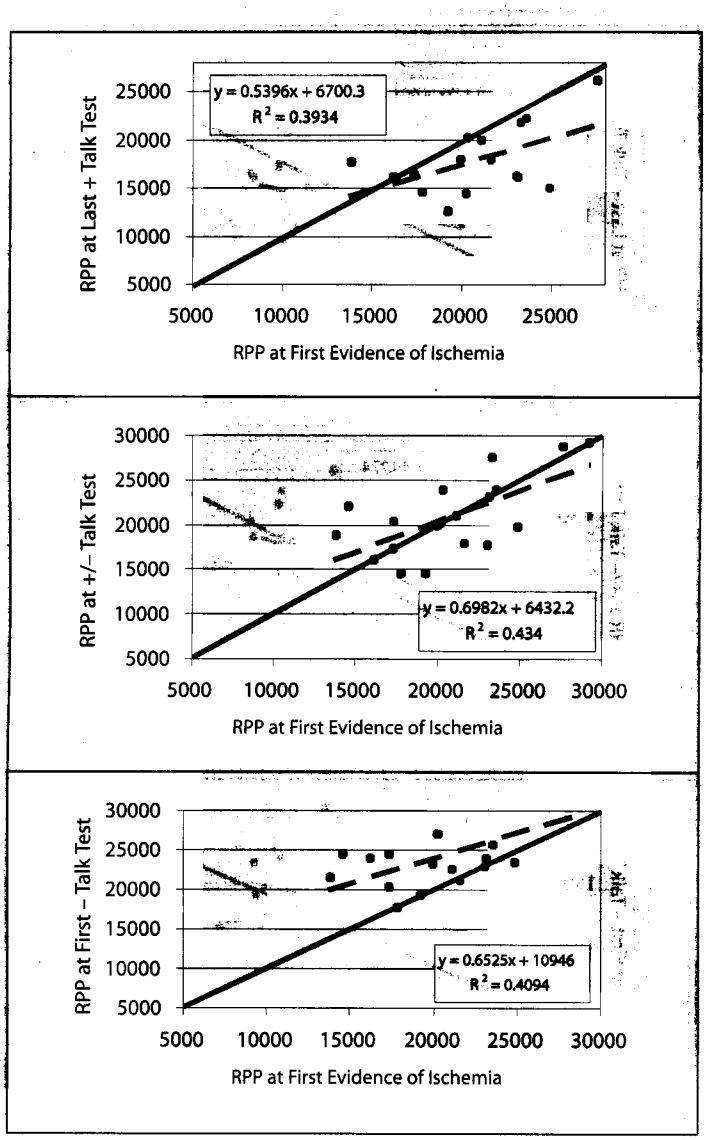

Figure 3. Scatter plot of the rate pressure product (RPP) at the first electrocardiographic evidence of ischemia and the RPP at the last positive (+), equivocal (+/–), and negative (–) stages of the Talk Test. Note that the RPP at the last positive stage of the Talk Test is generally less than the RPP at the first evidence of ischemia.

We do not have myocardial perfusion data that would demonstrate whether the electrocardiographic changes observed in this patient group are representative of exertional ischemia, nor do we have catheterization data in all patients. However, considering the clinical history and presentation of the patients, the clinically acceptable sensitivity and specificity of electrocardiographic exercise testing,[17] and the presence of other exercise testing abnormalities associated with ischemic cardiovascular disease,[19] we have interpreted our results as if the electrocardiographic changes are valid. Clearly, replication of the results in a larger sample and with the addition of myocardial perfusion imaging would be desirable. Considering the limited number of subjects in this series, this study is, at best, a pilot study. Nevertheless, the implications of the present results are that the ability to talk comfortably during exercise training may be a simple and effective strategy to avoid the risk of exercising with myocardial ischemia. To the degree that this may favorably impact the safety of exercise programs,[5] this certainly deserves further study. ■

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