TECH TIPS

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TECHNICALLY SPEAKING

EDUCATIONAL TOPICS FOR NUCLEAR TECHNOLOGISTS AND NURSES

Duke Treadmill Score and Patient Selection for MPI

EXERCISE TESTING AND THE DUKE TREADMILL SCORE

Most cardiac patients without previous revascularization and with a normal or near-normal resting electrocardiogram (ECG), who are able to exercise adequately, should generally be referred for a standard exercise treadmill test for further evaluation.[1] The Duke Treadmill Score (DTS) is the currently accepted standard for risk stratification on treadmill testing.[2-7] Approximately 50% of patients fall into the intermediate-risk DTS category,[8,9] and they can benefit from additional testing, such as myocardial perfusion imaging (MPI).[6,7,10-12]

Originally developed as a prognostic score, the DTS was later validated for diagnostic purposes.[8] The DTS is derived by taking into account 3 independent variables, including the amount of time that the patient exercises on the treadmill (in minutes), the maximum deviation in ST segment during exercise, and the angina index score during exercise. Table 1 shows the equation in which these variables are used to generate the DTS as well as the risk stratification scheme used for prognosis and diagnosis based on the DTS.

PROGNOSTIC ACCURACY

The DTS has proven to be a valid tool in determining prognosis in patients with suspected coronary artery disease (CAD) and helping clinicians decide whether to refer patients for further evaluation or intervention.[2,3] In a sample of 2842 chest pain patients, DTS added independent prognostic information to the assessment of clinical data, coronary anatomy, and left ventricular ejection fraction.[2] In a study of 613 outpatients with suspected CAD, DTS-predicted outcomes agreed closely with the subsequent observed outcomes.[3] The treadmill score was a better discriminator than the clinical data and was even more useful for outpatients than it had been for inpatients.[2] The score accurately separated patients who subsequently died from those who lived for 4 years.[2]

DIAGNOSTIC ACCURACY

The DTS is also a useful tool for risk stratification of important diagnostic patient subsets. In a sample of 3225 symptomatic patients, 60% of those identified by the DTS as low risk had no CAD, and 16% had single-vessel disease.[8] Of the patients identified as high risk by the DTS, 83% had more extensive disease. Only 0.4% of patients identified as high risk by DTS did not have a significant coronary lesion.[8] Five-year mortality was 3%, 10%, and 35% for patients stratified as low, moderate, and high risk, respectively, by DTS. These results show DTS to be effectively diagnostic for significant and severe CAD ($P < .0001$).[8]

TABLE 1. DUKE TREADMILL SCORE: EQUATION AND RISK STRATIFICATION [4,5]

EQUATION

DTS = exercise time* – (5 × max ST deviation in mm) – (4 × treadmill angina index†)

RISK STRATIFICATION

DTS	Risk
< -10	High (79% 4-year survival)
-10 to +4	Moderate (95% 4-year survival)
≥ +5	Low (99% 4-year survival)

*In minutes on the Bruce protocol.
†No angina during exercise = 0; nonlimiting angina = 1; stopped exercise due to angina = 2.[13]

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CLINICAL APPLICATION

The strongest predictive value of the DTS is in patients classified as high or low risk. Those identified by DTS as low risk have an excellent prognosis, and further evaluation is generally unnecessary.[1,9] Patients stratified as high risk have a poor prognosis, and further stratification would be of no value.[1,9] These patients should be referred for coronary angiography.[1]

However, approximately half of patients assessed with treadmill testing are classified by the DTS as having intermediate risk,[8,9] and management of these patients is more problematic.[1] MPI can be of clinical value in further risk stratification of patients with intermediate risk by DTS.[6,7,10-12]

DTS appears to have lower predictive value in elderly patients.[14] In a study population aged 75 years and older, DTS classified 68% of patients as having intermediate risk.[14] The group who was identified as low risk (26% of patients) still had an annual cardiac mortality rate of 2%.[14]

CONCLUSION

The DTS provides accurate diagnostic and prognostic information for the evaluation of symptomatic patients with clinically suspected ischemic heart disease.[8] It provides clear decision-making information in patients identified as having low or high risk. Patients with intermediate risk, however, should be referred for further testing, such as MPI. An increasing proportion of patients referred for MPI are unable to exercise adequately, making them candidates for pharmacologic stress.[15]

References

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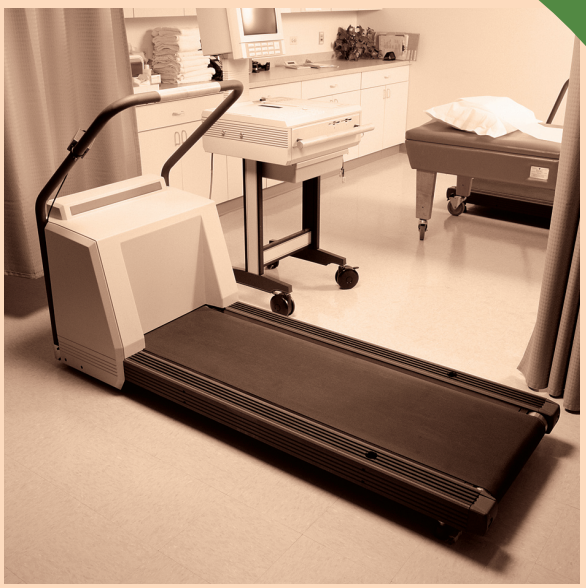

Patients with intermediate risk … should be referred for further testing ….

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