THE AMERICAN HEART ASSOCIATION (AHA) and American Association of Critical-Care Nurses (AACN) recommend using continuous ST-segment monitoring in certain adult patient populations, but this type of monitoring for silent myocardial ischemia is widely underused.1,2 This article describes this potentially lifesaving measure and what you need to know about it.

Which patients should be monitored?
The AHA practice standards divide patients into three classes: Class I for conditions in which continuous ST-segment monitoring is indicated in most, if not all, patients; Class II for conditions that may benefit from monitoring; and Class III for conditions in which ST-segment monitoring has no benefit.1

Class I
Continuous ST-segment monitoring is indicated in these cases:

• Patients in the early period of acute coronary syndrome (ACS), including myocardial infarction (MI) with and without ST-segment elevation, unstable angina, and patients in whom MI is being ruled out. The patient should have ST-segment monitoring for at least 24 hours, and monitoring should be continued until patients are event-free for 12 to 24 hours.
• Patients who come to the ED with chest pain or anginal-equivalent symptoms. This group may benefit from ST-segment monitoring for 8 to 12 hours in conjunction with evaluation of serum cardiac biomarkers. Using ST-segment monitoring here can produce significant cost savings because fewer “rule out MI” patients would be admitted to the hospital unnecessarily.
• Patients who’ve had nonurgent percutaneous coronary intervention (PCI) and who are experiencing procedural complications such as vessel dissection or thrombosis. ST-segment monitoring for these patients should begin immediately after their procedure and continue for 24 hours; longer if ST-segment events arise.
• Patients with possible variant angina due to coronary vasospasm. These patients should have ST-segment monitoring until drug therapy has been initiated and they’re ST-segment event-free for 12 to 24 hours.

Class II
Continuous ST-segment monitoring may be beneficial but isn’t considered critical for these patients.1

• Post-acute MI patients who may have recurrent anginal symptoms or infarct extension. ST-segment monitoring should continue for these patients until they’ve been event-free for 24 hours.
• Patients who’ve had nonurgent, uncomplicated PCI. ST-segment monitoring can be started immediately after PCI and continue for 4 to 8 hours as a means to differentiate between cardiac and noncardiac chest pain.
• Postoperative surgical patients, especially older adults with cardiac risk factors. The AHA guideline supports ST-segment monitoring in emergent major operations, significant vascular surgeries, prolonged surgical procedures with considerable fluid shifts or blood loss, and with patients being weaned from mechanical ventilation. In these high-risk patients, intraoperative and

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postoperative ST-segment monitoring for 24 to 48 hours should be contemplated.

Class III
For these patients, ST-segment monitoring isn’t recommended because of the low incidence of events.¹

- Patients with left bundle-branch block, ventricular paced rhythm, and patients experiencing dysrhythmias that affect the ST segment. These conditions distort ST-segment morphology and can trigger false alarms.

  - Agitated patients because of the frequent false alarms for ST changes that result from artifact.

Preparing your patient
Before starting ST-segment monitoring, prepare your patient’s skin. Clip excessive hair before electrode placement. Clean the skin, dry it, and gently abrade it with a dry washcloth to remove any oils or debris.² Use an indelible skin marker to mark the skin electrode locations on the patient; if electrodes are removed, they can be replaced in their original position so that no ST-segment changes occur because of electrode relocation. Check the conductive gel on each electrode for sufficient moisture before applying the electrode.

The AACN recommends placing the right arm electrode in the infraclavicular fossa close to the right shoulder, the left arm electrode in the infraclavicular fossa close to the left shoulder, and the left leg electrode below the rib cage on the left side of the abdomen. The ground or reference electrode can be placed anywhere, but usually is placed on the right side of the abdomen. Precordial lead placement is based on the patient’s needs, for example, V₃ is recommended for identifying demand-related ischemia in noncardiac patients undergoing surgical procedures or admitted to the ICU. The patient should be in the supine position because position changes can change the heart’s position relative to the monitoring electrodes.¹ If an alarm sounds and the patient is found in a side-lying position, return the patient to the supine position and check if the ST-segment deviation persists in the supine position.

Which leads to monitor?
Ideally, if 12-lead ECG is available, ST-segment monitoring should be performed using all 12 leads.² If 12-lead ECG isn’t available, ST-segment monitoring lead selection is based on an assessment of the patient’s ischemic risk. Selecting a patient’s most sensitive monitoring lead or leads, known as the ST fingerprint, is based on a thorough analysis of the first hospital ECG, before any reperfusion therapy has been initiated.³

The ST fingerprint depicts the maximum ST-segment deviation from the isoelectric baseline during an acute ischemic event. The ST fingerprint pattern is distinctive, correlates with the location and extent of each patient’s coronary artery disease, and should be used as the lead to monitor successive ischemic events.³

Use these leads for these types of patients:

- For PCI patients, the ECG recorded during catheter balloon inflation should denote the ST fingerprint.³
- If the ST fingerprint is unknown with patients in ACS or suspected ACS, use leads III and V₃.²

Getting the point
The J point identifies the patient’s ST-segment baseline. The waveform at left shows ST-segment depression; ST-segment elevation is shown at right.
• For noncardiac surgical patients and noncardiac patients admitted to intensive care, use lead V5.2.

Document the actual millimeters of ST-segment depression or elevation in relation to the isoelectric baseline (preferably measured from the T-P segment of the ECG lead tracing). The J point, where the QRS complex ends, reveals the patient’s ST-segment baseline. Measure the ST segment 0.6 second after the J point. ST elevation or depression of 1 to 2 mm lasting for at least 1 minute can be clinically significant and indicates that additional patient assessment is needed.2

Set the individual ST-segment alarm parameters 1 mm above and 1 mm below the patient’s baseline ST-segment measurement for patients at high risk of ischemia, and 2 mm above and below the baseline for more stable patients.1

See Getting the point for a normal ST segment with reference points and examples of ST-segment elevation and depression.

Call to action
You can champion best-practice initiatives such as continuous ST-segment monitoring through the creation of interdisciplinary teams that:
• use clinical case studies as educational tools that promote current monitoring standards and early ischemic intervention
• evaluate monitoring software and equipment capabilities, limitations, costs, and training needs
• determine hospital-based needs for maximum monitoring benefits aimed at reducing patients’ risk for ischemic events
• assess current and posteducational competency of staff in evaluating ST-segment deviation.

By understanding ST-segment monitoring and when it should be used, you may be able to help reduce patient risks and healthcare costs. ■

References

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