Coronary heart disease (CHD) continues to be a leading cause of morbidity and mortality among adults. Patients with chest pain suggestive of acute coronary syndrome (ACS), constitute a heterogeneous group concerning both diagnosis and future risk of cardiac events. Routine 12-15 lead electrocardiogram (ECG) is an essential diagnostic tool for these patients, but aside from ST elevation acute myocardial infarction (STEMI), many have non-diagnostic patterns. Early risk stratification is essential for further treatment and management, usually based on integration of clinical characteristics, ECG and biochemical markers.

The original indication of continuous ECG monitoring for detection of ischemia and dysrhythmia in patients with coronary artery disease is still valid. Early detection with proper management can prevent damage to the myocardium, which is of utmost clinical importance. Presence of ischemic episodes during continuous ST-segment monitoring has been related to worse outcome.

Current use of long-term ECG monitoring is reasonably useful for rate assessment and dysrhythmia detection. However, for ischemia detection and for accurate interpretation of any arrhythmia, full 12-15 lead ECG is preferable and yields much better results.

The Holter technique, which is commonly used for detection of dysrhythmia in out-patients, is an offline method. This obviously limits its clinical benefit, since results cannot be provided until several hours or even days after the dysrhythmic or ischemic episodes. Moreover, both Holter, as well as the on-line basic telemetric monitoring, are based on utilizing no more than 3 channels (4 leads). Newer attempts to use ST automated trending devices have, thus, yielded only moderate sensitivity and specificity (<75% overall) in detecting ECG ST-segment changes.

Recently, novel technologies have been introduced, providing on-line ST-segment monitoring, with continuous 12-lead ECG. However, aside from dysrhythmia, only limited data are available concerning ischemia in patients with ACS.

Jernberg et al. found that, indeed, continuous 12-lead ECG monitoring during the first 6 to 9 h after admission to ICCU, provides useful prognostic information on-line with useful early risk stratification. Thus, early identification of higher risk patients obviously requires more intensive treatment, whereas lower risk patients may benefit from a more conservative approach, with rapid transfer to intermediate care and for early discharge.

For documentation and interpretation of dysrhythmia, the standard Holter technique may be sufficient. However, modern use of effective invasive treatment (ablation), and current use of Implantable Cardioverter Defibrillator (ICD) for numerous arrhythmic conditions, requires much better definition and accuracy, which cannot be achieved with limited 3 channel recordings.

Thus, 12 lead recording is needed for accurate programming of catheter ablation, for patients with supraventricular tachycardia. Same is for patients with premature beats, who may develop reduced heart function, where treatment may be even lifesaving. Accurate location of the origin of these beats is possible only by the 12 leads recording. Moreover, patients with frequent episodes of ventricular fibrillation (VF) may be relatively protected with ICD. Yet, if they require frequent shocks, they become candidates for ablation of the trigger, which requires 12 lead ECG.

During the last years, detection of intermittent Brugada ECG pattern (prone to VF and sudden death, but can be protected with ICD or ablation) became possible only using multi-channel recording. Twelve lead recording was also used to measure QT dispersion, and correct definition of long QT, which are related to life-threatening arrhythmias. Premature beats morphology, as defined by 12 lead ECG, is related to severity of myocardial involvement. Follow up of patients with permanent atrial fibrillation, using 12 lead ECG monitoring, may identify non-responders after cardiac resynchronization therapy.

Thus, continuous full 12-15 lead ECG monitoring is superior to standard 3 channel telemetry or Holter monitoring, and provides important diagnostic and prognostic information with major clinical impact.

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References


