

## HEART MONITOR TREADMILL 12 LEAD EKG

### Holter Monitor Electrocardiography

- Portable ambulatory monitoring system
- Continuously records electrical activity of the heart for 24 hours or more
- Also known as ambulatory electrocardiographic monitor (AEM)
- <http://www.youtube.com/watch?v=zjrB0ndJRQY>

### Holter Monitor Electrocardiography

- Detects cardiac abnormalities
  - That occur while patient is engaged in normal daily routine
- Holter system designed so that
  - Patient is able to maintain daily activities
    - With minimal inconveniences

### Holter Monitor Electrocardiography

- Similar to a resting 12-lead ECG
  - Electrical impulses given off by heart are picked up by electrodes
    - Transmitted through lead wires to a recording device
  - Different than a resting 12-lead ECG
    - Only about 10 seconds of heart's activity are recorded with a 12-lead ECG

### Purpose

- Used to diagnose cardiac rate, rhythm, and conduction abnormalities.
- Most frequently used to:
  - Assess the rate and rhythm of the heart during daily activities
  - Evaluate patients with unexplained chest pain, dizziness, or syncope (fainting)

### Purpose

- Most frequently used to:
  - Discover intermittent cardiac dysrhythmias not picked up on a routine resting 12-lead ECG
    - Resting ECG: only records between 40 and 50 heartbeats
    - Holter monitor: records approximately 100,000 heartbeats in a 24-hour period
  - Detect myocardial ischemia
  - Assess the effectiveness of antidysrhythmic medications
    - Examples: digitalis and antianginal medications
  - Assess the effectiveness of a pacemaker

## Digital Holter Monitor

- To document heart's activity, uses either:
  - External (removable) memory card
  - Internal (nonremovable) memory card

## Digital Holter Monitor

- Lightweight and battery-powered
- Can be:
  - Clipped onto a belt around waist
  - Held in a protective pouch
    - Hung around patient's neck with a lanyard

## Digital Holter Monitor

- Continuously records electrical activity of heart:
  - For 24 hours, 48 hours, or 72 hours
    - Most physicians order a 24-hour recording
  - Stores it on the memory card
- Automatically stops recording after monitoring period is completed

## Patient Preparation

- Take a shower or bath before coming to the medical office
  - Will not be able to shower or bathe again until monitor is removed
- Do not apply body lotion, oil, or powder to chest before or during the test
  - May make it more difficult to apply electrodes

## Patient Preparation

- Take usual medications (unless physician specifies otherwise)
- Wear loose, comfortable clothing
  - Example: shirt or blouse that buttons down front for easier application of electrodes

## Electrode Placement

- Holter monitor electrodes
  - Pick up electrical impulses given off by heart
  - Consist of foam
  - Are round or rectangular in shape
  - Adhesive backing
  - Central sponge pad
  - Disposable

## Electrode Placement

- Newer Holter monitors are three-channel recording systems
  - Can record three leads at one time
- Use between four and seven electrodes (depending on brand of monitor)
- Check monitor's effectiveness after hooking up patient

## Patient Diary

- All activities and emotional states must be documented
  - Along with time of occurrence
- Physical symptoms experienced during activity
  - Must be indicated next to each activity
- Dysrhythmia or abnormal ECG change recorded by Holter compared with diary
  - To determine if an activity, emotional state, or symptom triggered the ECG abnormality

## Event Marker

- Some Holter monitors have an *event marker* button
  - Used along with patient diary for evaluation
- When event marker button is pressed
  - Beep may sound as audible feedback
- Patient should be instructed to:
  - Depress the button momentarily when experiencing a symptom
  - Record time and nature of symptom in the diary

## Holter Monitor Patient Guidelines

- Participate in normal everyday activities
- Do not shower, bathe, or swim while wearing monitor
- Check periodically to make sure monitor indicator light is on and electrode and lead wires are still attached to chest
- Do not touch or move electrodes or lead wires
- If a lead wire detaches, snap it back on ASAP and record in patient diary

## Holter Monitor Patient Guidelines

- If electrode becomes loose, apply tape to restore contact and record in patient diary
- Do not handle monitor or take it out of its pouch
- Do not use certain electric or magnetic appliances or objects
- Record activities and emotional states
- Record physical symptoms experienced during each activity

## Evaluating Results

- At end of monitoring period
  - Holter monitor removed from patient
- Memory card information uploaded to computer
- Specialized ECG software:
  - Performs calculations on the data
  - Prepares an ECG summary report
    - Displayed on screen of the computer

## Evaluating Results

- **Computer-generated ECG report**
  - Summarizes information about:
    - Patient's heart rate and rhythm
    - Any abnormalities that occurred during the monitoring period
  - Includes selected samples of patient's cardiac activity:
    - Patient event-strips
    - Any abnormal cardiac activity (e.g., dysrhythmias)
  - Results reviewed and interpreted further by physician

## Maintenance of the Holter Monitor

- At end of recording period:
  - Remove battery from monitor and discard
- Clean casing of monitor frequently
  - Using a soft cloth moistened with a mild disinfectant
  - Avoid use of commercial solvents and abrasives

## Maintenance of the Holter Monitor

- Clean patient cable and lead wires periodically
  - Using a cloth moistened with a mild disinfectant
  - Never immerse in cleaning solution
  - Clean snap of each lead wire
  - Store monitor in a dry, dust-free area

## Treadmill Stress Study

- Study to evaluate Coronary artery disease
- Study to evaluate functional capacity
- Study to evaluate arrhythmias
- <http://www.youtube.com/watch?v=PXay0q1kJVw>

## Treadmill Stress Study

- Heart rate and blood pressure are recorded at the rest, during the exercise, and during recovery period
- Place 12 lead EKG monitor
- Start preprogram protocol (Bruce protocol 2 or 3 mins)
- EKG is constantly displayed on the monitor
- The study is stopped when the pt achieves a target heart rate which is 85% of the max heart rate predicted for the pt's age or pt may continue further or if the pt develops chest discomfort, SOB, EKG changes and serious irregular arrhythmias.
- The study may stopped if the bp is too high or shows significant systolic and diastolic changes.

## Treadmill Stress Study

- Preparation for the study:
  - Not to eat or drink for three hrs prior to the study
  - Stop beta blocker 24 hrs prior to the study
  - Wear comfortable clothing and shoes
  - Sign a consent form
  - Takes about total 20 mins for the study

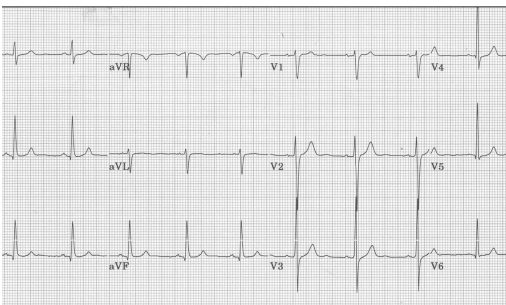
### Treadmill Stress Study

- Low risk of the study
- Supervise the study with the license health professional

### Treadmill Stress Study

- Reliability:
  - 70-80% reliable
  - About 10% of pts have a false positive
  - Result is provide after the study by the provider
  - Positive study is followed by the stress echocardiogram, nuclear study, or angiogram

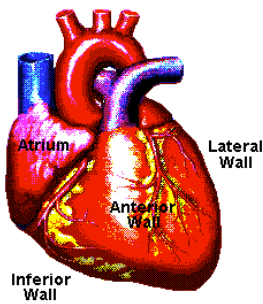
### 12 Lead ECG



### 12 Lead ECG

- Lead II, III, and aVF: inferior wall of the left ventricle
- Lead I, aVL: lateral wall of the left ventricle
- Lead V5 and V6: lateral wall of the left ventricle
- Lead V1 and V2: septal wall
- Lead V3 and V4: anterior wall of the left ventricle

### Location of the heart



### Lateral anterior heart attack

