History

• Developed in late 1950’s as a result of research of Dr Norman Holter
TYPES

- Holter - continuous recording.
- Event recorder- patient activated.
  - loop / non loop
- Implantable loop recorders.
ANALYSIS.

• Event recordings
  – short duration
  – automated unnecessary

• Holter
  – templates with manual editing
  – time series with manual adjustments
STORAGE DATA

• Analogue - on magnetic tapes
  – Disadvantage: tape and capstan speed fluctuation

• Digital - on solid memory cards
INDICATIONS

- Investigation symptoms
- CAD therapy
- Investigation known arrhythmias and arrhythmogenic conditions
- post open heart surgery
- Evaluation therapy
- Research
CORRELATE ECG FINDINGS WITH SYMPTOMS
ARRHYTHMIAS CAUSE DIFFERENT SYMPTOMS

- Palpitations
- Dizziness LOC
  - Hypotension and poor cerebral flow
- Chest pain
  - Poor coronary flow
PALPITATIONS

- Most frequent cardiac symptom
- 40% due to arrhythmia
- Daily occurrence
  - 24 or 48 hour holter
PALPITATIONS - ASSOCIATED RHYTHMS

- Sinus tachycardia
- Atrial tachycardias
- Reentrant tachycardias
  - AVNRT, AVRT
- Ventricular tachycardia
- Ectopic beats
SYNCOPE

• Holter
  – low diagnostic rate
• large range of causes
  – List as many causes as possible?
• Infrequent symptoms
CAD THERAPY

• ST analysis
  – facilitate treatment
  – show silent ischaemia
INVESTIGATION OF KNOWN ARRHYTHMIAS AND ARRHYTHMOGENIC CONDITIONS

- Cardiomyopathies
- WPW syndrome
- Prolonged Q-T syndrome
- Intermittent conduction defects
- Abnormal resting ECG’s
- VE’s - risk stratification
POST OPEN HEART SURGERY

- To exclude conduction system damage
- To assess post op chest pain
EVALUATION THERAPY

- Antiarrhythmic drugs
- Antianginal drugs
- AF rate control
  - to assess baseline daytime rate and exercise response
- Pacemakers
  - to document functions and malfunctions
  - to evaluate underlying rhythm
  - to evaluate symptoms
RESEARCH

- Identification of sudden death at risk groups
- Evaluation of new drugs
- RR variability
PAEDIATRIC INDICATIONS

- Any rhythm abnormality
- WPW
- Non specific chest pain and palpitations
- Post open heart surgery
- Familial cot deaths
- Assessment treatment drugs
- Familial Conditions
  - Long Q-T syndrome
RANGE OF NORMALITY - GENERALLY ACCEPTED AS NORMAL

- Sinus arrhythmia
- SVE’s
- Incomplete RBBB
- High Take off ST segment
- T wave inversion in lead III but not in aVF
- T wave inversion in aVR and V1
RANGE OF NORMALITY - NOT NECESSARILY INDICATIVE OF HEART DISEASE

• VE’s
• RBBB
• T wave inversion in other leads
• Non-specific ST changes
RANGE OF NORMALITY - NOCTURNAL OR DURING SLEEP, IN ATHLETES OR FIT YOUNG PEOPLE.

- Wenckebach
- Sinus bradycardia
- Sinus arrest
- Sinus node exit block
AMBULATORY MONITORING - PATIENT PREPARATION

• Accuracy of analysis depends upon quality of data recorded
• Good preparation and patient instruction are paramount
• Good electrical contact must be obtained and secured
SKIN PREPARATION

- Determines the conductivity at electrode and skin contact point
- Reduces amount artefact and lost data
SKIN PREPARATION

- To make area clean and dry
- Shave all body hair in area
- Use abrasive material to remove layer of dead skin cells, without causing irritation or bleeding
- Wipe with alcohol to remove dead skin and skin oils
- Dry area with gauze pad
ELECTRODE ATTACHMENT, AND SECURING

• Attach lead wires to electrodes
• Place electrodes in position
• Secure by pressing around the OUTER adhesive edge
• **DO NOT** press wet gel electrodes over gelled area to cause gel expulsion under adhesive
ELECTRODE PLACEMENT - to obtain most significant data.

- Precordial modified leads - bipolar

- Modified V1
  - identification of origin of ventricular ectopic activity
  - easier SVE with aberration vs. VE identification
  - more visible for FL waves
• Modified V5
  – displays identifiable P waves and large QRS deflections
  – mainly see lateral ST changes

• Modified V3
  – LAD associated
  – ST changes

• Seven lead cable
  – identification localise areas of ischaemic episodes, including silent ischaemia
E.C.G. SIGNAL TEST

• To check quality of ECG signal and recorder performance

• Check calibration
  – 1mv=10mm

• Check signal
  – R wave amplitude MUST BE >9mm V5 and >4mm V1
  – to increase amplitude - reposition electrodes closer to sternum

• Eliminate artefact as will intensify during recording
  – Re-prepare or re-position electrodes
HOOK UP COMPLETION

- Secure electrodes with tape to maintain electrical contact
- Stress loops should be one to two inches diameter, and two inches from the electrode
PATIENT DIARY AND INSTRUCTION

• Patient co-operation with documentation of symptoms, events and activities is very important
DEFINITIONS

• **Wet Gel electrodes**
  – gel that is semi liquid at room temperature

• **Dry Gel electrodes**
  – gel that is usually solid at room temperature