

Electrocardiogram (ECG)

No: 004D

1. Introduction

The electrocardiogram provides a baseline reading which shows the electrical alterations within the intracellular potential of myocardial cells. This facilitates the diagnosis of underlying ischaemic heart disease and offers a baseline for hypertensive subjects for which later readings can be compared. The ECG of hypertensive subjects can, for example, indicate the need for good blood pressure control and, where certain wave formations reveal left ventricular hypertrophy, it may suggest that there is organ damage. It is therefore vital that the technique be performed efficiently by competent individuals, so accurate analysis can be performed.

2. Responsibilities

Physicians and research nurses trained in the method are responsible for recording electrocardiograms from all subjects.

3. Equipment

- 12 lead ECG electrocardiograph (Siemens -Sicard 440)
- Biotabs
- Alcohol impregnated wipes
- Razor and sharps bin
- Pillows x 2
- Couch

4. Method

Preparation of subject

- Explain the procedure to the subject, ensuring that it is pitched at their level of understanding. Too much or little information may cause unnecessary anxiety and should be avoided if possible. Be sure to explain that the procedure is painless.
- Instruct the subject to position themselves on the couch. They should have their upper torso lying at an angle of about 45°, with their head supported by two pillows. Their arms should lie parallel to their body and their legs should be extended.
- Try to get the subject to relax. They should have been settled for approximately 5 minutes prior to commencing the reading.
- Chaperones may be required for males recording female ECG's. Ensure subject privacy at all times.

Preparation of equipment

- Ensure that the ECG machine has been suitably charged or plugged into the mains supply. Switch it on (off is marked O) using the black switch on the back left hand panel. Press the ON/OFF button on the top left hand side of the monitor. The visual viewfinder will display "self test in progress" and then proceed to display "self test ok."
- Check all 12 leads are present and functioning, either by recording a rhythm strip or ensuring that the "leads unavailable" message is not present.
- Ensure that a fresh box of Biotabs and alcohol impregnated wipes are at hand.

Recording patient details

- Look in the bracketed box < >, to show how many recordings have been stored in the memory; the number shows how much space is remaining. It is always advisable to ensure that there are more than 10 spaces remaining before storing a further recording. This ensures that a recording previously stored is not lost.
- The buttons needed to programme the subject's details are button 1 (left hand side) and the general keyboard figures for letters and numbers.
- Press button 1. Enter the letters GH (this is needed for the interpretation of the transmitted ECG recordings, it enables the data to be recognised as Genetics of Hypertension results). The subject's unique ID number should then be entered. This should read LN (representing study area-for analysis purposes) 00001 (5 numbers representing family ID) 000 (3 numbers representing subject position number).

For example, an ID which appears as:- GHLN00001001 suggests LN = London research centre, 00001 = Family ID 1, 001 subject position in family (1=mother / 2=father 3=siblings).

- The following sequence should then be strictly adhered to, to enter individual subject details:- (Use the down arrow (top right hand side) and menu button.)

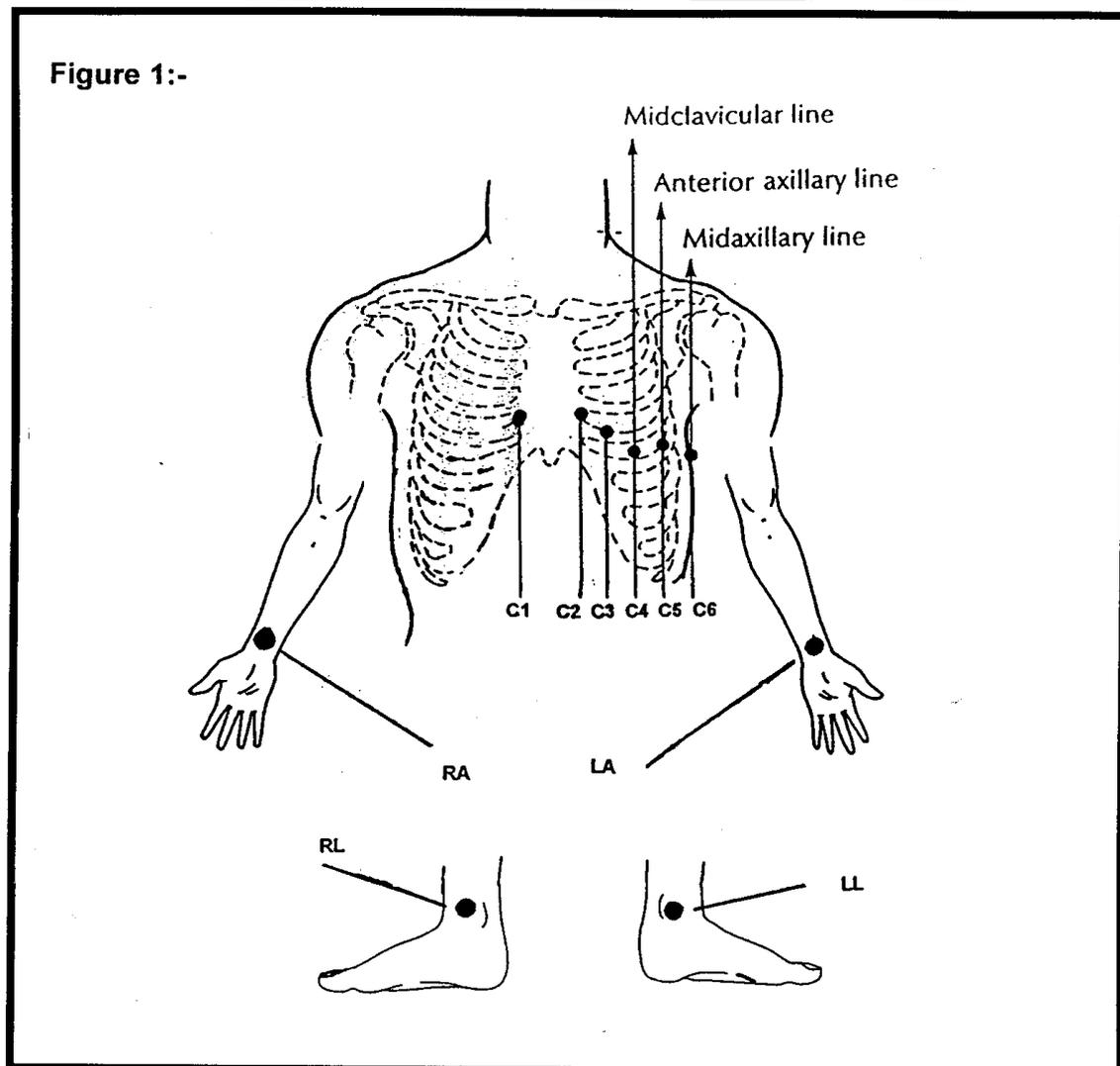
Press the down arrow -	enter subject's last name
Press the down arrow -	enter subject's first name
Press the down arrow -	enter subject's age
Press the down arrow -	press the right arrow and select male or female
Press the down arrow -	press the right arrow, select drug therapy (If required 2 can be selected)
Press the down arrow -	press the right arrow, select clinical class (all should either be No 01 normal or No 04 hypertensive)
Press the down arrow -	press the right arrow, enter your research ID initials
Press the down arrow -	press the right arrow, ignore REQBY
Press the down arrow -	press the right arrow, enter location (GP practice code)

For details that need to be altered, use the arrow to relocate the data and then type over the previous information with the changes.

Applying the leads

- Instruct the subject to remove clothing from the upper body and to relax as much as possible on the couch. Instruct ladies to remove their tights.
- Clean the skin with the alcohol wipes prior to placing the Biotabs. Allow the alcohol to air dry to ensure a good contact.
- It may be necessary to shave away some body hair from the chest where the Biotabs do not sit securely. This is obviously done as needed and with the subject's consent to do so. Biotabs which do not sit securely on the skin do not give very clear readings.
- Place the 10 Biotabs on the limbs and chest positions as illustrated in figure 1:-

figure 1



Ideal positions for limb and chest leads	
RL	Right leg, inner ankle (black lead)
LL	Left leg, inner ankle (green lead)
RA	Right arm, inside wrist (red lead)
LA	Left arm, inside wrist (yellow lead)
C1	Fourth intercostal space, at right sternal edge
C2	Fourth intercostal space, at left sternal edge
C3	Midway between C2 and C4 on left side
C4	Fifth intercostal space at midclavicular line on left side
C5	Same level as C4 on anterior axillary line on left side
C6	Same level as C4 on midaxillary line on left side

It is vital that the chest leads are positioned accurately and limb leads are placed in the correct places. Failure to do this will give rise to unusual ECG data and possibly inaccurate interpretation of results.

- Arm Biotabs should be attached to the subject's inner wrists and the subject should be instructed to have their arms parallel to their body during the procedure.
- After all the Biotabs are in-situ, attach the ECG leads using the appropriate colour coded chart. Instruct the subject to relax and lie still as much as possible. They should be reminded to breath normally throughout the procedure and should not talk during the 10 second recording.
- Start the recording by pressing button 2 (Auto). Wait for the reading and assess the data recorded. If the quality of the recording is acceptable, press button 4 - this saves the reading. If the quality is unacceptable, do not press save, but repeat the process until a good quality recording has been obtained. Keep a copy of the ECG trace with the subject's screening records. On a monthly basis Professor Macfarlane, will send to each centre, copies of each subject's ECG recordings which have been reported on, these should be photocopied. One copy should be sent to the relevant subject's GP and the other copy should be kept with the subject's records. The subject's records should therefore contain one reported and one standard print out ECG trace.
- Remove the ECG leads.
- Remove the Biotabs, However, ask the subject whether they would prefer to do this. This may be quite uncomfortable for the subject.
- Instruct the subject to redress and answer any questions they may have (if possible).
- Ensure that the ECG has all the necessary subject information, time and date recorded on it. If not, repeat the recording.

- When the subject has finished redressing and all the ECG checks have been done, the subject is free to leave. Thank them for their time and participation in the research.
- Switch off the ECG monitor if you are not screening any more subjects, (ensure you have saved the recording prior to switching the machine off) and tidy the leads together ready for the next subject. Dispose of the used Biotab`s and alcohol wipes. If a razor was used, dispose of it in a designated sharps bin.
- Put the subject's ECG in their case report file and await the reported ECG which will be photocopied and then sent to the subject's GP.
- On a weekly basis transmit the saved ECG recordings via the modem for central storage and analysis. Use SOP 005 for guidance on this procedure.

5. Additional Information

- A straight line on the ECG paper may suggest a poor electrode connection. Use a fresh Biotab, apply the correct electrode and try again.
- A satisfactory ECG reading will not be obtained if the subject moves or an electrode dislodges during the recording process. If this occurs the procedure needs to be restarted.
- Body hair may give rise to poor electrode contact and a poor ECG trace.
- Electrical apparatus or metal jewellery (such as necklaces or nipple rings) may interfere with the ECG electrodes and subsequently give rise to a poor ECG trace. Instruct the subject to remove such items or cover with some micropore tape.
- Please be aware that there is a natural pause in printing the results of the 12 lead ECG and analysis data. A complete recording should have both a 12 lead ECG and analysis report.

6. Reference Documents

Electrocardiography - A guide to practice, The Royal Hospitals NHS trust.