Measuring The Head for Electrode Placement: The 10-20 System

Objectives:

1. To become familiar with the nomenclature of EEG electrode placement
2. To learn the International 10-20 system of electrode placement
Patient Set-up Observation
Electrode application Practical

Objectives:
1. To learn, through observation, standard
techniques for patient preparation and electrode
and sensor application for polysomnography.
2. To learn, through practical application, proper
techniques for electrode and sensor location and
application for polysomnography.
3. To learn, through practical application, proper
technique for physiologic calibration and
documentation on a polysomnogram.

Percentage Applications in Sleep

“83% Sleep Efficiency”

“8% Stage N1”
Percentage – Fractions - Decimals

50% = ½ = 0.50

Figuring Tips

10% of $35.00 = ?
Figuring Tips

10% of $35.00 = $3.50 and...

20% of $35.00 = $7.00
Figuring 10-20 percentages

If Nasion – Inion is 24 cm.

50% = 12 cm

10% = (24.0) → 2.4 cm

20% = 2.4 x 2 = 4.8 cm

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Figuring 10-20 percentages

If circumference is 60 cm.

50% = ?

10% = ?

5% = ?
Figuring 10-20 percentages

If Fp1 to O1 is 24 cm.

50% = ?

25% = ?

The Electrodes

Essentials of Sleep Technology
*A1 & A2 are the reference electrodes now known as M1 & M2

Essentials of Sleep Technology
**Occipital**

**Auricular**

*A1 & A2 are the reference electrodes now known as M1 & M2*

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**Measuring the Head**

- **Landmarks**
  - Nasion
  - Inion
  - Pre-auricular points
- **Electrode locations**
  - Each location is an intersection of 2 measurements
Measuring for Full EEG - Step 1

- Measure the distance along the midline between the nasion and inion. *(e.g.: 30 cm)*
- Mark 50% of this distance *(15 cm)* along the midline
- Determine 10% of the distance *(3 cm)*, and mark posterior from the nasion along the midline.
  Determine 20% of the distance *(6 cm)* and mark this distance from the previous mark.
- Continue marking at 20% three more times along the midline. The final mark should be 10% above the inion.

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Essentials of Sleep Technology
Measuring for Full EEG - Step 2

- Measure the distance between the left and right preauricular points. (e.g.: 35 cm)
- Mark 50% of this distance (17.5 cm) along the midline. This is the second mark for CZ.
- Measure up 10% (3.5 cm) from the right preauricular point and mark for T4.
- Place a mark for C4 halfway between T4 and CZ. (This is 20% of the distance above T4 or 7 cm)
- Repeat for the left side of the head.
Measuring for Full EEG - Step 3

• Measure the circumference of the head, *(e.g. 60 cm)* beginning with the midpoint of FP and passing the tape through the 10% marks. *(T3, O2, T4)*
• Mark 50% of this distance *(30 cm)* along the 10% occiput line
• Mark 5% of the circumference *(3 cm)* on either side of the frontal midpoint. *(FP1 and FP2)*
• Beginning with FP1 and continuing posterior along the mid-temporal plane, mark at 10% intervals *(6 cm)* to identify F7, T3, T5, O1, O2, T6, T4 and F8
Measuring for Full EEG - Step 4

- Measure the distance between Fp1 and O1, passing through C3, (e.g. 24 cm) Mark at the midpoint to complete C3. (12 cm)
- Mark 25% of this distance (6 cm) posterior from Fp1 is marked for F3, 25% from F3 should be C3, 25% from C3 is marked for P3 and 25% from P3 should be O1
- Repeat on the right side of the head for F4, C4, P4
Measuring for Full EEG - Step 5

- Measure the distance from F7 to F8, passing through Fz. (e.g: 24 cm)
- Mark at midpoint to complete Fz
- 25 % (6 cm) of the distance from F7 is marked for F3, 25% from F3 is Fz, 25% from Fz is marked for F4. (F4 should be 25% from F8)

Measuring for Full EEG - Step 6

- Measure the distance from T5 to T6, passing through Pz. (e.g: 24 cm)
- Mark at midpoint to complete Pz
- 25 % (6 cm) of the distance from T5 is marked for P3, 25% from P3 is Pz, 25% from Pz is marked for P4. (P4 should be 25% from T6)
Modified 10-20 For Sleep Staging
• Measure Nasion to Inion
• Mark 50%, 10% and 20% (20% from the 10% mark)

![Diagram showing Nasion, Inion, and pre-auricular points with percentage marks.]

1. Pre-Auricular Essentials of Sleep Technology
• Measure pre-auricular pre-auricular point.
• Mark 50% intersecting with the mid-point mark of step1. (Cz)
• Mark 10% up from each pre-auricular point.
• Mark 20% from the 10% mark

![Diagram showing pre-auricular points and the Cz point.]

Essentials of Sleep Technology
• Measure the circumference of the head, passing through the 10% markings
• Make a small vertical mark at 50%, intersecting the 10% occipital line (Oz)
• Mark 5% left and right of Oz (O1 & O2).
• Mark 5% left and right of Fpz (Fp1 & Fp2)
• Mark 10% from Fp1 & Fp2 (F7 & F8)

Essentials of Sleep Technology

• Measure from Fp1 to O1, passing through the line for C3 from step 2
• Mark 50% of this distance for C3
• Mark 25% for initial mark of F3
• Repeat on the right side of the head for C4, F4

Essentials of Sleep Technology
• Measure from F7 to F8, passing through 20% mark from step 1.
• Mark 25% on the left (F3).
• Mark 25% on the right (F4)

10-20 Quick Review

Steps 1 & 2
• Measure from Nasion to Inion → mark 10% and 20%
• Measure from Pre-auricular to Pre-auricular
• → mark 10% and 20%

Step 3
• Measure circumference using 10% marks
• → mark 5% and 10%

Steps 4 & 5
• Measure from Fp1 to O1 and from Fp2 to O2 (Banana)
  → mark 25% and 50%
• Measure from F7 to F8 (Rainbow)
• → mark 25% and 50%