# Measurement and Application and Overview

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#### Tools of the Trade

- As with any profession, a tech is only as good as the tools used.
- You will need to have marking pencils in two different colors, a centimeter tape measure, calipers and hair clips (for patients with long hair).
- The marking pencils need to be sharp to avoid thick marks which may contribute to errors. Why measure in millimeters if you make marks that are 5 mm wide?

## 10-20 System

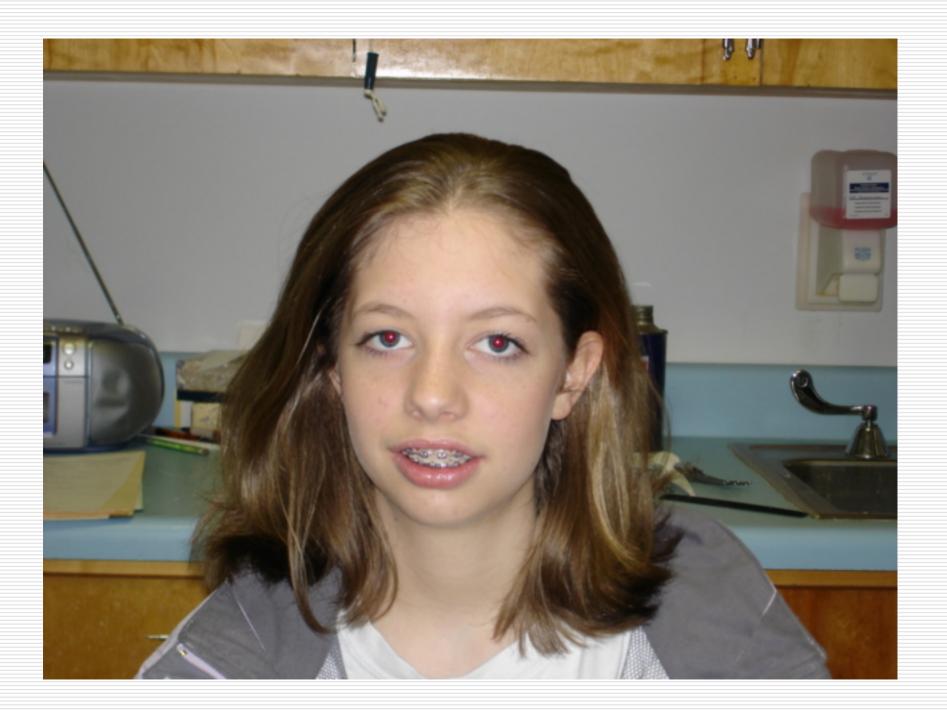
The 10-20 system name is based on the percentages used for determining electrode placements.

A total measurement is divided either into 10, 20 or 25% segments.

We will use hypothetical measurements for illustration purposes in this conference.

## Hypothetical Numbers

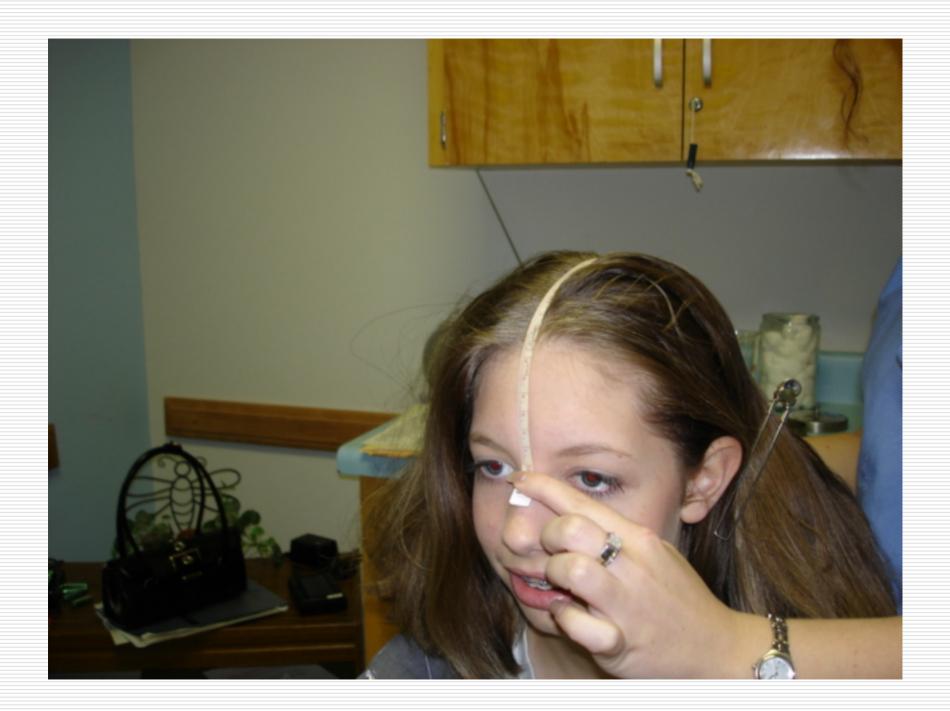
- Nasion to inion 35 cm
- Pre-auricular to
  - pre-auricular 35 cm
- ☐ Circumference 55 cm
- □ Parasagittals 24 cm
- □ Anterior transverse 22 cm
- □ Posterior transverse 24 cm



#### Our Patient

- This young lady volunteered to go through the measurement process again after her EEG was already completed! Can you imagine?
- Make a mark at the nasion and the inion. Use a different color for these marks to distinguish them from the remaining measurements.

The first step is to section the hair from anterior to posterior (nasion to inion) going through the vertex.





# Doing your math

Measure from nasion to inion. The total is 35 cm.

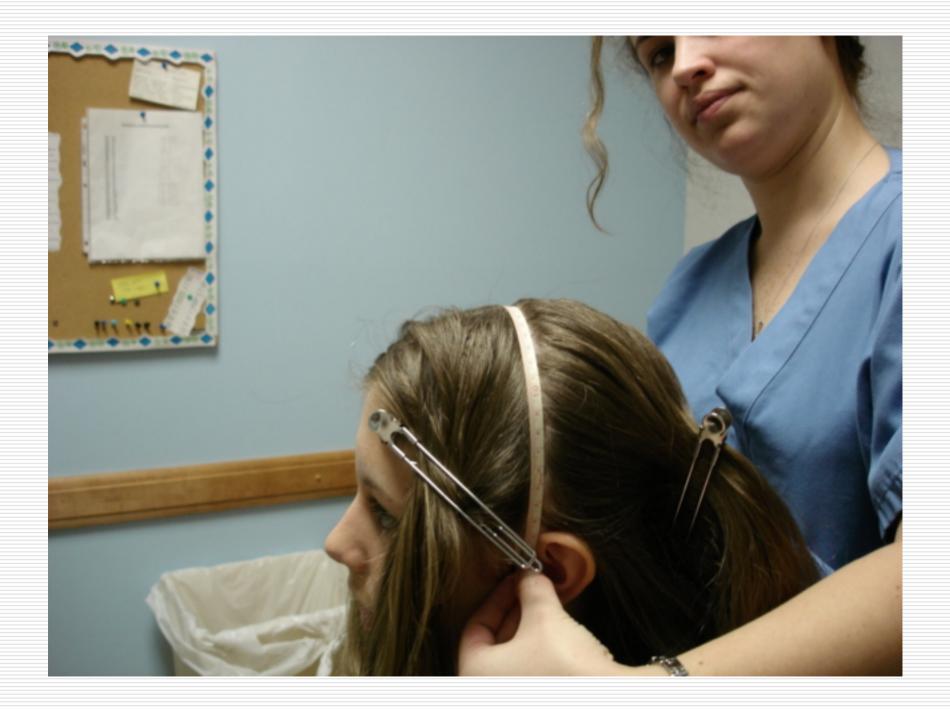
Take 10% of that number or 3.5 cm and make a mark 3.5 cm above the nasion.

Take 20% of the 35 or 7 cm and add that to the 3.5. Make a mark at 10.5, then 17.5, and 24.5.

Your final mark should be 10% (3.5 cm) above the inion mark

## Continuing sagittal measurements

□ You have now made the marks that will determine the anterior-posterior positions of Fpz, Fz, Cz, Pz and Oz. (although Fpz and Oz are not usually used in routine work.



#### Pre-auricular to Pre-auricular

- Section the hair from ear to ear going through the vertex.
- Ask the patient to open and close their mouth. Find the indentation created by the temporo-mandibular joint when the mouth is open and mark that point on each side.
- Measure between those marks going through the vertex (Cz) mark made in last step.

#### Pre-auriculars continued

- Take 10 % of the total or 3.5 and make a mark above the pre-auricular mark you created.
- ☐ Take 20% of the total or 7 cm. Add 7 cm to 3.5 and make a mark at 10.5.
- □ Continue adding 7 cm to the previous number; then mark 17.5 and 24.5. The last mark should be 3.5 from the mark over the ear.

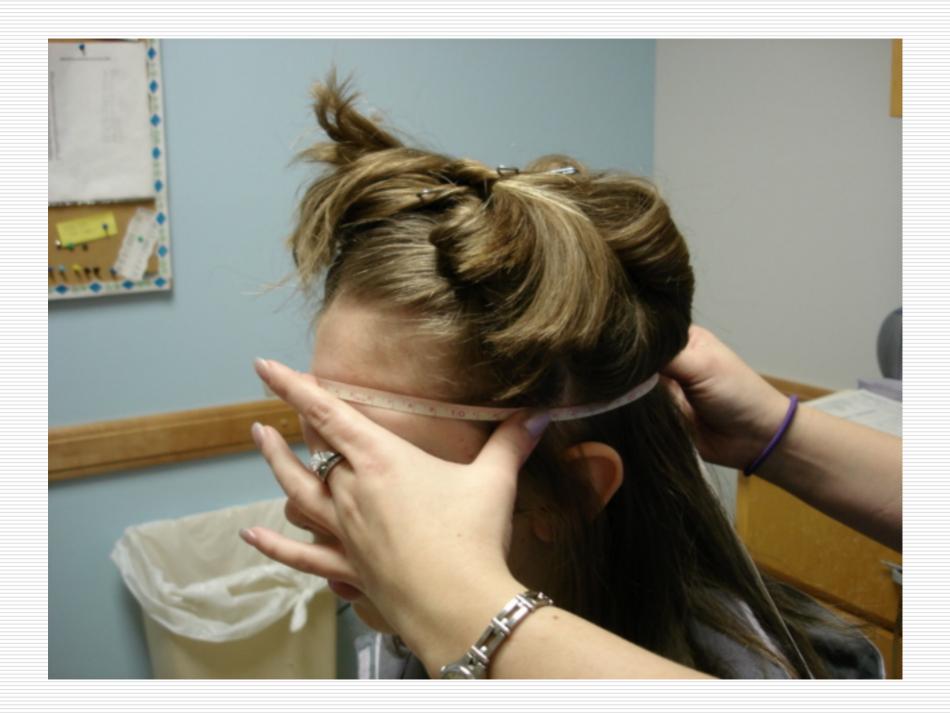
#### **Alternate Method Hint**

- An alternate method is to just move the tape each time, always lining up the 0 with the previous mark and marking at 7.
- Some say this can contribute to mistakes but so can adding numbers incorrectly!

#### First Position Determined

At this point, you will have a cross mark at the intersection of the vertex. This is the Cz location.

As measurement continues, you will make the cross marks at every electrode position.



#### Circumference

- Section hair around the circumference using the Fpz, Oz and marks just above the ears as a guide.
- Now using the tape as a guide, place it under the Fpz mark and the mark above the ear. Make a mark above the tape along the top edge of the tape at the approximate location of F7, T5, T6 and F8.

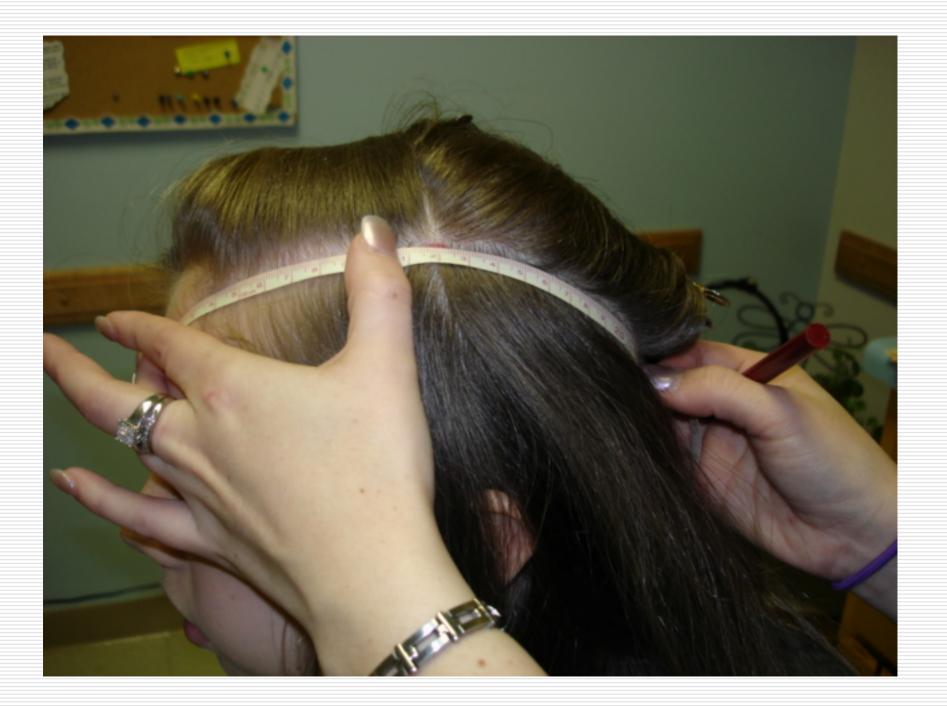


#### Circumference continued

- Measure the total circumference.
- □ Take 10% of the total or 5.5 cm and set the calipers to 5.5 cm.
- Place the caliper legs with the nose evenly dividing them and make a mark at the tip of each leg.

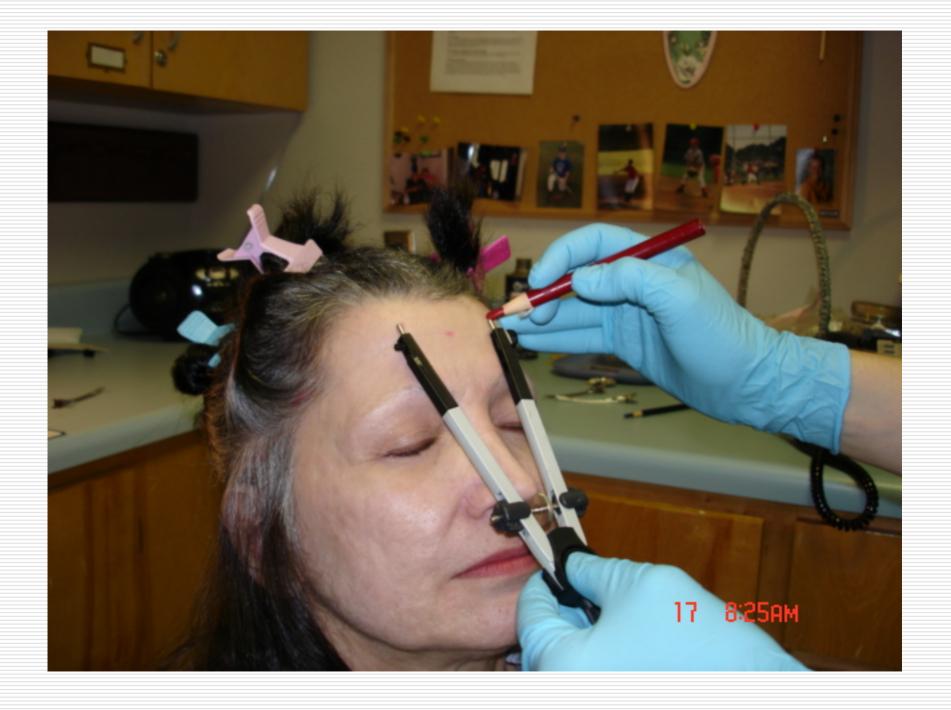
#### Circumference continued

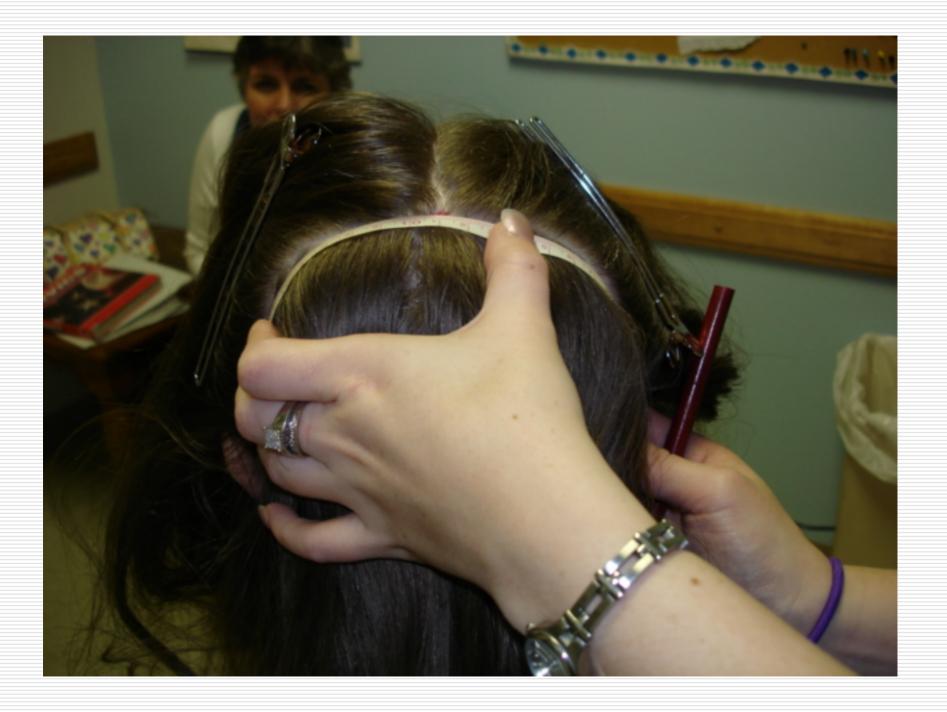
- The final mark should be 5.5 cm from the first mark.
- □ You should now have cross marks at F7,T3, T5, T6, O1, O2, T6, T4 and F8.
- Using the Fpz mark as a guide for the level, make the cross marks at Fp1 and Fp2.



## Parasagittals

- Section the hair from Fp1 to O1 going through the mark at the central electrode position.
- Measure the total from Fp1 to O1. Total is 24. Take 25% of total which is 6 and make a mark at 6 cm, 12 cm and 18 cm. Mark above the tape.
- □ You should now have a cross mark at the C3 position. Repeat for the right side being sure to mark above the tape just like you did on the left.





#### POSTERIOR TRANSVERSE

- Section hair from T5 to T6 going through the marks at the parietals
- Measure from T5 to T6. Total is 24.

- Divide 24 by 25%. Make a mark at 6, 12, and 18.
- ☐ You now should have cross marks at T5, P3, Pz, P4 and T6.



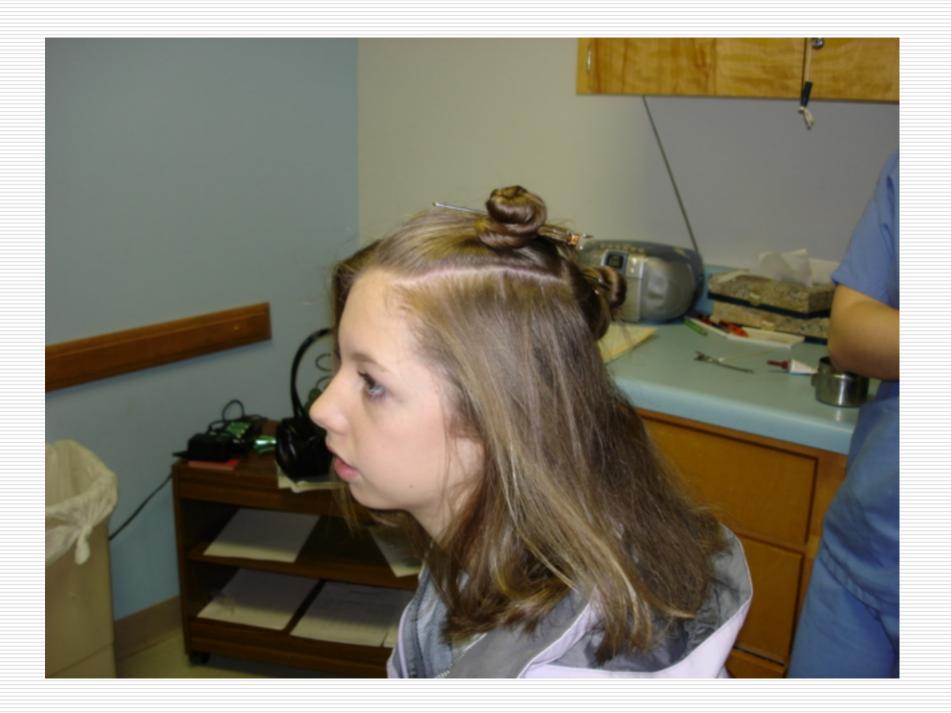
#### TRANSVERSE FRONTAL

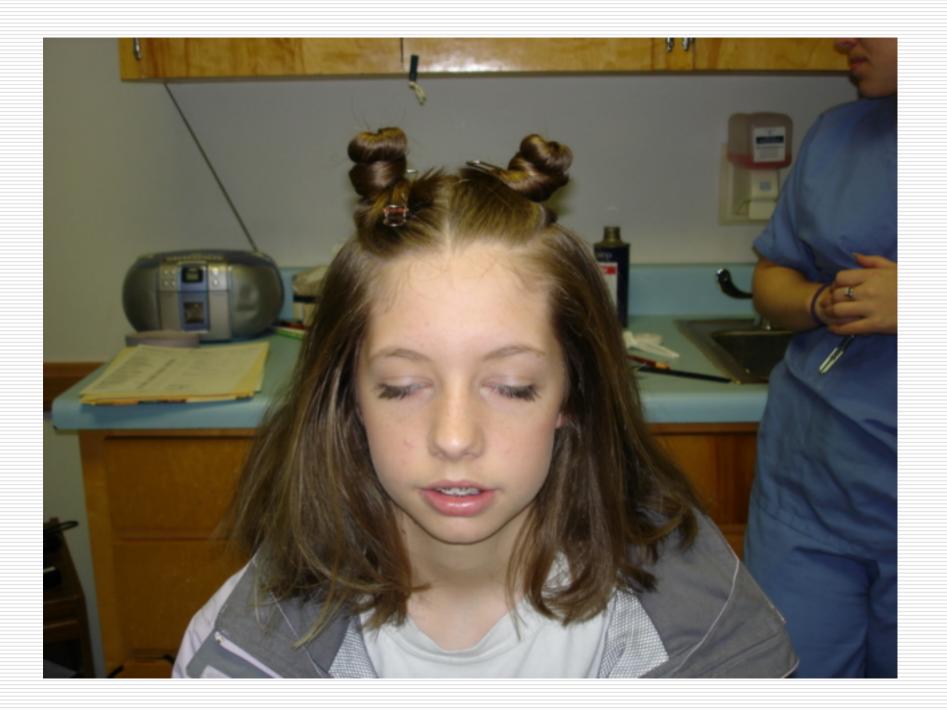
- Section hair from F7 through Fz to F8
- Measure the to distance from F7 to F8
- □ Total is 22 cm. Take 25% of that which is 5.5 cm
- Make a mark at 5.5 cm, one at 11 and one at 16.5 cm.
- ☐ There should be cross marks now at F7, F3, Fz, F4 and F8.

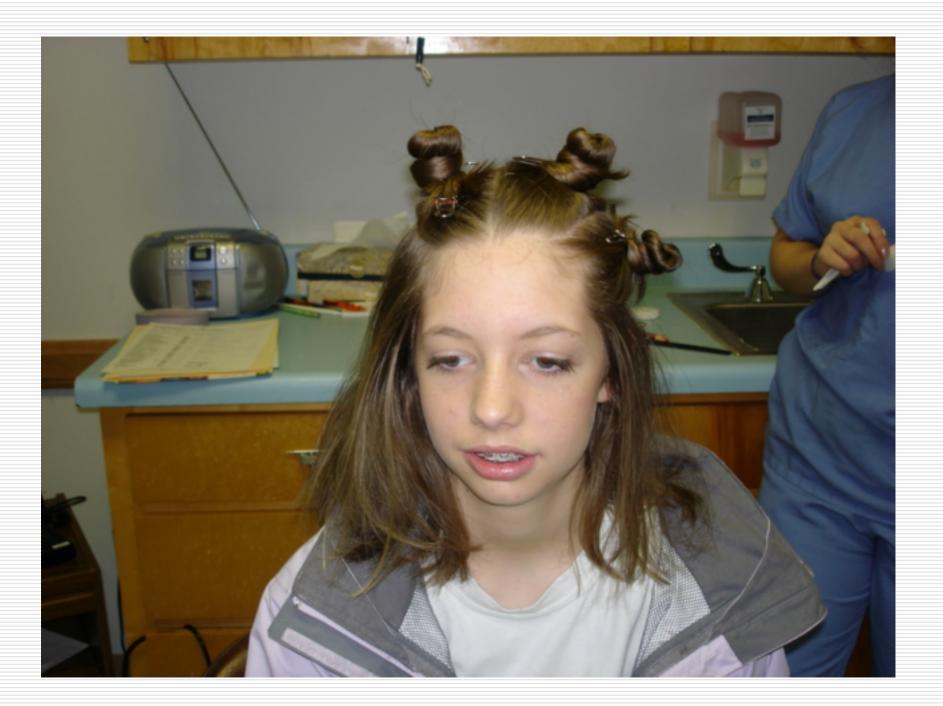
#### SECTIONING HAIR

- As the final step, section the hair and secure with hair clips or rubber bands.
- When the hair is all clipped out of the way, electrode application can be achieved much more efficiently.



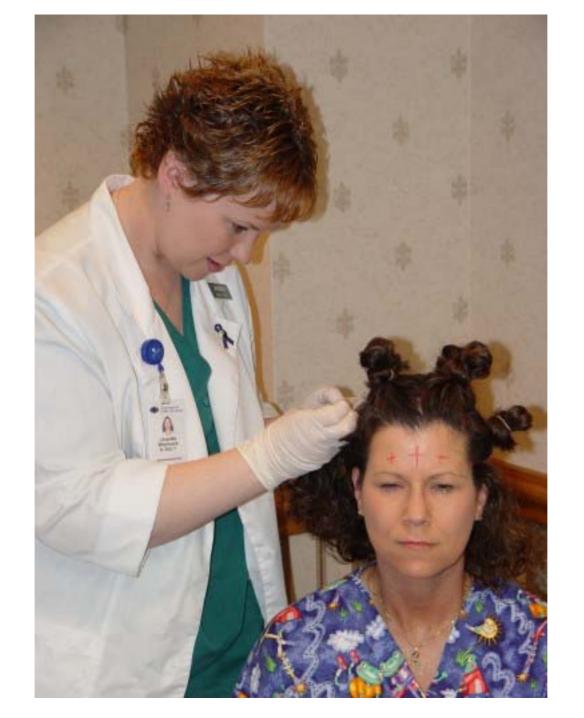












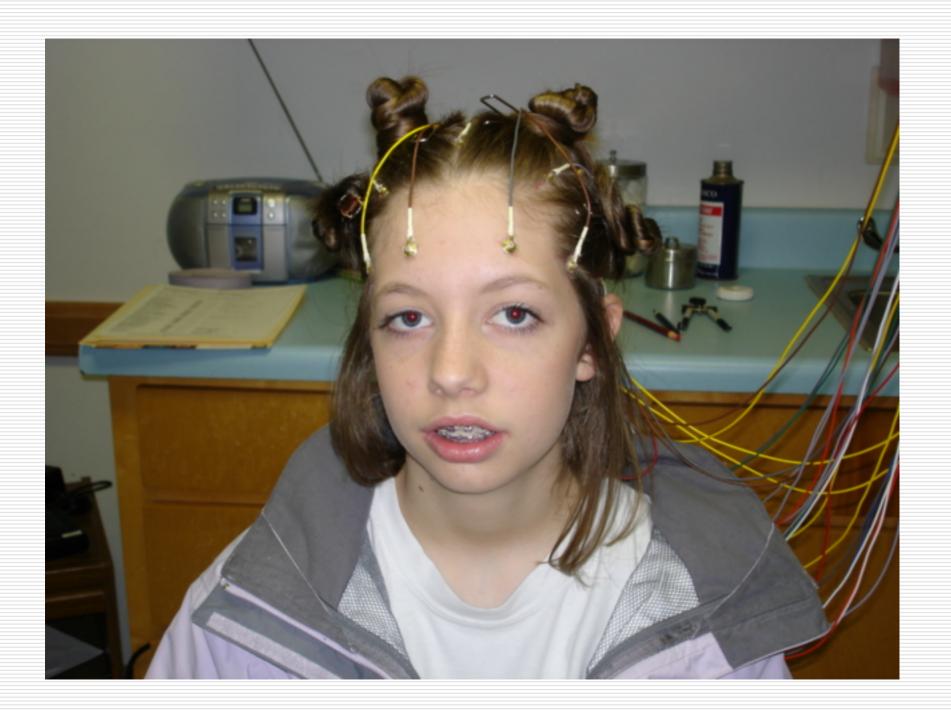
### Final Inspection

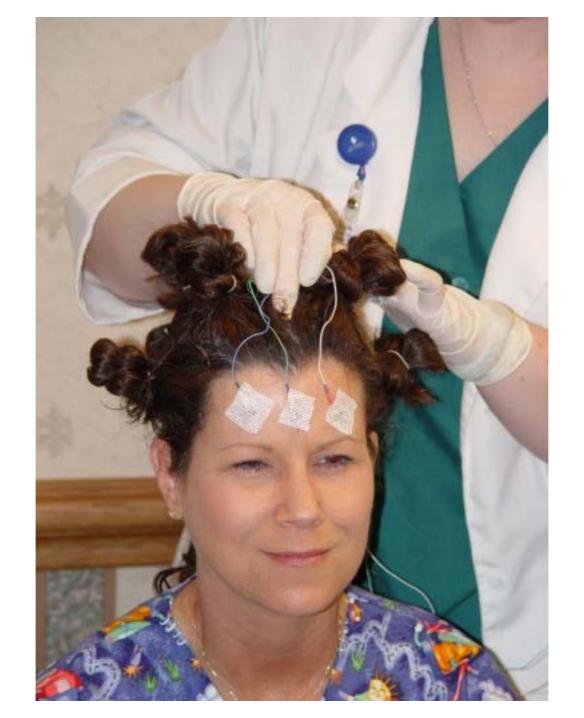
- Look at the marks to see if they appear to be anatomically correct.
- During the Measurement and Application section of the board, now is a good time to remeasure and check electrode positioning.
- Are they anatomically correct? Did you mark nasion and inion so the examiners can easily identify them?

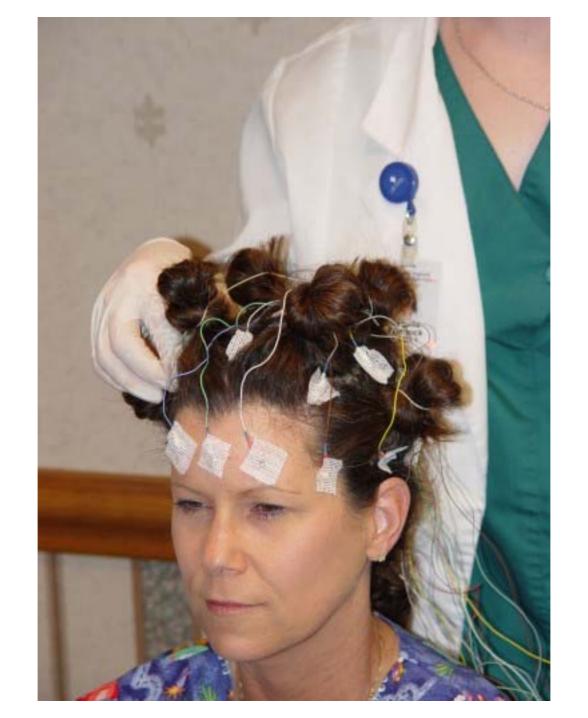
#### T1 and T2 Measurments

- Measure from pre-auricular point to the outer canthus of the eye
- Make a vertical mark at one third the distance
- Make a mark along the top edge of the tape
- Measure up one centimeter from the last mark and intersect with the vertical mark















#### THANK YOU!!

We encourage you to practice until this becomes second nature to you.