

■ As explained by the instructor during the lab

■ Additional

Visual Acuity

Purpose: Assesses clarity of vision (central vision).

In the visual acuity examination, we assess Cranial Nerve II (the Optic nerve)

Method:

- Use a Snellen chart at 6 meters.

Why 6 meters?

At a distance of 6 meters, the light rays entering the eye are nearly parallel; therefore, accommodation is not required.

- Test each eye separately (cover one eye)

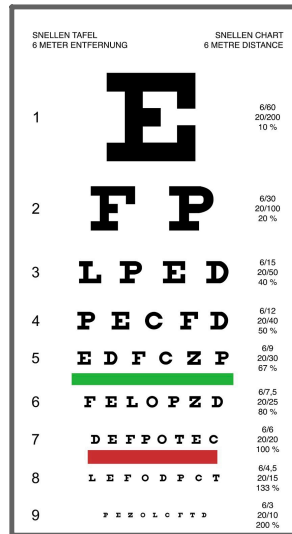
- Optic nerve lesions are often unilateral.
- The eye should be covered without applying pressure, as pressure may transiently affect vision.
- Testing is usually initiated with the right eye.

- Corrected vision (glasses/contact lenses) should be used if available.

- Record as a fraction (e.g., 6/6 is normal; 6/12 means the patient sees at 6m what a normal person sees at 12m).

• The first number represents the testing distance (6 meters).

• The second number represents the distance at which a person with normal visual acuity can read the same line.



Snellen chart

Result	Meaning / Symbol	Explanation
6/6	Normal vision	The patient can see at 6 meters what a person with normal vision sees at the same distance.
6/60	Severe visual impairment	The patient can see at 6 meters what a person with normal vision can see at 60 meters.
CF	Counting Fingers	The patient cannot read any letters on the Snellen chart but can count fingers at a certain distance (e.g., 1 meter).
HM	Hand Movement	The patient cannot count fingers but can detect hand movements in front of the eye.
PL	Perception of Light	The patient cannot detect letters or hand movements but can perceive the presence or intensity of light.
NLP	No Light Perception	The patient cannot perceive light at all; complete blindness in the tested eye.

Severely reduced visual acuity may indicate underlying conditions such as diabetic retinopathy, optic neuritis, or cataract....

Color Vision

Purpose: Assesses the ability to differentiate colors (tests for color blindness)

Colors blindness: is a hereditary disorder, often linked to the X chromosome. It is more commonly observed in males than in females, as their XY genetic makes them more susceptible to this condition. The most common type of color blindness is difficulty in distinguishing red from green.

Method:

- Use Ishihara plates to test for red-green color blindness.

There are two numbers embedded within the Ishihara plate:

1. A number visible to individuals with normal color vision.
2. A number visible only to individuals with color vision deficiency.



Ishihara plates

- The patient is shown plates with numbers embedded in colored dots.
- Ask the patient to identify the numbers.

2. Auditory Weber and Rinne Tests

focuses on the cochlear component of Cranial Nerve VIII (the Vestibulocochlear nerve) and the functional integrity of the middle ear and its ossicles.

Rinne's Test

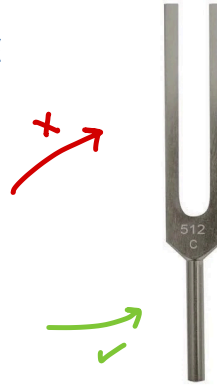
Purpose: Compares air conduction (AC) and bone conduction (BC).

AC (Air Conduction) → Sound is transmitted via: External ear → Tympanic membrane → Ossicles → Cochlea → Cranial Nerve VIII

BC (Bone Conduction) → Sound is transmitted via: Skull bones → Cochlea → Cranial Nerve VIII

Normal principle: AC > BC, as air transmits sound more efficiently than bone.

- AC > BC → طبيعي (Rinne positive)
- BC > AC → Conductive hearing loss (Rinne negative)
- AC > BC but reduced → Sensorineural loss

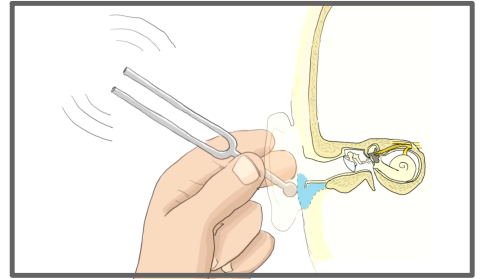


Method:

- Before starting ensure not to touch the top of the tuning fork after it has been struck as this will stop the vibration hold by the stem instead

- Place the vibrating tuning fork on the mastoid process (bone conduction).

Ask the patient if they can hear the sound and instruct them to tell you the exact moment when the sound stops. Placing the tuning fork on the bone transmits the sound directly to the cochlea, allowing assessment of the auditory (cochlear) part of Cranial Nerve VIII independently of the middle ear, since the sound bypasses the external and middle ear structures



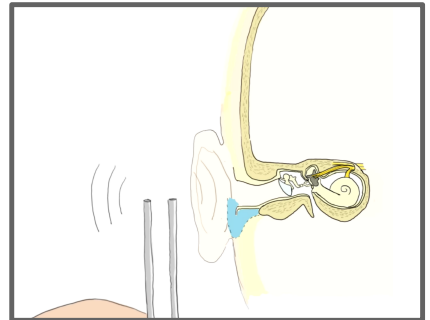
- Once the patient can no longer hear it, move it in front of the ear (air conduction).

After the patient can no longer hear the sound on the bone, move the tuning fork approximately 2 cm in front of the ear canal.

2. Ask the patient: Do you still hear the sound?

• If the patient responds Yes → air conduction (AC) is better than bone conduction (BC) → normal.

• If the patient responds No → bone conduction (BC) is better than air conduction (AC) → possible conductive hearing loss.



- Ask if they can still hear it.

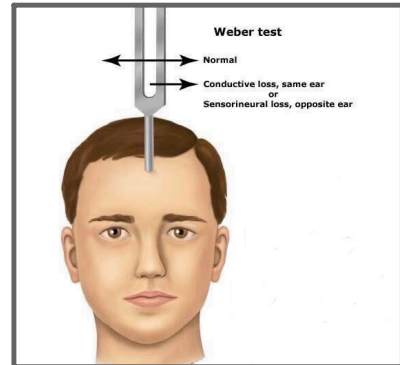
- Normal (Rinne positive): AC > BC (air conduction is better).
- Conductive hearing loss (Rinne negative): BC > AC.
- Sensorineural hearing loss: AC > BC but both are reduced.

Weber's test

Purpose: Differentiates conductive from sensorineural hearing loss.

Method:

- Place a vibrating tuning fork (512 Hz) on the patient's forehead.



- Ask the patient where the sound is heard best:
- **Normal:** Heard equally in both ears.
- **Conductive hearing loss:** Sound localizes to the affected ear.
- **Sensorineural hearing loss:** Sound localizes to the unaffected ear.

Case / Condition	Weber Test	Rinne Test	Cause / Explanation
Normal hearing	Sound heard in the middle	AC > BC in both ears	No hearing loss
Unilateral conductive hearing loss	Sound localizes to the affected ear	BC > AC in the same ear (negative Rinne)	Middle ear pathology (e.g., cerumen impaction, otitis media, ossicular problem)
Unilateral sensorineural hearing loss	Sound localizes to the unaffected ear	AC > BC in the affected ear, but reduced	Cochlear or auditory nerve (CN VIII) problem

Rules:

1. Weber lateralizes to the affected ear in conductive loss.
2. Weber lateralizes to the unaffected ear in sensorineural loss.
3. Rinne normal ($AC > BC$) → normal hearing or sensorineural loss.
4. Rinne negative ($BC > AC$) → conductive loss

Case Examples

Example 1: Unilateral conductive hearing loss (Right ear)

- Rinne: $BC > AC$ in the right ear → conductive
 - Weber: Sound lateralizes to the right ear → matches Rinne
 - Interpretation: Right ear has a middle ear problem (e.g., cerumen, otitis media, ossicles), cochlea and auditory nerve are normal.
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Example 2: Unilateral sensorineural hearing loss (Right ear)

- Rinne: $AC > BC$ but reduced in the right ear → sensorineural
 - Weber: Sound lateralizes to the left (healthy) ear
 - Interpretation: Right ear has cochlear or CN VIII problem; left ear is normal.
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Example 3: Mixed hearing loss (Left ear conductive + Right ear sensorineural)

- Rinne:
 - Left ear → $BC > AC$ → conductive
 - Right ear → $AC > BC$ but reduced → sensorineural
 - Weber: Sound lateralizes to the left ear (conductive)
 - Interpretation: Conductive loss “steals” sound in Weber; left ear perceives it louder despite right ear also being affected.
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Example 4: Bilateral sensorineural hearing loss

- Rinne: $AC > BC$ but reduced in both ears → sensorineural
- Weber: Sound heard in the middle → symmetric loss
- Interpretation: Both ears have cochlear or auditory nerve problems; Weber remains midline because the loss is equal.

3. Vibration and Position Sense of Upper Limbs

Vibration Sense

Purpose: Assesses posterior column function (e.g., in peripheral neuropathy, vitamin B12 deficiency).

Method:

- Use a 128 Hz tuning fork over the sternum and ask the patient do you feel the buzzing?)
- Place it on bony prominences (e.g., distal interphalangeal joint, wrist, elbow). **The Dr said , if the thumb has normal vibration sense, there is no need to examine the other joints, as this provides a reliable indicator of vibration sense in the upper limb**
- Ask if they feel the vibration and when it stops.
- If impaired, move proximally (indicates peripheral neuropathy).

The Dr also mentioned that to check whether a patient is providing inaccurate responses or simply wants to finish the examination quickly, one can use the following method: During vibration testing of the thumb, if the patient claims to feel the vibration but may not actually feel it, you can stop the vibration by placing your hand on the top of the tuning fork (incorrect handling). Then ask the patient again if they still feel the vibration. If the patient responds Yes, this likely indicates a false response.

Joint Position Sense (Proprioception) of upper limb

Purpose: Assesses posterior column pathway.

Method:

- Explain the procedure with eyes open
- Hold the sides of the patient's finger (avoid pressure cues).**
- Move it up or down and ask the patient to identify the direction with eyes closed.
 - If impaired, test more proximal joints.

4. Touch Sensation of Upper Limbs

Method:

- Use a cotton wisp and lightly touch the skin.
- Ask the patient to say “yes” when they feel it.
- Compare both sides and different dermatomes.

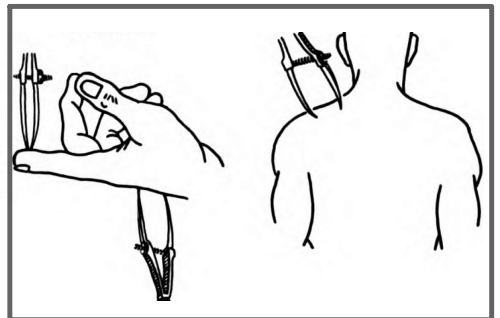


5. Two-point discrimination:

Method:

- Use school compass to apply two points on the skin of fingers and back.
- change the distance between two points on the skin.
- Ask the patient if they feel one or two points.
- Impaired in parietal lobe lesions or peripheral nerve damage.

Most individuals can distinguish two points when the distance between them is approximately 5 cm during testing on the back.



6. Stereognosis and Graphesthesia

Stereognosis

Purpose: Tests higher cortical function (parietal lobe).

Method:

- Place a familiar object (coin, key) in the patient's hand.
- Ask them to identify it with eyes closed.

Graphesthesia

Purpose: Assesses the ability to recognize numbers or letters drawn on the skin.

Method:

- Ask the patient to close their eyes.
- Use a blunt object or your fingers to draw numbers or letters on their palm.
- Ask them to identify the number/letter.

External resources:

[https://youtu.be/FgF91K7dU8Y?
si=doS5UfrKWrpEkQKm](https://youtu.be/FgF91K7dU8Y?si=doS5UfrKWrpEkQKm)

<https://youtu.be/6hHC98ILEyl?si=12sjChhfJ86A8HLO>