Neurological Examination
Summary

William P Howlett.
Kilimanjaro Christian Medical Centre, Moshi, Tanzania

Illustrations: Ellinor Moldekleiv Hoff. UIB, Norway

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Target audience

medical students, health care students & doctors in Africa
Aim

To demonstrate how to carry out a neurological examination
Cranial Nerves

examine in the seated position
Olfactory (First) CN
Testing Smell
Testing Smell

loss of smell? *if there is*

sniff to show that the nose is open

close eyes

block one nostril by *applying* a finger

identify up to 4 familiar smells *eg* orange/lemon, soap, cloves & coffee
Testing smell
Olfactory nerve
Optic (Second) CN

Testing: Visual Acuity

Testing: Visual Fields

Doing: Fundoscopy
Visual Acuity

*testing how well you see*

can you see okay?
do you use glasses? *If so wear them*

stand 6 meters from *Snellen Chart (SC)*

cover each eye & *identify letters on smallest* line completely visible

Line = distance of person with normal vision can see at *eg 6, 12, 18, 24, 36*

*VA recorded as 6/5, 6/6--6/24-- CF/HM/PL*

if *SC not available* use hand chart/newspaper to test colour vision *use Ishihara plates*
Visual Fields
see in all directions

Confrontation

Field perimetry
Visual Fields
Confrontation

look at my nose
hold both hands upright ½ meter apart & 30 cms above horizontal
move finger tip
ask pt to identify movement
repeat for other side & 30 cms below horizontal
examine each eye individually if indicated
Testing for visual field defects by confrontation
Visual Fields Perimetry

use *finger tip* or *white pin*

start behind *pts visual field*

come *forward diagonally* @ 45 degree angle in NE to SW direction

ask pt *to indicate when* he sees movement

repeat in all *(four)* quadrants
1 metre

Testing visual fields by confrontation
Fundoscopy

Using the ophthalmoscope

• check light is bright & focus is at 0
• ask pt to fixate ie look straight ahead
• hold opthcope in right hand & 30 cm away & 15-20 degrees lateral & level to fixation point
• aim at back head & keep out of line of sight
• see red reflex & move slowly to 1-2 cm from pts right eye
• keep opthcope & line fixation in same plane
• adjust lens & identify blood vessels & disc
• repeat in other eye
Examining the eye with an ophthalmoscope
Pupillary reflexes (Rx)

Light Rx

Consensual Rx

Accommodation Rx
Consensual Response
Pupillary reactions

ask patient to look in distance
shine bright light on bridge of nose
inspect pupils for PERLA (pupils equal, react to light & accommodation)

Light Rx: bring the light from side or behind
inspect pupil for constriction

Consensual Rx: repeat & look in other eye

Accommodation Rx: look in distance & at my finger
Testing the light reflex
Optic nerve
Testing eye movements

Oculomotor (Third) CN

Trochlear (Fourth) CN

Abducens (Sixth) CN
Eye Movements

inspect & ask re double vision
please look right, left, up & down
make a cross and/or H sign in/air with finger
follow my finger with your eyes
if weakness present: test movements in each eye separately
Muscles involved in eye movements
Trigeminal (Fifth) CN

Testing facial sensation

Testing facial power *ie* mastication
Testing facial sensation & jaw power

**Sensation:**
- *ask* if numbness, loss of feeling on face
- *touch* each side once at V1, V2 & V3
- *compare* right & left

**Power:**
- open & close mouth against resistance

**Jaw Jerk:** tap chin with patella hammer
Facial sensation: left side ophthalmic ($V_1$), maxillary ($V_2$) and mandibular ($V_3$) divisions of the trigeminal nerve
Corneal Reflex

hold the lower lid down
ask pt to look up
use a wisp of cotton wool
touch the cornea from below
observe blinking in both eyes
Corneal reflex (V and VII)

Touch cornea from below with wisp of cotton wool
Facial Nerve (Seventh) CN

Testing facial expression

Testing taste
Testing facial expression & taste

Expression: inspect the face
  look up
  close eyes
  smile

Taste: apply salt & sugar to tip tongue & identify the taste
Facial nerve palsy right lower motor neurone lesion

Loss of wrinkling of forehead
Loss of nasolabial fold
Drooping of the mouth
Facial nerve palsy right sided lower motor neurone lesion  
(during eye closure)  
Failure to close the eye  
Loss of nasolabial fold  
Drooping of the mouth.
Acoustic Nerve (Eight) CN Cochlear & Vestibular

Testing: hearing

Testing: balance
Vestibular Nerve

Examining balance

(Not illustrated here see textbook 'Neurology in Africa’)

Hallpike’s manoeuvre

Caloric testing
Cochlear Nerve

Examining for deafness

can you hear normally? if not

test hearing by rubbing fingers outside one ear & blocking other ear

from approx one meter behind pt whisper, if still can’t hear speak and/or shout

if deaf do Rinne & Weber test
Testing for hearing
Auditory nerve
Tuning Fork Tests
Rinne test

place beating tuning fork on mastoid bone

when hearing stops place next ear canal

(normal: air conduction>bone conduction)

if pt can’t hear: deafness is conductive

if pt can hear: deafness is sensorineural
Testing the type of deafness
The Rinne test A+B
The Weber test  C
Weber test

place base of beating tuning fork on middle of forehead
ask in which ear sound is loudest
normally heard equally in both ears
if heard best in deaf ear then deafness is conductive in that ear
if heard best in good ear then deafness is sensorineural in deaf ear
Weber test

Sensorineural hearing loss

Conductive hearing loss

Normal
Glossopharyngeal (Ninth) CN & Vagus (Tenth) CN

Testing the gag reflex
Testing Gag Reflex

say “aah”

inspect uvula

touch soft palate with tongue depressor on both sides

ask if feeling is the same on both sides
Testing the gag reflex
glossopharyngeal and vagus nerves
Accessory (Eleventh) CN

Testing head turning & shoulder elevation
Sternomastoids

Testing head turning

inspect for wasting

please turn head to left

place hand on side opposite movement & resist it

repeat on the other side
Testing the sternomastoid
Accessory nerve
Trapezius

Testing shoulder elevation

inspect trapezius

elevate or shrug shoulders

resist elevation of shoulders
Testing the trapezius
Accessory nerve
Hypoglossal (Twelfth) CN

Testing tongue movements
Testing tongue movements

look at tongue at rest
put tongue out & look at it
push tongue in & out rapidly
push tongue against inside cheek
feel tongue through cheek
Testing the tongue

Hypoglossal nerve
Limbs: Upper
examine in the seated position
Examination of Limbs

Upper

Inspection
Tone
Power
Co-ordination
Reflexes
Sensation
Examination of Limbs (upper) Inspection

expose arms & forearms
inspect in sitting position
look for obvious:

- deformities
- wasting
- fasciculations
- posture
- skin
Tone
Examination of Limbs (upper)

Tone

relax the patient

examine tone at elbow & wrist

move limbs passively through full range of movement

look at pts face

feel for degree of resistance

compare both sides
Testing tone
Roll the wrist
Power
Examination of Limbs (upper)

**Power**

**move** limbs *actively* in proximal to distal direction

**resist** movements *passively*

**routine exam:** test one proximal & one distal muscle group

**test for mild weakness:** hold hands outstretched in supine position:

*watch* for pronation & drift downwards
Shoulder abduction
Deltoid
Axillary nerve
C5
Elbow extension
Triceps
Radial nerve
C7
Elbow flexion
Biceps
Musculocutaneous nerve
C5 C6
Wrist extension
Extensor radialis
Radial nerve
C7
Finger flexion
Flexor digitorum
Median and ulnar nerve
C8
Finger abduction
Dorsal interossel
Ulnar nerve
T1
Co-ordination
Co-ordination

Finger-nose test

Finger-nose-finger test
Examination of Limbs (upper)

finger-nose test

relax pt

hold arm outstretched fully horizontally with eyes open

touch \textit{tip of} nose with \textit{tip of} finger

repeat on other side
Examination of Limbs \textit{(upper)}


to perform the Finger-Nose-Finger Test

1. **Relax** the patient (pt).
2. **Hold** your finger at arm's length in front of the patient.
3. **Ask** the patient to touch your finger to his nose and your finger.
4. **Watch** for accuracy.
5. **Repeat** on the other side.
Testing co-ordination
The finger-nose test
Reflexes
Examination of Limbs (upper) Reflexes (sitting position)

ensure pt is relaxed

flex arm to 90 degrees

place finger over tendon

tap: biceps, triceps & supinator

(not more than twice)

look for muscle contraction or its action

if Rx is absent get pt to reinforce
The biceps reflex
C5, C6
The supinator reflex
C5, 6
The triceps reflex

C7
Sensation
Examination of Limbs (upper)  
Sensation (light touch) 
requires co-operation pt & examiner
tell the patient what to expect
use wisp of cotton wool or finger tip
demonstrate on non affected area eg face
close eyes say yes each time feels stimulus
start distally & touch site once
go from abnormal to normal area
Testing superficial sensation light touch
Examination of Limbs (upper) Sensation (Joint position) requires co-operation of pt & examiner

grip finger tip sides & tell pt what to expect

show up & down movement at distal interphalangeal joint with eyes open

repeat asking pt to identify correctly the direction of movement with eyes closed
Examination of Limbs (upper) Sensation (Vibration)

requires co-operation of pt & examiner
tell the patient what to expect
demonstrate the normal on non affected area eg collar bone

place beating tuning fork on distal metacarpo-phalangeal joint pt eyes closed

pt identify each time vibration starts/stops

proceed proximally until vibration is intact
Testing joint position in the finger
Limbs: Lower
examine in the lying position
Examination of Limbs (Lower)

Inspection
Tone
Power
Co-ordination
Reflexes
Sensation
Examination of Limbs (lower)

Inspection

expose thighs, legs & feet

look for:

deformities & posture

wasting & fasciculations

skin
Tone
Examination of Limbs (lower) Tone

relax patient
examine tone at knee & ankle
move limbs passively through full range of movement
look at pts face while doing it
feel for degree of resistance
compare both sides
test for clonus at ankle & then knee
Power
Examination of Limbs (lower)

Power

move limb actively
start proximally & proceed distally
resist movements passively
in a routine exam: test just one proximal & one distal group
Hip flexion
Quadriceps femoris
Femoral nerve
L3  L4
Hip extension
Gluteus maximus
Sciatic nerve
$L_5 S_1$
Hip flexion
Iliopsoas
Lumbar plexus and femoral nerve
L  L
1  2
Knee extension
Quadiceps femoris
Femoral nerve
L₃ L₄
Ankle dorsiflexion
Tibialis anterior
Common peroneal nerve
L4, L5
Plantar flexion
Gastrocnemius and soleus
Sciatic nerve
S1  S2
Co-ordination
Examination of Limbs (lower) Co-ordination

ensure pt relaxed

heel-shin test

hold foot up in the air
place heel on the knee
run the heel down the shin

look for any inco-ordination
Testing co-ordination
The hee-shin test
Testing co-ordination

The heel-shin test
Reflexes
Examination of Limbs (lower) Reflexes

ensure pt is relaxed
flex knees & ankles to 90 degrees
tap the quadriceps & achilles tendons
not more than twice
look for muscle contraction or action
if rx is absent carry out reinforcement
do the plantar reflex
The knee reflex
L3, 4
The ankle reflex
S1
Testing the plantar response

A  Normal
B  Upgoing plantar response
   or Babinski sign
Testing the plantar response
Sensation
Examination of Limbs (lower)

Sensation (light touch)

requires co-operation of pt & examiner
tell the patient what to expect
use wisp of cotton wool or finger tip
demonstrate on non affected area eg face
tell pt to say yes each time feel stimulus
(eyes closed)
start distally (on feet) & touch site once

gothing from abnormal to normal area
Testing superficial sensation light touch
Examination of Limbs (lower) Sensation (Joint position) requires co-operation pt & examiner

grip toe & tell the patient what to expect

show up & down movement at distal tarsophalangeal joint with eyes open

repeat asking pt to identify correctly the direction of movement with eyes closed
Testing deep sensation
A

Joint position sense
B

Vibration sense
Examination of Limbs \textit{(lower)}

\textbf{Sensation (Vibration)}

requires co-operation pt & examiner
tell the patient what to expect
demonstrate the normal on non affected area \textit{eg collar bone}
place beating tuning fork on \textit{distal metatarso-phalangeal joint (eyes closed)}
identify each time vibration \textit{starts & stops}
proceed proximally until vibration intact
Testing deep sensation
A  Joint position sense
B  Vibration sense
Gait

Romberg’s test

Walking
Gait
Romberg’s test

stand with *heels together & toes apart & eyes closed*

observe for *swaying or falling*
Testing joint position sense
The Romberg test
(eyes closed)
Gait

Testing Walking

ask pt to walk normally with arms by sides
observe for unsteadiness & abnormal gait, arm swing, turning, symmetry
if ataxia still suspected repeat
  – walking a straight line
  – one foot placed in front of the other
  – arms held aloft in front & looking straight ahead
Testing gait