7 Neurology

STROKE

ABCD2 for TIA

Age > 60	1pt		
BP ≥ 140/90	1pt	*0-2*	*= low risk*
Clinical feat:			*= 0.2-0.8% risk of stroke next 7d*
Unilateral weakness	2pt		
Speech disturbance	1pt		
Other	0pt		
Duration			
≥ 60min	2pt		
10-59min	1pt		
<10min	0pt		
Diabetes	1pt		

Admission criteria for TIA

- 4 in 2 weeks, 2 in 24hrs
- Crescendo TIA
- Anticoagulated
- High-grade ***carotid stenosis***
- Likely ***cardiac source*** (AF)

Stroke Prevention

- *Aspirin* 150mg/day
- *Warfarin*
- Carotid endarterectomy

Stroke Mimics

MISTA

- **M**igraine
- **I**nfection: Sepsis, Cerebral
- **S**eizure eg Todd's paresis, SOL
- **T**rauma, **T**ox
- Aortic dissection

Cerebellar Signs

RAIN

Rapid alt movt (dysdidokinesis)
Ataxia (esp truncal)
Intention tremor, past pointing
Nystagmus

Stroke Syndromes

ACA: Contralateral LL paralysis, confusion, behaviour, urinary incontinence

MCA: Contralateral hemiplegia UL > LL, hemisensory loss, homonymous hemianopia

Dom MCA = global aphasia; Non-dom MCA = neglect, contractual apraxia

- M1 global aphasia, L side neglect
- M2 expressive aphasia, L side neglect
- M3 receptive aphasia, minimal weakness

PICA: multiple CN syndromes
- LMS CN 7,9,10, CL SL tract
- ***Wallenberg's syndrome*** (LMS)
  - ipsilateral facial paraesthesia
  - contralateral arms/legs pain/temp
  - seen in vertebral artery dissection

Stroke Thrombolysis

ACEM Independent Review
- NNTB @ 3hrs = 7
- NNTH (ICH) = 42
- NNTH (Death) = 122

NINDs

	tPA	Placebo	
Improved @ 3m	47	39	*+8%*
90-day mortality	17	21	*- 4%*
ICH < 36hrs	6.4	0.6	*+5.8%*
ICH < 3m	7.7	1.3	+6.4%
New stroke	5.8	0.4	+0.4%

Medication

- *Alteplase* 0.9mg/kg max 90mg
- 10% as bolus over 1min then rest over 1hr

Indications

No perfusion scan
- < 1/3 MCA territory
- ***< 25 NIHSS score***
- < 90min to lysis
- < 80yo

Perfusion scan
- < 1/3 MCA territory
- ***< 25 NIHSS score***
- ***< 6hr***
- Demonstrated perfusion
- NOT ICA or Basilar

Contraindications

Absolute (ST. ABCD)
- **S**troke < 3m
- **T**rauma, sig to face or head
- **A**nytime ***ICH***
- **B**leeding, active (not menses)
- **C**erebral ***mets*** or vasc ***malformation***
- **D**issection, suspected Ao

Relative

- Isch stroke > 3m
- Dementia
- Pregnancy
- Patient wishes
- Trauma
- CPR > 10min
- Current anticoagulation
- Non-compress vascular puncture
- Major surgery < 3w
- Internal bleeding incl PUD
- Severe HTN SBP > 180
- Intracranial abnormality

General Stroke Mx

- BP < 220/120 (*labetolol* 10-20mg IVI)
- BP < 200 if haemorrhagic stroke
- Prevent pressure sores, aspiration

ACUTE VESTIBULAR SYNDROME

severe vertigo, N&V, spont nystagmus, postural instability

Causes

- Peripheral: ***vestibular neuronitis, labrynthitis***
- Central: ***posterior infarct***

HINTS Test

Differentiate central vs peripheral AVS

Head Impulse

- move head L&R with eyes fixed on nose
- head turn to effected side = ***corrective saccade***
- means ***peripheral cause***

Nystagmus

- Peripheral: unidirectional (lesion fast phase), horizontal
- Central: rotational, vertical, or direction-changing

Test of Skew

- Look at nose, cover eye; uncover eye & look at gaze
- Gaze fixed to nose = -ve skew = peripheral
- Gaze corrects to nose = +ve skew = central

Peripheral Vertigo

Vestibular Neuronitis

- Most common AVS
- Related to ***viral illness***
- Can try *prednisolone* 125mg for 3d → taper

Labrynthitis

- Rare
- Essentially same as vest neuritis but with ***hearing loss***
- Usually toxic as well

BPPV

- Stuck ***otoliths***
- Most common cause of vertigo (not AVS)
- ***Episodic***, sudden onset
- Antiemetics, ***stemetil, largactil***, Eply's manœuvre

Meniere's

- Lack of ***endolymph*** resorption (or excess production)
- ***Episodic*** but ***Tinnitus/*** ≠ BPPV
- Restrict salt intake, avoid caffeine, try *thiazides*

HEADACHE

DDx Headache

- Infection: Meningitis, encephalitis, sinusitis
- Ischaemia: CVA, TIA
- Haemorrhage: Trauma, SAH
- Vascular: Dissection, GCA, venous thrombosis
- O&G: Eclampsia
- Cardio: HTN
- Eyes: glaucoma, optic neuronitis
- Neuralgia: trigeminal, post-herpetic
- Systemic illness (sinister in 33%)
- Withdrawal
- Sinusitis
- Headache syndromes
- TMJ syndrome
- Intracranial HTN
- Tumour
- Post-LP

Drug Classes in Headache

- Simple analgesia/Opiate
- Serotonin agonist eg *trypans, ergots*
- Dopamine agonists eg *largactil, stemetil*
- Other
  - **Dexamethasone**
  - **Amitriptyline, Gabapentin**
  - **Haloperidol, droperidol**
  - **Propofol**

DELIRIUM

- Treat underlying cause
- Familiar faces, less stimulation
- Rx: ***respiridone*** 0.5mg
  haloperidol 0.5mg
  olanzapine 2.5mg
- Prevention eg hearing aids, visual aids, prevent sleep deprivation, maintain mobility, low stimulation environment

Delirium vs Dementia vs Psychosis

	Delerium	Dementia	Psychosis
Main	**Confusion**	Memory loss	Loss of contact with reality
Onset	Acute	Gradual	Either
Course	Fluctuant	Progressive	Chronic with exacerbation
Duration	Hrs-Mths	Mths-Yrs	Mths-Yrs
Conscious State	**Clouded**	Normal	Normal
Attention	**Impaired**	Normal (until late)	Normal
Orientation	**Fluctuant**	Poor	Normal
Speech	Incoherent	Mild erroris	Normal
Thought	Disorganised	Impoversihed	Disorganised
Illusion/Hallucination	Common visual	Rare	Common
Reversible	**Usually**	Rare	Rare
EEG	Mod-severe bckgrd slowing	Normal-mild	Normal

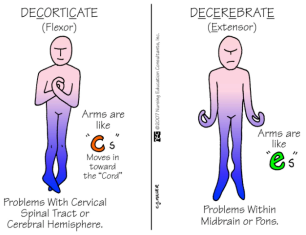
ALTERED CONSCIOUSNESS

Glasgow Coma Scale

	1	2	3	4	5	6
E	None	Pain	Voice	Open	-	-
V	None	Incomp	Inapp	Conf	Orient	-
M	None	DecEr	DecOr	Wdraw	Local	Obey

DecErebrate
- extensors
- straight elbows
- pointed toes

DecOrticate
- Flexors
- bent elbows
- touching toes



DDx ALOC

AEIOU TIPS
- **A**cidosis, arrhythmia, NH_4, Etoh
- **E**pilepsy
- **I**nfection
- **O**verdose, underdose
- **U**raemia
- **T**rauma
- **I**nsulin
- **P**sychogenic
- **S**troke, SOL

Coma Cocktail

- 50ml 50% *Dextrose*
- 400 mcg *Naloxone*
- 100mg *Thiamine*

Reye's Syndrome

- *Aspirin* associated ∴ only use in Kawasaki in kids now
- Rapidly progressive encephalopathy
- Tx supportive (mostly target cerebral oedema)

AUTOIMMUNE

Guillain Barre Syndrome

- Sensory & motor
- Demyelination, infection (***campylobacter, CMV, EBV***)
- Predominant ***symmetrical ascending flaccid weakness***
- Loss of DTRs
- Ascending glove & stocking paraesthesia
- ***Miller-Fischer*** variant = CN 1st
- ↑ ***CSF protein (> 0.55 g/L)***, all else ok (if WCC ↑ not GBS)
- Don't use ***sux***, use *IVIG* or *plasma exchange*

Myasthenia Gravis

- AChR autoantibodies = pure motor
- ***Isolated muscle weakness (esp ocular, prox limbs)***
- ***Fatiguability***, relieved with rest
- Mx *pred*, thymectomy, *IVIG*, plasma exchange
- ***Pyridostigmine, neostigmine*** regular

Complications

- ***Myesthenic crisis:*** common, missed dose
- ***Cholinergic crisis:*** OD on ***Pyridostigmine***

Eaten-Lambert

- Proximal weakness
- ***Lambert sign*** - better with exercise

Multiple Sclerosis

- Demyelination from loss of oligodendrocytes
- LP ***oligoclonal bands***
- Mx: ***methylpred, ACTH***, plasma exchange

Common manifestations

- Cord: limb weakness & UMN signs
- ***Optic neuritis*** (esp colour), worse after heat
- Brainstem: diplopia etc
- Cerebral: seizure, ↓IQ

SEIZURES

- ***6% population*** have a non-febrile seizure
- 50% of the 6% have a 2nd episode
- 75% of the 50% go on to have epilepsy (~2%)

Cause

- Idiopathic
- ARF
- Trauma
- SOL
- Degen
- Infection
- Congenital malformation
- Metabolic: low Na, Glc, Ca
- Vascular (intracerebral or pre)
- Drugs & OD eg sertraline
- Structural brain lesion
- ***Non-compliance***

Causes (neonates)

- hypoxia, haemorrhage, hypoglycaemia
- pyridoxine def
- infection
- drug withdrawal
- familial

Seizure Mimics

- TIA
- Syncope
- Arrhythmia
- Movement disorder
- Sleep disorder
- Psychogenic
- Migraine

Risk Factors for Recurrence

Adults

- < 50yo
- FHx
- Hx of neuro insult eg trauma, hypoxia
- Structural lesion
- 2 in 1 week

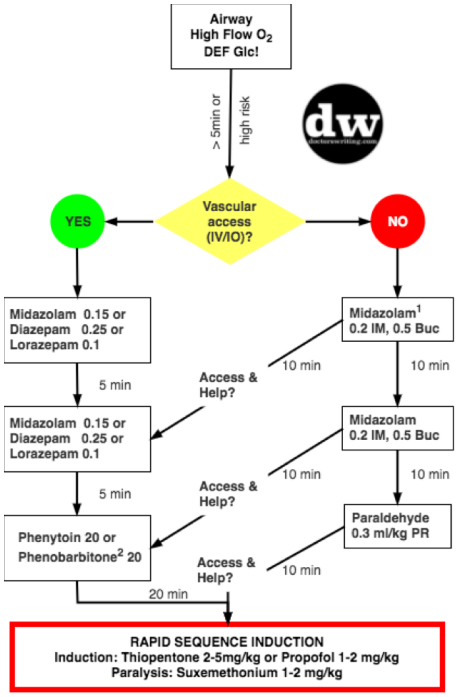
Paeds

- Abnormal EEG
- Seizure in sleep
- Complex Febrile seizure
- Todd's paresis

Pseudo-seizure Features

Presence of:	*Absence of:*
- Side-to-side head movt	- No tongue biting
- Pelvic thrusting	- No incontinence
- Non-sync movt	- No post-ictal state
- Out-of-phase movt	- Avoidance manoeuvres
- Eyes look away	- Normal serum lactate

Paed Mx



All doses are mg/kg unless otherwise stated
[1]Diazepam PR 0.5 mg/kg is also available
[2]Use phenobarbitone if already on phenytoin

Seizure Drugs in Paeds

	Drug	Dose[1]	Route
1st	*Midazolam*	0.15,0.20, 0.50	IV/IM/Bc
	Diazepam	0.25, 0.5	IV/PR
	Lorazepam	0.1	IV
2nd	*Phenytoin*	20	IV
	Phenobarbitone[2]	20	IV
	Paraldehyde	0.3	PR
RSI	*Thiopentone*	2-5	IV
	Propofol	1-2	IV
	Suxemethonium	1-2	IV
PD[3]	*Pyridoxine*	10mg	IV

[1]*All doses mg/kg except paraldehyde ml/kg*
[2]*Use if already on phenytoin*
[3]*Pyridoxine def doesnt respond to others - seen from 0-6m*

Febrile Seizures

3% incidence

	Simple	*Complex*
Seizure	Generalised	Focal
Duration	< 15min	≥ 15min
Recovery	< 1 hr	≥ 1hr
Neurology	No	Focal
Episode	1st	> 1st for illness

Prognosis

- recurrence ***1/(1 + age)*** (1yo 50%, 2yo 30%)
- epilepsy:

Risk Factor	*Interpretation*	
- Complex febrile seizure	No RF	01%
- Low fever	1 RF	02%
- Low age	> 1 RF	10%
- Neurodevelopmental		
- FHx		

Seizure Complications

Kids

- 4% mortality if status
- arrhythmia
- HTN
- APO
- Hyperthermia
- DIC

Neonate

- CP
- Spasticity
- Feeding difficulties

Status

- cont seizure or no return to normal > 30min
- start Tx at 5min (most abort at 2min)

Adult Mx

- Glc ± *Thiamine*
- A: left lateral
- B: O_2 high flow
- C: IV access
- D: Abort seizure
  - 1st line: *Midazolam* 5-10mg IM/IV
  - 2nd line: *Midazolam* infusion
- D: Prevent further seizures
  - *Clonazepam* 1mg BD for 3/7 or
  - *Phenytoin* 2g max 50mg/min
- Look for cause

MENINGITIS

Bacterial

- S pneumoniae or N meningititis
- < 2m old: GBS, e coli, listeria
- > 2m old: S. pneumoniae, n meningititis, HiB

Aseptic

- Viral: Mumps, CMV, HIV, EBV, Coxsackie
- Fungi/Parasites: Cryptococcus, toxoplasma
- Autoimmune: SLE, sarcoid, Wegners

Atypical Bacteria

- TB, Mycoplasma, Borrelia, Treponema

Meningitis Mx

Dexamethasone 10mg (0.15mg/kg)
Ceftriaxone 4g (100mg/kg), *Vanc*/*Cipro* 400mg if allergic

± BenPen 2.4g to cover listeria if at risk (immunocompromised, > 50, alcohol, pregnant, debilitated)

± *Vanc* if mastoid
± *Aciclovir* 10mg/kg
< 2m *cefotaxime* 50mg/kg + *BenPen* 60mg/kg

LUMBAR PUNCTURE

Indications

- SAH
- Infection
- Autoimmune: GBS, MS, MG
- Benign Intracranial HTN (BIHTN)

Contraindications

- Anticoagulation
- Coagulopathy
- Plt < 50
- ALOC
- Seizure
- ↑ ICP
- Focal neurology
- Cushing's reflex

Intracranial Pressure

- normal adult: 5-13 mmHg
- normal adolescent: 5-15 mmHg
- normal < 8yo: 1-7 mmHg

Causes of Raised

- Infection incl abscess
- Tumour
- ICH incl SAH
- BIHTN

Causes of Lower

- Hyperventilation
- SAH block
- CSF leak
- Diabetic coma
- Dehydration
- Degeneration

Complications

- Herniation/coning
- ***Post LP headache***
- Disc laceration
- Infection
- Poor specimen
- Spinal epidural haematoma
- Worsening paraparesis
- Nerve root puncture/graze
- Intra-spinal epidermoid cyst

Post LP Headache

2-15% incidence in 24-48hrs

Risk

- technical: large needle, bevel tip, orientation of tip, no stylet when withdrawing
- Pt: young, female, Phx same, low BMI, headache prior

Mx

- Fluids
- Rest supine
- *Caffeine*
- Blood patch (unreliable)

CSF/LP Interpretation

	White cells		Biochem		
	Neut	Lymph	Protein	Glc: [1]	G Stain
Normal	0	5	0.4	0.6	-ve
Bacterial	**100-10k**	<100	**>1**	**< 0.4**	80% +ve
BPT[2]	100-10k	100-10k	>1	<0.4	20% +ve
Viral	< 100	**100-10k**	**0.4-1.0**	**0.6**	-ve
TB	< 100	50-1k	1-5	< 0.3	-ve

[1]*CSF:Blood*
[2]*Bacterial – partially treated*
NB abscess has HIGH protein

NEUROLOGICAL TOXINS

Botulism

- Ach blocker
- Cause: poor canning, ***honey***, corn syrup
- Ex: ***anticholinergic***, ***cranial/bulbar early (ie descending)***
- Mx: ***lavage/charcoal***, ***antitoxin***
  - Adults: ***equine botulism antitoxin***
  - Infants: ***human botulism Ig*** 100mg/kg
- **DON'T GIVE AMINOGLYCASIDES**
  (releases more toxins when bacteria dies)

Diphtheria

- Toxin destroys everything
- Myocarditis or Hepatitis cause death
- Motor paralysis is earliest sx
- Mx: *Antitoxin* 20K-120K units

Tetanus

- Clostridium → Tetanospasmin ***migrates along nerves***
- Inhibits GABA = ***sustained paralysis***

Clinical Features

- Triad: ***rigidity + muscle spasm + autonomic dysfunction***
- Incubation 3-14d → onset 1-7d → rigid 2w → spasm 2w → auto dysfunction 2w
- Resp: chest wall rigidity, laryngospasm, aspiration
- Autonomic: ↑HR, BP, Salivation, Bronchorrhoea
- MSK: Rhabdo/AKI

Acute Management

- Source control: ***metronidazole, Ig (300u/kg), Vaccine***
- High dose relaxant & sedation
- Rigidity: ***BZDP, $MgSO_4$***

Prophylaxis

Time[1]	Wound	TTox	Tlg[2]
Complete Immunisation (3x TTox)			
< 5y	all	No	No
5-10y	clean/minor	No	No
	all other	**Yes**	No
> 10y	All	**Yes**	No
Incomplete Immunisation (< 3 TTox)			
	clean/minor	**Yes**	No
	all other	**Yes**	**Yes**

TTox Tetanus Toxoid vaccine; Tlg Tetanus Immunoglobulin
[1] *Time since vaccination*
[2] *Provides 4 weeks protection; 250IU IM < 24h, 500IU IM > 24h, **4000IU IV if clinical evidence of tetanus***

Tetanus Prone Wound

ABCDEF

- **A**vulsed tooth re-implanted
- **B**urns, **B**ites
- **C**ompound #, **C**rush
- **D**eep/penetrating
- **E**nvironmental: obvious contamination eg soil, manure
- **F**B (esp wood splinters)

Indications for Tlg

Tetanus prone wound and:

- Immunocompromised eg HIV
- Vaccination incomplete/unknown
- Evidence of tetanus
- Allergy to TTox

Prognosis (Poor)

RUST
Route of spread: umbilicus, uterus, burns, #, IM injection
Unwrap: incubation < 7d; Onset < 48h
Spasm
Temp > 38.4, **T**achy > 120 (adults) > 150 (neo)

HICCOUGH DDX

- Stroke
- Gastric distension
- Lung Ca
- Pre-term baby
- Uraemia
- Low Na or Ca
- Vagal or phrenic n. stimulation

Mx

- ***Largactil***, nebulised ***lignocaine***, pharyngeal stimulation, Valsalva, CPAP mask

DYSTONIC REACTIONS

- not genetic or dose related
- oculogyric crisis prominent
- can be delayed (50% D1; 95% by D5)

Cause

- anti-emetics
- anti-psychotics
- anti-histamines
- tox: CO

Mx

- ***Benztropine*** 2mg IV then 2mg PO TDS 48hr

DDx

- Akathisia (anti emetics)
- Tardive dyskinesia (antipsychotics)
- Chorea (antipsychotics)

NEURO SIGNS & SYMPTOMS

Cranial Nerves

- UMN vs LMN: U has sparing of forehead
- Bells' ***Pred*** 1mg/kg max 100mg OD 5d w/in 48hrs
- Ramsay Hunt: CN VII, EAC, ***valaciclovir*** 1g TDS

Visual Field Defects

Defect	***Anatomy***	***Causes***
Tunnel	Concentric diminution	Glaucoma, papilloedema, syphilis
↑ Blind Spot	ON enlarged	↑ ICP
Central Scotoma	ON → Chiasm	Demyelinating, toxic
Unilateral LOV	Ocular, ON	Vascular, tumour
BT Hemianopia	OC	Pit tumour
HO Hemianopia	OT → OC	Vascular, tumour
UQ Hemianopia	Temporal	Vascular, tumour
LQ Hemianopia	Parietal	Vascular, tumour

ON Optic Nerve; ICP Intracranial Pressure; LOV Loss of Vision; OC Optic Chiasm; OT Optic Tract; BT Bitemporal; HO Homonymous; UQ Upper Quadrant; LQ Lower Quadrant

Parietal Lobe Defects

Dominant

AALF

- **A**calculia
- **A**graphia
- **L**eft-right disorientation
- **F**inger agnosia

Non-dominant

- Graphaesthesia
- Tactile extinction

Dysphasia

BeWr! Brocas = Broken speech

- ***Brocas*** — **E**xpressive dysphasia (motor) *Dom frontal lobe*
- ***Wernickes*** — **R**eceptive dysphasia (sensory) *Dom temporal lobe*
- Arcuate Fasciculus — Conductive dysphasia

WEAKNESS

Causes

Non-neuromuscular

- Anaemia
- Chronic disease
- Malignancy
- Psychological
- Electrolytes eg ↓ K, Ca
- Chronic Fatigue
- Rheum
- Dehydration
- Malnutrition
- Cardiac failure
- Rx eg ***statins***
- Sepsis
- ↓ Thyroid

Neuromuscular

- Autoimmune: GBS, MS, Myasthenia
- Cord compression
- Environmental: botulism, tetanus, tick paralysis, marine
- Myopathy: HypoK periodic paralysis, Cushing's, Addison's

Clinical Features of Neuromuscular Weakness

	UMN	LMN	NMJ	Myopathy
Atrophy	-	+++	+	+
Fasc	-	Common	-	-
DTR	++	-	-	-
Tone	Spastic	Flaccid	Flaccid	Reduced
Distribution	Region	Distal	Variable	Prox>Dist
Plantar	↑	↓	↓	↓

UMN Upper Motor Neuron; LMN Lower Motor Neuron; NMJ Neuromuscular Junction; Fasc Fasciculations; DTR Deep Tendon Reflexes

GAIT

Types of gait

- Broad-based = cerebellar
- Hemiplegic = cerebral
- Tabetic: foot slapping (sensory/dorsal column)
- Steppage: due to foot drop
- Duck waddle: myopathy, esp hips
- Scissor gait: UMN eg spastic paraparesis
- Parkinsonian: shuffling

Cerebellar

Midline Cerebellar Vermis

- Postural instability
- Includes alcoholic cerebellar degeneration

Spinocerebellar

- Truncal ataxia (Drunken Sailor)
- +ve Babinski
- Hereditary eg Friedrichs

Cerebellar Hemisphere

- lateral hemispheres
- Intention tremor
- Cerebellar dysarthria (feat explosive variation to voice)
- Dysdiadochokinesia
- Dysmetria (inability to judge distance)

Sensory

- Dorsal column (lack of proprioception)
- Cerebellum, thalamus, parietal lobes are inputs
- +ve rhombergs

Vestibular

See vertigo

Movement

- NM junctions
- LMN

Cranial Nerve		Type	Function	Symptoms/Signs
I	Olfactory	S	Smell	Anosmia
II	Optic	S	Vision	↓ VA
III	Occulomotor	M	Eye movt: elevation, adduction Pupil: constriction	Eye ***'down-&-out'*** Loss of meiosis/accom (outer layer)
IV	Trochlear	M	Eye movt: depression of adducted eye	Lateral eye deviation
V	Trigmenial	B	M: Mastication S: Sensation	M: weakness/loss of mastication S: Facial anaesthesia
VI	Abducens	M	Eye movt: abduction	Medial eye deviation
VII	Facial	B	M: Facial expression, salivation, lacrimation S: Taste	M: facial muscles, dry mouth/no tears S: Loss of taste ant 2/3
VIII	Vestibulococchlear	S	Balance & Hearing	Vertigo, nystagmus, hearing loss
IX	Glossopharygneal	B	M: Salivation S: Taste, pharyngeal sensation	M: dry mouth S: no gag ref, no taste post 1/3
X	Vagus	B	M: Swallow, phonation S: Cardiac, GIT, Resp, Taste	M: dysphagia/dysphonia S: no cough ref, no taste (hard palate)
XI	Accessory	M	Pharyngeal/laryngeal, neck & shoulder	Weak head turn/shrug
XII	Hypoglossal	M	Tongue	Tongue atrophy, deviation, fasciculation