Brainstem and Cranial Nerves

Introduction

Stuart Bunt

Semester 2

The Brainstem

Development of the Brainstem

- Neural plate forms the neural tube
- Cell movement and contraction makes it form a tube

Overgrowth of neural plate leads to curvature

Formation of dilations

- forebrain - prosencephalon
- midbrain - mesencephalon
  - cephalic flexure
- hindbrain - rhombencephalon
  - cervical flexure
- spinal cord

Pontine flexure/Telencephalon

- Pontine flexure forms the rhombencephalon and 4th ventricle
- telencephalic vesicle forms cortex and contents (basal ganglia, hippocampus etc.) grow in a “C” shape
- Diencephalon
  - thalamus
  - hypothalamic half from endoderm
  - Rathke’s pouch from roof of mouth
• formation of basal and alar plates
• This basic organisation most obvious in the spinal cord and mesencephalon

In the brainstem the pattern is modified

- Afferents (A) are fibres growing “into” an area (in the brainstem this usually means sensory)
- Efferents (E) are fibres growing “out” of an area (in the brainstem this is usually motor fibres)
- These fibres can be divided up into somatic (S) (“body”) fibres and visceral (V) (“gut”) fibres
- These can further be divided into special (S) (e.g. vision is SA and visceral motor fibres under voluntary control SVE) and general (G) (e.g. sensation from the face GSA, normal motor fibres to striated muscle GSE)

Spinal cord pattern modified in the rhombencephalon

Brain section from mesencephalon

III nerve fibres
In the rhombencephalon the dorsal opening changes the pattern.

Brain section from rhombencephalon

Rhombencephalon
- metencephalon – pons and cerebellum
- myelencephalon – brainstem/SC junction
- The special visceral afferents and efferents migrate out to form the nucleus Solitarius and nucleus ambiguus

Can use anatomical knowledge to identify sites of lesions
- Remember positions 1-12
- Note many pathways (which you will learn later) pass nearby
- Cranial nerve symptoms usually pretty obvious
- Often serious (brainstem involvement)

Cranial nerves exit from the skull
- except spinal branch of accessory – which has some spinal roots
- (learn exit points in the skull)

Note position of nerves on the brainstem

Cranial nerves exit from the skull – except spinal branch of accessory – which has some spinal roots – (learn exit points in the skull)
Sensory cranial nerves
- 1. Olfactory, only sensation to enter the cortex without passing through the thalamus (old sense?)
- Rhinencephalon forms the cortex?

Sensory nerves
- 2. Optic (chiasm)
- 8. Vestibulo-cochlear

Motor nerves
- 3. Occulomotor – extraocular eye muscles except:
- 4. Trochlear (only one that emerges dorsally) – trochlear muscle
- 6. Abducens – lateral rectus

Motor nerves (cont.)
- 11. Accessory
- 12. Hypoglossal

Mixed nerves
- 5. Trigeminal
- 7. Facial
- 9. Glossopharyngeal
- 10. Vagus