Anatomy & terminology

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Stedman – 25th Ed.

extremitas (eks-trem’I-tas)
[L. fr. extremus, last, outermost] [NA]. Extremity; one of the ends of an elongated or pointed structure. Incorrectly used to mean Limb. See membrum.
**LIMBS** - *not extremities*

- **Upper limb**
  - Arm – shoulder to elbow
  - Forearm – elbow to wrist
  - Hand – this is end of limb

- **Lower limb**
  - Thigh – hip to knee
  - Leg – knee to ankle
  - Foot – all 26 bones
Where to explore muscles?

Use embryologic contours

Root Level

medial  anterior  proximal
lateral  posterior  distal
Upper limb - Motor innervation

- No C-7 below wrist
- C-6 below elbow – volar: pronator teres, dorsal – brachioradialis; supinator
- C-7 above elbow – triceps, anconeus,
- C-7 from trunk - acting on UL: latissimus dorsi, serratus anterior, pectoralis major
- Thenar – C8; hypothenar-T1

Upper limb – sensory innervation

- C-6 – digit 1
- C-7 - digit 2,3
- C-8 – digit 4,5
- T-1 – medial forearm
Lower limb – motor enervation

- Quadriceps and adductors – L 2-4
- L-4 below knee – *only* anterior tibial
- L-5 below ankle – *only* ext dig br
- Toes – S1 – S2: medial to lateral ie. Digit 1 to digit 5
Lower limb – sensory enervation

- L-2 to S-1 medial to lateral; anterior to posterior; proximal to distal
- L5 - dorsal medial foot
- S1 – dorsal lateral foot and sole

Trunk – sensory enervation

- Clavicle – T2
- Nipple – T4
- Xiphoid – T6
- Costal margin – T8
- Umbilicus – T10
- Inguinal ligament – T12
Facial muscles

- Posterior auricular is innervated by 1st branch after stylomastoid foramen
- Examine 4 branches
  - Frontalis
  - Orboculi
  - Nasalis
  - mentalis
Note nasalis and levator Labalis superioris
Surface recording around mouth or cheek – NO! NO! NO!

- Will record the underlying masseter or other 5th cranial nerve innervated muscles
- It is impossible to limit stimulus external to stylomastoid foramen to 7th cranial nerve

Posterior neck muscles

- Cervical root enervation (of posterior primary muscles) is much more caudal than you think!
- C-6 level is caudal to tip of C-7 spinous process
- C-7 is top of scapula
- C-8 is mid-scapula
WHERE TO INVESTIGATE

- POSTERIOR PRIMARY RAMI
- MORE CAUDAL THAN YOU THINK!
  ✦ C-6 is 1-2 CM CAUDAL TO TIP OF C-7 SPINOUS PROCESS
  ✦ C-7 is at TOP OF MEDIAL SCAPULA
  ✦ C-8 is at MID SCAPULA
Note arrow at C-6 myotome

Also see course of muscles supplied by posterior primary rami
Pectoralis major

- All branches of brachial plexus are available when exploring this muscle
  - C5,6 – upper portion (clavicular)
  - C7,8T1 – lower portion (sternal)
Posterior thorax

- Infraspinatus is accessible for surface recording (NB. For C-6 radiculopathy)
- Rhomboids accessible for needle EMG
- XI cranial nerve can be stimulated
- Upper trapezius accessible from surface recording and needle EMG
Diaphragm

- Accessible
  - Midline under xiphoid
  - Lateral – 10-11 ribs (after expiration)
  - Posterior – level of L-1 thru paraspinals
  - Ant-lat superiorly under rib cage
Brachial plexus – Upper Trunk

- C5,6 spinal nerves
  - Motor – deltoid, biceps, infraspinatus,
  - Sensory
    - Axillary n – sensory (lateral shoulder)
    - Digit 1 (C-6)
    - Lat antebrachial cutaneous nerve

Brachial Plexus – middle trunk

- C-7 spinal nerve
  - Motor – triceps, lat dorsi, serr ant, flex carp rad,
  - Sensory
    - Digit 2,3
    - Post antebrachial cutaneous nerve
Brachial plexus - Lower trunk

- C-8; T-1 spinal nerves
- Motor – triceps; hand intrinsics
- Sensory
  - Digit 5
  - Medial antebrachial cutaneous nerve

Serratus anterior

Access it electromyographically at its origin
Serratus anterior

- Most EMG’ers don’t where to explore
  - Needle electrode between fingers which are placed in adjacent intercostal spaces
  - Recording electrodes along lateral chest
  - (C5.6.7) – Long thoracic nerve of Bell
Serratus Winging

- Long thoracic nerve of Bell compromise
- C-5,6,7 radiculopathy
- Recognition
  - Wings *medially*
  - Winging made worse by shoulder forward flexion
Trapezius winging

- Causes
  - Local compromise of XI cranial N eg. Biopsy
  - Sacrifice of XI in radical neck surgery

- Symptoms and signs
  - Shoulder pain and weakness of shoulder abduction
  - Shoulder complex moves forward and downward
  - Scapular winging *aggravated by shoulder abduction*

- Wings *laterally*

- Winging is aggravated by shoulder abduction
35 y/o S/P lymph node biopsy (posterior)

SNAP’s in upper limb

- C-6 – digit 1
- C-7 – digit 2,3
- C-8 – digit 5
- Median nerve – digit 1,2,3,4(1/2)
- Ulnar nerve – digit 4(1/2),5
CV ulnar nerve across elbow

- Must do study with elbow flexed (70 degrees)
- Proximal conduction is ALWAYS faster
- Note the amplitude (reduced- if block)
- Include SNAP of digit 5
<table>
<thead>
<tr>
<th>Measurement</th>
<th>Elbow Straight</th>
<th>Elbow Flexed 70°</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above to below elbow</td>
<td>14 cm</td>
<td>17 cm</td>
</tr>
<tr>
<td>Conduction Velocity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Across elbow</td>
<td>47 m/s</td>
<td>57 m/s</td>
</tr>
<tr>
<td>Above elbow to wrist</td>
<td>52 m/s</td>
<td>62 m/s</td>
</tr>
<tr>
<td>Below elbow to wrist</td>
<td>56 m/s</td>
<td></td>
</tr>
</tbody>
</table>
Sunderland’s dissection
LUMBAR PARASPINALS

Brim of pelvis – L-4
Next lumbar spinous process – L-5
Lowest muscle bulk – S-1
Iliacus and psoas

- Outer 1/3 of inguinal ligament
- Femoral nerve is lateral to femoral artery
Where? – needle in posterior tibial muscle

- Middle 1/3 of leg
- Insert needle through anterior tibial muscle
- Just deep to ant tib electrical activity – post tibial muscle
Foot – locate intrinsic muscles

- Abductor hallucis – 1 cm below navicular tubercle
- Abductor dig V pedis – below the lateral malleolus at junction of normal and sole skin
Physiologic misnomers

- ‘Deep tendon’ reflexes – no such thing! Correctly called *muscle stretch reflexes*!
- ‘Evoked response’ – this is a tautology (I learned this from Dr Kimura !!)
- ‘Denervation potential’ – BAD TERM – positive waves and fibrillation potentials are seen in many conditions besides ‘dead axons’

More terminology

- Radiation of pain is a *misnomer*
  - *Radiating* means a continuous line from a point source
  - Better – referral to a distant site eg. Buttock, Thigh, shin, heel
PROUNCIATION

- Physiatrist – physi – a’ –trist (NB. ‘iatry’ is from Greek – *medical care* how do you say “physiology”??)
- Cerebral – cer’e-bral
- Vertebral – ver’ – te – bral
- Data – day-ta is preferred! Not dah-ta.
- Facet – fac’e- et in English (in French fa – cette’)

Anatomic misnomers

- Extremity – this is the end of an elongated structure. Misused for *LIMB*
  - *Upper limb* – comprises arm (shoulder to elbow); forearm (elbow to wrist) and hand
  - *Lower limb* – comprises thigh (hip to knee); leg (knee to ankle) and foot

- NB. Upper extremity is *HAND*; lower extremity is *FOOT*
Summary – anatomy & words

- Have a chart or anatomy book nearby
- Verify your recollection
- Never assume you are correct!
- **Review. Review. Review. Surface anatomy**
  - *Frequent error is ‘exploring opponens when it is most likely - abd poll brevis*

- Have a medical dictionary nearby, also

THANK YOU!
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