The Essentials of

PERIPHERAL NERVES

• Abbreviations
  • Peripheral nervous system (PNS)
  • Ventral, dorsal primary ramus (VPR, DPR)
  • Dorsal root ganglion (DRG)

Gross Anatomy

• General Concepts
  • Ramus
    • First branch(es) of spinal nerve proper
      • VPR (larger branch) → ventral musculature, facet
      • DPR (smaller branch) → paraspinal muscles, facet
  • Nerve
    • 4-10 or more fascicles surrounded by epineurium
  • Fascicle
    • Nerve fibers (hundreds) surrounded by connective tissue
  • Connective tissue (covers nerve fibers)
    • Epineurium
      • Outer layer of connective tissue
      • Longitudinally oriented
      • Continuous with surrounding connective tissues
- Groups fascicles into nerves, limits stretching
  - **Perineurium**
    - Intermediate layer of connective tissue
    - Multilayered sheath that invest fascicles
    - Extends from nerve roots to nerve ends
    - Functions as blood-nerve barrier
  - **Endoneurium**
    - Innermost layer of connective tissue
    - Intrafascicular, surrounds individual nerve fibers
- **Peripheral nerve**
  - Combination of one or more rami
  - +/- Schwann cell myelin sheath
  - Sensory, motor fibers usually mixed
    - Some PNS branches purely sensory
- **Plexus**
  - Network of anastomosing nerves
- **Overview**
  - **Brachial plexus**
    - Composed of
      - C5-T1 VPRs
      - +/- Minor C4, T2
    - Major branches
      - Radial nerve
      - Median nerve
      - Ulnar nerve
      - Musculocutaneous nerve
• Axillary nerve

• **Lumbar plexus**
  o Composed of
    • L2-4 VPRs
    • Minor T12, L1 branches
  o Major branches
    • Obturator nerve
    • Femoral nerve

• **Lumbosacral trunk (LST)**
  o Composed of
    • L5 + L4 VPR (minor)
  o Functionally part of sacral plexus

• **Sacral plexus**
  o Composed of
    • LST + S1-3 VPRs
    • Minor branch of S4
  o Major branches
    • Sciatic nerve
    • Common peroneal nerve
    • Tibial nerve

• **Anatomy Relationships**
  • Nerves usually accompanied by similarly-named arteries, veins
    o Supply similar target tissues
    o Form "neurovascular 'bundle'"

**Imaging Anatomy**

• **Normal**
• MR findings
  o Nerves appear round/ovoid
  o Well-defined internal fascicular architecture
  o No abrupt change in caliber, course
  o STIR/fat suppressed T2WI
    ▪ Fascicles appear mildly hyperintense
    ▪ Interspersed with hypointense fibrofatty connective tissue

• Abnormal
  • Abnormal size (usually enlarged)
  • +/- Loss of normal fascicular architecture
  • Abrupt change in caliber or course
  • STIR/fat suppressed T2WI
    o Hyperintense; approach signal of vessels

• Imaging Recommendations
  • High-resolution MR
    o T1WI MR (relationship to adjacent structures)
    o STIR/fat suppressed T2WI (fascicular anatomy)
    o Fat-saturated T1 C+ (neuritis vs. tumor, etc.)

• Imaging Pitfalls
  • Nerves, vessels sometimes difficult to differentiate
    o Nerves
      ▪ Round/ovoid, linear
      ▪ No "flow void"
      ▪ Branch at relatively acute angles
      ▪ Enhance minimally
      ▪ Distinctive axial fascicular architecture
o Vessels
  • Also round/ovoid, linear
  • Have internal "flow voids"
  • Branch at large angles
  • Enhance intensely

Clinical Implications

  • **Clinical Importance**
    • Neuropathy syndromes specific to abnormal nerve(s)
    • Imaging complimentary to clinical exam, electrodiagnostic testing