MRI of the Brachial Plexus

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Outline

• Anatomy
• MRI techniques
• Imaging anatomy

Clinical Cases
• Primary tumors
• Metastatic disease
• Neuritis
• Trauma
Topology

Roots

Trunks

Divisions

Cords

Branches
RF Coils

- Body Coil - poor SNR
- Torso Phased Array - good
- Neurovascular Array - good
- Flexi-coil - limited coverage
Core Pulse Sequences

- T1 spin echo or fast spin echo (ETL 2)
  - TR 600, TE 15

- Fast Inversion Recovery T2 (STIR)
  - TR 5000, TE 48-72, TI 160 - 180 (3T)

- Dixon or "Ideal" Fat-Water Separation
  - T2W or T1W (post-Gd "fatsat")
Other Pulse Sequences

- Gradient Echo (TOF) - "Vascular GRASS"
  - TR 20, TE 10, 30° flip

- 3D Fast Spoiled GRE MRA scans (IV Gd)
  - TR 5, TE 1.2, 25° flip (MR angiography)
Five Basic Series

- **Coronal T1, T2 (IR or Ideal)**
  - 512 x 192, 20-24 cm FOV
  - T1: 2 NEX, T2: 2-4 NEX

- **Sagittal T1, T2, GRE**
  - 288 x 192, 16-20 cm FOV

- **OPTIONAL**
  - IV Gd (MRA, static, or both)
  - Axial T1 and T2 (neurorads; spinal canal)
Topology to Anatomy

- Roots - Level 1
- Trunks - Level 2
- Divisions - Level 3
- Cords - Level 4
- Branches - Level 5
Level 0: Midline
Level 1: Roots

- Intervertebral foramina
- Contributions from C5-T1
- Arise from ventral rami only
Level 1: Roots
Level 2: Trunks

- Between scalene muscles (anterior and middle)

- Contributions:
  - upper trunk, C5 + C6
  - middle trunk, C7
  - lower trunk, C8 + T1

-Trunks are short-
Level 2: Trunks
Level 3: Divisions

- Supraclavicular triangle
  (above middle third of clavicle)

- *Anterior* and *posterior* divisions
  from each trunk

- Lat. scalenes to lat. border first rib
Level 3: Divisions
Level 4: Cords

Medial Axilla: mid-clavicle to medial coracoid

Cords:

- **Lateral:** ant div. upper + middle trunk
- **Medial:** post div. upper trunk
- **Posterior:** post div. upper + middle + lower
Level 4: Cords
Level 5: Branches

- Coracoid/pectoralis minor
- Nerves:
  - Radial
  - Axillary
  - Musculocutaneous
  - Median
  - Ulnar
Level 5: Branches
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Desmoid

+ Plexus Involvement
Desmoid

$T_1$  $T_2$  GRE
Breast Cancer

+ Plexus Involvement
Breast Cancer

+ Plexus Involvement
Breast Cancer
Breast Cancer

+ Plexus Involvement
Breast Cancer

+ Plexus Involvement
Lung Cancer
Lung Cancer - Chest Wall Pain

NO Plexus Involvement
Idiopathic Neuritis
Idiopathic Neuritis
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Yet Another Motorcycle Crash
Severe Plexus Injury

Cor T1

Cor T2 IR
Conclusions

- Plexus runs with sc/axillary artery
- Sagittal and coronal planes most useful
- Axials useful if suspect spinal extension
- Fat suppression methods such as STIR and IDEAL/Dixon are much better than chemical fatsat