Cervical Transforaminal Epidural injections
Pro-view

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Disclosures

• No financial disclosures
Overview of procedure

- Anatomical reasoning
- Physiological reasoning
- Risks/complications
- Benefits
- Techniques
  - Flouro, CT, US

Why not interlaminar?
Cervical Epidemiology

• Radharkrishnan et al.
  – Average annual age-adjusted incidence of 83.2 per 100 000 (0.08% of population)
    • Men 107.3/100 000, Women 63.5/100 000
  – Peak incidence between 50-54 years of age
  – History of trauma/ physical exertion prior to onset in just under 15%
  – Order of decreasing frequency: C7 (31-81%), C6 (19-25%), C8 (4-12%), C5 (2-14%)
Anatomical reasoning

Cervical Radiculopathy

- Disc herniation
- Spondylosis
Indications

• Should have extensive trial or medications, PT, activity modification given the potential risks of ALL cervical epidural injections.

Anatomic approach

Transforaminal
- Oblique view
- Posterior foramen
- Midpoint to inferior SAP
- Fluoroscopy, CT, US

Inter-laminar catheter
- C7-T1 or C6-C7 level
- Inter-laminar approach
- Feed catheter to level desired

ISIS practice guidelines for Spinal Diagnostic & Treatment procedures
Physiological reasoning

Steroids

- Placement of steroids near site of inflammation
- Increased inflammatory markers
  - TNF-α, IL-6, IL-8,
- Decreased nerve thresholds
- Direct c-fiber inhibition
CTF ESI Outcome studies

**Good**
- Bush 1996
  - N=68, 76% cured, 24% minimal pain, 39m f/u
- Berger 1999
  - CT-guided, 59% improved
- Slipman 2000
  - 60% excellent at 21m, 2.2 injections, 30% surgery
- Riew, 2000
  - 60% cancel surgery, no difference steroid, bupivcaine

**Poor**
- Slipman- 2001
  - Whiplash, nml imaging
  - 14% good outcome
- Slipman- 2004
  - Whiplash, foraminal stenosis
  - 20% good outcome
Outcome studies

- No direct comparisons CIL to CTF
- Lumbar studies show benefit for radiculopathy with TF approach.

Risks
Bleeding

• Epidural Hematoma
  – ASA closed claims database 1970-1999
    • 40% of all chronic pain mgmt claims were epidurals
    • Most common complication was nerve injury- 25%
      – Pre-fluoroscopy, pre-ultrasound nerve blocks
  • Spinal cord injury is leading cause of type of nerve injury in 1990’s. Epidurals 50% of these.
• ~1% of interlaminar epidurals hematoma.
Bleeding

- Risk Factors
  - Coagulopathy
  - Thrombolytics
  - NSAIDs
  - Herbal Medications
    - Garlic, Ginko, Ginseng,
  - Supplements
    - fish oils, including omega 3's !!
Bleeding

• **NSAIDs**
  – No significant risk or hematoma
  – Minor Hemorrhagic complications
    • Horlocker TT. Anest Analg 2002; 95: 1691-7

• **Antiplatelet Meds** (clopidogrel, ticlopidine, asa/dipyridamole, dabigatran, rivaroxaban)
  – Increases risk of bleeding complications, stop 7 days prior

• **Supplements/Herbals** (MSM, garlic, ginseng, ginger, Fish oil*)
  – Concurrent use with other meds affecting clotting mechanisms increase the risk of bleeding
  *- recommend stop 7 days in advance.
Bleeding

• Need to be aware of WHY patient is anticoagulated.
  – ISIS ASM 2009. Furman: Pt cancelled day of appt, died unexpectedly stopping ASA 7 days prior.

• Stents: recommendations are for 1 yr anticoagulation plavix/asa- drug eluting, then ASA for life. Bare metal: 6 mo.

• ALWAYS consult with prescribing MD before stopping anticoagulants.
Infections

- **Meningitis**
  - Rarely Reported
    - Morris 1994
    - Nelson 1973
    - Civen 2006 Clin Infect dz: Serratia from compound betamethasone
  - Dural Puncture

- **Arachnoiditis** (infectious and medication etiology)
  - Ryan 1981

- **Abscess** - most common organism Staph. Epi.
  - Major risk factor: Indwelling catheter
  - Second most common complication in ASA claims- 21% (nerve inj 25%)
  - Epidural abscess
  - Extra dural abscess
    - Gouke, British Journal of Anesthesia 1990; 65: 427-429
    - Facet joint infections.

- **Local infection**
Procedure Specific Complications

- Interlaminar
  - Possible Intrathecal Injection
  - Venous Injection
  - Inadvertant Discogram- hopefully not, though been done.
  - Epimembranous Injection
  - Intra-articular facet joint injection
  - Lack of flow past an area of stenosis
  - Peculiar flow pattern along the circumneural sheaths
    - Renfrew DL. Atlas of Spinal Injection 2004 Table 2-4 p. 23.

- Fungal Infection
  - Torula Meningitis
Procedure Specific Complications

• Transforaminal

- Audit of 322 injections
- Overall incidence of minor complications 9%
- Transient headaches 3%
- Increased back pain 2%
- Facial Flushing 1%
- Increased Leg Pain 0.6%
- Vaso-vagal reaction 0.3%
Neuraxis Injury

• Direct Mechanical Injury
  – Spinal Cord
  – Spinal Nerve
  – Vascular Injury
    • Anterior Spinal Artery Syndrome
      – Sudden painless onset of LE weakness
      – Variable sensory deficits, with relative preservation of proprioception
      – Supplies Cauda Equina and anterior 2/3 of spinal cord
Procedure Specific Complications

- Transforaminal
  - Intrathecal/Subarachnoid injection (dural sleeve)
  - Intravascular injection
      - Audit of 504 cervical injections-19% incidence of intravascular injection
      - Presence of reinforcing arteries are more common in lower cervical spine
    - Brain or cord infarcts, vertebrobasilar infarcts, death. 78 cases reported by Scanlon et al. Spine 2007;32(11):1249-56
Figure 2 Axial 3-dimensional T2 sequence through the C3-C4 neural foramina Vertebral artery loops within the C3-C4 neural foramina (arrows).

Fink J R et al. Neurology 2010;75:192-192
Anatomical hazards

Cervical Vasculature

- Vertebral artery
  - May have medullary branch
- Deep cervical
  - May have medullary branch
- Ascending cervical
  - May have medullary branch
- Usually lie just lateral to foramen in posterior mid-inferior position
- C5-6, C6-7 most common entry

Procedure Specific Complications

• Transforminal Cervical

• Decreasing Risk of Complications
  – Advance needle from Anterior Oblique approach
  – Ensure needle remains over SAP along the posterior aspect of the intervertebral foramen
  – Use AP view to adjust final needle depth into foramen
  – Do not advance needle >50% across medial-lateral dimension of the foramen
  – Use contrast under “live” fluoro. Leave tubing connected. Test dose, then steroid.
  – Use of a non-particulate steroid?
    • Riew 2003- intravertebral a. injection
Needle choice

• Blunt tip needles
  – Less likely to penetrate vascular?

• Trucath
  – Still 10% vascular uptake with catheter.
  – 3% unable to get to foramen
Summary

- Try ALL non-interventional therapies first!!
- Use for radiculopathy ONLY. Not axial.
- Have extensive training, excellent radiology.
- Low threshold to abort. Especially if flashback seen in needle.
- Digital subtraction imaging, if available.
- Non-particulate steroid.
Safest Approach?

• Unclear, both have rare catastrophic complications

• But then again…. 
MEDICATION COMPLICATIONS