Cervical Spine Approaches: An Otolaryngologist Perspective

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When are we involved?

- Transoral Approaches
- Multilevel exposure
- Exposed Hardware
- Concurrent neck lesion or Dysphagia/Dysphonia
- Revision Surgery
  - Difficult tissue planes
  - Need wider exposure to work beyond current plate

Our Role

- Preoperative Assessment
  - Identify Risk Factors / surgical planning
- Surgical Access
- Post Operative Care Otolaryngic Issues
  - Dysphagia
  - Dysphonia

Approaches to the C Spine

- Craniovertebral Junction
  - Transmaxillary
  - Leforte
  - Transoral
  - Transmandibular
  - Endoscopic Nasal/Oral
  - Endoscopic Cervical
- C2/3-T1
  - Transcervical
  - Transmandibular
Complications Cervical Spine Surgery

- Transoral
  - Airway obstruction
  - Velopharyngeal insufficiency (VPI)
  - Palate Fistula
  - Pharyngeal CSF leak fistula
  - Dysphagia
  - Dysphonia
  - TMJ arthropathy

- Transcervical
  - Scar
  - Airway Obstruction
  - Dysphagia
  - Dysphonia
  - Pharyngeal diverticula

Etiology of Dysphagia

- CN 9,10,12 Injury
- Muscle fibrosis
- Anatomic
  - Loss of Spine Height
  - Scarring to Plate
- Palate dysfunction from transoral
- Still to be defined

Dysphagia

- Early dysphagia 50-70%
- Dysphagia > 1 year 10-15%

Predictors:
- Females
- Multi level/ revision surgery

Vocal Fold Paralysis Risk Factors

- Overall ~1.5-10%
- Prior Spine Surgery (9%)
- Side of Approach
  - Several Studies no difference
  - Right Side 12% > Left 6%
  - Left more redundant
  - Right RLN not protected in TE Groove


**Endotracheal Cuff Pressure**

- Reducing cuff pressure to 20mmHg = 1.3%

Kilburg. J Neurosurg Spine 2006 Apr 4

**Preop Assessment if Hx Prior Spine Surgery**

- 11/50 pts with prior spine surgery had unilateral VF paralysis.
- 5 were asymptomatic
- Plan approach from the same side


**Preoperative Exam**

- **History**
  - What is the diagnosis?
  - extent of surgery
  - Infection
  - Degenerative Disease
  - Tumor Resection?
- **Surgical Plan**
  - Level of Spine
  - Number of Discs?

**History**

- Prior Spine or Neck Surgery?
  - Which Side?
- Pre-existing VF dysfunction?
- Pre-existing Dysphagia?
- Co-existing Disease in Neck?
**Physical Exam**
- Oral Cavity
  - Trismus - TMJ?
  - Tongue/Posterior Pharynx
- Neck
  - Flexion/Extension range?
  - Prior Neck Surgery - Side/Incision?
  - Coexisting disease/mass

**Preoperative Assessment**
- Functional Exam
  - Fiber Optic Exam
    - Pharynx
    - Glottic mobility
    - Sensation of pharynx and epiglottis

**Preoperative Assessment**
- Available Imaging
  - Evaluate location of lesion
  - Relation to external anatomy
  - If available, vascular anomalies to suggest non-recurrent nerve?

**Assessment**
- Chose best approach/side to minimize post op deficit
- Counsel patient regarding potential for dysphonia and dysphagia
- Is airway compromise a risk?
Plan

Airway management
- Is oral intubation possible
- Will endo-tracheal tube be in the way?
- Post Op Edema expected?

Post Op Feeding
- Plan for NG?
- Is there potential for permanent dysphagia

Surgical Approach

After Appropriate Consent

Approach to Upper Spine?

- Craniocervical Junction
  - Type A, B, C

- Upper Spine
  - Endo-oral
  - Trans-oral
  - Glossotomy
  - Mandibulotomy

Upper Spine Options

- Nonsurgical traction
- Endoscopic transnasal
- Endoscopic transoral
- Open transoral

El-Sayed, Wu, Mummennen, J Craniovert Junction 2010
Wu, Mummennen, El-Sayed Otol Clin N Am Oct 2011
How Much Access Do You Need?

- Consider Relation of Spine to Oral Cavity
- Odontoid Height Varies With Relation to Palate
- Tongue Variation
- Soft Palate Length
- Opening of Mandible

Traditional Trans-oral Approach

- Split soft palate
- +/- Remove hard palate
- Expose posterior pharyngeal wall
  - U shape flap
  - Midline Split

Other Open Approaches

- Leforte I
- Glossotomy
- Mandibulotomy

A tracheotomy can buy a few centimeters of inferior access
Transoral Procedure

- Palate Split

- Glossotomy without Manidibulotomy can achieve inferior access

Provides More Superior Access and More Inferior Access

Glossotomy

Posterior Pharynx Wall Incision
Endoscopic Approaches to Spine

- Endoscopic Transnasal Approach to Odontoid.
  - Expanded purely endonasal approach to spine
  - Resect middle turbinate
  - Ethmoidectomy
  - Posterior septectomy
  - Raise septal flap
  - Wide sphenoidotomy
    - Kassam et al Neurosurg 2005

Expanded Endonasal Approach

- Expose vidian canals
- Raise Mucosal Flap
- Ablate Basopharyngeal fascia
- Ablate paraspinal muscle insertion into clival junction
- Drill out clivus

Access Allowed with purely endonasal approach

- Sphenoid-Clivus
- Can reach down to Odontoid into body C2
- Disadvantages
  - Increased nasal morbidity
  - Crusting
  - Atrophic rhinitis
  - Need for nasal irrigations

Other Endoscopic Approaches to Spine

- Endoscopic Transcervical Approach to Upper Spine
  - Wolinsky et al J Neurosurg 2007
UCSF Experience:
Combined Endonasal/Endo-oral

- Transnasal Approach with Expanded Endonasal Approach (Kassam et al)
- Transoral Approach
  - Retract Palate with Red Rubber Catheter thru nose (Mummaneni et al, Neurosurg 2005)

Advantages of Combined Endo Nasal/Endo Oral Approach

- In some cases can avoid the nasal morbidity of pure endonasal approach
- Avoid the palate split of the open approach

Posterior Pharynx Incision

- We utilize a midline incision
  - Expanded endonasal approach ablates the posterior pharyngeal wall mucosa
  - Other approaches may use “U” flap incision which denervates the posterior wall superior constrictor muscles

Posterior Pharyngeal Linear Incision

El-Sayed IH et al, J Cervicovert Junction Spine et al 2010
Advantages of Combined Approach

- Can approach high lesions though nose without creating oral morbidity
- Reduces need for extensive endonasal dissection
  - Middle turbinate resection
  - Posterior septectomy
  - Sphenoidectomy

Endo Nasal/Oral Compared to Transoral

- Reduced
  - Length of stay (p=.014)
  - Intubation > 24 hours/Tracheotomy (p=.024)

- Velopharyngeal Insufficiency
  - 45% incidence after Upper Spine Surgery
  - Endoscopic approach may reduce VPI (p=.06)

Approach Selection

- We divide the spine to Type A, B, C based on the relation to the palate.
- A “nasal palatal line” can define lesions approached nasal vs oral.

El-Sayed IH et al, J Craniovert Junction Spine et al 2010
Analysis of Lesion

- Where is surgical target on the spine
- What is Height of the Odontoid
- How Low can we reach through the nose
- How high can we reach through oral cavity
- What is the LEAST morbid approach?

Case 1: EndoOral

- Dx Osteomyelitis
  - Subluxed C1/C2
- Surgery Debride C2
- Lesion is above and 2.5cm below the NPL
- EndoOral Approach provides access to entire lesion

Case 2: Endonasal/EndoOral

- Inflammatory Psuedotumor
- Prior Transoral Approach
- Has upper extremity weakness
- Endo-nasal endo-oral Approach

Case 2: EndoNasal/EndoOral

- Post Op Image
- Resected partial clivus, C1 ring, partial C2
Case 3: Combined Nasal/Oral

- Chiari malformation and impression of odontoid.
- A portion of the clivus, ring of C1 and the odontoid were drilled out via transnasal approach.
- The oral port provided access for instruments and endoscope.

Case 4: Endonasal

- Patient with chiari malformation and basilar impression. The tip of the odontoid is the surgical target.
- Best approached Endonasal
  - Cannot be reached through oral cavity without resecting hard palate.

Some patients may be better Candidates for
- Endonasal
- Endooral
- Combined endo oral/endo nasal

Lower Spine

- Transcervical Approach
- Transmandibular/Transcervical for combined lesions
External Spine Relations

- Mandible Ramus ~C2/3
- Hyoid –C4
- Larynx C4/5
- Cricoid- C5/6

Key Anatomic Points

- Surgical Landmarks
  - SCM
  - Submax Gland
  - Digastric
  - Laryngopharynx
  - Great Vessels
  - Cricoid
- To Preserve
  - CN 7,12
  - SLN, RLN
  - Sympathetic N
  - Carotid

My Tricks

- Scar
  - Subplatysmal Flaps (Generates referrals)
- Superior Access
  - Sub Max Transposition
  - Divide Digastric (rare)
- Inferior Access
  - Identify SLN bundle between Hyoid and Thyroid cartilage
  - Sub Cricoid Tunnel

Lower Spine

- Subplatysmal Flaps
- Submax Gland Transposition
- Preserve CN12, SLN and Vessels
- Identify Cricoid and Make SubCricoid Tunnel of tissue interventing tracheolarynx and great vessels
- Identify longus coli and Sweep pharyngoesophagus off prevertebral fascia..
Transcervical Planning

- Mark Anatomy
- Correlate with Spine
  - Hyoid
  - Larynx
  - Cricoid
- C Arm Identifies Level
  - Plan incision half way

C23 ACDF

C2/3

Submandibular gland
Digastric and CN 12

C2/3 Exposure

Divided digastric m.

C23 ACDF, PEEK cage
T1-C1 Exposure

- Combine Transcervical with Mandible split and circumglossal dissection.

Conclusion

- Post Operative “complications” can be significant
- Try to reduce by adequate preop assessment
- Surgical approach can reduce complications
  - Endoscopic
  - Appropriate Side
  - Preserve Vital Structures

Thank You