Endoscopic Management of Sinonasal Tumors:
An evolution of philosophy & technique

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Transnasal endoscopic surgery:
Always attracts controversy
- Endoscopes replacing headlights for chronic sinusitis
- Endoscopes replacing craniotomy for CSF leaks
- Endoscopes replacing open approaches for pituitary surgery
- Endoscopes replacing open approaches for tumor

Innovation in Surgery
- Lasting change happens slowly
- Scientific validation required at each step for broader acceptance

Indications for Endoscopic Approaches
- Chronic Rhinosinusitis 1985
- CSF Leaks 1990
- Pituitary Tumors 1995
- Sinonasal Malignancy 2000

"Diffusion of Innovations" Rogers 1962
Adoption of Hybrid Corn Seed: Iowa 1943

Disclosures
- Consultant: Arrinex, 480 Biomedical, Olympus, Medtronic, Sinuwave
Inverted Papilloma: 30 years of literature reflect evolution of technique & opinion

- 1986 Segal et al. “Medial maxillectomy and ethmoidectomy via lateral rhinotomy…is the surgery of choice”

- 1989 Lawson et al. “Limited lesions of the lateral nasal wall…may be approached by an intranasal or external ethmoidectomy. More advanced lesions involving the ethmoid, sphenoid, & nasopharynx require lateral rhinotomy and medial maxillectomy”

- 1990 Myers et al. “The technique of lateral rhinotomy and en bloc excision of the lateral nasal wall, followed by meticulous removal of all mucosa in the ipsilateral paranasal sinuses, remains the standard therapy”

- 1994 Cantrell et al. “Endoscopic excision is a viable alternative for many inverted papillomas”

1998: Paul Donald, En bloc vs. Piecemeal Resection

“In some areas at the skull base, it is highly impractical or impossible to perform a total en bloc resection”

“Although piecemeal resection violates one of the basic tenets of oncologic surgery, it is successful in complete tumor removal and avoidance of local recurrence”

Transfacial Approach In: Surgery of the Skull Base 1998

2006 Meta-analysis

- Recurrence Rate
  - Endoscopic vs. Non-Endoscopic
    - 12% vs. 20%, $P<0.01$
  - Non-Endoscopic
    - Historical vs. Contemporary
      - 20% vs. 19%, $P=0.78$
    - No apparent selection bias for larger tumors


- 2006 Hwang et al. “A systematic review of the literature supports endoscopic resection as a favorable treatment option for most cases of sinonasal inverted papilloma.”

- 2012 Carta et al. “Our findings support the current view of endoscopic surgery as the state of the art for treating the vast majority of inverted papilloma and indicate that it should become the standard of care”
Inverted Papilloma: 30 years of literature reflect evolution of technique & opinion

- Scientific evidence ultimately drove acceptance of endoscopic technique
- Incremental advancement of quality of evidence, ultimately changing opinion
- Slow process before verdict reached

Surgical Treatment

OLD: Inverted papilloma = open medial maxillectomy

NEW: Inverted papilloma = endoscopic tailored resection

One size does not fit all...

New technical principles for tumor surgery

- Segmental or piecemeal removal is acceptable
- Debulk with microdebrider, trap excised tumor
- Key is to identify and remove site of tumor attachment
- Drill/no drill?

Inverted Papilloma Radiologic Evaluation

- CT
  - Osteitic bone may reveal point of attachment
- MR
  - Differentiate tumor from mucosal thickening
  - Most helpful for assessing frontal
  - Not necessary if tumor confined to maxillary


Inverted Papilloma Radiologic Evaluation

- Fang et al, 2016 IFAR
  - CT + MRI successfully predicted site of attachment in 86% of cases
    - 94.6% sensitivity and 92.3% specificity
  - Not obligated to use both imaging modalities in every patient with IP

Yousuf & Wright, Am J Rhinol, 2007
Endoscopic resection of benign tumors
- Literature support for endoscopic approach
- Literature support for piecemeal resection
- Medial maxillectomy is no longer the standard of care for inverted papilloma
- Endoscopic resection has become the standard of care

Advanced benign tumors: Develop comfort with identifying attachment
- Office Biopsy = glomangiopericytoma

Advanced benign tumors: Develop comfort with resecting skull base
- Olfactory Groove Meningioma
Advanced benign tumors: Develop comfort with resecting skull base

Malignant Tumor Management
- Similar principles of management as for benign: Debulk (not en bloc) and focus on site of attachment

- Differences:
  - Orbit: Prepare to resect periorbita
  - Orbit: Aim for preservation of eye
  - Multiple frozen sections
  - Systemic workup of metastasis: Neck MRI, PET-CT scan
  - Tumor board discussion: Some tumors may be favorably managed with chemoradiation first (SNUC)

General evolution of thought in head & neck oncology
Robbins KT et al, JAMA Oto 2016; multi-author position statement
“Removing the Taboo on the Surgical Violation (Cut-through) of Cancer”

“Piecemeal removal of sinonasal, laryngeal, oropharyngeal, and hypopharyngeal cancer ...did not compromise tumor control. This time-honored dictum of avoiding tumor violation is no longer valid in selected situations.”

Extradural: Adenocarcinoma

BUT...
- Expert opinion still needs to be substantiated by higher levels of scientific evidence
- Otherwise, there will always be a gap between what we feel is in our patients’ best interest and what is the ruling standard
Systematic Plan: Adenoid Cystic CA

1 year postop

Be prepared for all possibilities

Melanoma dx’d after FESS
Be prepared for all possibilities

- 62 year old with 3 month history of left midfacial numbness
- Marked hypesthesia in V2 distribution
- Bx= poorly differentiated carcinoma

Surgical planning in endoscopic resection of sinonasal malignancy

- Know limits of endoscopic resection
- Understand that MRI cannot always predict resectability
- Anticipate where endoscopic resection may not be possible
- “Be prepared to open” means having a specific plan for dealing with trouble spots

Surgical Planning

- Multidisciplinary team assembled preop
  - Rhinologist
  - Head & Neck Surgeon: Poss maxillectomy or transcervical approach
  - Orbital Surgeon: Poss transconjunctival orbital apex dissection
- Intraoperative findings reviewed together
  - Agreed on satisfactory/unsatisfactory margins at “trouble spots”

Case

- Tumor based in pterygopalatine fossa/infratemporal fossa
- Anterior maxilla spared
- Successful dissection of infratemporal fossa to masseter, negative margin
- Positive margin at inferior orbital fissure with periorbital infiltration
- Ophthalmology entered case
Successfully cleared margins at orbit as well as remainder of infratemporal fossa

Patient discharged home on postoperative day 1

Summary
- Open techniques augment endoscopic techniques, often complementary
- Anticipate potential trouble zones preoperatively
- Seek multidisciplinary team where appropriate
- Don’t improvise: have a specific “plan B” and be ready to execute it

NCCN (National Comprehensive Cancer Network) Clinical Practice Guidelines
- “En bloc resection of primary tumor should be attempted whenever feasible”
- An overarching goal is tumor resection with histologic verification of negative margins
  - Positive margins increase risk for relapse

Donald: “Although piecemeal resection violates one of the basic tenets of oncologic surgery, it is successful in complete tumor removal and avoidance of local recurrence”

VS.

NCCN: “En bloc resection of primary tumor should be attempted whenever feasible”

How to resolve the contradiction?

So, does the literature support endoscopic resection of sinonasal malignancy as a viable alternative to open approaches?

Not so much...
### Endoscopic Resection of Sinonasal Malignancy: Problems with the Literature

- Heterogeneity of tumor types
- Low levels of evidence (most typically level 4 case series)
- Difficulty of comparison with traditional open approaches
  - Piecemeal vs en bloc
  - Selection bias against larger tumors for endoscopic approaches
- Body of literature not mature

### Endoscopic vs Craniofacial Resection of Sinonasal Malignancies:
**Systematic review and pooled data analysis (Level 3)**

- Higgins et al 2011 (Intl Forum Allergy Rhinol)
- Systematic review 1966-2008
- 2314 citations → 15 series → 226 patients extracted
- Tumor types:
  - Esthesioneuroblastoma (47%)
  - Adenocarcinoma (24%)
  - Undifferentiated carcinoma (22%)

### Meta-Analysis of Endoscopic Malignancy Resection 2016

- Rawal et al (OtoHNS 2016)
- Pooled data of endoscopic resection, mean follow up 43.0 months
- 2-year survival 85.8%
- 5-year survival 83.5%
- High grade tumor with worse survival outcomes vs. low grade tumor (p=0.015)
- Advanced stage with comparable survival outcomes as low stage outcomes (p=0.79)
- Comparable to published survival rates of open surgery but unable to do direct comparison

### Focus on Esthesioneuroblastoma

- “The craniofacial resection provides the gold standard for the surgical treatment of esthesioneuroblastoma”

  Paul Levine, MD
  Ogura Lecture, May 2008
  Triological Society

  Still true 9 years later?
“The craniofacial resection provides the gold standard for the surgical treatment of esthesioneuroblastoma”

Cannot be refuted based on today’s literature, but this statement may be revisited as levels of evidence improve; may take many years.

The Need for Better Data in Sinonasal Cancer

• To develop a national registry database for documenting clinical outcomes in patients with sinonasal cancer
• To acquire sufficient numbers of patients with relatively rare tumor subtypes to allow meaningful analysis of outcomes of endoscopic resection of sinonasal cancer

COle-Reagins SINonasal CANcer Registry

“CORSICA”

Features of CORSICA

• Launched at Stanford University
• Multicenter: Involvement of top academic institutions in the USA (& internationally)
• Standardized: To ensure consistent capture of critical data
• Accessible: By tablet, laptop, desktop
• Multi-disciplinary: Surgery, radiation therapy, chemotherapy, radiology, pathology

Collaborators

- Recruitment ongoing, goal of 150 patients/year

Summary

- Endoscopic approaches are standard of care for benign sinonasal and skull base lesions
- Endoscopic surgical principles for benign tumors can be applied to surgery for malignancy
- Tumor-specific, stage-specific prospective data needed to further validate the endoscopic approach to sinonasal malignancy
Summary

- Early evidence suggests that endoscopic approaches may offer comparable survival outcomes to open approaches if the resection of tumor and margins are anatomically equivalent

- No evidence that endoscopic approaches are superior to open approaches but there may be reduced surgical morbidity

- Best current evidence for early stage tumors

- Need more data to compare outcomes for advanced stage tumors