Frontal Osteoplastic Flap in 2019
…where does it fit in

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Disclosures

Siesta Medical
Stock holder – sleep apnea device
Advisor
Royalty Recipient

Patent Pending 61/624,105
Sinus diagnostics and therapeutics

Keyssa, Inc.
Stock holder – electronic connectors
Advisor
Overview

• Trends in Frontal Sinus Surgery
• Indications for Osteoplastic Flap (OPF) or Cranialization
• OPF and Cranialization techniques
• Outcomes and follow up
• Conclusion

Trends in Frontal Sinus Surgery

CPT Codes for Endoscopic
2000-2010 - 31276
2011 - 31276 & 31296

CPT Codes for Open
31070, 31075, 31080,
31081, 31084, 31085,
31086, 31087

Svider IFAR 2015
Indications for Open Treatment…

- Osteoneogenesis precluding endoscopic approach
- Lateral pathology – mucocele, osteoma
- Tumor requiring dural resection - inaccessible
- Infected foreign material (bone cement)
- Trauma to posterior table w/ inaccessible CSF leak
- Osteomyelitis of frontal bone/Potts Puffy Tumor
- Gender reassignment / Facial feminization

Open Surgery Must be taught still!

Osteoneogenesis with Lateral Mucocele
Malignant Tumor with Inaccessible Base and Dural Resection

Inaccessible Foreign Material with Mucocele and Osteoneogenesis
Posterior Table Trauma with CSF leak

Potts Puffy Tumor from Trauma
Frontal Sinus Osteoplastic Flap – Procedure

- 1894 Schonborn hinged OPF 1895 Brieger free OPF
- 1904 Hoffman and 1908 Beck used an x-ray template
- 1910 Marx used fat for obliteration
- 1940/50s Begara, Itoiz, Tato - spontaneous obliteration
- 1951 Gibson and Walker developed fat obliteration

- 1958 Goodale and Montgomery popularized the osteoplastic approach with fat obliteration

Early Experience…. Goodale and Montgomery

- Began in 1956 - reported on 100 cases in 1965

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<th>TABLE 1.</th>
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<tbody>
<tr>
<td>I. Osteoma 15</td>
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<tr>
<td>A. Uninfected 9</td>
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<td>B. Infected 6</td>
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<td>II. Trauma 2</td>
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<tr>
<td>III. Foreign Body 1</td>
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<td>E. Bilateral Operation 31</td>
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<td>F. Brain Abscess 2</td>
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Obliteration - Technique

• Pre-operative
  – CT scan with image guidance if possible
  – 6 foot PA Caldwell with penny taped to forehead!

• Prepare patient for potential consequences
  – Reduced sensation of forehead
  – Reduced motion of forehead
  – Potential deformity of forehead / need for revision
  – Need long term follow up - potential for mucocele/infection

Procedure Steps….

• Exposure
• Osteoplastic Cuts
• Obliteration / Preservation
• Flap Fixation
• Closure
Frontal Osteoplastic Flap – Incisions / Exposure

Frontal Osteoplastic Flap - Exposure
Frontal Osteoplastic Flap - Outline

6 foot PA Caldwell with a penny taped to the forehead

Another Option in Trauma -

Strong CMFTR 2009
Frontal Osteoplastic Flap – Outline and Cuts

Frontal Osteoplastic Flap – Drill out

- Strip all mucosa and remove disease
  - Mucocele, osteoneogenesis, all bone cement, tumor, etc

- Must be done with magnification
  - Loupes, Microscope, Endoscope
  - I like the microscope best when possible

- Diamond burr, irrigation

- SYSTEMATIC movement throughout entire sinus
  - Anterior and posterior walls
  - Anterior wall done ex vivo on back table
Frontal Osteoplastic Flap – Frontal Outflow

• Decide if you are obliterating or not

• If you are not, keep frontal outflow atraumatic

• If you are obliterating, frontal outflow must be sealed
  – Many ways to do this…

• My preferred
  – Imbricate mucosa inferiorly
  – Drill boney walls of outflow track
  – Obstruct with muscle
  – Seal with tisseal or other fibrin glue

Frontal Osteoplastic Flap – Obliteration (or not!)
Frontal Osteoplastic Flap – Fixate Flap

- Resuspension of soft tissue is important to prevent sagging of soft tissue, particularly the cheeks
- Periosteum should be reapproximated and even lifted in some cases to prevent prolapse
Cranialization – RARE!

- Described by Donald and Bernstein 1978
  - 2 cases of penetrating frontal sinus trauma

- Case series in the literature nearly all trauma…except...
  - One early series of 19 patients from 1984-97
  - Tumor, osteitis, trauma, CRS  Ameline Ann d’Oto-Lar Chir 2001

- Surgery includes complete removal of the posterior table

- Mucosa must be completely removed and burred down with a diamond burr

Ruggiero Op Tech Oto 2010
Several Series published….

Penn – 24 cases from 2004-2007  (3.4% of CRS)
  Hahn AJRA 2009

Mass Eye & Ear – 34 cases from 1995-2010 (1.1% of CRS)
  Silverman Int J Oto 2012

Emory – 57 cases from 1998-2013
  Ochsner Laryn 2015

Fulda – 75 cases from 1986-97
  Weber Laryn 2000

Are the series similar?

~ 75% are inflammatory – CRS/mucocele
  Mix of benign tumors, fractures, malignancy

Revisions varied from 5-10% depending on follow up!

90% fat obliteration, though Emory 32/57

Incisions predominantly coronal, though Mass E&E 50%
Frontal Sinus Osteoplastic Flap – complications

- 93% symptom free, 7% persistent pain

- Intraoperative
  - 7/82 Bone flap too big
    - 5/82 dural exposure, 2/82 dural tear
  - 7/84 bone flap too small, requiring additional exposure
  - 16/82 tear of periorbita (14 during burring of bone)
  - 6 with contour change, 1 hypertrophic scar (not midbrow)

Weber Laryn 2000

Frontal Osteoplastic Flap - Controversies

- Obliteration Material
- Radiography – CT and MRI
- How to identify failure!
Obliteration materials

- Nothing?
  - YES! But incomplete obliteration is common Bosley 1972

- HA and cements, bioglass, PRP, etc
  - Short term histology is favorable, but long term studies are mixed Peltola JOMFS 2007

- Multiple materials tried. Fat became the standard
  - Delgaudio notes a revision rate of 25% in fat or cement
  - However, pts obliterated with cement required 2 procedures/pt
  - Fat is preferred, cements not recommended Weber Larynx 2000

MRI evaluation of Frontal Sinus Obliteration

- Fat resorption between 4 and 85%
- T2 intensity, T1 enhancement, fat replacement seen in all patients
- Did not differentiate symptomatic from others Loevner, Yousem, Lanza, Kennedy, Goldberg AJNR 1995

- 51 patients with MRI scan 7d to 130m; mean of 24m
- 53% of patients had <20 fat present
- 18% of patients had >60%
- Recommend MRI at 1, 2, 5 years Weber Larynx 2000
How to Identify Failure!

- Besides an expanding mucocele, there is no sure radiographic method to identify a failed obliteration

- Justification for re-operation is clinical
  - Pain with infection
  - Swelling
  - Purulence/drainage

Conclusions

- Endoscopic techniques for most indications employing a less traumatic, lower morbidity approach to the frontal sinus
- Open approaches are critically important for selected cases
- Frontal Osteoplastic Flap can be performed with low morbidity and excellent access
- Non-obliterative techniques are preferred when possible partially related to the difficulty in assessment with MRI
- Cranialization is rarely needed, but can be used in selected situations, predominantly in trauma