Minimally Invasive Salivary Gland Surgery

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Outline

- Obstructive salivary pathology
- Why sialendoscopy?
- Anatomy
- Sialendoscopy setup & technique
- Management strategies
- Cases

Gland obstruction is the most common non-neoplastic salivary disorder

- Gland obstruction \( \rightarrow \) Sialadenitis
  - Sialolithiasis 60-70%
    - Submandibular 80%
    - Parotid 20%
  - Anomalies
    - Stricture
    - Ductal Polyp
  - Autoimmune, JRP, RAI

Cause of Sialolithiasis?

- Salivary stasis
- Retrograde bacterial contamination
- Tobacco use
- Diuretics
- No link with hypercalcemia or hard water

Incidence/Prevalence of Stones

<table>
<thead>
<tr>
<th>NEPHROLITHIASIS</th>
<th>SIALOLITHIASIS</th>
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<td>10:1</td>
<td>1:10,000,000</td>
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Nephrolithiasis 10:1, Sialolithiasis 1:10,000,000
**Why Sialendoscopy?**

- Efficacious
  - 80% success purely endoscopic
  - 92% success combined endoscopic and open
- Safe
- Gland preserving
  - SMG excision rate of 5% now, 35% before

**Uses for sialendoscopy**

- Diagnostic
- Instrumentation
  - Stone removal, fragmentation
  - Confirm stone removal
  - Assist in open approach to sialolithotomy

**Stones can be missed on imaging**

- Dental artifact can obscure CT
- Sialendoscopy after negative U/S revealed parotid stones 63% and SMG stones 32%
- Stones are likely underdiagnosed

**Sialendoscopy may prevent retained stones after sialadenectomy**

- Hoffman et al: 4 of 7 would have missed stones
- Marchal et al: 1 of 9 pts who failed combined approach had retained stone → reoperation
- Milton et al: 3 of 57 pts with retained stones after SMG excision
  - *17-32% of stones missed w/o sialendoscopy*

**Retained stone after SMG excision**
Antegrad Sialendoscopy

Complications of sialendoscopy are unusual and not severe

- Sialendoscopy only
  - Postop swelling 88% (few days)
  - Infection- papilla 23%, gland ≥ 5%
  - Duct laceration 5% (unlikely to → long term fistula)
  - Stricture <2% (usu stones >5mm)
  - Intraductal tool breakage/blockage (rare)
- Combined approach
  - Same as above plus:
    - FOM pain 8%
    - Lingual nerve paresthesia- temporary 4%, permanent <1%
    - Ranula 3%
    - FN paralysis 0%
  - May have to ligate the duct- gland atrophies 50% of the time

Barriers

- Cost
  - $40K for a complete set
  - $3K to rent
- Equipment
  - Learning Curve (50 procedures)
  - Few patients (though likely under-referred)

Indications:

- For sialendoscopy & sialography
  - Chronic or recurrent sialadenitis
  - Stones, strictures, autoimmune, JRP, RAI
  - Rule out cause of atypical facial pain
  - Preoperative planning
- Contraindication
  - Acute sialadenitis – higher risk perforation

Uses of Sialography

- Identify strictures not seen on CT or U/S
  - Identify acinar pathology
  - Therapeutic by dilating, irrigating, concurrent balloon dilation, steroid
- Preop planning
  - Patent duct?
  - Endoscopic vs open

Normal parotid sialogram
Stenson’s Duct Pearls

- “Go slow to go fast”
- Dilate, Don't Penetrate
- Pull cheek straight once scope is inserted
- Straighten the path with diagnostic 0.8mm scope first
**Wharton’s Duct Pearls**

- Kittner retraction
- **Angle Instruments Down & Out**
- External neck pressure
- Smaller opening than parotid, may need Turner needle to cannulate

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**Sialendoscopes**

- 1.3mm Marchal Sialendoscope
- Sinus endoscope for comparison

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**Dimensions**

Avg diameter: 1.5mm
Length: 4-6cm

- “Comma area”
- Genu over posterior border mylohyoid
- Angle: 24-178 degrees

- Kittner retraction
- External neck pressure
- Smaller opening than parotid, may need Turner needle to cannulate

**Instruments**

- Down & Out

**External neck pressure**

**Smaller opening than parotid, may need Turner needle to cannulate**
Sialodochoplasty (complex) for right submandibular sialolithiasis with salivary stones

Options for exposure of the floor of mouth include cutting one flange of the plastic spandex retractor and securing it to the bite block. Another approach identified with use of Army-Navy Spandex Lip and Cheek Retractor and Max Mouth Gag.

- 0.015 inch (0.4mm) guidewire
- Marchal hollow bore dilators
- 24g 22g angiocath
- Turner needle
- 6% cannot be cannulated

Cannulation Dilation Technique

*Right submandibular salivendoscopy initial work done through microscope from head of bed; video tower for salivendoscopy to the right of patient with nurse and equipment on left.*
Cannulation and dilation of right submandibular duct employing the microscope

Initial diagnostic sialendoscopy with 0.8 mm o.d. scope is followed by placement with 1.6 mm o.d. sialendoscope with working channel

**Factors to decide approach to sialolithiasis**
- Size
- Location
- Palpable?
- Parotid vs SMG
- Stricture
- Mobility
- Number
- Density
- Xerostomia

**Approaches to minimally invasive salivary surgery**
- Endoscopic
- Endoscopic + Fragmentation
- Endoscopic + Open (Combined)
  - Open Ductoplasty
    - Transoral
    - SMG - FOM
    - Parotid - Transbuccal
  - Transfacial - parotid
- Sialadenectomy

**SMG stone**

![Image of SMG stone](image)

Proximal dilation

Fig. 4 Management of submandibular gland stones (from Hoosh et al. 2009, med.)

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Hypoechoic nonvascular signal = dilated intraglandular ducts

*Not the same patient

Plan: transoral open ductoplasty via cutdown directly onto palpable stone, then sialendoscopy. Pt against SMG excision

SMG stone

Plan: sialendoscopy, possible ductoplasty, pt against SMG excision
Transillumination w/ sialendoscope to locate stone

Stone

Anterior mobilization of sublingual gland

5-0 Vycryl sutures from duct to lingual FOM mucosa

Kenalog 10mg/ml at end of case
Tannic acid for hemostasis

OR time = 2.5hrs

Plan: sialendoscopy, possible ductoplasty, possible SMG excision
In office sialolithotomy

More palpable stones

Plan:
- Repeat sialendoscopy, possible ductoplasty, possible SMG excision

Figure 1. Radiopaque 5mm left parotid sialolith proximal to the hilum measuring 238 Hounsfield units
Plan: sialendoscopy, possible laser

1 year later had recurrent sialadenitis requiring hospitalization
2 years later recurrent sialadenitis, able to express 3mm stone in clinic
3 years later asymptomatic

Plan: sialendoscopy, laser lithotripsy, possible transoral ductoplasty, pt against parotidectomy
1mm “Mini papillotomy” incision of buccal mucosa anterior to ostium

Ho:YAG Laser; fragment removal with Storz foreign body forceps and biopsy forceps
Infused kenalog 50 mg/ml
OR time: 4 hours

Plan: sialogram to evaluate duct patency, r/o stricture
Plan: sialendoscopy, possible laser fragmentation, likely transfacial open approach, possible parotidectomy

Stone visible only with posterior pressure on the tail of the parotid = Not amenable to laser fragmentation

https://medicine.uiowa.edu/iowaprotocols/sialendoscopy-after-parotid-stone-fragmentation-transillumination-composite

B-0 and 7-0 nylon modified interrupted Connell suture closure of duct over 6 French Cook salivary dilator

Hi success, Low complication rates with Parotid endoscopic & open approach

- Combined endoscopic + transfacial open approach
  - Success 97%
  - Complications 6%
    - 0% FN paralysis in combined endoscopic & open VS
    - 30% temporary, 2% permanent FN paralysis in superficial parotidectomy

Transfacial approach is better than parotidectomy

- Less costly
  - Savings up to 15%
- Shorter operative time
- Lower morbidity
- Must be appropriately selected
  - Large, proximal, adherent stone, inability to see endoscopically
- May end up needing parotidectomy

Failure to remove stone via sialendoscopy
- Significant postop pain swelling → sialadenitis
- Required Augmentin 4-8 weeks
- Planned for repeat sialendoscopy, likely transfacial approach but able to get to stone and remove endoscopically with basket only!
- Basket fragmentation technique: keep basket open, one hand on basket, other hand on scope, pull stone into tip of scope with basket

Stone too large to get past stricture so fragmented stone using basket as ‘cheese wire’ and tip of scope as ‘cutting board’ (Basket Fragmentation Technique)

Parotid Stone

Guidewire to help direct tip of scope into the correct branch like Seldinger technique
- Strictures just distal to dilated duct where mobile stone is trapped
- Wire basket kept open, use forward back motion until basket wraps around ‘equator’ of stone

Fragments removed one at a time
- Complete removal of stone fragments, dilated duct where stone was
- Minor trauma to duct mucosa
- Normal duct distally

Deep parotid stone removed without incisions!

Conclusions

- Continually evolving treatment of obstructive salivary gland disease
- Minimally invasive strategies are safe, effective, gland preserving, nerve sparing
- Sialolithiasis treatment includes sialography, sialendoscopic removal, combined endoscopic & open approaches, sialadenectomy

References

IgG4 related disease
- Mikulicz syndrome, Kuttner tumor, chronic sclerosing sialadenitis
- Sjogren's- lymphocytic infiltrate of exocrine glands
  - Sialendoscopy- mucus plugs
    - Early- marked vascular reticulation, hyperemia
    - Late (sclerosis): pale poorly vascularized
- Sialogram/Sialendoscopy +/- steroid infusion may be therapeutic and diagnostic

Autoimmune salivary disease

Juvenile Recurrent Parotitis
- 2nd most common ped parotid dz (mumps 1st)
- 3-6 years of age, usu resolves at puberty
- Bilateral non-obstructive non-suppurative inflammation
- Acute unilateral pain & swelling days-weeks
- Sialendoscopy- Lack of natural vascularization
- Sialogram/Sialendoscopy +/- steroid infusion may be therapeutic and diagnostic
- Symptom free 78%, partial resolution 22%

RAI Sialadenitis
- Nal Sodium Iodide symporter in Ductal cells
- Salivary iodine: 20-100x serum concentration
- Up to 24% RAI secreted into saliva
- Periductal inflam, infiltrate → obstruction
  → Ascending infection
- Increased capillary permeability → parenchymal damage
- Vicious cycle permeability → chronic sclerosis
- Pain, swelling, dysgeusia, xerostomia

RAI Sialadenitis
- Sialogram/Sialendoscopy +/- steroid infusion may be therapeutic and diagnostic
- Meta analysis 33pts had 50-100% success rate
- 50% of pts unable to cannulate
- Intervene before unable to cannulate
- Sialadenectomy in 9%

Extracorporeal shockwave lithotripsy (NOT available in the US)
- Indicated for small-medium mid-proximal stones
- 3 sessions 1 month apart
- Not painful, no sedation needed
- Contraindications
  - Significant ductal stenosis: Need sialogram first!
  - Pregnancy
  - S/p stapedectomy
- Rare complications
ESWL disconnects stones from duct walls and allows antegrade migration facilitating endoscopic removal

Success rate:
- ESWL only - 32%
- ESWL + pure endoscopic - 29%
- ESWL + combined endoscopic & open - 39%


RAI

- 19yo F s/p total thyroidectomy and RAI for papillary thyroid ca
- 156.7 mCi I131
- R>L parotid pain, swelling w meals
- No saliva expressed from all 4 glands
- Plan: sialogram, possible steroid, possible balloon dilation

Plan: Sialendoscopy, balloon dilation, steroid infusion
View thru 0.8mm sialendoscope alongside 3mm Cook salivary balloon dilator

Pre-Dilation  Post-Dilation
Plan: sialogram to eval for strictures and stones

Filling defects can be air bubbles OR stones
Stone visible at papilla & dilated duct on ultrasound = stone

Plan: sialendoscopy, possible ductoplasty

0.4mm wire basket thru 1.3mm sialendoscope

3 hours postop