Sinusitis what it is and what is SNOT: Updates on therapies and other assorted snacks

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Factors that predispose patients to Rhinosinusitis:

- Impaired mucociliary clearance: allows for blockage of sinus drainage passages
  - Viral upper respiratory tract infections
    - Impaired clearance causes blockage, which allows bacteria to proliferate, causing mucosal thickening, worsening obstruction
  - Cystic fibrosis, ciliary dyskinesia (Kartagener’s), immunodeficiency
- Allergies - cause mucosal inflammation
- Anatomic abnormalities
  - Septal deviation, abnormalities of concha/turbinates, or sinus openings

Coronal CT scan depicting nasal septal deviation to the right and right septal spur (*)
SINUSITIS

• Acute Sinusitis
  - 7-14 days to 1 month of symptoms
  - Infectious etiology
    - Viral (rhinovirus, parainfluenza, RSV, influenza virus)
    - Bacterial (strep pneumo, H. flu, Moraxella catarrhalis)
  - Symptoms: Purulent nasal drainage + facial pain/pressure + nasal obstruction
    - May also have recent onset hyposmia, fever, maxillary tooth pain, cough, headache
  - Diagnosis: Primarily clinical diagnosis, based on time course and symptoms
Chronic Sinusitis

- >12 weeks
- Etiology: Often not infectious, however bacterial profile differs from acute
  - Staph aureus, coag-negative staph, anaerobes, polymicrobial infections, pseudomonas
  - Culture-directed antimicrobial therapy is essential
  - Can also be fungal
- Symptoms: *Chronic* Purulent nasal drainage + facial pain/pressure + nasal obstruction + hyposmia
- Diagnosis: endoscopic evidence of polyps, purulent mucus from sinuses, CT sinus findings
Acute Recurrent Sinusitis

Four or more episodes per year of acute bacterial rhinosinusitis without signs or symptoms of rhinosinusitis between episodes

Each episode should meet the diagnostic criteria for acute bacterial rhinosinusitis
Symptom summary Rhinosinusitis

- Rhinosinusitis Symptoms
- "major" criteria
  - facial pain
  - nasal obstruction
  - Hyposmia
  - purulence on examination
  - fever

- "minor" criteria
  - Headache
  - Fatigue
  - dental pain
  - cough
Cellular Factors

• Various cellular elements such as constitutive cells (epithelial cells, fibroblasts, and mast cells) and monocytes produce cytokines within nasal polyps.  
  
• Epithelial and fibroblast explants produce abundant quantities of GM-CSF, IL-6, and IL-8.  

• These studies suggest that the epithelium and constitutive cells contribute significantly to chronic eosinophilic inflammation, possibly producing a vicious cycle in which eosinophil infiltration is triggered by abnormalities within the epithelium and perpetuated further by the damaging effects of eosinophil-derived proteins and mediators on the epithelium.
Immunological Factors

- Chronic sinusitis represents an ongoing inflammatory process for which inciting agents have been difficult to identify or prove.
- Chronic sinusitis with or without nasal polyposis is characterized by inflammatory thickening and polypoid changes in the sinus mucosa.\(^{18, 19, 20}\)
- The histologic hallmark is marked tissue eosinophilia.\(^{18, 19, 20, 21}\)
  - The majority of the eosinophils express the activation marker EG2, a phenotype associated with degranulation and other signs of activation, such as cytokine and mediator production.
  - Nasal polyp biopsies probed for various cytokine mRNA by in situ hybridization revealed a marked increase in inflammatory cells expressing mRNA for GM-CSF, IL-3, and tumor necrosis factor-\(\alpha\) (TNF-\(\alpha\)).\(^{21, 22, 23}\)
  - These cytokines are known to promote eosinophil accumulation through the up-regulation of endothelial cell adhesion molecules, including vascular cell adhesion molecule-1, and to cause eosinophil activation and prolonged survival (GM-CSF, IL-3).
  - Activated eosinophils in nasal polyps produce GM-CSF and TNF-\(\alpha\) mRNA, and eosinophils per se account to some extent for the presence of these cytokines in nasal polyp tissues.
- However, the driving force for eosinophil accumulation in chronic sinusitis remains unknown.
I exercised once, but found I was allergic to it. My skin flushed and my heart raced. I got sweaty and short of breath. Very dangerous.
Allergy and chronic sinus disease

• More than 50% of individuals with allergic rhinitis (AR) have clinical or radiographic evidence of chronic sinusitis and, conversely, 25–58% of individuals with sinusitis have aeroallergen sensitization. Elevated total IgE is a risk factor for the presence of severe chronic sinusitis and both sensitivity to multiple allergens and sensitivity to perennial allergens (e.g., dust mites) are independently associated with increased likelihood of having chronic sinusitis.
Allergy and sinus disease

- Most compelling is tentative suggestion of a role for omalizumab in the treatment of CHES. In a very recent double-blind placebo-controlled study of 24 subjects with asthma and NPs, significant improvements were shown in the treatment arm for symptom, endoscopy, and sinus CT scores after only 16 weeks of treatment and this was associated with significantly improved quality of life. Importantly, this improvement occurred irrespective of the presence of allergy, again suggesting that it may be IgE sensitization to bystander pathogens and not inhalant allergens that is really driving this disease process.
Effectiveness of common treatments

• Antihistamine
  • Inhibition of histamine receptor
  • Ineffective in relieving chronic nasal congestion

• First-generation antihistamines
  • Anticholinergic
  • adverse effects such as drowsiness
  • Leads to drying of secretions

Second-generation antihistamines
  Higher affinity to histamine receptors and increased potency
  No anticholinergic effect
  Cetirizine
    – Block other mediator release such as that of leukotrienes and kinins
    – Inhibit monocyte and lymphocyte chemotaxis
    – Beneficial in the treatment of chronic congestion
Leukotriene inhibition

- Leukotriene
  - More potent than histamine in triggering nasal allergic inflammation
  - Leukotriene Receptor Antagonists
    - Effective in allergic rhinitis
    - Beneficial effects for the indication of chronic rhinosinusitis
Topical Corticosteroids

- Topical corticosteroids
  - Improve patency of the ostiomeatal complex
    - reduction in mucosal swelling
    - Inhibit both immediate and late-phase reactions to antigenic stimulation (After 7 days of treatment)
  - 90% of patients with allergic rhinitis will experience improvement
Topical corticosteroids

- Topical corticosteroids
- Common adverse effects – nasal irritation, mucosal bleeding, and crusting – propylene glycol contained in the preparations
- Alleviated by switching to a aqueous delivery system
- Concomitant nasal saline used lessen or eliminate the adverse effects
Comparing nasal steroids


- (1) A meta-analysis of randomized controlled trials comparing the efficacy of intranasal corticosteroids and oral antihistamines in the treatment of allergic rhinitis showed a clear benefit in favour of intranasal steroids in relieving nasal symptoms. (2) There is no clear evidence to support the suggestion that one steroid spray is more effective than another in the treatment of seasonal or perennial allergic rhinitis. (3) All the sprays have a similar side-effect profile; the commonest being epistaxis with a reported incidence between 17 and 23 per cent. In all the clinical trials, the placebo spray had an appreciable rate of epistaxis of between 10 to 15 per cent. (4) Fluticasone causes a reduction in endogenous cortisol secretion but no significant adrenal suppression was seen with triamcinolone, beclomethasone, budesonide or mometasone. (5) There is little evidence that skeletal growth is restricted by the administration of topical nasal steroid sprays. (6) There is considerable variation in the daily cost of each spray. Beclomethasone, dexamethasone and budesonide are significantly cheaper than fluticasone, mometasone or triamcinolone.
Nasal Steroids vs H1 blockers

• 2267 subjects with allergic rhinitis in 16 randomised controlled trials
• Intranasal corticosteroids produced significantly greater relief than oral antihistamines of
  • nasal blockage (standardised mean difference −0.63, 95% confidence interval −0.73 to −0.53),
  • nasal discharge (−0.5, −0.6 to −0.4),
  • sneezing (−0.49, −0.59 to −0.39), nasal itch (−0.38, −0.49 to −0.21),
  • postnasal drip (−0.24, −0.42 to −0.06),
  • total nasal symptoms (−0.42, −0.53 to −0.32),
• There were no significant differences between treatments for nasal discomfort, nasal resistance, or eye symptoms. The effects on sneezing, total nasal symptoms, and eye symptoms were significantly heterogeneous between studies. Other combined outcomes were homogeneous between studies. Subgroup analysis of the outcome of eye symptoms suggested that the duration of assessment (averaged mean score over the study period versus mean score at end of study period) might have accounted for the heterogeneity.
Azelastine or similar

https://doi.org/10.1016/j.clinthera.2005.04.012

- Three hundred seven patients were randomized to treatment, and 299 completed 2 weeks of study treatment. The age of the population ranged from 12 to 74 years (mean, 35 years), 62.9% were female, and 69.6% were white. Over 2 weeks of treatment, both groups had significant improvements in the TNSS compared with baseline ($P < 0.001$). The overall change in TNSS was significantly greater with azelastine nasal spray compared with cetirizine (29.3% vs 23.0% improvement, respectively; $P = 0.015$). In terms of onset of action, azelastine nasal spray significantly improved the instantaneous TNSS compared with cetirizine at 60 and 240 minutes after the initial dose (both, $P = 0.040$). Scores on each domain of the RQLQ were significantly improved in both groups compared with baseline ($P < 0.001$); the overall RQLQ score was significantly improved with azelastine nasal spray compared with cetirizine ($P = 0.049$). Both treatments were well tolerated.
Decongestants

- Decongestants
- Vasoconstriction of dilated mucosal blood vessels (α-adrenergic agonists)
- Symptomatic relief of nasal congestion
- No therapeutic efficacy for the treatment of sinusitis
Decongestants and hypertensive effects
JAMA Aug 2005 Meta Analysis

- Twenty-four trials had extractable vital sign information (45 treatment arms; 1285 patients). Pseudoephedrine caused a small but significant increase in SBP (0.99, mm Hg; 95% CI, 0.08 to 1.90) and HR (2.83 beats/min; 95% CI, 2.0 to 3.6), with no effect on DBP (0.63 mm Hg, 95% CI, –0.10 to 1.35). The effect in patients with controlled hypertension demonstrated an SBP increase of similar magnitude (1.20 mm Hg; 95% CI, 0.56 to 1.84 mm Hg). Higher doses and immediate-release preparations were associated with greater BP increases. Studies with more women had less effect on BP or HR. Shorter duration of use was associated with greater increases in SBP and DBP.
Saline Rinses

- Cochrane review
  - 8 RCTs reviewed. All showed improvement in symptoms, quality of life scores, and endoscopic findings
- Daily rinses also preventative
  - RCT - Rabago and colleagues (24) used daily saline nasal irrigation and found that patients using irrigation had fewer 2-week blocks with nasal congestion, sinus headaches, and frontal pain and pressure, and used fewer antibiotics and nasal sprays than the control group. In a 12-month follow-up study, the patients using irrigation reported continued improvement of sinonasal symptoms and quality of life
Steroid rinses

- Budesonide Respules have been added to nasal irrigation as an adjuvant method of treating sinus inflammation. Budesonide, as an aqueous nasal spray, has been shown to be beneficial for those with CRS and allergic rhinitis (29). The theory behind use of the budesonide Respules in irrigation is that much higher concentrations of steroids can be topically delivered to sinus mucosa than what is available as a prescription nasal steroid spray. In a pilot study involving 18 patients over 8 weeks, the addition of budesonide suspension to twice-daily nasal saline irrigations provided significant improvements in sinus symptoms, including the sense of smell (30). There were also improvements in both radiographic and nasal endoscopy objective measures. Seventy-five percent of patients in this small study had complete regression of nasal polyps, and there were trends toward improvement in asthma symptoms. In a separate study to evaluate for systemic absorption of the steroid, Bhalla and colleagues (31) found no suppression of the hypothalamic-pituitary-adrenal axis after 8 weeks of budesonide nasal irrigation. Yu and coworkers (32) studied the use of topical budesonide Respules after functional endoscopic sinus surgery and found decreased mucosal inflammation, shortening the stage of epithelization and accelerating the recovery of mucosa after functional endoscopic sinus surgery. The available literature suggests that steroid nasal irrigation with budesonide as a promising new therapy for select patients with CRS.
### Antimicrobial Regimens for Acute Bacterial Rhinosinusitis in Children

<table>
<thead>
<tr>
<th>Indication</th>
<th>First-line (Daily Dose)</th>
<th>Second-line (Daily Dose)</th>
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<tbody>
<tr>
<td>Initial empirical therapy</td>
<td>• Amoxicillin-clavulanate (45 mg/kg/day PO bid)</td>
<td>• Amoxicillin-clavulanate (90 mg/kg/day PO bid)</td>
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<tr>
<td>β-lactam allergy</td>
<td></td>
<td></td>
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<tr>
<td>Type I hypersensitivity</td>
<td>• Levofloxacin (10–20 mg/kg/day PO every 12–24 h)</td>
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<tr>
<td>Non-type I hypersensitivity</td>
<td>• Clindamycin (30–40 mg/kg/day PO tid) plus cefixime (8 mg/kg/day PO bid) or cefpodoxime (10 mg/kg/day PO bid)</td>
<td></td>
</tr>
<tr>
<td>Risk for antibiotic resistance or failed initial therapy</td>
<td>• Amoxicillin-clavulanate (90 mg/kg/day PO bid)</td>
<td>• Clindamycin (30–40 mg/kg/day PO tid) plus cefixime (8 mg/kg/day PO bid) or cefpodoxime (10 mg/kg/day PO bid)</td>
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<tr>
<td></td>
<td></td>
<td>• Levofloxacin (10–20 mg/kg/day PO every 12–24 h)</td>
</tr>
<tr>
<td>Severe infection requiring hospitalization</td>
<td>• Ampicillin/sulbactam (200–400 mg/kg/day IV every 6 h)</td>
<td>• Ceftriaxone (50 mg/kg/day IV every 12 h)</td>
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<tr>
<td></td>
<td>• Cefotaxime (100–200 mg/kg/day IV every 6 h)</td>
<td>• Cefotaxime (100–200 mg/kg/day IV every 6 h)</td>
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<tr>
<td></td>
<td>• Levofloxacin (10–20 mg/kg/day IV every 12–24 h)</td>
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Abbreviations: bid, twice daily; IV, intravenously; PO, orally; qd, daily; tid, 3 times a day.

*Resistance to clindamycin (~31%) is found frequently among *Streptococcus pneumoniae* serotype 19A isolates in different regions of the United States [94].
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<th>Second-line (Daily Dose)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial empirical therapy</td>
<td>• Amoxicillin-clavulanate (500 mg/125 mg PO tid, or 875 mg/125 mg PO bid)</td>
<td>• Amoxicillin-clavulanate (2000 mg/125 mg PO bid)</td>
</tr>
<tr>
<td>β-lactam allergy</td>
<td>• Doxycycline (100 mg PO bid or 200 mg PO qd)</td>
<td>• Doxycycline (100 mg PO bid or 200 mg PO qd)</td>
</tr>
<tr>
<td>Risk for antibiotic resistance or failed initial therapy</td>
<td>• Levofloxacin (500 mg PO qd)</td>
<td>• Levofloxacin (500 mg PO qd)</td>
</tr>
<tr>
<td></td>
<td>• Moxifloxacin (400 mg PO qd)</td>
<td>• Moxifloxacin (400 mg PO qd)</td>
</tr>
<tr>
<td>Severe infection requiring hospitalization</td>
<td>• Ampicillin-sulbactam (1.5–3 g IV every 6 h)</td>
<td>• Levofloxacin (500 mg PO or IV qd)</td>
</tr>
<tr>
<td></td>
<td>• Levofloxacin (500 mg PO or IV qd)</td>
<td>• Moxifloxacin (400 mg PO or IV qd)</td>
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<tr>
<td></td>
<td>• Ceftriaxone (1–2 g IV every 12–24 h)</td>
<td>• Cefotaxime (2 g IV every 4–6 h)</td>
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</table>
Macrolide Studies
Macrolide Immunomodulator effect

- Macrolide antibiotics targets cytokine production Decreased IL-5, IL-8, GM-CSF, TGF-β, IL-6, IL-8, TNF-α
- Altered structure and function of biofilm
- Reduced expression leukocyte adhesion molecules
- Accelerate neutrophil apoptosis
- Impaired neutrophil oxidative burst
- Decrease secretion and improve mucociliary clearance
- Inhibited release of elastase, protease, phospholipase C, and eotaxin A by P aeruginosa

Additional and backup – Clarithromycin and azithromycin achieve excellent mucosal levels – Pneumococcal resistance to macrolides double over the past 10 years from approximately 10% to 20% – Clindamycin should be reserved for culture-documented resistant S. pneumoniae
Macrolide Studies

- In another study, erythromycin or clarithromycin was given to patients with chronic rhinosinusitis with nasal polyps. After 3 months, the IL-8 levels were significantly decreased, which corresponded to a decrease in size of the nasal polyps (58). Available evidence suggests that low-dose, long-duration macrolide therapy is safe and can result in improvements in both subjective and objective measures of CRS in select patients.
# Meta-analysis of macrolides in Chronic rhinosinusitis

<table>
<thead>
<tr>
<th>Type of study</th>
<th>Dosage 24h (mg)</th>
<th>Duration (months)</th>
<th>Macrolide</th>
<th>Results</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prospective, randomized, controlled trial, n = 90</td>
<td>1000 (2 wk)</td>
<td>3</td>
<td>Clarithromycin</td>
<td>As effective as surgery in chronic sinusitis</td>
<td>Ragab, 2004</td>
</tr>
<tr>
<td></td>
<td>500 (10 wk)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prospective, open, n = 17</td>
<td>500</td>
<td>12</td>
<td>Erythromycin</td>
<td>12 responders, mucociliary transport, headache, postnasal drip, all improved, ( P &lt; 0.05 )</td>
<td>Cervin, 2002</td>
</tr>
<tr>
<td>Prospective, open, n = 20</td>
<td>1000</td>
<td>0.5</td>
<td>Clarithromycin</td>
<td>Improvement in CD68, IL-6, IL-8, TNF-α and clinical parameters</td>
<td>Macleod, 2001</td>
</tr>
<tr>
<td>Prospective, open, n = 20</td>
<td>400</td>
<td>3</td>
<td>Clarithromycin</td>
<td>Reduction of IL-8 in nasal lavage, decreased nasal polyp size</td>
<td>Yamada, 2000</td>
</tr>
</tbody>
</table>

Cervin et al. 2005
Length of Antibiotic treatment and symptoms relief

• Duration of antibiotic
• Broad-spectrum antibiotic for up to 3 weeks.
  • – Improvement in symptoms within 3 to 5 days.
  • – Resolution of symptoms within 7 to 10 days after first improvement.
  • – Another week- to diminish mucosal edema and improve mucociliary function □
  Rapid recurrence after previous treatment
  • – Add 3- to 6-week course of once-daily prophylactic antibiotic therapy
Nasal endoscopy

In our study endoscopy when compared to gold standard CT scan, we found sensitivity 88.04 %, specificity 28.57 %, positive predictive value 94.19 %, negative predictive value 15.38 %, positive likelihood ratio 1.23, negative likelihood ratio 0.42, thereby showing that nasal endoscopy had high sensitivity for diagnosing the disease but not specific enough to refute the diagnosis.
The severity of rhinosinusitis on preoperative computed tomography scan does not predict the severity of symptoms as assessed by the SNOT-20 inventory in patients undergoing functional endoscopic sinus surgery. Further, computed tomography scores fail to predict the amount of symptomatic improvement after functional endoscopic sinus surgery. Patients receive a mean reduction in symptom scores of 77% after treatment with functional endoscopic sinus surgery.
Role of clinical, endoscopic, and CT findings

• In post-ESS CRS patients, most symptoms do not correlate well with either endoscopy or CT findings. Endoscopy and CT scores correlate well. Abnormal endoscopy findings have the ability to confidently rule in the presence of CT opacification, thus validating the importance of endoscopy in clinical decision making. However, a normal endoscopy cannot assure a normal CT. Thus, symptoms, endoscopy, and CT are complementary in the evaluation of the post-ESS CRS patient.
SINUS SURGERY

- Indications:
  - Sinonasal polyposis
    - Goal of surgery to remove nasal obstruction to allow for delivery of medical therapy.
    - Surgery is adjunctive and polyps recur without medical regimen
  - Chronic rhinosinusitis after failure of maximal medical therapy
  - Recurrent acute rhinosinusitis
    - 4 or more episodes refractory to medical therapy with documentation of endoscopic disease or CT sinus with evidence of disease while symptomatic
  - Acute complications of sinusitis (orbital or intracranial)
  - Fungal sinusitis
    - Allergic fungal sinusitis, fungal ball
    - Invasive fungal sinusitis: surgical emergency, occurs in immunocompromised patients
  - Mucocele: epithelium-lined, mucous containing sacs filling usually frontal or ethmoid sinuses and are often expansile, causing bone erosion
    - Surgery to prevent intracranial/orbital complications
Effectiveness of FESS

In the largest study of its kind, the UK National Sinonasal audit was a multi-centre prospective cohort study from 87 hospitals and 298 UK Consultant Otorhinolaryngologists.

- Patients aged 16 years or older that underwent primary or revision surgery for CRS with or without nasal polyposis over a six-month period were included.
- Health-related quality of life was assessed using the SNOT-22 pre-operatively, then at 3, 12 and 36 months’ follow-up.
- 70% of the 3128 patients had nasal polyps and of these 52% had previous sinonasal surgery, compared with 34% in those without nasal polyps.
- The mean overall baseline SNOT-22 score in 2852 (91%) that completed a questionnaire was 42.0, 41.0 in CRSwNP and 44.2 in CRSsNP.
- At 3 months following surgery, this mean total score reduced to 25.5, a reduction of 16.5, which represents a large improvement in health-related quality of life.
- Scores for polyp patients were consistently better versus those without polyps at all follow up periods.
- At 36 months the overall mean SNOT-22 score was 27.7. Of 1459/2797 (52%) who were available for further follow-up at 60 months, the mean SNOT-22 score was 28.2.
FESS compared with continued medical therapy

- Similarly, in order to evaluate the benefit gained from endoscopic sinus surgery in CRS compared to continuing medical therapy, Smith et al. enrolled 31 patients who failed 3 months of medical therapy for CRS and were listed for surgery.
- The time patients spent on the waiting list was used as a self-selecting period for continued medical therapy.
- SNOT-22 scores were recorded at baseline, at 2 weeks prior to surgery and then at 6 and 12 months post-operatively.
- After a mean of 7.1 months of continued medical therapy prior to surgery, the mean baseline SNOT-22 score of 57.6 significantly increased to 66.1 by the time of surgery.
- However, following surgery the mean SNOT-22 score was 16.0, a decrease of 50.1 points.
Early vs Late Surgical Intervention

- Hypothesising that untreated CRS is a progressive disease Hopkins et al. took data on 1493 patients collected prospectively in the UK Sinonasal Audit to evaluate the symptomatic benefit from early primary surgery versus intervention later in the disease process.
  - Duration of symptoms was recorded and SNOT-22 scores collected at baseline, 3, 12 and 60 months following surgery, with return rates of 80 %, 78 % and 49 % respectively.
  - Patients were divided into an Early cohort - less than 12 months since symptoms began, a Mid cohort - 12–60 months, and a Late cohort - more than 60 months.
  - In the late cohort, the mean baseline score was 40.8, significantly higher than 35.8, found in the early cohort.
- Post-operatively, mean SNOT-22 scores were significantly lower at all follow up periods in the early cohort compared to the mid or late cohort.
  - At 3 and 12 months, this difference appeared to be explained by lower pre-operative scores in the early cohort because the mean change in SNOT-22 scores was similar, but at 60 months a persistent worsening in symptom scores meant that the benefit gained following surgery initially in the late cohort was not sustained.
  - Similar outcomes were found with asthma patients excluded.
  - Furthermore, a significantly higher proportion of patients reached a Minimal Clinically Important Difference of $\geq 8.9$ points in the early group versus the late group at 12 and 60 months. This study indicates that early surgical intervention after a trial of medical therapy may deliver better symptomatic outcomes that are sustained for as long as five years.
Balloon sinuplasty

- In a prospective, multicenter, randomized trial, Bikhazi et al. (2014) evaluated and compared 1-year outcomes from the REMODEL study between office balloon dilation and functional endoscopic sinus surgery (FESS).
  - Adults with maxillary chronic rhinosinusitis (CRS), including those with anterior ethmoid disease, who failed medical management and were surgical candidates for FESS, underwent either standalone balloon dilation or FESS in a 1:1 randomization scheme and were followed through a minimum of 1 year.
  - Sinonasal symptom improvement was assessed using the validated 20-item Sino-Nasal Outcome Test (SNOT-20) survey. Standardized effect sizes were computed to further assess clinical significance. Ostial patency rate, rhinosinusitis episode frequency, impact of sinus disease on activity and work productivity using the validated Work Productivity and Activity Impairment survey, complications, and revision rate were also compared and 89 (96.7%) completed 1-year follow-up.
  - Both groups showed clinically meaningful and statistically significant (p less than 0.0001) improvement in mean overall SNOT-20 scores and in all four SNOT-20 subscales.
  - The 1-year mean change in SNOT-20 after balloon dilation (-1.64) was non-inferior to FESS (-1.65; p less than 0.001). The standardized effect size was large, showing clinically significant improvement for both interventions.
    - Ostial patency was 96.7 and 98.7% after balloon dilation and FESS, respectively, and each group reported significant reductions in rhinosinusitis episodes (mean decrease, 4.2 for balloon dilation and 3.5 for FESS).
    - Overall work productivity and daily activity impairment due to chronic sinusitis were significantly improved in both groups. There were no complications and revision surgery rate was 2% in each arm through 1 year.
Balloon sinuplasty

- Balloon catheters were used in 3,276 peripheral (maxillary, frontal, and sphenoid) sinuses, for an average of 3.2 sinuses per patient. There were no major adverse events related to the use of balloon catheter instruments. The revision rate was 1.3% of sinuses treated with a balloon catheter after an average follow-up of 40.2 weeks. Sinus symptoms were improved in 95.2%, unchanged in 3.8%, and worse in 1.0% of patients. Postoperative sinus infections were significantly less frequent and less severe compared to infections before surgery. The results were consistent across all patient categories, including balloon-only patients and revision patients.
Balloon sinuplasty vs medical therapy

- Secondary end points included comparisons of change for the Rhinosinusitis Disability Index (RSDI) and the Sino-Nasal Outcome Test (SNOT-20).
- Results: A total of 198 patients were enrolled (146 surgery and 52 MM). Of the patients who chose BSD, 72% (105/146) had their procedures completed in an office setting. Overall, BSD instruments were successful in dilating 97.6% of targeted sinuses (561/575). Patients who chose BSD showed a significantly greater improvement in the Chronic Sinusitis Survey score versus MM (42.0 versus 27.0, p 0.001). Results from the RSDI and SNOT-20 surveys showed similar improvements for surgery versus MM (RSDI, 36.0 versus 18.1, p 0.001; SNOT-20, 1.7 versus 1.0, p 0.002).
YOUR INSURANCE SHOULD COVER IT

BUT IT DOESN'T
Therapy Post FESS

- A number of well-designed RCTs to assess the effect of post-operative nasal steroid sprays exist. The highest quality was a double-blinded, placebo-controlled, randomised controlled trial of fluticasone propionate commencing 6 weeks after FESS
  - Demonstrated significant symptomatic improvement compared to the placebo group at 1 and 5-year follow-up using a visual analogue scale in which patients were asked “How do you feel overall?”
  - Topical nasal steroid spray was the only post-operative care strategy to be strongly recommended (grade of evidence = A) in Rudmik’s systematic review.
Migraine and “sinus headache”

• What is “sinus headache”? It is migraine with sinus symptoms. A very large study involving almost 3000 patients was very important in evaluating the frequent complaint of “sinus headache.” In this study, the participants had at least six “sinus headaches” in the six months prior to entrance into the study. They had never been diagnosed with migraine and had never been treated with a migraine-specific medication.

• What were the results? Eighty-eight percent of the participants were found to be having migraine headache and not sinus headache. Strict criteria from the International Classification of Headache Disorders were used to tell the difference between headache types. In addition to their common symptoms of facial pain and pressure and nasal and sinus congestion, sufferers often had the following symptoms we associate with migraine:
Migraine and “sinus headache”

Study with 2500 Patients.

- 90% of patients presenting with "sinus headache" meet criteria for migraine-type diagnosis (migraine with aura, migraine without aura, or migrainous headache).
- Although not used as part of the IHS definition of migraine, "sinus" symptoms such as sinus pain/pressure, nasal congestion and runny nose are common clinical features of migraine.
- Patients are significantly impacted by these headaches and are often dissatisfied with their current headache treatment.
- Clinicians need to consider the clinical presentation of "sinus headache" as a common presentation of migraine.
More migraine

- In a multicenter prospective study, Schreiber and found that 88% of 2991 patients complaining of sinus headache had migraine or probable migraine. Most of those with migraine had nasal symptoms, sinus pressure, and sinus pain.
Smoking and sinusitis

• Smoking is associated with statistically worse outcomes after ESS based on average SNOT-16 scores. Although no investigator has proved that the effects of smoking on sinonasal health are reversible, we counsel smoking patients considering ESS about the desirability of smoking cessation (for this and many health reasons), and the possibility of a poorer postsurgery outcome should they continue smoking.
Smoking and sinusitis

- Multiple studies have analyzed the pathophysiologic effects of tobacco smoke on sinonasal mucosa. Cigarette smoke induces a physiologic nasal response including increased nasal airway resistance, nasal irritation, nasal congestion, and rhinorrhea. Tobacco smoke extract has been demonstrated to have adverse effects on sinonasal epithelial mucociliary clearance and innate immune function as well as olfactory mucosal metaplasia.

- Can take up to ten years to reset the effects of smoking on the sinusitis.
WELL.....THAT TAKES CARE OF THE HOUSEWORK!