Rhinoplasty and the Nasal Valve

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Grand Rounds Presentation
January 16, 2008
Nasal Obstruction

- Nasal valve obstruction – uncommon
  - 10-13% of pts with nasal obstruction
- Control mucosal disease medically
- Detailed past surgical history
Nasal Obstruction

- Mucosal
  - Inflammatory, Hypertrophy
  - Stricture
  - Synechia
  - Physiologic nasal cycle
  - Dependent (sleep position)
  - Vasomotor rhinitis
  - Allergic
- Cartilage
- Septum
  - Absent, Thickened, Deflected, Twisted
- Upper lateral
  - Weak articulation with septum, Deflected, Physiologic collapse
- Turbinate
  - Bone
  - Mucosal
- Turbulence
- External pressure
- Mass
  - Foreign body

Pre-op Assessment

► External appearance
► +/- Decongestion
► Intranasal exam
  ▪ Anterior rhinoscopy
  ▪ Nasal endoscopy
► Symptom scores
► Cottle & Modified Cottle Maneuver
► Normal & exaggerated nasal breathing

Physics

► Poiseuille's law:

\[ q = \frac{\pi r^4 \Delta p}{8\eta L} \]

where \( r, L \) are the radius and length of the tube.

\( \Delta p \) is the pressure drop along the tube.

\( \eta \) is the fluid’s viscosity.

► Bernoulli's Principle:

\[ P_1 + \frac{1}{2} \rho v_1^2 + \rho gh_1 = P_2 + \frac{1}{2} \rho v_2^2 + \rho gh_2 \]

The often cited example of the Bernoulli Equation or “Bernoulli Effect” is the reduction in pressure which occurs when the fluid speed increases.

\( A_2 < A_1 \)
\( v_2 > v_1 \)
\( P_2 < P_1 \)
Nasal Valve Anatomy

► Mink 1903

► Site of highest nasal resistance

► Nasal valve complex
  ▪ Superior → b/w caudal end of upper lateral cartilages & septum
  ▪ Posterior → Head of inferior turbinate
  ▪ Inferior → Nasal floor
  ▪ Lateral → Bony piriform aperture and adjacent fibrofatty tissue

► Normal cross-sectional area
  ▪ 55 to 83 mm²

Internal Nasal Valve Anatomy

- Internal nasal valve area
  - Superolateral → caudal border of ULC
  - Medial → septum
  - Inferior → floor of pyriform aperture
  - Posterior → head of inferior turbinate

- Internal nasal valve
  - Specific structure w/in internal nasal valve area
  - Caudal border of ULC and septum
  - 10 to 15 degrees in Caucasian nose
    - Wider in African or Asian nose
  - Angle < 10 degrees
    - Nasal obstruction sx's

Bailey’s. Photograph courtesy of Dean Toriumi
Internal Nasal Valve Variations

<table>
<thead>
<tr>
<th>Type</th>
<th>Image</th>
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<tbody>
<tr>
<td>convex caudal border type</td>
<td><img src="image1.png" alt="Image" /></td>
</tr>
<tr>
<td>angle occupied by the septal body</td>
<td><img src="image2.png" alt="Image" /></td>
</tr>
<tr>
<td>twisted caudal border type</td>
<td><img src="image3.png" alt="Image" /></td>
</tr>
<tr>
<td>sharp angle type</td>
<td><img src="image4.png" alt="Image" /></td>
</tr>
<tr>
<td>blunt angle type</td>
<td><img src="image5.png" alt="Image" /></td>
</tr>
<tr>
<td>concave caudal border type</td>
<td><img src="image6.png" alt="Image" /></td>
</tr>
</tbody>
</table>
Internal Nasal Valve

Figure 3  Endoscopic examination of an individual having bilateral INV occupied with septal body at both pre- and postdecongestive status. One can easily notice mucosal shrinkage, leaving behind some mucosal protuberance remnants after decongestant application.
<table>
<thead>
<tr>
<th>Number of counted nasal cavity</th>
<th>Angle occupied by the septal body</th>
<th>Sharp angle type</th>
<th>Blunt angle type</th>
<th>Concave caudal border type</th>
<th>Convex caudal border type</th>
<th>Twisted caudal border type</th>
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<tbody>
<tr>
<td>Incidence</td>
<td>129</td>
<td>54</td>
<td>26</td>
<td>23</td>
<td>12</td>
<td>4</td>
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<tr>
<td>MCA1 (cm²)</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>pre-d</td>
<td>0.48 ± 0.18</td>
<td>0.49 ± 0.14</td>
<td>0.46 ± 0.14</td>
<td>0.42 ± 0.12</td>
<td></td>
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</tr>
<tr>
<td>post-d</td>
<td>0.49 ± 0.13</td>
<td>0.51 ± 0.14</td>
<td>0.47 ± 0.13</td>
<td>0.47 ± 0.16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vol1 (cm³)</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pre-d</td>
<td>1.03 ± 0.78</td>
<td>0.91 ± 0.76</td>
<td>1.49 ± 0.31</td>
<td>1.21 ± 0.69</td>
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<td></td>
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<tr>
<td>post-d</td>
<td>1.13 ± 0.88</td>
<td>1.09 ± 0.69</td>
<td>1.53 ± 0.37</td>
<td>1.45 ± 0.73</td>
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<tr>
<td>MCA2 (cm²)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pre-d</td>
<td>0.48 ± 0.21</td>
<td>0.50 ± 0.16</td>
<td>0.53 ± 0.17</td>
<td>0.46 ± 0.15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>post-d</td>
<td>0.51 ± 0.15</td>
<td>0.59 ± 0.15</td>
<td>0.59 ± 0.13</td>
<td>0.52 ± 0.17</td>
<td></td>
<td></td>
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<tr>
<td>Vol2 (cm³)</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>pre-d</td>
<td>2.29 ± 0.26</td>
<td>2.27 ± 0.20</td>
<td>3.35 ± 0.25</td>
<td>2.14 ± 0.19</td>
<td></td>
<td></td>
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<tr>
<td>post-d</td>
<td>2.36 ± 0.40</td>
<td>2.37 ± 0.36</td>
<td>3.86 ± 0.37</td>
<td>2.19 ± 0.27</td>
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<tr>
<td>R_{insp} (Pa/cm³/s)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pre-d</td>
<td>0.51 ± 0.17</td>
<td>0.39 ± 0.12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>post-d</td>
<td>0.46 ± 0.21</td>
<td>0.32 ± 0.07</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R_{exp} (Pa/cm³/s)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pre-d</td>
<td>0.52 ± 0.19</td>
<td>0.41 ± 0.15</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>post-d</td>
<td>0.47 ± 0.20</td>
<td>0.34 ± 0.07</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

MCA1, minimal cross-section area at the first 2 cm of nasal cavity; MCA2, minimal cross-section area between the 2nd and 5th cm of nasal cavity; Vol1, nasal cavity volume at the first 2 cm; Vol2, nasal cavity volume between the 2nd and 5th cm; R_{insp}, nasal inspiratory resistance; R_{exp}, nasal expiratory resistance; pre-d, before decongestion; post-d, after decongestion.
External Nasal Valve Anatomy

- External nasal valve
  - Nasal vestibule
    - Compartment caudal to INV
  - Fibrofatty tissues of alar lobule & LLC
  - Fascia continuous w/perichondrium and periosteum
  - Caudal septum
  - Piriform aperture
Post-op Stenosis

► Uncommon in absence of trauma or surgery

► Reduction rhinoplasty
  ▪ Minimum cross-sectional area @ INV decreased by 25%

► Over 90 % of post-op nasal obstruction
  ▪ Septum is not responsible

► Up to 64% @ internal valve

► Up to 50% @ external valve

Post-op Stenosis

- High risk
  - High, narrow dorsum
  - Weak middle vault
  - Short nasal bones
  - Thin nasal skin
  - Positive Cottle
Cottle Maneuver

- Positive test if obstruction relieved
- Suggests nasal valve compromise
- Not always reliable
Modified Cottle Maneuver

- More specific test
- Thin instrument (cotton swab, cerumen curette) placed at level of ENV and INV
- Accurate method to identify level of obstruction
Modified Cottle Maneuver

Modified Cottle Maneuver

Figure 2. A: Upper lateral cartilage support is performed by using the curette to gently support the internal nasal valve. B: Position of the curette outside the nose simulates its position within.

Deviated Septum

► Most common cause of INV stenosis
► Septoplasty and turbinate reduction
  ▪ Most common procedures addressing nasal valve obstruction
Turbinate Hypertrophy

► Can contribute to INV stenosis
► Mucosal or bony
► Primary treatment → antihistamine, decongestant, topical steroids
► Surgery reserved for those who still complain of nasal obstruction.
  - Submucous resection
Spreader Grafts

- 1984 - Sheen, J
  - Widely used for both functional and cosmetic purposes
  - Main advantage → correct lack of dorsal support to lateral walls
  - Restores a normal dorsal profile

- 1984 – Sheen, C
  - Anecdotal reports of continuous nasal patency and euphoria
Spreader Grafts Placement

- Easiest via open approach
- Typically 1 to 2 mm thick
- Extend the entire length of ULC
  - Cephalic border beneath nasal bones to the caudal margin
- Submucosal pocket b/w septum & ULC
- Secured with 5-0 PDS horizontal mattress suture
- Do not pass suture through nasal cavity → further narrow the valve angle
Endonasal Placement

► 89 pts
► Septoplasty approach
► 3 different techniques for fixating the grafts were evaluated
  ▪ Tight fit
  ▪ 2-cyanobutylacrylate glue
    ► High post op infection rate
  ▪ Transcutaneous suture

Andre, RF et al. Endonasal Spreader Graft Placement as Treatment for Internal Nasal Valve Insufficiency No Need to Divide the Upper Lateral Cartilages From the Septum. Arch Facial Plast Surg. 2004;6:36-40
Endonasal Placement

Figure 4. Fixation methods.
Endonasal Placement

Figure 6. Outcome by fixation method.

Andre, RF et al. Endonasal Spreader Graft Placement as Treatment for Internal Nasal Valve Insufficiency No Need to Divide the Upper Lateral Cartilages From the Septum. Arch Facial Plast Surg. 2004;6:36-40
Endoscopic Placement

- Cadaver study
- Submucoperichondrial septal flap elevated
- 30-degree nasal rigid endoscope
- Nasal valve identified
- Fibrous junction separated by Freer elevator
- Graft placed

Results:
- Increased area on acoustic rhinometry

Figure 1  Endoscopic view (30°) of junction between the upper lateral cartilage (*) and the nasal septum (#) (left side). Tip of the probe, placed from externally, marks the fibrous junction.

Figure 2  Spreader graft (^) sandwiched in between the upper lateral cartilage (*) and nasal septum (#) (left side).

Endoscopic Placement

Table 1
Nasal valve cross-sectional area cm² results from acoustic rhinometry

<table>
<thead>
<tr>
<th>Head</th>
<th>Side implanted</th>
<th>Control side</th>
<th>Grafted side</th>
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<tr>
<td></td>
<td>Before implant</td>
<td>After implant</td>
<td>Net change</td>
</tr>
<tr>
<td>1</td>
<td>Right</td>
<td>1.17</td>
<td>1.41</td>
</tr>
<tr>
<td>2</td>
<td>Left</td>
<td>0.59</td>
<td>0.61</td>
</tr>
<tr>
<td>3</td>
<td>Right</td>
<td>0.85</td>
<td>0.92</td>
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<tr>
<td>4</td>
<td>Left</td>
<td>0.63</td>
<td>0.29</td>
</tr>
<tr>
<td>5</td>
<td>Left</td>
<td>0.99</td>
<td>1.16</td>
</tr>
<tr>
<td>6</td>
<td>Left</td>
<td>1.07</td>
<td>1.06</td>
</tr>
<tr>
<td>7</td>
<td>Left</td>
<td>0.63</td>
<td>0.75</td>
</tr>
<tr>
<td>8</td>
<td>Left</td>
<td>0.22</td>
<td>0.16</td>
</tr>
<tr>
<td>Mean</td>
<td></td>
<td>0.769</td>
<td>0.795</td>
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<tr>
<td>SD</td>
<td></td>
<td>0.311</td>
<td>0.430</td>
</tr>
</tbody>
</table>

- SG side vs control ($P \ 0.004$)
- Pregraft vs postgraft ($P \ 0.005$)

Septal crossbar

► Used for crooked noses

► Increases nasal valve patency on concave side

Fig. 1. (Above, left) Preoperative curvature of the septum. (Above, right) Pattern of the staggered incisions. (Below, left) Septal crossbar graft fitted between two septal vertical intracartilaginous incisions (closed approach). (Below, right) Additional posterior suture (open approach).
Conchal Butterfly Graft

► Anteriorly based skin & perichondrial flap
► Ascending portion of conchal bowl harvested
► 2.5 cm x 1.2 cm (men)
► 2.2 cm x 0.9 cm (women)

Conchal Butterfly Graft

- Closed approach
  - Intercartilagenous incisions
  - Full transfixion
- “V”-shaped portion caudal
- Dorsum adjusted
  - Avoid polly-beak

Fig. 4. Through the intercartilagenous incision, the graft is inserted superficial to the upper lateral cartilage.

Fig. 5. The 5-0 PDS suture on a P-2 needle is placed from deep to superficial through the caudal margin of the upper lateral cartilage, through the caudal margin of the graft, and tied as a simple interrupted suture. Alternatively, the vestibular skin may be included with the bite through the upper lateral cartilage.
Conchal Butterfly Graft

Spring Graft

- Modification of splay graft
- Places resected alar cartilage deep to the ULC as a strengthened spring
- Two pieces of convex cartilage
- Placed at midvault w/concavity facing dorsally
  - Maximizes outward force to open INV

- Not effective if alar cartilage is thin, narrow, and weak.


**Fig. 1.** Two convex cartilage grafts resected from alar cartilages are sutured on top with two U-shaped sutures to form the spring graft, which is similar to laminated springs in automotive suspension systems.

**Fig. 2.** The spring graft is placed with the concavity facing upward in the shape of a U to increase the force of widening that is going to be exerted on the upper lateral cartilages. Over the septum, the wings of the spring graft are placed deep to the dissected upper lateral cartilages. Note that the upper lateral cartilages have already been opened even before being sutured over the spring graft.
Upper Lateral Cartilage Suspension

- Traditional spreader grafts
- Dorsal septal trim
- Elevation of dorsal ULC
- Suspension over grafts
- Effaces INV angle

Flaring Suture

► Improves INV angle directly

► Open approach
  ▪ Caudal/lateral ULC exposed
  ▪ 5-0 clear nylon horizontal mattress suture from lateral ULC to contralateral ULC
  ▪ Suture is tightened → both ULC pulled dorsally
    ▶ Fulcrums on spreader grafts and nasal dorsum

► +/- spreader grafts and alar batten grafts

Fig. 3. A flaring suture placed in the upper lateral cartilages gives lateral support and may actually increase the nasal valve angle.

Figure 3. Schematic showing combined use of spreader grafts and flaring sutures to improve the cross-sectional area of the internal valve (from Park).
Flaring Suture

- Improved nasal patency scores
  - Spreader grafts = 3.3 to 6.7
    - $P = .05$
  - Flaring sutures = 3.3 to 6.7
    - $P = .01$
  - Alar battens = 2.7 to 6.3
    - $P = .01$

Flaring Suture

Mini Spreader Grafts

- Cephalic trim + spreader graft
- Resected LLC rotated to dorsum as spreader grafts
- Sutured cephalad to suspend nasal tip

Rhinomanometric data
- Improved nasal resistance in 25 cases
- No iatrogenic nasal obstruction in reported cases

Fig. 2. (Above, left) Intraoperative photograph showing the alar cartilages and nasal dorsum before reshaping. (Above, right) Excision of two strips of cartilage from the cephalic portion of the lateral crus, with preservation of attachment at the medial end. (Center, left) Preservation of a fibrous connection between the two strips of lateral cartilage removed and the lateral crus. (Center, right) Detachment of the mucous membrane from both sides of the dorsal nasal septum and preparation of the site for the grafts. (Below, left) Positioning of the mini spreader grafts and attachment with two mattress sutures. (Below, right) Suture of the upper lateral cartilages and final result.
Autospreader Flap

- Preserves “normally resected” portion of ULC in dorsal reduction
- Open or closed approach

- Cartilage separated from septum
- Portion of ULC incised
  - Mucoperichondrium left intact
- Rotated internally
  - Between septum and medial edge of ULC
  - Supported as a flap by attachment to mucoperichondrium

Autospreader Flap

Fig. 1. Arrows represent the cartilage flap.

Fig. 2. Internally rotating the upper lateral cartilage maintains the nasal valve (green arrows).

Fig. 4. Preoperative and postoperative views of a patient who underwent primary rhinoplasty using the autospreader flap technique. Observe the smooth dorsal lines 1 year after surgery.

Autospreader Flap

Limitations

- Deviated dorsal septum
- Asymmetric dorsal aesthetic lines

Nasal septal grafts are thicker and stronger, resisting the deforming forces of a deviated septum and thus correcting the curvature.

Resorbable Spreader Grafts

► Revision rhinoplasty
  ▪ No available donor cartilage

► Lactosorb = polylactic and polyglycolic acid polymer
  ▪ 12 months to absorb
  ▪ Enough time to stabilize?

Resorbable Spreader Grafts

- 10 patients w/valvular collapse undergoing secondary rhinoplasty
- F/U observations ranging from 12 to 18 months
- No recurrence of airway obstruction

Polyethylene Spreader Grafts

- Revision rhinoplasty
  - No available donor cartilage

- High density porous polyethylene (HDPP)
  - Associated complications → infection & extrusion
  - Extrusion possible unless covered w/soft tissue flaps

- Not a replacement for autogenous septal cartilage grafts.

Polyethylene Spreader Grafts

- 15 patients
- Multiple revision rhinoplasty
- Mean f/u of 16 months
- No complications
- No recurrence of airway obstruction occurred

Polyethylene Spreader Grafts

Injectable Spreader Graft

- Case reports (single surgeon)
- Calcium hydroxylapatite (Radiesse)
- Hyaluronic acid (Restylane)

Fig. 2. Left internal nasal valve (INV) collapse at rest (A). Injection 1 near the apex of the INV (B). Injection 2 is posterior to the first and directed to the caudal–medial aspect of the upper lateral cartilage (ULC) (C). Final injection placed cephalic to second injection and directed toward the ULC–septal junction on the medial side of the ULC (D). Immediate postinjection state showing an improved patent Left INV angle after injection of 0.15 mL calcium hydroxylapatite (E).
Deep-plane rhytidectomy

- Dissection deep to SMAS in the region of the melolabial folds
- Vector of pull directed in a superolateral direction
- Mimics the Cottle maneuver
Rhytidectomy and the Nasal Valve

- 20 pts
- Cheek-lift or deep-plane face-lift
- Acoustic rhinometry pre/post op
  - Internal nasal valve
    - Average increase of 22%
    - Decreased MCA over time
  - External nasal valve
    - Average increase of 5%
- Improved nasal patency scores
  - 70% of pts

Electric Stimulation

- 40 patients
  - Electrotherapy group (n = 20) and a placebo group (n ≥ 20).

- High-frequency transcutaneous and intranasal electric stimulation of nasal muscles
  - Followed for 10 to 12 months
    - 12 pts in the electrotherapy group had subjective improvement
    - Placebo group, 7 patients (35%) had subjective improvement

- F/U → rapid decline of positive results when treatment was discontinued

Vaiman, M et al. Treatment of nasal valve collapse with transcutaneous and intranasal electric stimulation ENT Journal 2004;83(11).
Biofeedback

- Muscular dysfunction contributes to nasal obstruction
  - Observed after stroke, Bell’s palsy
- EMG guided biofeedback

Biofeedback


Fig. 5. Endonasal pictures of nasal valve before (A) and after (B) treatment. Follow-up after 9 months.
Nasal Obstructive Symptoms Evaluation (NOSE) Scale

- Validated disease specific quality of life (QOL) assessment.

- Scaled from 0 to 100

- Higher scores = more severe nasal obstruction
Nasal Obstructive Symptoms Evaluation Scale

→ To the Patient: Please help us to better understand the impact of nasal obstruction on your quality of life by completing the following survey. Thank you!

Over the past 1 month, how much of a problem were the following conditions for you?

Please Circle the Most Correct Response

<table>
<thead>
<tr>
<th></th>
<th>Not a Problem</th>
<th>Very Mild Problem</th>
<th>Moderate Problem</th>
<th>Fairly Bad Problem</th>
<th>Severe Problem</th>
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<tbody>
<tr>
<td>1. Nasal congestion or stuffiness</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>2. Nasal blockage or obstruction</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3. Trouble breathing through my nose</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4. Trouble sleeping</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5. Unable to get enough air through my nose during exercise or exertion</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

6. Please mark on this line how troublesome is your difficulty in breathing through your nose:

[ ] None  [ ] Medium  [ ] Severe

Figure. Nasal Obstructive Symptoms Evaluation scale. This questionnaire was given to patients preoperatively and postoperatively (see “Methods” section).
Nasal Obstruction Septoplasty Effectiveness Study

- 59 pts
- 3 and 6 months after septoplasty, +/- partial turbinectomy

- Mean NOSE score at 3 months after septoplasty
  - 67.5 versus 23.1, \( P < 0.0001 \)

- Pt satisfaction very high

- Pts used fewer nasal medications
  - Oral decongestants \( P 0.02 \)
  - Nasal steroids \( P 0.01 \)

- Pretreatment NOSE score
  - Only independent predictive variable for larger improvement
  - \( P 0.001 \)

Table 1. Scores on the disease-specific quality-of-life instrument (NOSE scale) at baseline and at 3 months and 6 months after the date of surgery.

<table>
<thead>
<tr>
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<th>Septoplasty alone (n = 16)</th>
<th>All subjects (n = 59)</th>
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<tbody>
<tr>
<td></td>
<td>(n = 43)</td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>66.6 (20.0)</td>
<td>67.5 (19.5)</td>
</tr>
<tr>
<td>3 mo</td>
<td>69.7 (18.7)</td>
<td>67.5 (19.5)</td>
</tr>
<tr>
<td>6 mo</td>
<td>20.3 (15.4)*</td>
<td>23.1 (19.5)*</td>
</tr>
<tr>
<td></td>
<td>21.5 (21.3)*</td>
<td>26.6 (23.8)*</td>
</tr>
</tbody>
</table>

*P < 0.0001 compared with baseline.

Values are mean (SD); higher scores indicate worse nasal obstruction.

QOL – Nasal Valve Surgery

- Functional septorhinoplasty = surgeries designed to correct the underlying anatomical or functional problem associated with nasal valve compromise, either internal or external
  - Lower third
    - Alar batten grafts, tip elevation and support, vestibular stenosis repair
  - Middle third
    - Spreader graft insertion, upper lateral cartilage suturing or suspension
  - Upper third
    - Osteotomies
  - Internal abnormalities
    - Septoplasty, turbinate reduction, intranasal synechiae lysis

QOL – NV surgery

► 26 pts
► Medication use did not change @ 6 months
  ▪ \( P \, .25 \)
► 75\% of pts “very happy” or “extremely happy” @ 6 months
► Physician-rated severity scale → poor correlation w/baseline NOSE scores

QOL – NV surgery

<table>
<thead>
<tr>
<th></th>
<th>Baseline (n = 20)</th>
<th>3 mo postoperative (n = 14)</th>
<th>6 months postoperative (n = 20)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NOSE score</strong></td>
<td>68.9 (20.9)</td>
<td>20.7 (19.5)</td>
<td>15.8 (18.2)</td>
</tr>
</tbody>
</table>

Data are given as mean (SD) with higher scores indicating worse quality of life or greater nasal obstruction. Baseline vs. 3 months, \( P < .0001 \); baseline vs. 6 months, \( P < .0001 \); 3 months vs. 6 months, \( P = 0.0077 \).

NOSE = Nasal Obstruction Symptom Evaluation.

Quality of Life – FNR

► 41 pts

► Mean NOSE scores decreased in all pts who underwent FNR
  ▪ 58.4 vs 15.7; \( P \leq 0.01 \)

► Similar improvement was noted as measured by the linear symptom scale
  ▪ 7.6 vs 2.2; \( P \leq 0.01 \)

Table 1. Scores on Disease-Specific Quality-of-Life Instrument (NOSE) and Linear Scales Preoperatively (Baseline) and Postoperatively*

<table>
<thead>
<tr>
<th>Time of Evaluation</th>
<th>All Patients (N = 41)</th>
<th>Spreader Grafting (All-Inclusive) (n = 31)</th>
<th>Spreader Grafting, Septoplasty, and Turbinate Modification (n = 24)</th>
<th>Spreader Grafting Without Turbinate Reduction (n = 7)</th>
<th>External Valve Suspension (n = 7)</th>
<th>Septoplasty With Turbinate Reduction (n = 5)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NOSE Scale</td>
<td>Linear Scale</td>
<td>NOSE Scale</td>
<td>Linear Scale</td>
<td>NOSE Scale</td>
<td>Linear Scale</td>
</tr>
<tr>
<td>Preoperative</td>
<td>58.4 (13.4)</td>
<td>7.6 (1.7)</td>
<td>58.8 (11.9)</td>
<td>7.6 (1.7)</td>
<td>57.8 (11.9)</td>
<td>7.6 (1.4)</td>
</tr>
<tr>
<td>Postoperative</td>
<td>15.7 (16.3)†</td>
<td>2.2 (2.1)†</td>
<td>16.4 (15.4)†</td>
<td>2.3 (2.0)†</td>
<td>13.8 (14.3)†</td>
<td>2.1 (1.8)†</td>
</tr>
<tr>
<td>Follow-up, d</td>
<td>227</td>
<td>NA</td>
<td>264</td>
<td>NA</td>
<td>242</td>
<td>NA</td>
</tr>
</tbody>
</table>

Abbreviations: NA, not applicable; NOSE, Nasal Obstructive Symptoms Evaluation.
*Data are given as mean (SD) score unless otherwise indicated.
†p<.01.
‡p<.001.
§p<.05.
Conclusions

- Nasal obstruction is bad
- Nasal surgery is good
Bibliography

4. Bailey's. Photograph courtesy of Dean Toriumi