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Clinical Consensus Statement: Septoplasty with or without Inferior Turbinate Reduction

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Abstract

Objective. To develop a clinical consensus statement on septoplasty with or without inferior turbinate reduction.

Methods. An expert panel of otolaryngologists with no relevant conflicts of interest was assembled to represent general otolaryngology and relevant subspecialty societies. A working definition of septoplasty with or without inferior turbinate reduction and the scope of pertinent otolaryngologic practice were first established. Patients 18 years and older were defined as the targeted population of interest. A modified Delphi method was then used to distill expert opinion into clinical statements that met a standardized definition of consensus.

Results. The group defined nasal septoplasty as a surgical procedure designed to correct a deviated nasal septum for the purpose of improving nasal function, form, or both. After 2 iterative Delphi method surveys, 20 statements met the standardized definition of consensus, while 13 statements did not. The clinical statements were grouped into 8 categories for presentation and discussion: (1) definition and diagnosis, (2) imaging studies, (3) medical management prior to septoplasty, (4) perioperative management, (5) surgical considerations, (6) adjuvant procedures, (7) postoperative care, and (8) outcomes.

Conclusion. This clinical consensus statement was developed by and for otolaryngologists and is intended to promote appropriate and, when possible, evidence-based care for patients undergoing septoplasty with or without inferior turbinate reduction. A complete definition of septoplasty with or without inferior turbinate reduction was first developed, and additional statements were subsequently produced and evaluated addressing diagnosis, medical management prior to septoplasty, and surgical considerations, as well as the appropriate role of perioperative, postoperative, and adjuvant procedures, in addition to outcomes. Additionally, a series of clinical statements were developed, such as "Computed tomography scan may not accurately demonstrate the degree of septal deviation," "Septoplasty can assist delivery of intranasal medications to the nasal cavity," "Endoscopy can be used to improve visualization of posterior-based septal deviation during septoplasty," and "Quilting sutures can obviate the need for nasal packing after septoplasty." It is anticipated that the application of these principles will result in decreased variations in the care of septoplasty patients and an increase in the quality of care.

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Nasal obstruction is a highly prevalent problem in the United States that can negatively affect quality of life. One of the common causes of nasal obstruction is a deviated septum, with or without hypertrophic inferior turbinates. In the presence of such nasal obstruction, nasal septoplasty and inferior turbinate reduction procedures can improve the nasal airway. Septoplasty can also be used as an adjunctive procedure to improve access to, and the function of, the paranasal sinuses.

Despite a long history of septoplasty as a procedure, there are significant differences of opinion regarding the appropriate methods for diagnosis and treatment of nasal obstruction secondary to septal deviation and turbinate hypertrophy. The roles of nasal endoscopy, imaging, photodocumentation, and tests such as acoustic rhinometry/rhinomanometry in the diagnosis of nasal obstruction are unclear. Payers have imposed requirements for using some of these methodologies prior to approving payment for septal surgery in the absence of appropriate evidence-based literature to support the requirements. Similarly, requirements for extended medical therapy prior to authorization for septoplasty and/or inferior turbinate reduction surgery have been imposed by a number of payers without clear evidence of benefit.

The desire to improve quality of care, promote appropriate care, and educate clinicians led the Rhinology and Paranasal Sinus Committee of the American Academy of Otolaryngology—Head and Neck Surgery Foundation (AAO-HNSF) to submit the topic of septoplasty to the AAO-HNSF Guidelines Task Force. Due to the limited evidence to support a guideline in this regard, the topic of septoplasty was selected for clinical consensus statement (CCS) development. The objectives are to promote appropriate care, reduce inappropriate variations in care, and educate clinicians regarding multiple aspects of the medical and surgical management of nasal obstruction employing septoplasty with or without inferior turbinate reduction.

Methods

This CCS was developed in discrete predetermined steps: (1) evaluation of the suitability of septoplasty with or without inferior turbinate reduction as the subject of a CCS; (2) panel recruitment; (3) vetting of potential conflict of interests among proposed panel members; (4) systematic literature review; (5) determination of working definitions of septoplasty and inferior turbinoplasty, intended scope of practice, and population of interest for the consensus statement; (6) modified Delphi survey development and completion; (7) iterative revision of clinical statements based on survey results; and (8) data aggregation, analysis, and presentation. The pertinent details of each of these steps are briefly described.

Determination of Septoplasty as the Topic of a Consensus Statement: Panel Recruitment and Vetting

Panel membership was strategically developed to ensure appropriate representation of all relevant subgroups within the specialty of otolaryngology. The various subgroups were contacted about the consensus statement project with the requirements and desired qualifications for panel membership, and each subgroup then selected its own representative expert to participate. Participating subgroups include the American Academy of Facial Plastic & Reconstructive Surgery (T.S.L., T.T.T.), the American Rhinologic Society (J.K.H., S.M.A., S.M.B.), the Triologic Society (A.M.S.), the American Academy of Otolaryngic Allergy (D.P.B.), the Society of Otorhinolaryngology and Head-Neck Nurses (E.J.R.), and the appropriate committees within the American Academy of Otolaryngology, including the Board of Directors (S.P.S.), the Board of Governors (D.R.E.), the Rhinology and Paranasal Sinus Committee (J.K.H., K.C.W.), the Physician Payment Policy Committee (M.S), the Plastic and Reconstructive Surgery Committee (P.D.W.), the Science and Educational Committee (S.P.S.), and the Women in Otolaryngology Section (S.T.G., S.K.W.). There were 5 rhinology fellowship-trained members (J.K.H., S.M.B., S.T.G., S.K.W., K.C.W.), 3 plastic fellowship-trained members (T.S.L., T.T.T., P.D.W.), and 1 nonvoting methodologist (R.M.R.) on the panel. All the members are in active clinical practice. Once the panel was assembled, complete disclosure of potential conflicts of interest were reported and vetted within the group. A panel vote was used to determine whether a disclosed conflict of interest necessitated disqualification from panel participation. The panel chair (J.K.H.) and assistant chair (S.P.S.) led the development of the clinical statements and the Delphi method with input from a senior consultant/methodologist from the Academy leadership in the Guidelines Task Force (R.M.R.) and administrative support from an Academy staff liaison (L.C.N.).

Literature Review and Determination of the Scope of the Consensus Statement

A systematic literature review was performed to identify current high-level evidence regarding the diagnosis and medical and surgical management of septoplasty with or without inferior turbinate reduction. The literature searches were conducted in November 2014 (clinical practice guidelines and systematic reviews) and January 2015 (randomized controlled trials) with the assistance of a professional database search consultant. The systematic search included systematic reviews (including meta-analyses), clinical practice guidelines, and other relevant CCSs in English from PubMed; CAB Abstracts; National Guidelines Clearinghouse; CMA

Infobase; Scottish Intercollegiate Guidelines Network; New Zealand Guidelines Group; Australian National Health and Medical Research Council; Trip Database; Guidelines International Network; Cochrane Database of Systematic Reviews; Excerpta Medica; Cumulative Index to Nursing and Allied Health; Allied and Complementary Medicine Database; BIOSIS Citation Index; Web of Science; Agency for Healthcare Research and Quality; Research Summaries, Reviews, and Reports; and Health Services/Technology Assessment Texts from 2004 with the following search string: ''Search (((nasal OR nose) AND (septoplasty OR septorhinoplasty OR (''septum surgery'' OR ''septal surgery''))) OR ''Nasal Septum/surgery''[Mesh]).''''Search ((turbinate* OR turbinoplasty OR ''Turbinates/surgery''[Mesh])).''

Search Strategy Process

Clinical Practice Guidelines. The initial literature search identified 34 potential guidelines published in 2004 or later. Two members of the guideline update group independently assessed the full text of each for relevance and quality. For inclusion, the guideline had to fulfill all of the following criteria: (1) explicit scope and purpose, (2) multidisciplinary stakeholder involvement, (3) systematic literature review, (4) explicit system for ranking evidence, and (5) explicit system for linking evidence to recommendations. The reviewers found that 3 guidelines were relevant to septoplasty with or without inferior turbinate reduction and therefore met these criteria.

Systematic Reviews. The initial literature search identified 132 potential systematic reviews published in 2004 or later. Two members of the CCS panel independently assessed the full text of each for relevance and quality. For inclusion, the systematic review had to fulfill all of the following criteria: (1) clear objective and methods defined explicitly by the reviewers, (2) an explicit search strategy described with full details, and (3) valid data extraction, usually performed by at least 2 independent investigators to abstract data from the source articles to minimize bias. The reviewers found 19 systematic reviews that were relevant to septoplasty with or without inferior turbinate reduction and met these criteria.

Randomized Controlled Trials. The initial literature search identified 355 potential randomized controlled trials (of which 11 were removed by the staff liaison because they were systematic reviews, pertained to children, or pertained to animals) and 2503 observational studies published in 1969 or later. Two members of the CCS panel independently assessed the full text of the randomized controlled trials for relevance and quality. For inclusion, the randomized controlled trials had to fulfill the following criteria: (1) a relevant study topic and (2) a randomized design.

The reviewers identified 111 randomized controlled trials that were relevant to septoplasty with or without inferior turbinate reduction and met these criteria. Originally, only 73 randomized controlled trials were included in the summary, as these were the studies that were published from 2004 to present. However, 4 of those studies were excluded because the full text was unavailable or it was not written in the English language. The final number of randomized controlled trials included was 69. Consequently, the gaps in literature were used as a framework for the qualitative survey.

The panel made several decisions regarding the scope of this CCS before formally beginning the Delphi process. They decided that the target audience of the statement would specifically be otolaryngologists who perform septoplasty with or without turbinoplasty. A working definition of septoplasty was determined to include procedures performed for nasal obstruction and exclude septoplasty to harvest material (cartilage) for other surgical procedures (grafting or septal flap), endoscopic skull base surgery (eg, pituitary), or access for sinus surgery. The target population was defined as adults (>18 years old) and candidates for septoplasty. Once the target population and scope of practice were determined, the panel used the results of the literature review to prioritize the clinical areas that could most benefit from potential consensus of an expert panel. These areas were then used as the basis for the formulation of the initial statements that were then evaluated through the Delphi survey method.

Disclaimer. The panel elected to limit the target population age to adults (>18 years). The panel is not implying that it is inappropriate to perform septoplasty at a younger age. The advice in this CCS may apply to younger children whose septum has fully developed, but that decision should be made by a clinician on an individual basis.

Delphi Survey Method Process and Administration

A modified Delphi survey method was utilized to distill expert opinion into concise CCSs. The Delphi method involves using multiple anonymous surveys to assess for objective consensus within an expert panel.[1] This rigorous and standardized approach minimizes bias and facilitates expert consensus. Web-based software (www.surveymonkey.com) was used to administer confidential surveys to panel members.

Statement Development Process

During the first conference call, each development group member was asked to submit at least 5 questions to the staff liaison based on what she or he perceived were key opportunities to (1) address controversial clinical issues, (2) reduce variability in care, (3) clarify evidence gaps, or (4) improve quality of care through structured expert consensus. The staff liaison collated and organized the submitted questions (ie, diagnosis, medical therapy) and provided them to the chair for review and revision. In the case of the septoplasty CCS, this effort garnered 51 questions.

The final topic question list, based on electronic exchange after the first conference call, was made into a 2-column table. The first column, left blank, had the heading ''Rank,'' and the second column, containing the topic questions, had the heading ''Topic Question.'' The staff liaison distributed the list to the working group members and asked them to

rank each topic in order of importance, assigning each question a number between 1 and 51. In addition to ranking the topic list questions, each development group member was asked to provide 1 draft consensus statement for each of his or her top 5 ranked topic questions. The purpose of this was to assemble a list of draft consensus statements that the chair will use to create the list of consensus statements for the first Delphi survey.

The rank tables are collated by the staff liaison to determine the mean rank score for each topic, with lower scores indicating higher priority. When the staff liaison sorted the ranked topic list in order of priority (highest to lowest), the related statements submitted by the development group members under each topic was also included. This process facilitated discussion, as well as a more streamlined review of the material, since it was easier for the chair to proceed down the ranked topic list and readily see related statements when he led the second conference call.[2]

Based on the outcomes of the top-ranked topic list choices and resulting discussion, the panel chair developed the first Delphi survey, which consisted of 33 statements. Prior to dissemination to the panel, the Delphi surveys were reviewed by the methodologist for content and clarity. Questions in the survey were answered with a 9-point Likert scale, where 1 = strongly disagree, 3 = disagree, 5 = neutral, 7 = agree, and 9 = strongly agree. The surveys were distributed, and responses were aggregated, distributed back to the panel, discussed via teleconference, and revised, if warranted. The purpose of the teleconference was to provide an opportunity to clarify any ambiguity, propose revisions, or drop any statements recommended by the panel.

The criteria for consensus were established a priori:

Consensus: Statements achieving a mean score $\geq$7.00 and having no more than 1 outlier (ie, any rating $\geq$2 Likert points from the mean in either direction).

Near consensus: Statements achieving a mean score $\geq$6.50 and having no more than 2 outliers (ie, any rating $\geq$2 Likert points from the mean in either direction).

No consensus: Statements that did not meet the criteria of consensus or near consensus.

Additionally, for the purposes of emphasis within the discussion, strong consensus was subsequently defined as a mean Likert score $\geq$8.00 with no outliers.

Two iterations of the Delphi survey were performed. All answers were de-identified and remained confidential; however, names were collected to ensure proper follow-up, if needed.

The panel extensively discussed (via teleconference) the results of each item after the first Delphi survey. Items that reached consensus were accepted, and items that did not meet consensus were discussed to determine if wording or specific language was pivotal in their not reaching consensus. The second iteration of the survey was used to reassess items for which there was near consensus or for which there was suggestion of significant alterations in wording that could have affected survey results. The entire panel also extensively discussed the results of the second Delphi survey. All items reaching consensus were accepted. A third iteration of the Delphi process was not necessary. The factors leading to the remaining items not reaching consensus were not attributed to wording or other modifiable factors but rather a true lack of consensus.

The final version of the CCSs were grouped into 8 specific areas: (1) definition and diagnosis, (2) imaging studies, (3) medical management prior to septoplasty, (4) perioperative management, (5) surgical considerations, (6) adjuvant procedures, (7) postoperative care, (8) outcomes. The final manuscript was drafted with participation and final review from each panel member.

Results

Thirty-three clinical statements were developed for assessment with the Delphi survey method. All panelists completed all survey items. After 2 iterations of the Delphi survey, 20 statements (61%) met the standardized definition for consensus, and 13 (39%) statements did not reach consensus and are listed in **Table 1**. The clinical statements were organized into 8 specific subject areas, and the results of each are individually considered below.

Definition and Diagnosis

Three statements reached consensus in this category (**Table 2**). The group defined nasal septoplasty as a surgical procedure designed to correct a deviated nasal septum for the purpose of improving nasal function, form, or both. Determination of appropriate candidacy for septoplasty is generally based on patient symptoms and physical examination. The panel strongly agreed on the statement that anterior rhinoscopy, nasal endoscopy, or both are sufficient to document septal deviation prior to septoplasty. In addition, strong consensus was reached on the statement that nasal endoscopy can provide useful information prior to septoplasty, such as other causes of nasal obstruction, even when anterior rhinoscopy documents septal deviation. However, the panel did not reach consensus on the statement that nasal endoscopy is necessary to evaluate the nasal cavity of all patients who are candidates for septoplasty. Also the panel did not reach consensus that acoustic rhinometry or rhinomanometry can be helpful for patients who present with nasal obstruction as a primary complaint, but are not necessary for the diagnosis of septal deviation specifically. Finally, with regard to definition and diagnosis of nasal septal deviation, the panel reached consensus on the statement that photodocumentation is unnecessary to confirm the presence of septal deviation prior to septoplasty.

Imaging Studies

Three statements reached consensus (**Table 3**), and 3 did not. The panel strongly agreed with the statement that plain x-rays do not provide useful information in surgical

Table 1. Septoplasty Statements That Did Not Meet Criteria for Consensus.

No.	Statement	Subgroup	Mean	Outliers
1	Acoustic rhinometry and rhinomanometry can be helpful for patients who present with nasal obstruction as a primary complaint, but they are not necessary for the diagnosis of septal deviation specifically.	Definition and diagnosis	5.29	4
2	Nasal endoscopy is necessary to evaluate the nasal cavity of all patients who are candidates for septoplasty.	Definition and diagnosis	5.39	9
3	A plain radiograph of the paranasal sinuses is unnecessary to document septal deviation prior to septoplasty, but it may be useful in diagnosing other sinonasal pathology in patients with symptoms that cannot be explained by septal deviation.	Imaging studies	3.79	8
4	Computed tomography scans may provide useful information in surgical decision making for the septoplasty, but they are not necessary in most cases, except for diagnosis at the time of trauma, documentation, or liability issues.	Imaging studies	5.29	5
5	Plain x-rays or computed tomography scans do not provide useful information in surgical decision making for the septoplasty.	Imaging studies	6.71	7
6	A 4-week trial of nasal steroid prior to septoplasty is sufficient to assess surgical candidacy.	Medical management prior to septoplasty	6.43	3
7	Septoplasty can be used in the primary management of obstructive sleep apnea for patients with deviated septum.	Adjuvant procedures	5.86	4
8	Septoplasty can be effective in reducing primary snoring in patients with a deviated septum.	Adjuvant procedures	6.57	5
9	Septoplasty can reduce facial pain caused by intranasal contact points.	Adjuvant procedures	6.79	5
10	Septoplasty may benefit anosmia or hyposmia, but the effect is unpredictable.	Surgical considerations	6.07	3
11	Caudally based septal deviation can be best addressed by using a head light during septoplasty.	Surgical considerations	6.57	2
12	Nasal packing or splinting is optional after septoplasty but can be useful in controlling hemorrhage and maintaining appropriate position of intranasal structures.	Postoperative care	7.71	2
13	Septoplasty with or without turbinate reduction can be performed without packing, splints, or quilting sutures.	Postoperative care	4.5	6

planning for septoplasty. The panel also strongly agreed that computed tomography (CT) scans of the nose and paranasal sinuses are unnecessary to document septal deviation prior to septoplasty, but they may be helpful in diagnosing other sinonasal pathology, particularly in patients with symptoms that cannot be explained by septal deviation alone. In addition, the panel strongly agreed that CT scanning may not accurately demonstrate the degree of septal deviation and should therefore not be the primary determinant for septoplasty candidacy. The panel did not reach a consensus on whether CT scanning or plain x-rays could provide any useful information for septoplasty surgical decision making. Additionally, the panel did not reach consensus on the statement ''A plain radiograph of the paranasal sinuses is unnecessary to document septal deviation prior to septoplasty, but it may be useful in diagnosing other sinonasal pathology in patients with symptoms that cannot be explained by septal deviation.''

Medical Management Prior to Septoplasty

With respect to the medical aspects of septoplasty with or without turbinoplasty, 2 statements reached consensus (**Table 3**), and 1 did not. Consensus was reached that (1) septoplasty can facilitate delivering intranasal medications to the nasal cavity when septal deviation impairs access or obstructs the intended delivery site(s) and (2) a trial of

Table 2. Definition and Diagnosis Statements.

No.	Statement	Mean	Outliers	Quality Improvement Opportunity
1	Nasal endoscopy can provide useful information prior to septoplasty, such as other causes of nasal obstruction, even when anterior rhinoscopy documents septal deviation.	8.71	0	Promoting appropriate care, educating and empowering physicians and patients
2	Anterior rhinoscopy, nasal endoscopy, or both are sufficient to document septal deviation prior to septoplasty.	8.43	1	Promoting appropriate care
3	Photodocumentation is unnecessary to document septal deviation prior to septoplasty.	8.14	1	Improving access to care

Table 3. Imaging and Medical Management Prior to Septoplasty Statements.

No.	Statement	Mean	Outliers	Quality Improvement Opportunity
1	A computed tomography scan of the paranasal sinuses is unnecessary to document septal deviation prior to septoplasty, but it may be useful in diagnosing other sinonasal pathology in patients with symptoms that cannot be explained by septal deviation.	8.5	0	Reducing inappropriate or harmful care; cost savings
2	Plain x-rays do not provide useful information in surgical decision making for septoplasty.	8.86	0	Reducing inappropriate or harmful care; cost savings
3	A computed tomography scan may not accurately demonstrate the degree of septal deviation and should not be the primary determinant for septoplasty candidacy.	8.29	0	Reducing inappropriate or harmful care; improving access to care; cost savings
4	A trial of medical therapy >4 weeks' duration is unnecessary to assess surgical candidacy for septoplasty.	8.29	0	Promoting appropriate care; reducing regional variation in delivery of care
5	Septoplasty can facilitate delivering intranasal medications to the nasal cavity when septal deviation impairs access or obstructs the intended delivery site(s).	7.93	1	Promoting appropriate care; educating and empowering physicians and patients

medical therapy >4 weeks' duration is unnecessary to assess surgical candidacy for septoplasty. However, the panel did not reach consensus on the statement that a 4-week trial of nasal steroid prior to septoplasty is sufficient to assess surgical candidacy.

Perioperative Management

After several discussions and review of the pertinent literature, the panel reached only 1 consensus statement regarding perioperative management (**Table 4**). The statement is that there is no benefit to routine postoperative antibiotics after septoplasty unless nasal packing or a splint is placed during the procedure.

Surgical Considerations

For the surgical aspects of septoplasty, 3 statements reached consensus (**Table 4**). Consensus was reached that an external rhinoplasty approach may be necessary in cases of severe septal deviation. The panel also reached consensus that septoplasty may be necessary as a surgical component in the repair of septal perforations. Last, the panel reached consensus that endoscopic visualization during septoplasty

Table 4. Medical Considerations: Perioperative, Surgical, Adjuvant, and Postoperative Management.

No.	Statement	Mean	Outliers	Quality Improvement Opportunity
1	There is no benefit to routine perioperative antibiotics during septoplasty unless nasal packing or a splint is placed during the procedure.	8.07	0	Promoting appropriate care; reducing regional variation in delivery of care
2	An external rhinoplasty approach may be necessary in cases of severe septal deviation.	7.79	0	Promoting appropriate care
3	Septoplasty may be necessary as a surgical component in the repair of septal perforation.	7.57	1	Promoting appropriate care; improving access to care
4	Endoscopic visualization during septoplasty can assist the surgeon in correcting posterior septal deviation.	7.93	1	Promoting appropriate care; improving access to care
5	Inferior turbinate hypertrophy can be an independent cause of nasal obstruction in the septoplasty patient.	8.36	1	Promoting appropriate care
6	Inferior turbinoplasty is an effective adjunctive procedure to septoplasty for patients with inferior turbinate hypertrophy.	8.71	0	Promoting appropriate care
7	Septal quilting sutures can obviate the need for nasal packing after septoplasty.	7.57	1	Reducing inappropriate or harmful care

can assist the surgeon in correcting posterior septal deviations. In 2 situations, the panel could not reach consensus. Regarding the topics of whether septoplasty could be of benefit in the management of anosmia or hyposmia and the specific management of caudal septal deviations, the panel members could not agree, citing lack of evidence as well as insufficient agreement concerning practical experience.

Adjuvant Procedures

In the area of adjuvant aspects, 2 statements met strong consensus regarding turbinate hypertrophy (**Table 4**), and 3 statements did not. The panel met consensus that in a septoplasty patient, inferior turbinate hypertrophy can be an independent cause of nasal obstruction. In addition, the panel met consensus that inferior turbinoplasty is an effective adjunctive procedure to septoplasty in the presence of hypertrophic inferior turbinates. The panel did not reach consensus on whether septoplasty can be used in the primary management of obstructive sleep apnea for patients with deviated septum and whether it can be effective in reducing primary snoring in patients with a deviated septum. Furthermore, that septoplasty can reduce facial pain caused by intranasal contact points also did not reach panel consensus.

Postoperative Care

Only 1 statement reached consensus in this section (**Table 4**), which was that septal quilting sutures can obviate the need for nasal packing after septoplasty. No additional comments were added by panel members to alter or qualify this statement. Two statements did not meet consensus. One statement was that after septoplasty, nasal packing or splinting can be useful in controlling bleeding and maintaining appropriate position of intranasal structures. The other statement was that septoplasty with or without turbinate reduction can be performed without packing, splints, or quilting sutures.

Outcomes

The panel reached consensus for 5 statements regarding outcome measures for septoplasty with or without inferior turbinate reduction (**Table 5**). There were no statements that did not meet consensus related to outcome measures. Consensus was met for the statement that septoplasty can improve quality of life for patients with septal deviation. In addition, consensus was met for statements that (1) septoplasty can improve continuous positive airway pressure tolerance for patients with sleep apnea and a deviated septum, (2) septoplasty can improve outcomes of sinus surgery when the septum is contacting the middle turbinate and obstructing the drainage of the ostiomeatal complex, and (3) septoplasty may be useful in managing epistaxis. The panel also reached consensus on the statement that the effect of septoplasty on anosmia or hyposmia is unpredictable.

Discussion

Definition and Diagnosis

The determination of an appropriate candidate for septoplasty is based on the patient's symptoms and physical examination. There was strong panel consensus that anterior rhinoscopy, nasal endoscopy, or both are sufficient to document septal deviation prior to septoplasty. While diagnostic modalities such as acoustic rhinometry and rhinomanometry can provide

Table 5. Outcomes.

No.	Statement	Mean	Outliers	Quality Improvement Opportunity
1	Septoplasty can improve continuous positive air pressure tolerance for patients with sleep apnea and a deviated septum.	8.14	0	Promoting appropriate care; educating and empowering physicians and patients
2	Septoplasty may be useful in managing epistaxis.	7.43	1	Promoting appropriate care
3	The effect of septoplasty on anosmia or hyposmia is unpredictable.	7.43	1	Reducing inappropriate or harmful care
4	Septoplasty can improve quality of life for patients with septal deviation.	8.71	0	Promoting appropriate care; educating and empowering physicians and patients
5	Septoplasty can improve outcomes of sinus surgery when the septum is contacting the middle turbinate and obstructing the drainage of the ostiomeatal complex.	8.36	0	Promoting appropriate care; educating and empowering physicians and patients

objective assessments of nasal anatomy and airflow, these tests lack the sensitivity and specificity of anterior rhinoscopy or nasal endoscopy.[3] In addition, such test results often do not correlate with patient symptoms.[4] In a recent review of the literature, Aziz and colleagues concluded that such tests add little to aid in making an appropriate clinical diagnosis.[4]

The topic of nasal endoscopy as a routine diagnostic procedure before a recommendation of nasal septoplasty brought about much discussion among the panel. There are situations where more posterior nasal anatomic or inflammatory conditions might impair nasal function yet be obscured from view with a nasal speculum. Strong consensus was reached by the panel on the statement that nasal endoscopy can provide useful information prior to septoplasty, such as other causes of nasal obstruction, even when anterior rhinoscopy documents septal deviation. In other words, while nasal endoscopy is not necessary to establish a diagnosis of septal deviation, it can help to determine whether other conditions coexist with septal deviation, such as chronic rhinosinusitis, nasal polyps, or nasal tumor.

Similarly, the panel agreed that clinical assessment by history and physical examination is enough to substantiate the need for septoplasty. History of nasal obstruction and corresponding physical examination of the deviated septum should be what is required to perform a septoplasty. If a physical examination does not correlate with the history, nasal endoscopy can further help the physician in determining the cause of patient symptoms. Despite the fact that some insurance carriers may require photodocumentation of the deviated septum prior to performing septoplasty, the panel reached consensus stating that photodocumentation is unnecessary to document septal deviation prior to septoplasty.

Imaging Studies

The gold standard for diagnosing septal deviation causing nasal obstruction is history and physical examination. However, CT scanning can be an adjunctive test if history and physical examination do not account for the nasal obstruction. CT scanning without physical examination can underestimate or incorrectly diagnose nasal obstruction, especially in the nonbony and anterior parts of the nose, such as the internal nasal valve. Sedaghat et al concluded that CT scans were a ''poor substitute for physical exam, the gold standard, in assessment of septal deviation.''[5,6] The CT scans were consistent with examination for the osseous portion of the septum. However, CT scans underestimated the physical examination findings in the anterior or caudal part of the nose. When Aziz et al analyzed the various measurement tools available for the diagnosis of septal deflection—including anterior rhinoscopy, nasal endoscopy, acoustic rhinometry, and rhinomanometry with CT scanning[4]—they found that anterior rhinoscopy, nasal endoscopy, and CT scanning were more sensitive and specific than the other modalities in identifying the ''presence, location and severity of nasal septal deflection.'' Kahveci et al found similar results and showed correlation among the physical exam, NOSE scoring, and CT scanning to septal deviation.[7] However, physical examination and symptom scoring are easier and significantly less expensive than CT scanning without any of the radiation exposure and expense.

CT scan for patients with nasal obstruction and congestion may play a role in identifying related anatomic abnormalities or disease, such as large concha bullosa, pansinusitis, osteomas, and other nasal/paranasal sinus disease. Karatas et al noted that a CT scan identified additional diagnoses in a majority of patients studied—diagnoses potentially requiring surgical intervention that may not have been found on examination alone.[8] Berenholz et al found that 57% of the patients with nasal obstruction had other pathology, noticed on CT scan.[9]

For patients with symptoms beyond nasal obstruction, such as facial pain, rhinorrhea, and anosmia, CT scan may play a role in diagnosis and surgical planning together with findings on nasal endoscopy. CT scanning may be helpful in workers' compensation documentation and in identifying

septal deflections that need to be corrected in the face of chronic sinusitis to fit Proetz's principles to limit airflow and mucous flow toward the middle meatus.[10] Plain radiographs are of no value and should not be performed in the workup of septal deviation, since they cannot distinguish the variable changes of the nasal valve and miss most of the adjunctive diagnoses identified by multiview CT scan.

Medical Management Prior to Septoplasty

Nasal and sinus disease is often treated topically with intranasal medications. A variety of topical medical delivery systems exist, including sprays, nebulized solutions, nasal irrigations, and ointments. The success of these treatments depends on the ability to apply these medications to the diseased areas. A deviated septum can impede medication delivery to these sites by anatomically blocking access or by preventing adequate airflow through the nasal cavity in the case of delivery with nebulizers or sprays. Septoplasty can improve both nasal patency and airflow, as measured objectively by rhinomanometry, acoustic rhinometry, or peak nasal inspiratory flow.[11] By alleviating an obstructing septal deviation, septoplasty can therefore facilitate the delivery of these topical medications.

The panel discussed in depth the role for a trial of medical therapy prior to septoplasty. The discussion centered on (1) the necessity of a trial of preoperative topical nasal steroid in the face of a significant clinically diagnosed symptomatic septal deviation and (2) the duration of such treatment prior to surgical treatment.

The panel did not reach consensus that a preoperative trial of medical management should be given prior to surgical correction of a symptomatic septal deviation, because in some patients, the deviated septa may be so severe due to various causes (eg, trauma) that no amount of medical management will alleviate the nasal obstruction. However, the panel did reach consensus that if the surgeon does decide to proceed with a preoperative trial of medical management, such a trial does not need to be longer than 4 weeks. The panel felt that in light of the paucity of specific treatment duration recommendations in the literature, a 4-week trial would be clinically sufficient to assess symptomatic improvement prior to proceeding with a septoplasty.

Perioperative Management

A study by Rechtweg et al surveyed the members of the American Rhinologic Society and showed that 66% of physicians routinely use antibiotics after septoplasty.[12] This appears to be consistent with the standard practice for the using postoperative antibiotics after septoplasty. However, the postoperative infection rates after septoplasty are low, regardless of the use of antibiotics.[13] Another study found no increase in post-septoplasty infection rate in patients treated with preoperative antibiotic prophylaxis.[14] A recent randomized study looking at complication rates in patients undergoing septoplasty with or without turbinate reduction and packing for 1 day revealed no difference in infection rates between patients receiving antibiotics and those not receiving antibiotics.[15]

A 2008 review article by Georgiou et al reviewed the results of 11 studies and concluded that postoperative infections from septoplasty or septorhinoplasty in the absence of antibiotics was very low, with an infection rate of 2.3%. One of these studies demonstrated an infection rate of only 0.48%.[16] Another review article in 2014 by Gioacchini, focusing on 5 studies published since 2005, came to a similar conclusion that routine antibiotic use in septoplasty did not provide any advantage.[17] The panel's discussion centered on the lack of proven benefit of routine antibiotic usage following septoplasty in the absence of either packing or splints and that the decision of the surgeon not to utilize antibiotics in these instances was supported by the current literature.

The panel also discussed the applicability of this statement as being specific to routine postoperative antibiotic use in the absence of packing or splints. The panel further acknowledged that a variety of other factors may prompt a surgeon to utilize postoperative antibiotics in the absence of packing or splints, such as patient comorbidities and surgical indicators (eg, revision surgery, the use of grafts). Therefore, given the literature, the panel reached the consensus that antibiotics have no benefit in routine septoplasty in patients without nasal packing or splint placement.

Surgical Considerations

Septoplasty is traditionally performed in an endonasal fashion through a hemitransfixion incision and in select cases may be performed in the vicinity of an isolated septal spur. However, there are instances in which an ''open'' or external rhinoplasty approach may be required to completely address a septal deviation, especially in circumstances where there is substantial caudal deviation or dorsal septal deviation involving the ''L'' strut or in cases where a large amount of intact quadrangular cartilage must be removed, reshaped, and replaced (eg, extracorporeal septoplasty). External approaches have been utilized for several years and in large series have been shown to improve outcomes in cases of complex septal deformities or revision cases.[18,19] Becker and colleagues[18] reviewed 477 patients undergoing primary septoplasty, and 13% (n = 60) required an open approach to address their deviated septa because of complex deformities. While most septal deviations can be managed via the endonasal route, consideration should be given to external approaches when complex, especially anterior, septal deformities are present.

The repair of septal perforations has been reported widely with varied success rates over the years. Factors predictive of success include perforation size, bilaterality of flap coverage, and grafting materials,[20] and an endoscopic approach may prove to be more successful in the management of smaller perforations.[21] Performing concomitant maneuvers on the nose or septum may facilitate release of mucoperichondrium, which can be used to close perforations,[22] and septoplasty itself may aid in the repair of septal perforations.[23,24]

Anterior rhinoscopy is the initial means by which the nasal septum is examined; however, many[18,25-27] believe

that nasal endoscopy is useful for completely examining the nasal septum as well as for performing septoplasty itself. It has been observed that nasal endoscopy is sensitive and specific for identifying the location and severity of septal deviation,[4] and endoscopic visualization can assist with identification and management of the posterior septum,[26] since visualization of the posterior nasal cavity can be challenging with anterior rhinoscopy, even when the mucosa is adequately decongested. Endoscopic septoplasty has been shown to be equivalent to ''open'' septoplasty, as well as to demonstrate fewer complications[26,28] and decreased operative time.[29] Becker and colleagues[18] noted that patients undergoing revision surgery were noted to have multiple sites of deviation, and 8% of them had a posterior septal deviation identified, thereby serving as a reminder that a complete evaluation of the nasal cavity may prevent the need for surgical revision if all sites of obstruction are identified and treated.

Adjuvant Procedures

With respect to inferior turbinoplasty as an adjunctive role in treatment of nasal obstruction, the panel discussed the effectiveness of the combined procedures. The presence of concomitant inferior turbinate hypertrophy occurs frequently in patients with nasal obstruction and septal deviation.[30] The panel's consensus that inferior turbinate hypertrophy can be an independent cause of nasal obstruction was consistent with previous reports.[31-33] In a single-blinded placebo-controlled randomized trial with crossover option with 32 patients, Nease et al reported that inferior turbinate reduction was an effective treatment for nasal obstruction, on the basis of improvement in nasal obstruction per a visual analog scale.[34]

In consideration of the risks associated with inferior turbinoplasty (eg, atrophic rhinitis, bleeding, or adhesions), conservative inferior turbinoplasty in the setting of hypertrophic turbinates is supported by the evidence but not without opposing viewpoints. The panel's consensus that inferior turbinoplasty is an effective adjunctive procedure to septoplasty (in the presence of hypertrophic inferior turbinates) is consistent with several randomized controlled trials (level 2 evidence).[30,33-36] Devseren et al performed a randomized controlled trial in 42 patients who underwent septoplasty alone versus septoplasty with inferior turbinoplasty and found that patients who had turbinoplasty with septoplasty reported greater subjective improvement in nasal obstruction, as measured by a visual analog scale, as compared with the septoplasty-alone group.[35]

Objective measures of successful inferior turbinate hypertrophy treatment are lacking, but acoustic rhinometry and nasal area measurements have been used.[36] Nasal function changes after radiofrequency tissue volume reduction (RFTVR) of the inferior turbinates (n = 24) were studied in a randomized controlled trial by Rhee et al,[30] who found that saccharin transit time and ciliary function were preserved. Nasal obstruction was significantly improved by RFTVR. They reported that ''in cases of inferior turbinate hypertrophy associated with mild to moderate septal deviation or septal ridges, the symptom relief obtained by RFTVR may reduce invasive procedures such as septoplasty.''

Not all studies have been supportive of concomitant turbinoplasty with septoplasty, owing to potential adverse outcomes, which include decreased nasal ciliary function,[37] increased hemorrhage rates, and synechia between turbinate and the septal mucosa.[38,39] Grymer et al concluded that contralateral turbinoplasty with a septoplasty was effective at improving nasal patency in a nonrandomized study.[33] However, further work from this group evaluated the 84 patients, comparing septoplasty alone with septoplasty and inferior turbinate submucous resection, and it found no significant benefit to nasal obstruction by treating the inferior turbinates in addition to the septum.[40]

Postoperative Care

Nasal packing following septoplasty theoretically decreases the risk of postoperative bleeding, septal hematoma, and synechiae formation. However, there is no evidence present in the literature that demonstrates the benefits of nasal packing following septoplasty.[41] On the contrary, postoperative nasal packing has been associated with patient discomfort, pain, infection, as well nasal obstruction, which can aggravate other conditions, such as obstructive sleep apnea. An additional theoretical risk with postoperative nasal packing is displacement of the packing and subsequent aspiration.

In a randomized controlled study comparing transeptal quilting sutures and nasal packing, those patients undergoing placement of septal quilting sutures experienced significantly fewer postoperative symptoms, including pain and discomfort.[42] Additionally, a systematic review of 7 randomized controlled trials involving 869 patients, comparing septal quilting sutures versus nasal packing following septoplasty, revealed that pain and headache were significantly reduced in the septal quilting groups, while postoperative complications—including bleeding, septal hematoma synechiae formation, septal perforation, and local infection—were not significantly different between the 2 groups.[43] Given this evidence, one can conclude that septal quilting sutures can obviate the need for nasal packing after septoplasty and thus avoid the pain and discomfort, as well as the risks, associated with postoperative nasal packing.

Outcomes

Septoplasty and inferior turbinoplasty are often performed for patients presenting with a primary complaint of nasal obstruction, but they can also be used as an adjunct procedure for other conditions, such as chronic rhinosinusitis, obstructive sleep apnea, and epistaxis. A systematic review of the literature has shown evidence that septal surgery does improve objective measures of nasal patency and airflow.[11] However, some methods to measure nasal patency, such as rhinomanometry and acoustic rhinometry, are often not readily available outside a research setting.[3,4,44] Patients often report significant subjective improvement in nasal breathing after septoplasty with or without inferior turbinate reduction, which may not be necessarily reflected in objective measurements. As with other

sinonasal disorders, such as chronic rhinosinusitis, patient-reported quality-of-life measures are an important assessment tool for understanding the success of surgical intervention and have been used with increasing frequency in recent years. The Nasal Obstruction Symptom Evaluation (NOSE) scale was developed as a validated, disease-specific quality-of-life instrument for use in patients with nasal obstruction[45] and has been used to assess septoplasty results. Patients undergoing septoplasty for septal deformity and obstructive symptoms have been reported to have significant improvement in disease-specific quality of life after surgical intervention.[46,47]

Septoplasty can also be viewed as an adjunct procedure to aid in the surgical treatment of other conditions. Septoplasty is frequently performed in conjunction with endoscopic sinus surgery for patients with chronic rhinosinusitis.[48] In addition to allowing better surgical access to the paranasal sinuses, septoplasty can potentially improve intranasal anatomy so that the septal deviation will no longer obstruct the middle meatus and subsequent drainage of the ostiomeatal complex. In addition to improving the overall drainage pathway of the sinuses, it can allow for postoperative topical medication delivery.[49] In fact, one study suggests that septoplasty alone might be adequate for the treatment of chronic rhinosinusitis in patients with a septal deviation contributing to the disease process.[50] It is important to recognize that septoplasty will not necessarily improve anosmia or hyposmia, as the effects on smell are unpredictable.[51]

Septoplasty is also a potentially useful adjunct for patients with obstructive sleep apnea.[52,53] Although correction of nasal obstruction is not sufficient to correct underlying obstructive sleep apnea, nasal surgery to address nasal obstruction has been shown to improve patient tolerance of continuous positive airway pressure. In addition, by improving or reducing the nasal obstruction with septoplasty and inferior turbinate reduction in obstructive sleep apnea patients, the postoperative continuous positive airway pressure was reduced.[54]

Septal deviation is often considered a risk factor for the development of epistaxis, as certain areas of the nasal septal mucosa are subject to trauma from turbulent airflow. Therefore, correcting the underlying septal deviation can potentially improve nasal anatomy, decrease turbulent airflow, and decrease the risk of further epistaxis.

Conclusion

This CCS was developed by and for otolaryngologists and is intended to promote appropriate and, when possible, evidence-based care for patients undergoing septoplasty with or without inferior turbinate reduction. A complete definition of septoplasty with or without inferior turbinate reduction was first developed, and additional statements were subsequently produced and evaluated addressing the diagnosis, medical management prior to septoplasty, and surgical considerations, as well as the appropriate role of perioperative, postoperative, and adjuvant procedures, in addition to outcomes. Additionally, a series of clinical statements were developed by an expert panel, such as ''CT scan may not accurately demonstrate the degree of septal deviation,'''Septoplasty can assist delivery of intranasal medications to the nasal cavity,'''Endoscopy can be used to improve visualization of posterior-based septal deviation during septoplasty,'' and ''Quilting sutures can obviate the need for nasal packing after septoplasty.'' It is anticipated that the application of these principles will result in decreased variations in the care of septoplasty patients and an increase in the quality of care.

Disclaimers

Clinical consensus statements are based on the opinions of carefully chosen expert panels and provided for informational and educational purposes only. The purpose of the expert panel is to synthesize information, along with possible conflicting interpretations of the data, into clear and accurate answers to the question of interest. Clinical consensus statements may reflect uncertainties, gaps in knowledge, opinions, or minority view points, but through a consensus development process, many of the uncertainties are overcome, a consensual opinion is reached, and statements are formed. Clinical consensus statements are not clinical practice guidelines and do not follow the same procedures as clinical practice guidelines. Clinical consensus statements do not purport to be a legal standard of care. The responsible physician, in light of all the circumstances presented by the individual patient, must determine the appropriate treatment, diagnosis, and management. Consideration of clinical consensus statements will not ensure successful patient outcomes in every situation. The American Academy of Otolaryngology—Head and Neck Surgery Foundation emphasizes that these clinical consensus statements should not be deemed to include all proper diagnosis/management/treatment decisions or methods of care or to exclude other treatment decisions or methods of care reasonably directed to obtaining the same results.

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