Objective: To analyze the radiographic, anatomic, and histologic characteristics of the nasal septal swell body.

Design: Computer-aided analysis of magnetic resonance images (MRIs) and histologic examination of cadaveric nasal septa.

Setting: Tertiary medical center.

Patients: Fifty-four head MRI studies were performed on adult live patients; we also used 10 cadaveric nasal septa.

Main Outcome Measures: Radiographic dimensions of the swell body and distances to other nasal landmarks were measured. Nasal septa and swell body histologic characteristics were evaluated using light microscopy. Relative proportions of vascular, connective, and glandular tissues within the swell body and the adjacent septum were compared.

Results: The swell body was fusiform shaped and located anterior to the middle turbinate, with mean (SD) width of 12.4 (1.9) mm; height, 19.6 (3.2) mm; and length, 28.4 (3.5) mm. The epicenter was 24.8 (2.9) mm from the nasal floor, 43.9 (4.1) mm from the nasal tip, and 39.0 (4.6) mm from the sphenoid face. Histologic analyses revealed that, compared with adjacent septal mucosa, the swell body contained significantly more venous sinuses (37% vs 16%, \( P < .001 \)) and fewer glandular elements (28% vs 41%, \( P < .001 \)).

Conclusions: The swell body is a conserved region of the septum located anterior to the middle turbinate approximately 2.5 cm above the nasal floor. The high proportion of venous sinuses within the swell body suggests the capacity to alter nasal airflow. Additional study is required before these findings are used in a clinical setting.


The nasal septal swell body (SB) is a widened region of the anterior nasal septum. This mucosal-lined swelling is readily identifiable on anterior rhinoscopy, nasal endoscopy, and on sinonasal imaging studies. Little is known about the structure or function of the SB. Samples of the SB mucosa taken during nasal surgery have offered some insight into the composition of the SB, which contains both glandular and vasoerectile tissues.1 Magnetic resonance imaging (MRI) studies of the nasal cavity have documented a significant decrease in the size of the anterior nasal septum following topical decongestion.2 A better understanding of the SB and its function could prove clinically relevant, given the close proximity of this structure to the region of the internal nasal valve3 and its possible influence airflow through its vasoactive properties. Surgical management of anatomic nasal obstruction due to extreme turbinectomy or septal deviation has become commonplace and has been shown to improve nasal airflow.4

The goals of the present study were to perform a systematic evaluation of the nasal septal SB and to characterize its radiographic, anatomic, and histologic features. We also explore the functionality and possible clinical significance of this structure.

METHODS

The Saint Louis University institutional review board approved this project. A 3-dimensional computer-aided analysis of the nasal septum and SB was performed on T1-weighted postgadolinium MRI studies of adult heads. The MRI brain studies, ordered for nonsinonasal complaints and reported as normal after being reviewed by a radiologist, were performed using the head coil of a 1.5-T scanner (Philips, Andover, Massachusetts) while the patient was in the supine position. The studies were loaded and analyzed on the StealthStation TREON surgical navigation computer (Medtronic Corpo-
RATION, Minneapolis, Minnesota). The SB was identified in the axial, coronal, and sagittal views, and the epicenter was marked at the level of greatest width for reference. The dimensions of the SB were measured using the software measuring tool. Measurements of the superior-inferior (height), anterior-posterior (length), and lateral (width) dimensions of the SB region were recorded. Measurements were also taken from the SB epicenter to other clinically relevant nasal landmarks, including the nasal floor, the sphenoid sinus face, and the nasal tip.

Ten cadaveric nasal septa were collected and examined grossly. The entire specimens were then sectioned through the most prominent aspect of the SB and through the septum adjacent to the SB. Specimens were stained with hematoxylin-eosin and examined via light microscopy by a pathologist and otolaryngologist unblinded to the location of the section. The image was visualized on a computer monitor, and a transparent grid was overlaid on the screen. We recorded the tissue type (glandular, venous sinusoid, artery, capillary, and connective) at each point of intersecting lines on the grid. The number of points recorded for each tissue type was divided by the total number of points to provide a calculation of the relative area for each tissue within the specimen. The tissue composition of the SB and adjacent septum were compared using the 2-tailed t test, and a P<.05 was considered significant.

RESULTS

A total of 54 MRI studies of the head were analyzed, of which 25 were from male patients and 29 from female patients. Postgadolinium images demonstrated bright signal of the sinonasal mucosa, including the region of the SB. The septal SB was easily identified in all studies and was consistently located superior to the anterior aspect of the inferior turbinate and anterior to the head of the middle turbinate (Figure 1). The SB was determined to be fusiform in shape and tapered gently at its anterior aspect, with the epicenter located near the junction of the septal cartilage and perpendicular plate of the ethmoid (Figure 2). The mean (SD) width of the SB was 12.4 (1.9) mm; length, 28.1 (3.6) mm (Figure 3A). The mean (SD) height was 19.6 (3.0) mm. With respect to anatomic location relative to other nasal structures, the epicenter of the SB was located at a point on the anterior septum a mean distance of 24.8 (2.9) mm from the nasal floor; 39.0 (4.6) mm from the sphenoid face; and 43.9 (4.1) mm from the nasal tip (Figure 3B).

Examination of the SB under light microscopy revealed a mucosal surface of columnar respiratory epithelium with a superficial layer of collagen and fibrocytes surrounding clustered mucosal glands. The deeper tissues displayed very prominent, large, thin-walled vascular spaces consistent with venous sinusoids (Figure 4A). As shown in Figure 4B, a sharp demarcation was evident at the transition point from normal adjacent septal mucosa to the zone of the SB. The underlying central cartilage and bone in the SB region and in other areas of the nasal septum were similar in thickness and histologic characteristics. Morphometric analysis of the proportions of venous, glandular, arterial, capillary, and connective tissue calculated for the SB region and the adjacent nasal septum is summarized in the Table. Compared with adjacent septal mucosa, the SB contained significantly more venous sinusoids (37% vs 16%) (P<.001) and fewer glandular elements (28% vs 41%) (P<.001). A significantly higher composition of collagenous connective tissue was noted in the adjacent septal mucosa (P=.01) (Figure 4C).

COMMENT

This study demonstrated that the nasal septal SB is a conserved component of the anterior nasal septum that is easily identified. Although the SB is continuous with and difficult to distinguish from adjacent portions of the nasal septum grossly, this structure has distinct microscopic boundaries and characteristic histologic features.

Previous studies have reported that the SB was composed of mostly glandular elements with only minimal venous sinusoids, providing less support for a role in influencing airflow.¹ Our findings of a significant distribution of sinusoids (37% of the composition) in the SB are contrary to those of Wexler and colleagues,¹ who noted only 10% venous sinusoids and 50% seromucinous glands in 2- to 4-mm biopsy specimens of the SB. In contrast to their methods, we analyzed full-thickness specimens of the entire nasal septum and were able to further demonstrate that seromucinous glands were organized more superficially in the mucosa, whereas the sinusoids tended
to occupy deeper areas. Thus, the discrepancies in venous sinusoid composition between our study and theirs may be owing to the biopsy techniques used. The present study demonstrates that the SB does indeed contain a significant proportion of venous sinusoids and fewer glandular and connective tissue elements than the adjacent septum.

The anatomy and histologic characteristics of the SB may provide clues to the potential function of this poorly understood structure. Nasal airflow is regulated predominantly by the nasal turbinates. However, the observation that the SB contains significant vasoerectile tissue has prompted suggestions that it may also influence nasal airflow. The anatomic location of the SB would appear supportive of this proposal; the SB occupies the space in the anterior nasal chamber anterior to the middle turbinate head and superior to the anterior portion of the inferior turbinate, approaching the region of the internal nasal valve. The SB may also increase turbulence and protect the nasal mucosa from rapidly moving inspiratory flow. This study, however, has limited clinical utility in the absence of additional data. The role of the SB in allergy, immunologic function, olfaction, and temperature regulation is intriguing but presently unclear.

It is important to note that the SB is a normal structure that is not to be confused with a septal deviation. On nasal examination, the SB appears as a swelling of the anterior septum located superiorly in the nasal cavity above the inferior turbinate, bilaterally. Unlike a septal deflection, the SB will shrink down in response to topical decongestion, underscoring the importance of examining the nose in both predecongestion and postdecongestion states.

In addition, this study raises the question of whether the SB should be directly addressed surgically in patients with nasal obstruction. At present, surgical treatment is considered aggressive and controversial. The anterior septum is very important in nasal airflow, and Gupta et al3 suggest that the superior septum should be addressed surgically in patients with obstruction. Generally, however, this approach focuses on modifications or resection of deviated cartilage in this area, with no particular attention paid to the overlying mucosa. Haight and...
Gardiner \(^2\) actually performed nasal cautery or cryo-
therapy of the “nasal septal turbinate” (septal SB) and the
inferior turbinate and concluded that there was no ad-
titional benefit from treating the septal turbinate. How-
ever, their study was limited by a very small number of
patients and multiple different techniques.

It is also possible that the SB is affected inadvertently
during routine septal surgery. Removing cartilage from
the area of the SB in the anterior septum improves the
cross-sectional area in the region of the nasal valve, but
it also might interfere with the microenvironment and
innervation to the SB, preventing parasympathetic tone
from promoting vasodilation. In light of recent studies
describing the complex interplay between the septum
and inferior turbinates before and after surgical ma-
nipulation,\(^8\) further study into the effects of treating the
SB in patients complaining of nasal obstruction may be
important.

Review of the zoologic literature reveals that the sep-
tal SB is conserved in several other mammals and has been
identified in rats, rabbits, and cats\(^9\) consistent with an ata-
vistic organ. The histologic characteristics of the SB in these
animals included cavernous endothelial-lined spaces\(^10\) simi-
lar to the findings of the present study. Some researchers
have questioned whether the SB could itself represent a
vestigial vomeronasal organ analogous to those in other
mammals used for the detection of pheromones.\(^10\) How-
ever, to our knowledge, no studies have demonstrated a
direct neurologic connection between the anterior sep-
tum and the central nervous system in humans. More work
is needed to evaluate the role of the SB in nasal physi-
ologic function and obstruction, and such work might lead
to new treatment options.

In conclusion, the septal SB is a normal 2 × 3-cm fu-
siform structure located anterior to the middle turbinate
and superior to the inferior turbinate approximately 2.5 cm
above the nasal floor. The proximity of the SB to the na-
sal valve region in conjunction with its composition of a
large number of venous sinusoids suggests a role in na-
sal airflow regulation, but the clinical significance of this
structure is presently unclear. Further research is re-
quired to determine the role of the SB in the pathophysi-
ologic characteristics and possible treatment of nasal
obstruction.

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