

The septal body revisited

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Abstract

Introduction: The term septal body refers to a thickened area of the nasal septum which is located superior to the inferior turbinate and anterior to the middle turbinate. Despite its important role in changing nasal airflow resistance, it has received little attention. Clinically, a well developed septal body may be misdiagnosed as high septal deviation.

Aim: The aim of the present study was to reassess the histological characteristics of the septal body mucosa and the morphometric differences between it and the adjacent septal mucosa. This information was then used to determine the exact location and surface area of the septal body.

Materials and methods: The study was performed on 30 cadaveric specimens (60 sides). Serial numbered sections of the whole septal mucosa were stained with haematoxylin and eosin as well as periodic acid Schiff – Alcian blue. Morphometric analysis was performed to determine the histological differences between the septal body mucosa, the anterior septal mucosa and the inferior septal mucosa. The precise boundaries of the septal body area were then defined in a manner similar to the Mohs micrographic surgical technique.

Results: The histological characteristics of the septal body mucosa included thick (more than 60 μm), pseudostratified, ciliated respiratory epithelium with goblet cells, abundant seromucinous glands and many blood sinusoids. Morphometric analysis showed that the septal body mucosa had thicker epithelium and more glandular acini and blood sinusoids than the rest of the septal mucosa. Mapping of the septal body area showed that its anterior end was 2.2 ± 0.3 cm (mean \pm standard deviation) behind the caudal edge of the septal cartilage, and its inferior border was 1.1 ± 0.2 cm above the floor of the nose. The mean horizontal diameter of the septal body was 2.0 ± 0.15 cm, and the mean vertical diameter was 1.5 ± 0.11 cm.

Conclusions: The present study determined the morphometric characteristics of the septal body as well as its location and surface area. The intimate relationship of the septal body to the internal nasal valve and the histological characteristics of its mucosa should stimulate research into its potential role in modifying nasal airflow pattern and resistance, and its role in changing the humidity and temperature of the inspiratory air stream.

Key words: Nasal Septum; Septal Body; Nasal Obstruction

Introduction

The nasal septal body, also known as the septal turbinate, septal cavernous body, Kiesselbach's body or septal erectile tissue, is that widened area of the septum located superior to the inferior turbinate and anterior to the middle turbinate. Structurally, it consists of septal cartilage, often a few millimetres thicker than the rest of the septum. The mucosa covering the septal body is also thicker than the rest of the septal mucosa.^{1–3} The central position of the septal body and its intimate relation to the internal nasal valve have drawn significant attention to its role in nasal airflow resistance and in control of the temperature and humidity of the incoming air stream.^{4–6}

However, clinically the septal body has received little attention. In some cases, the local bulge at the superior part of the septum has been misdiagnosed as a high septal deviation (Figure 1). There is evidence suggesting that the septal body could be included among the expansile tissues of the nose which regulate nasal resistance.^{1,7–11} Based upon this evidence, Saunders *et al.*⁷ suggested that the septal body be managed in the same way as hypertrophied inferior turbinates.

While computed tomography and magnetic resonance imaging studies have confirmed the anatomical and gross structural differences between the septal body and the remaining septum, there is no general agreement among rhinologists on the histological

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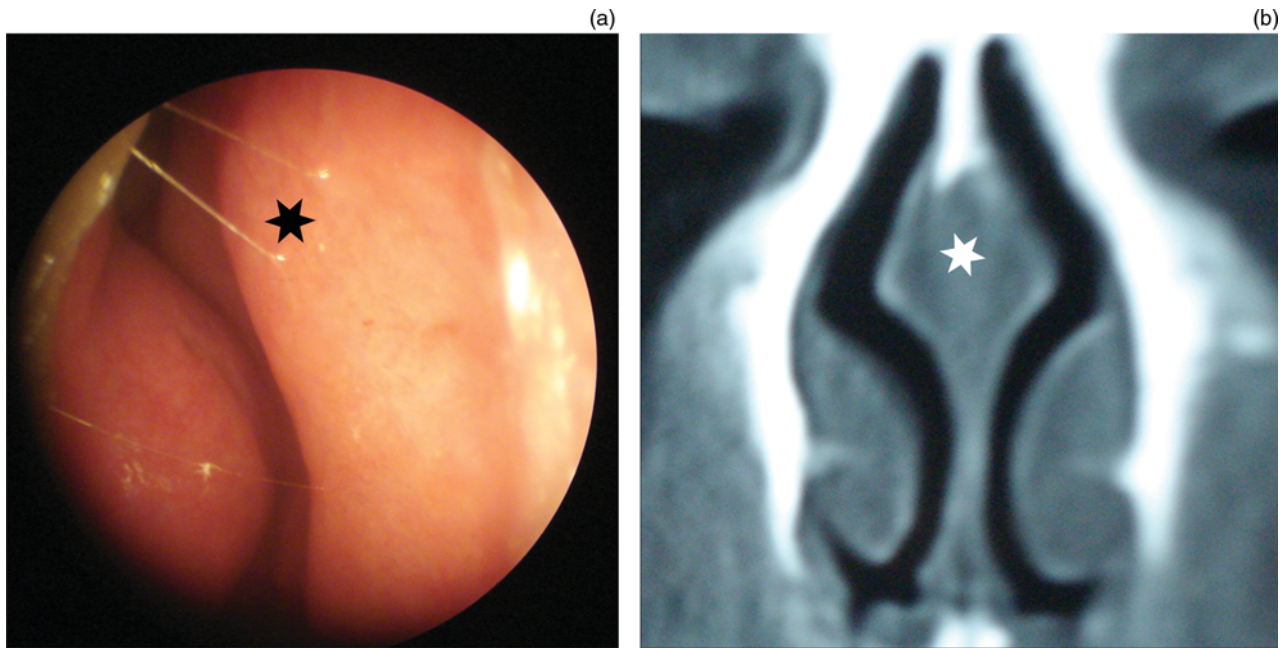


FIG. 1

(a) Endoscopic view of the septal body, showing it as a smooth, elevated area on the upper part of the nasal septum (*), giving the illusion of a high septal deviation. (b) Coronal computed tomography image of the anterior nose, showing the thickened septal body (*).

and morphometric differences between the mucosal linings of these two areas.^{7,12,13}

Some authors have suggested that the septal body mucosa may be identified using the following criteria: (1) the epithelium is composed of pseudostratified, columnar epithelium with goblet cells; (2) the epithelium is 60–100 μm thick; (3) many seromucinous glands are present; and (4) numerous blood sinusoids are present.^{14,15}

The septal mucosa around the septal body may be identified using the following criteria: (1) the epithelium is less than 60 μm thick; (2) the epithelium may show stratification (in the area anterior to the septal body); (3) fewer seromucinous glands are present; and (4) fewer blood sinusoids are present.

In the present study, we examined the whole septal mucosa on both sides of the septum, in order to reassess the characteristics of the septal body mucosa and to determine the histological and morphometric differences between it and the rest of the septal mucosa. We then used these data to precisely map the area of the septal body.

Materials and methods

The study was performed on 30 cadaveric specimens (60 sides). The whole septal mucosa was elevated in the sub-perichondrial plane and then completely excised. The specimen was then spread over a paraffin plate, placed in formalin solution and sent for tissue processing. After embedding in paraffin and serial sectioning, the numbered serial sections were stained with haematoxylin and eosin and periodic acid Schiff – Alcian blue.^{7,16}

Morphometric analysis focused on the glandular and vascular elements only. This was conducted

by placing a transparent plastic sheet having a grid of 1 cm squares over each $\times 40$ photomicrograph (printed at a total magnification of $\times 100$), then assigning a designation to each square based on the most predominant tissue type: glandular, vascular or other.

All squares over the lamina propria were examined for each section. The total number of examined squares for each section was considered to be 100 per cent. Data were then summarised and presented in percentage form.^{14,16,17} Only glandular and vascular components were included in the statistical analysis.

The thickness of the epithelium was measured at five randomly allocated points across the section, and the average thickness was calculated.

The septal body mucosa was identified using the histological and morphometric criteria suggested by Wexler *et al.*¹⁴ and Grevers *et al.*¹⁵ In this way, the area of the septal body was carefully mapped, in a manner similar to the Mohs micrographic surgical technique.^{18–21}

Statistical analysis was performed using the analysis of variance test with repeated data across the three regions of the mucosa, with pair-wise comparisons made as follow-on analysis. The glandular acini and the venous sinusoids were analysed separately.

Results

Histological and morphometric results

The epithelium of the septal body was found to be of the pseudostratified, ciliated type with goblet cells (Figure 2) and had a mean thickness of $82 \pm 7.3 \mu\text{m}$. The mucosa of the inferior septum had thinner but similar respiratory epithelium (Figure 3) with

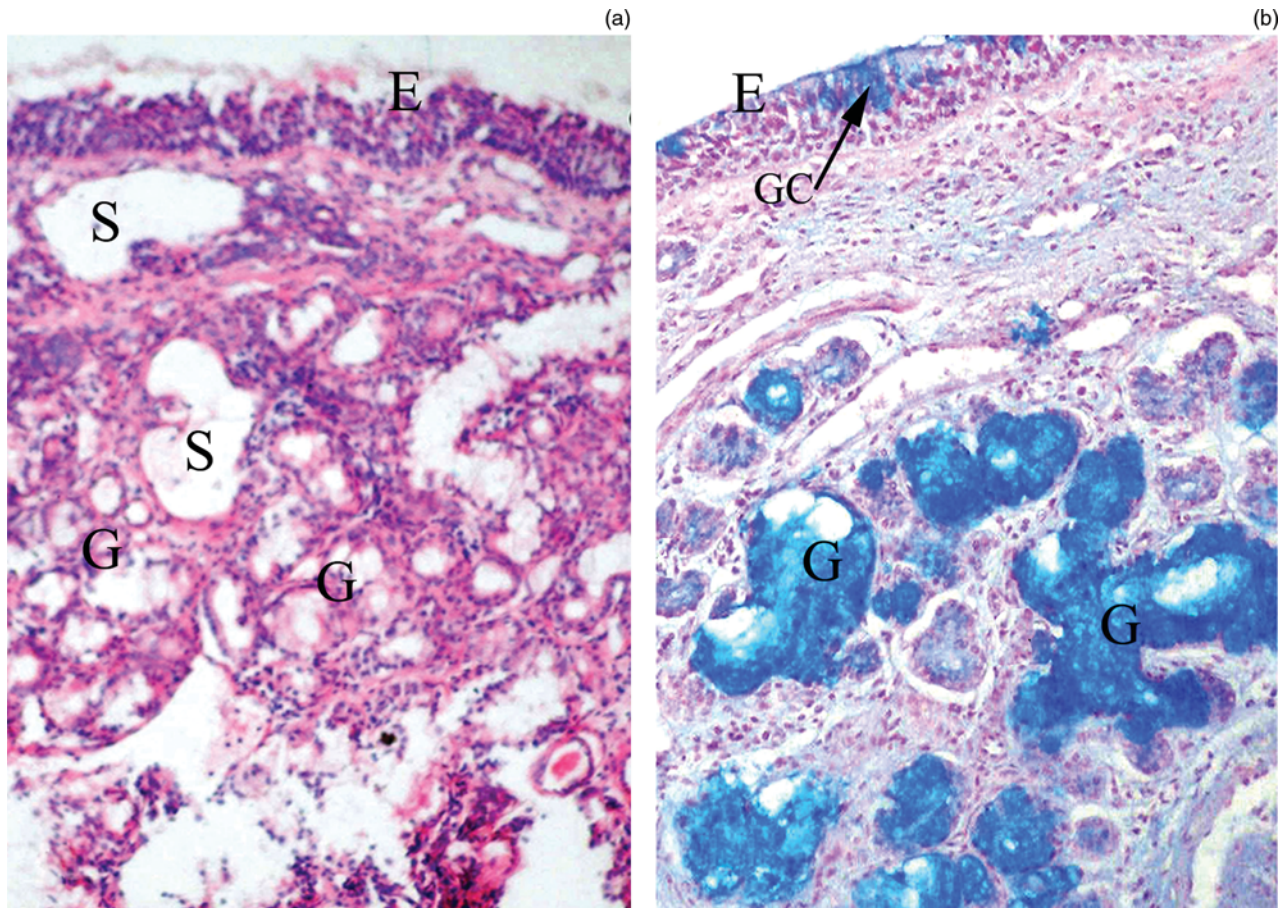


FIG. 2

(a) Photomicrograph of the septal body mucosa; the epithelium (E) is of the pseudostratified type and the submucosa shows many seromucinous glands (G) and blood sinusoids (S) (H&E; $\times 100$). (b) Photomicrograph of the septal body mucosa, showing pseudostratified epithelium (E), many goblet cells (GC) and seromucinous glands (G) (Periodic acid Schiff - Alcian blue; $\times 100$).

a mean thickness of $52 \pm 2.8 \mu\text{m}$. The anterior septal mucosa showed stratification of the surface epithelium with little expression of columnar or goblet cells (Figure 4). The thickness of the epithelium in the area immediately anterior to the septal body was $55 \pm 3.5 \mu\text{m}$.

The mucosa at the three sites exhibited glandular elements and blood sinusoids. A summary of the morphometric results is given in Table I. The septal body mucosa was found to have a prominence of glandular acini (69.5 ± 6.0 per cent) and dilated blood sinusoids (21.2 ± 3.1 per cent). The inferior septal mucosa showed smaller numbers of glandular acini (49.3 ± 1.1 per cent) and blood sinusoids (17.1 ± 2.8 per cent). The anterior septal mucosa showed far fewer glandular acini (9.3 ± 3.7 per cent) and blood sinusoids (8.7 ± 3.4 per cent).

Septal body mapping

The precise boundaries of the septal body were carefully determined by examining serial sections of the septal mucosa, in a manner similar to the Mohs micrographic surgical technique. Results of this mapping are shown in Table II. The septal body was found to be a roughly elliptical area with

a horizontal diameter ranging from 1.7 to 2.4 cm and a vertical diameter ranging from 1.2 to 1.7 cm. The distance between the anterior end of the septal body and the muco-cutaneous junction of the septum ranged from 0.7 to 1.5 cm, and the distance between its inferior boundary and the floor of the nose ranged from 1.8 to 2.6 cm.

Discussion

The present study showed that the septal body is a discrete structure with peculiar histological characteristics which differ from those of the adjacent septal areas. These characteristics include: well developed, thick respiratory epithelium with goblet cells; numerous seromucinous glandular acini; and many blood sinusoids.

In the recent study by Wexler *et al.*,¹⁴ the erectile tissue component of the septal body mucosa (i.e. blood sinusoids) was reported to comprise an average of 10 per cent of submucosal components. In the present study, this proportion was 21.2 per cent. This difference could be explained by the fact that Wexler and colleagues' study was performed on 4 mm mucosal specimens harvested from 14 volunteers, whereas the present study was performed

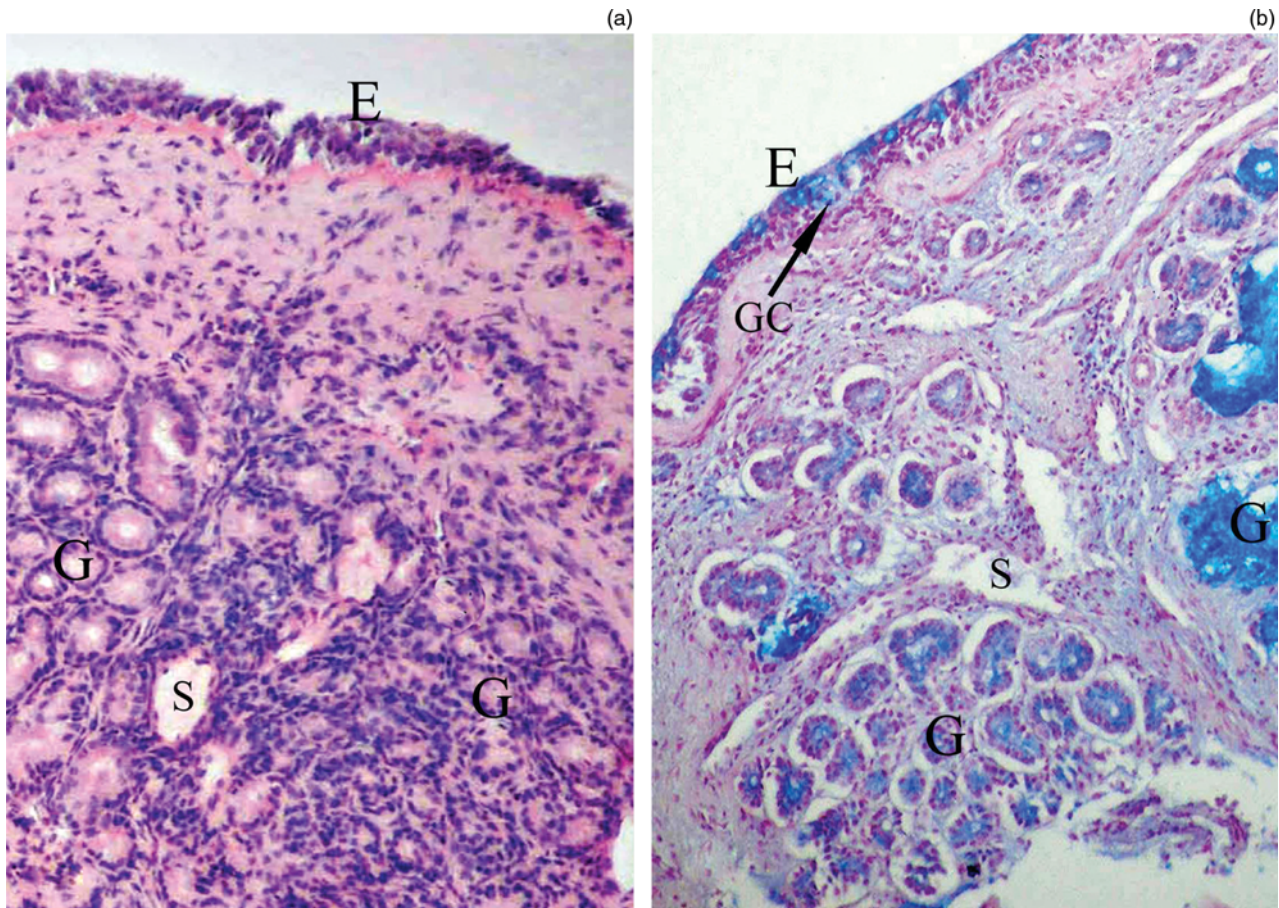


FIG. 3

(a) Photomicrograph of inferior septal mucosa; the epithelium (E) is thin and of the pseudostratified type, while the submucosa shows many seromucinous glands (G) and few blood sinusoids (S) (H&E; $\times 100$). (b) Photomicrograph of inferior septal mucosa, showing pseudostratified epithelium (E) with goblet cells (GC); the submucosa contains seromucinous glands (G) and few blood sinusoids (S) (Period acid Schiff - Alcian blue; $\times 100$).

on 60 whole septal mucosal specimens harvested from 30 cadavers. This enabled us to analyse the whole septal mucosa and to determine more precisely the percentages of glandular and vascular components in the submucosa. The presence of plentiful blood sinusoids within the septal body confirms that it could be considered part of the expansile vascular tissues of the nose which control the nasal airflow (altering it from laminar to turbulent flow).²

The presence of numerous goblet cells and seromucinous acini within the septal body is in accordance with the findings of Saunders *et al.*⁷ These authors noted the abundant glandular structures of this region and suggested their importance in humidifying the air flowing through the nasal cavity. They also suggested that preserving the mucosal integrity of this region is imperative in order to maintain the function of air humidification and also to prevent mucosal dryness and crust formation. This assertion was supported by the work of Lindemann *et al.*,^{22,23} who established the role of the septal mucosa in humidity control of the nasal cavity.

The glandular and vascular elements of the inferior septal mucosa were less abundant than those of the septal body. Likewise, the epithelium of the inferior septal mucosa was much thinner.

The anterior septal mucosa showed even fewer glandular acini and blood sinusoids. These results agree with the findings of other authors,^{2,14} and confirm the distinctive histology and physiological role of the septal body.

- **The septal body is a distinct structure located in the upper part of the nasal septum, anterior to the middle turbinate**
- **Histologically, it is characterised by thick (more than 60 μm), pseudostratified, ciliated respiratory epithelium with goblet cells, abundant seromucinous glands and many blood sinusoids**
- **These histological features make the septal body easy to distinguish from the rest of the septal mucosa**
- **Knowledge of the anatomical position and histological structure of the septal body should enable a better understanding of its significance in humidifying the inspired air current, and its role in controlling nasal airflow and nasal airway resistance**

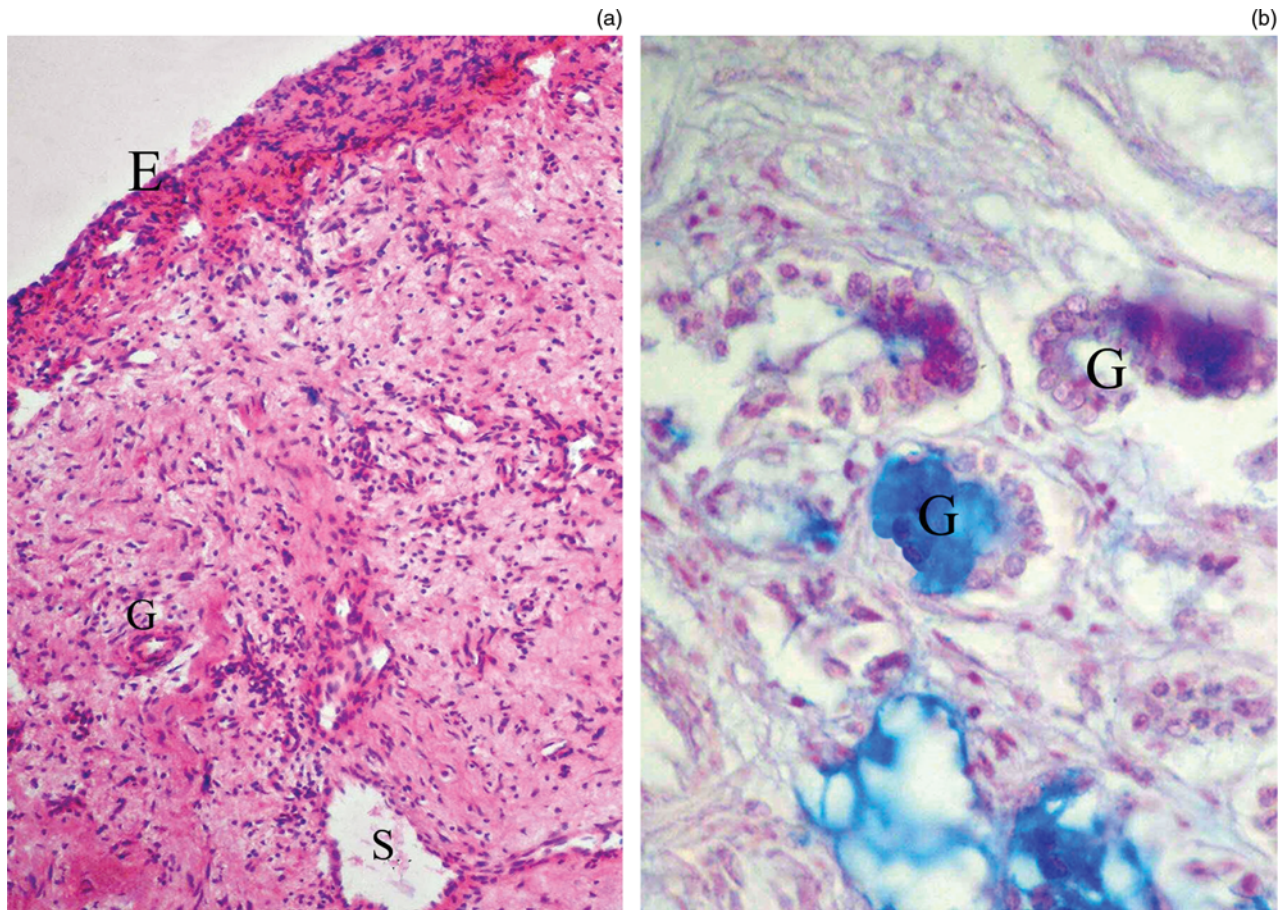


FIG. 4

(a) Photomicrograph of anterior septal mucosa; the epithelium (E) is stratified and the submucosa is dense with only a few seromucinous glands (G) and blood sinusoids (S) (H&E; $\times 100$). (b) Photomicrograph of anterior septal mucosa, showing few seromucinous glands (G) in the submucosa (Periodic acid Schiff - Alcian blue; $\times 100$).

In the current study, the authors carefully determined the surface area of the septal body as well as its cephalo-caudal and antero-posterior dimensions. Although other publications have described the

TABLE I

TISSUE ELEMENTS IN LAMINA PROPRIA OF MUCOSA OF SEPTAL BODY, ANTERIOR SEPTUM AND INFERIOR SEPTUM*

Element	Septal body	Anterior septum	Inferior septum
Glandular acini	69.5 \pm 6.0	9.3 \pm 3.7	49.3 \pm 1.1
Venous sinusoids	21.2 \pm 3.1	8.7 \pm 3.4	17.1 \pm 2.8

Data represent mean % \pm standard deviation. *Total examined specimens = 60.

TABLE II

ANATOMICAL MAPPING OF SEPTAL BODY

Parameter	Range (cm)	Mean \pm SD (cm)
Distance from muco-cutaneous junction of septum	1.8–2.6	2.2 \pm 0.3
Distance from nasal floor	0.7–1.5	1.1 \pm 0.2
Horizontal diameter	1.9–2.4	2.0 \pm 0.15
Vertical diameter	1.2–1.7	1.5 \pm 0.11

SD = standard deviation

relationship between the septal body and the internal nasal valve,^{1–3,24–27} the technique used in the present study allowed better objective mapping of the septal body and confirmed the proximity of the septal body to the internal nasal valve. Based upon the results of the present study, the septal body should be considered one of the important, integral parts of the flow-limiting segment of the nose, taking into consideration its large surface area and the vaso-expanding nature of its blood sinusoids.

Conclusion

The septal body has distinct morphometric features which differentiate it from the rest of the septal mucosa. Knowledge of the histological structure and anatomical position of the septal body should enable a better understanding of its significance in humidifying the inspired air current, and its role in controlling nasal airflow and nasal airway resistance.

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