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Correlation between prevelance of Haller cells and postoperative maxillary sinusitis after sinus lifting Procedure

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Abstract

Our aim was to investigate the prevalence of Haller cells in a group of patients listed for sinus lifting, and to assess the correlation between postoperative maxillary sinusitis and their presence. A total of 102 patients (150 sides) were evaluated retrospectively on cone-beam computed tomography (CT). The presence and dimensions of Haller cells were noted on the scans. The development of postoperative maxillary sinusitis was recorded. Fisher's exact test was used for statistical evaluation and probabilities of less than 0.05 were considered significant. Maxillary sinusitis developed after sinus lifting in five patients, and Haller cells were found in three of them. However, there was no correlation between the presence of Haller cells and postoperative maxillary sinusitis ($p = 0.638$). The cells were larger in patients with postoperative maxillary sinusitis, and the greater dimensions may be a potential risk factor for developing it after a sinus lift.

Keywords: sinus lifting; postoprative maxillary sinusitis; Haller cells; cone-beam CT

Introduction

A maxillary sinus lift is done when there is insufficient bony height for insertion of a dental implant in the posterior maxilla. It is defined as the opening of a bony window on the lateral wall of the maxillary sinus, lifting of the remaining window through the sinus cavity, and creation of a gap to be filled with different types of bone graft.[1] Common complications may be bleeding, postoperative maxillary sinusitis, and perforation of the Schneiderian membrane.[2] Maxillary sinusitis is an unpleasant complication that is caused by contamination of the maxillary sinus or obstruction of the ostium of the sinus.[3,4] Its rate of development after sinus lifting varies between 0%–20%,[5,6] and the size of the maxillary ostium is correlated with sinus drainage in some studies.[5,7] Anatomical variations in the nasal cavity and the ostiomeatal complex may cause sinus drainage to deteriorate, and possible factors that also diminish it are septal deviation, nasal polyposis, allergy, infundibular conditions, radiotherapy, and the presence of Haller cells.[5,8]

Haller cells are known as infraorbital ethmoid cells that are located on the roof of the maxillary sinus near the ostium.[9] They cause obstruction in the ostium and have been associated in some studies with maxillary sinusitis.[8–10] We know of only one study that has assessed the relation between the presence of Haller cells and postoperative maxillary sinusitis after sinus lifting.[6]

In this study we aimed to investigate the prevalance of Haller cells in patients listed for sinus lifting, and to find out whether there is a correlation between the presence and

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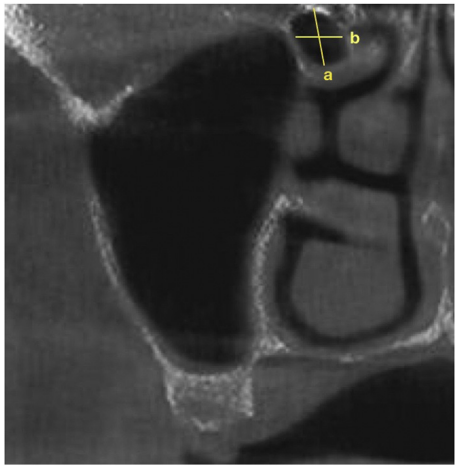

Fig. 1. Haller cell on the right maxillary ostium: a = vertical dimension of Haller cell, b = horizontal dimension of Haller cell.

dimensions of the Haller cells and the development of postoperative maxillary sinusitis (Fig. 1).

This is clinically important because when we examine preoperative cone-beam computed tomographic (CT) scans before sinus lifting we should be aware of the presence of Haller cells, because they can increase the risk of postoperative infection of the maxillary sinus.

Patients and methods

A retrospective study was conducted on 102 patients who underwent maxillary sinus lifting between March 2015 and September 2017. Ethics approval was obtained from Istanbul Medipol University (file number: 10840098-604.01.01-E.5445). Patients who had history of sinusitis, sinonasal tumours, nasal polyposis, or previous nasal surgery were excluded from the study. Patients who were included were systemically healthy, smoked less than five cigarettes/day) and had no history of other medical conditions. Cone-beam CT images were analysed by one of the authors (AA).

The cone-beam CT images were taken with an i-CAT 17–19 Imaging System (Imaging Sciences International, Inc.) with a standardised scanning protocol. The patients were positioned vertically on the cone-beam CT machine and stabilised with a head support, strap, and chin cup. The occlusal plane was horizontal to the floor surface, and the patients were monitored to ensure that they remained still throughout the scan (14.7 seconds).

All volumes were acquired at 120 kVp and 20.27 mAs using a 16 cm × 11 cm field of view and 0.25 voxels. The kV and mA variables were automatically calculated from scout views obtained with the i-CAT 17–19 Imaging System. The measurements were evaluated using panoramic reconstruction of the right and left condylar regions. The images were clear and symmetrical, and none was distorted or blurred. The software within the i-CAT 17–19 Imaging System was used to measure all variables. All constructions and measurements were made on a 24-inch inplane switching panel colour-active matrix thin-film-transistor liquid-crystal display (U2410 LCD monitor; Dell) with a resolution of 1920 × 1200 at 60 Hz and 0.27- × 0.27 mm pixel pitch. All tomographic images were examined in a dark room using the same notebook (Intel® Core™2 Duo CPU E6400, 2.13 GHz, 2 MB, GeForce GTX 470, 24-inch TFT LCD monitor, 3 GB memory, Windows XP Professional operating system; Intel Corporation). The researchers examined the reconstructed images in the axial, sagittal, and coronal planes using the DICOM format.

Precise criteria were used to recognise Haller cells as air cells of any size located medial to the infraorbital foramen on the orbital floor and roof of maxillary sinus, above the ostium of the maxillary sinus, and within the ethmoid infundibulum. The horizontal and vertical dimensions of the Haller cells were measured in the coronal plane. The presence of septal deviation was also noted, and the presence of postoperative maxillary sinusitis was correlated with the presence of Haller cells.

The clinical criteria used for diagnosing maxillary sinusitis after sinus lifting were nasal obstruction, pathological secretion, headache, and tenderness in the region of the maxillary sinus.[6,11]

Statistical analysis

All data were transferred to PASW Statistics for Windows (version 18.0, SPSS Inc) for statistical analysis. Fisher's exact test was used to compare the significance of the association between the presence of Haller cells and the development of maxillary sinusitis postoperatively.

Surgical technique

After the injection of 2% articaine hydrochloride (Ultracaine DS) to the maxillary surgical site, a crestal incision was made and a mucoperiosteal flap raised. Sites for the implants were mapped, and an osteotomy made using a piezosurgical device (NSK) at the lateral aspect of the maxillary sinus wall. After the sinus mucosa had been raised, an allograft with particle size ranging from 0.60 mm to 1.25 mm was used as the single graft material for filling the sinus floor (MinerOss, BioHorizons Inc). Augmentation of about 10 mm height of bone was aimed for in all cases. An absorbable collagen membrane (Bego) was placed over the lateral window. The mucoperiostal flap was sutured with 3/0 polyglactin 910 (Vicryl, Ethicon) at the end of the operation.

It was recommended that smokers refrained from smoking for a week before and a week after the operation). Postoperatively amoxycillin and clavulanic acid 1000 mg (Augmentin, GlaxoSmithKline) was prescribed together with metronidazole 500 mg (Flagyl, Pfizer) together with parac-

Table 1
Details of Haller cells. Data are mean (SD).

Position of Haller cells	No. of patients	Horizontal diameter (mm)	Vertical diameter (mm)
Right	23	5.25 (1.87)	3.6 (1.73)
Left	27	4.76 (1.47)	3.84 (1.34)
Bilateral	21	–	–

Table 2
Details of Haller cells in patients with maxillary sinusitis postoperatively. Data are mean (SD).

Haller cells	No. of patients with maxillary sinusitis	Horizontal diameter of cells (mm)	Vertical diameter of cels (mm)
Present	3	5.4 (1.75)	4.5 (1.6)
Absent	4		
p value*	0.638		

*Fisher's exact test was used for determination of significance between presence of Haller and postoperative maxillary sinusitis.

* Fisher's exact test.

etamol 500 mg and a nasal decongestant for five days. Sutures were removed after 10 days.

Results

A total of 150 sinus lifts were done in 102 patients (44 female and 58 male patients, mean (SD) age 51 (12) years). Seventy-two procedures were done on the right, and 78 on the left, and Haller cells were found in 71 of the 102 patients (69%) (Table 1). The mean (SD) horizontal diameter of Haller cells was 5.25 (1.87) mm on the right and 4.76 (1.47) mm on the left. The mean vertical diameter was 3.6 (1.73) on the right and 3.84 (1.34) on the left. Table 2 shows the measurements of the Haller cells in patients with postoperative sinusitis. In 29 patients the nasal septum was deviated through the surgical site.

Discussion

Sinus lifts were commonly done in the maxillary posterior atrophic regions to gain sufficient bony height for insertion of dental implants. They have possible risk factors and potential complications similar to those of other procedures, one of which is maxillary sinusitis. Acute maxillary sinusitis after a sinus lift puts survival of the bone graft at risk.[12] Complex osteomeatal anomalies are related to maxillary sinusitis, and the middle meatus and infundubulum are the areas most affected by anatomical variations, which can lead to diminished drainage and ventilation, and then infections.

The complex osteomeatal anomalies that are encountered most often are septal deviation, concha bullosa, paradoxical middle concha, pneumatisation of the uncinate process, and Haller cells. These cells are seen as an incidental finding during examination by cone-beam CT, but their position can affect the normal mucociliary activity of the maxillary sinus. Their quoted prevalence ranges from 2.7% to 45.1% in different studies,[8] and in our study it was 69.6%. In previous studies the presence and size of Haller cells were significantly associated with ipsilateral maxillary sinus disease.[13–16] However, Koshal et al stated that the association between maxillary sinusitis and Haller cells was not significant, though the presence of Haller cells has an important role in ventilation and drainage of the paranasal sinuses.[17] This may have a potential impact on safety during endoscopic operations.[17] When the Haller cells are bigger than 6 mm, it could be assumed that they are a possible aetiological risk factor for the development of maxillary sinusitis, but in different studies this dimension was thought to be more than 3 mm.[16,18,19] Our findings are compatible with the published figures. The dimensions of Haller cells were measured in patients who developed postoperative maxillary sinusitis, and the mean horizontal and vertical dimensions were 6.08 (2.45) mm and 4.5 (0.58) mm, respectively. Two patients who had Haller cells also had septa that deviated through the surgical site, which may be a secondary predisposing factor for the development of maxillary sinusitis. We had no perioperative complications such as perforations of the sinus membrane in patients with postoperative maxillary sinusitis. These patients were all non-smokers.

A previous study stated that postoperative complications after sinus lifts were linked significantly with the presence of Haller cells.[6] However; we were unable to confirm this.

Conclusion

We found no significant association between the presence of Haller cells and maxillary sinusitis after sinus lifts. However, we should keep in mind that the greater size of some Haller cells shown on cone-beam CT images may be a risk factor for the development of postoperative maxillary sinusitis.

Ethics statement/confirmation of patients' permission

Ethics approval was obtained from Istanbul Medipol University (file number: 10840098-604.01.01-E.5445). Patients' permission not necessary.

Conflict of interest

We have no conflicts of interest.

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