



Assessment of the lacrimal recess of the maxillary sinus on computed tomography scans



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ABSTRACT

Objective: To assess the frequency of the lacrimal recess in the maxillary sinus (MS) in computed tomography (CT) of the paranasal sinuses.

Methods: CT of the paranasal sinuses (CT PNS) done in a total of 78 patients. According to the discoveries, the MS were classified in two types: anterior or lateral.

Results: 41 CT PNS of 41 patients of a total of 78 patients preselected were excluded. 37 CT of the paranasal sinuses from 37 patients, in a total of 68 maxillary sinuses were studied. In the 33 right maxillary sinuses, 10 lacrimal recesses were found, 9 from male patients. Eleven left maxillary sinuses with lacrimal recess were found from a total of 35 left maxillary sinuses.

Conclusion: From the analysis of 68 MS, a frequency of 30.9% of lacrimal recesses in the maxillary sinuses in CT was observed.

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1. Introduction

Precise anatomical knowledge is indispensable for any surgeon. Otorhinolaryngological surgery involving the paranasal sinuses, especially when endoscopy-assisted, highlights the importance of such knowledge because of the close relationship between the nasal cavity and prime anatomical elements like the encephalon, hypophysis and ocular globes with their optical nerves, and also because of important vascular elements such as the internal carotid arteries, ethmoidal arteries and cavernosum sinus [1,2]. In the interior of the nasal cavity, the lateral wall can be distinguished, due to the presence of such structures as the nasal conchae, uncinat process, infundibulum and ethmoidal bulla. Its most anterior portion presents important structures such as the ethmoidal cells of the agger nasi, lacrimal sac and nasolacrimal duct (NLD) [3–5]. The wall of the nasal cavity is also the medial limit of the maxillary sinus (MS), which in its most anterior portion may present the anterior or lacrimal recess, thus named due to its proximity to the lacrimal sac and the NLD [6–8]. This recess is only cited in a few reports in the literature, without great comprehension of its correlation with the lacrimal sac and the NLD [1,2].

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The anatomical relationship between the MS and the LND has gained wider importance with the advent of endoscopy-assisted microsurgery and nasosinusal surgery and because of increasing usage of nasal endoscopy for performing middle meatotomy and transnasal dacryocystorhinostomy [9–17]. In cases of middle meatotomy, enlargement of the main ostium of the maxillary sinus presents higher risk of undergoing stenosis if there is manipulation of its anterior portion, where it is close to the NLD. Presence of the lacrimal recess in the maxillary sinus, anterior to the NLD, weakens the osseous lamina that covers it, with higher risk of fracturing during tissue resection [18,19]. In cases of endoscopy-assisted transnasal dacryocystorhinostomy, as well as the need for great mastery of the surgical instruments that is inherent to the technique, the surgeon must take into consideration the possibility of anatomical variations of the more anterior and medial portions of the maxillary sinus, i.e. of the area of the lacrimal recess, in order to ensure correct localization of the anatomical structures and avoid areas presenting risks [19,20].

The NLD, the structure involved in dacryocystorhinostomy, has a close anatomical relationship with the MS. The latter may present an anterior projection that advances beyond the limits of the NLD, thus forming an anterior recess. Even though this is a known anatomical variation, this recess is only vaguely cited in a few reports in the literature [1,2,5]. In the different literature sources that we investigated, there were no reports of any classification system of the maxillary sinus relating to lacrimal recesses. There were no reports on their frequency of occurrence, either. Therefore, the

objective of this study was to assess the frequency of occurrence of the lacrimal recess in the maxillary sinus, as observed on computed tomography scans (CT scans) of the paranasal sinuses.

2. Materials and methods

In this observational descriptive study, CT scans of the paranasal sinuses (CT-PNS) produced for a total of 78 patients at the university hospital of Unicamp University between April 1, 2000, and March 31, 2001, were studied. The protocol for this study had previously been approved without restrictions by the Research Ethics Committee of Unicamp University under the number 26/2002. Axial CT-PNS on patients aged 18 years and over on which the paranasal sinuses and the nasal fossae in the region of the middle nasal meatus could clearly be seen were included in the sample. CT-PNS that presented signs of previous surgical manipulation of the middle wall of the maxillary sinus and of the NLD and were of low image quality were excluded.

The maxillary sinuses were evaluated by two examiners at different times. The inter-examiner agreement was obtained using the kappa coefficient (k). The classification of the MS obeyed the following sequence (Fig. 1):

1. straight line 1: parasagittal straight line, going through the center of the NLD;
2. straight line 2: line perpendicular to straight line 1, also going through the center of the NLD;
3. straight line 3: diagonal straight line (D1) bisecting the right angle formed between straight lines 1 and 2.

According to the findings, the MS were classified into two types: anterior (ANT) or lateral (LAT), obeying the following criteria:

- ANT (anterior): the MS went beyond diagonal 1, and the thickness of the osseous wall anterior to the NLD was less than the diameter of the NLD itself, thus characterizing the MS lacrimal recess (Fig. 2)
- LAT (lateral): the MS did not go beyond diagonal 1 or when it did, the thickness of the osseous wall anterior to the NLD was greater than or equal to the diameter of the NLD itself.

The results are presented in a table in terms of the absolute frequency (n) and the relative percentage (%). The chi-square test and the Fisher exact test were used to analyze the data, taking a significance level of 5%.

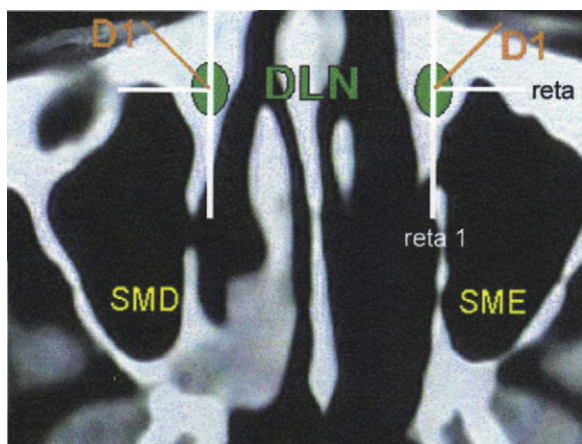


Fig. 1. NLD, lacrimonasal duct (green); D1, diagonal line (orange); RMS, right maxillary sinus; LMS, left maxillary sinus. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

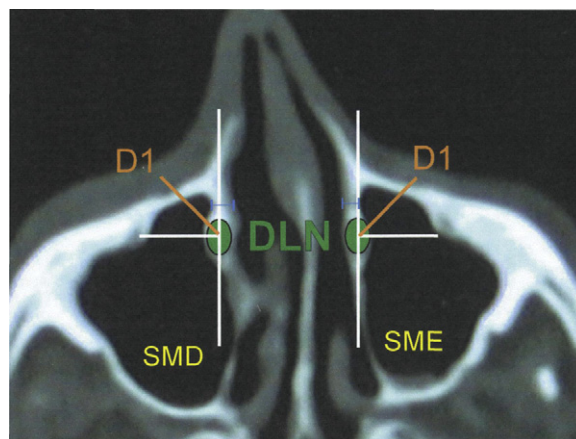


Fig. 2. CT-PNS in the axial plane showing anterior (ANT) maxillary sinuses. NLD, nasolacrimal duct (green); LMS, left maxillary sinus; RMS, right maxillary sinus; D1, diagonal 1 (orange); Blue line, indicates osseous thickness less than the NLD; White lines, reference lines.

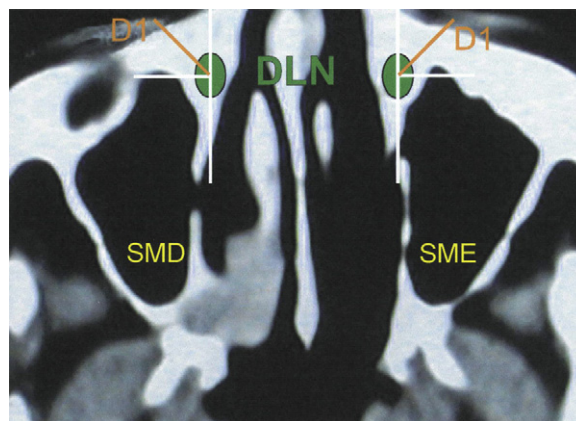


Fig. 3. CT-PNS in axial plane with the maxillary sinuses of the type LAT (lateral); DLN, lacrimonasal duct (green); SME, left maxillary sinus; SMD, right maxillary sinus; D1, diagonal 1 (orange); White lines, reference lines.

3. Results

With the application of the inclusion and exclusion criteria, 41 CT-PNS on 41 patients out of the total of 78 preselected patients were excluded. Thus, 37 CT scans on the paranasal sinuses of 37 patients were evaluated. Among these, six maxillary sinuses were excluded because they presented signs of previous surgical manipulation, and therefore 68 maxillary sinuses were studied. The patients' average age was 50.6 years ($sd = 15.8$). The patients were predominantly male (25 patients = 67.6%) and of white ethnicity (32 patients = 86.5%).

The percentage agreement between the two examiners in using the classification method for the CT-PNS was 97.2%. The kappa coefficient ($k = 0.94$; 95% CI [0.66–0.96]) was the same for the left and right maxillary sinuses, thus showing an excellent level of agreement.

Among the 33 right maxillary sinuses, 10 with lacrimal recesses were found, of which 9 were in male patients (Table 1). There were 11 left maxillary sinuses with lacrimal recesses out of the total of 35 left maxillary sinuses (Table 2). There was no association between gender and the type of sinus found on either side (Table 3). There was also no association between ethnicity and the type of maxillary sinus presented (Table 4).

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