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# Investigation on Oroantral Communication Rate

## Badania częstości występowania połączenia ustno-zatokowego

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**A** – research concept and design; **B** – collection and/or assembly of data; **C** – data analysis and interpretation; **D** – writing the article; **E** – critical revision of the article; **F** – final approval of article

## Abstract

**Background.** The maxillary sinuses begin to form in the fifth month of fetal life. About 30% of acute inflammation in the maxillary sinuses is odontogenic, caused by a bacterial infection of sinus mucosa, accidental opening of the sinus during extraction of an upper tooth, or its displacement into the maxillary sinus. Oro-antral fistula is a common complication following upper dental extraction.
**Objectives.** The aim of the research is to define the frequency of OAC in patients of the Department of Oral Surgery Medical University in Lublin, including gender and age, etiology, location, method of surgical treatment, and the follow-up.
**Material and Methods.** In 2012, there were 970 patients who were submitted for upper dental extractions. All patients were divided into three age groups: under 31 years old, 31–50 years old, and over 50 years old.
**Results.** Oro-antral communication occurred most frequently as a consequence of extraction of the first molars – in 27 out of 268 teeth, or 10.07%. OAC was mostly common in patients under 31 years of age – 35/506 extractions (6.92%). Our study concludes that OAC occurs twice as frequently among women as among men.
**Conclusions.** It is essential to have a radiographic examination before a planned extraction in order to determine the location of dental roots in respect of the maxillary sinus floor. Results of the study conducted on a group of Oral Surgery Department patients in Lublin showed some discrepancies with the results obtained by other authors. The issue of the occurrence, or non- occurrence, of oro-antral communication following dental extraction is, to some extent, determined by the variability of the anatomy as well as individual body composition variability among facial cranium. In the Department of Oral Surgery, Medical University of Lublin, the most frequently used method for oro-antral communication closure is the Wassmund-Borusiewicz technique **(Dent. Med. Probl. 2014, 51, 2, 173–177)**.

**Key words:** tooth extraction, oroantral communication, oral surgery.

## Streszczenie

**Wprowadzenie.** Zatoki szczękowe powstają w 5. miesiącu życia płodowego. Około 30% ostrych stanów zapalnych zatok szczękowych jest pochodzenia zębopochodnego, co jest spowodowane zakażeniem bakteryjnym błony śluzowej zatok, przypadkowym otwarciem zatoki podczas ekstrakcji zęba górnego lub jego wtłoczeniem. Przetoka ustno-zatokowa jest częstym powikłaniem po ekstrakcji zębów górnych.
**Cel pracy.** Ocena częstości występowania połączenia ustno-zatokowego u pacjentów przyjętych w Zakładzie Chirurgii Stomatologicznej Uniwersytetu Medycznego w Lublinie, z uwzględnieniem płci i grupy wiekowej.
**Materiał i metody.** W badaniu uwzględniono 970 pacjentów przyjętych w 2012 r. w celu ekstrakcji zębów górnych. Wszystkich pacjentów podzielono na 3 grupy wiekowe: poniżej 31 lat, 31–50 lat oraz powyżej 50 lat.
**Wyniki.** Z grupy usuniętych 1649 zębów połączenie ustno-zatokowe występowało najczęściej po ekstrakcji pierwszych górnych zębów trzonowych – 27 przypadków z 268, co stanowi 10,07%. Połączenie ustno-zatokowe występowało najczęściej u pacjentów w grupie wiekowej poniżej 31. r.ż. W przeprowadzonym badaniu stwierdza się ponad dwukrotnie częstsze występowanie połaczenia ustno-zatokowego u kobiet niż u mężczyzn.

**Wnioski.** Przed planowanymi ekstrakcjami jest istotne wykonanie diagnostyki radiologicznej w celu oceny położenia korzeni zębów względem światła zatoki szczękowej. Wyniki badań przeprowadzonych u pacjentów Zakładu Chirurgii Stomatologicznej UM w Lublinie wykazują pewne rozbieżności z wynikami innych autorów. Występowanie połączenia ustno-zatokowego po ekstrakcji zębów górnych lub jego brak w pewnym stopniu warunkują również zmienności budowy anatomicznej badanych grup oraz wewnątrzgrupowo zmienności osobnicze w budowie ciała, tj. twarzoczaszki. W Zakładzie Chirurgii Stomatologicznej UM w Lublinie do zamknięcia połączenia ustno-zatokowego najczęściej używa się metody Wassmunda-Borusiewicza **(Dent. Med. Probl. 2014, 51, 2, 173–177)**.

**Słowa kluczowe:** połączenie ustno-zatokowe, chirurgia stomatologiczna, ekstrakcja zęba.

The maxillary sinuses (*sinus maxillaris, antrum Highmori*) begin to form in the fifth month of fetal life. At birth, they achieve the size 7.3 mm length, 4.0 mm height and 2.7 mm width, and a volume at about 0.08 $cm^3$, and grow until the eruption of permanent teeth. According to Kirmeier, their final volume at the age 20–30 is about 21.99 $cm^3$. At that age sinus development is already completed, but there are no visible changes associated with aging and the frequent loss of teeth. The sinuses are connected to the nasal cavity by a maxillary hiatus which reaches the ethmoidal infundibulum situated in the medial middle nasal meatus [1–3].

About 30% of acute inflammation of the maxillary sinuses is odontogenic, caused by a bacterial infection of sinus mucosa, accidental opening of the sinus during the extraction of an upper tooth, or its displacement into the maxillary sinus [4]. The most common reasons are bacterial (*Streptococci* spp., *Staphylococci* spp., *Haemophilus influenze*, *Kliebsiella pneumoniae*, *Moraxella catharalis*, and *Esherihia coli*) or aspergillus infections (*Aspergillus fumigatus* or *flavus*) [5, 6].

Oroantral fistula is a common complication following upper dental extractions, mostly molars (first molars – 4.1% [7]), less often premolars, and occasionally canine teeth (some authors distinguish the anterior recess of the maxillary sinus which reaches the palatal site of the upper lateral incisors [8, 9]).

Knowledge of diagnosis and methods for the closure of such communications is essential for dentists. In the case of an upper tooth extraction, it is imperative to examine the alveolus and verify the presence of an oroantral communication. This can be done in various ways: by rinsing the alveolus with a saline solution, or by a gentle examination of the bottom of the alveolus with a sinus probe. The Valsalva test (blowing air with a nose when it is blocked) should not be carried out because the result can be a false negative and can cause subcutaneous oedema [10].

The most common method in Poland for the closure of oroantral communication is the Wassmund flap technique [10, 11]. This is performed by making an incision of the trapezoidal buccal mucperiosteal flap whose mobility is improved by making parallel incisions to the periosteum at the base of the flap. The other most common way to close OAC is by using a buccal fat pad [12]. The OAC can only be closed when the tooth is fully extracted, the maxillary sinus mucosa is healthy, and not more than 24 h has passed from its opening.

The aim of the research is to define a frequency of OAC in patients of the Department of Oral Surgery Medical University in Lublin, including gender and age, etiology, location, method of surgical treatment, and the follow-up.

## Material and Methods

In 2012, there were 970 patients who were submitted for upper dental extractions. 1649 teeth were included in this study. The age range of the research group was from 10–90 years old. No patients from other clinics with supernumerary, supplemental, or primary teeth were included. All patients were divided into 3 age groups, including similar numbers of extracted teeth. First group: under 31 years old (344 patients, 508 extracted teeth). Second group: 31–50 years old (305 patients, 547 extracted teeth). Third group: over 50 years old (321 patients, 596 extracted teeth). Indications of extractions were, following by number, pulp and periapical tissue diseases (1377 teeth), disturbances in eruption of teeth (234 teeth), periodontal diseases (19 teeth), oral inflammation and derivative changes (9 teeth), and other. Surgical procedures used for teeth extractions were not considered in the results. Oro-antral communication was closed using the Wassmund-Borusiewicz method in all cases enrolled in the study. Patients with oro-antral communication were appointed a follow-up visit the next day and sutures were removed after a two-week period of healing. In case of complications, laser biostimulation was performed.

## Results

Oroantral communication occurred most frequently as a consequence to the extraction of the first molars – in 27 out of 268 teeth, or 10.07%. A similar frequency occurred among second mo-

**Table 1**. The frequency of oro-antral communication

**Tabela 1.** Częstość połączeń ustno-zatokowych przy ekstrakcjach poszczególnych zębów

| Tooth | Extractions | OAC | Percent |
|---|---|---|---|
| Third molars | 407 | 16 | 3.93 |
| Second molars | 211 | 20 | 9.48 |
| First molars | 268 | 27 | 10.07 |
| Second premolars | 186 | 9 | 4.84 |
| First premolars | 175 | 4 | 2.29 |
| Canines | 176 | 1 | 0.57 |
| Second incisors | 122 | 0 | 0.00 |
| First incisors | 101 | 0 | 0.00 |

**Table 2.** The frequency of oroantral communication between the left and right sides

**Tabela 2.** Liczba ekstrakcji i połączeń ustno-zatokowych po stronie prawej i lewej

| | Extractions | OAC | Percent |
|---|---|---|---|
| Right side | 827 | 37 | 48.05 |
| Left side | 822 | 40 | 51.95 |

**Table 3.** The frequency of OAC between age groups

**Tabela 3.** Częstość połączeń ustno-zatokowych w odniesieniu do grup wiekowych pacjentów

| Age groups | OAC | Extractions | Percent |
|---|---|---|---|
| <31 | 35 | 506 | 6.92 |
| 31–50 | 23 | 547 | 4.20 |
| >51 | 19 | 596 | 3.19 |

lars – in 20 out of 211 extracted teeth (9.48%), followed less frequently by second premolars – 9/186 (4.84%). Third molars were 3.93%, and first premolars were 2.29%. There was only one case of oroantral communication after the extraction of a canine tooth – 0.57%. Neither sinus opening nor oroantral communication occurred after the extraction of 223 incisors (Table 1). There was no noticeable difference in the frequency of oroantral communication between the left and right sides (Table 2).

OAC was mostly common in patients under 31 years of age – 35/506 extractions (6.92%), followed by the 31–50 age group – 23/547 (4.20%), and occurred least among those aged 51+ – 19 out of 596 that makes 3.19% (Table 3).

Our study concludes that OAC occurs twice as frequently among women as among men. There were 56 out of 907 in the female group and only 21 out of 742 in the male group, or 6.17% compared to 2.83%. Therefore, there were 1649 total teeth extracted and only 77 cases of OAC (4.67%) (Table 4).

**Table 4.** The frequency of oro-antral communication

**Tabela 4.** Liczba połączeń ustno-zatokowych

| | |
|---|---|
| Extractions | 1649 |
| OAC | 77 |
| Percent | 4.67 |

# Discussion

There is not much available information about results of studies that include particular tooth cases. According to the Kitagawa et al. [9] studies, OAC was diagnosed "post-extraction" more frequently among men (5.2%) than among women (3%). However, our studies show opposite results (women – 6.17%, men – 2.83%). Based on the analysis of 15 articles containing 1072 cases, Franco-Carro et al. [12] and his team reached the following results: OAC occurrence at 56.11% in the men's group, average age – 42.94. Abuabar [13] and his team concluded that OAC occurred most commonly in the third decade of life and in third molars. The authors link this phenomenon to orthodontically indicated extractions. The average age of patients with OAC in our examination group was 38.01. Some authors, like Punwutikorn et al. [14] discovered a higher incidence during the sixth decade of life, which can be explained by both increased pneumatization of the maxillary sinus and gradual loss of the maxillary teeth. In addition, studies conducted by Franco-Carro et al. [12] revealed the extraction of third molars (41.05%) as the primal cause of OAC, followed by the first molars (26.74%), second molars (17.7%), the second and first premolars (8.67% and 4.7%) and finally canines (1.13%). Our study results differ significantly; antro-oral communication turned out to be the most common complication, secondary to first molar extraction (35%), followed by second molar extraction (26%). Third molar extractions were 20.8%, second and first premolars – 11.7%

and 5.2 % respectively. OAC occurrence after canine extraction was the least frequent complication (1.3%). Our study revealed no predilection for the occurrence of OAC for either the left or right maxilla (48.05% – right and 51.95% – left). Similar results were presented in a paper by Abuabara et al. (49% – right maxilla, 51% – left maxilla) [13].

According to Marszał [15], who conducted the study using new radiological diagnostic techniques, the connection between the tooth socket and maxillary sinus is most common in second molars. Our own study revealed first molars to be the main cause of OAC (10.7% of all extractions). The study by Rothamel et al. [16] indicates that 13% of OACs occur secondary to third molar extraction, but our study does not confirm these results with a percentage only reaching 3.93% of all extractions studied.

In the Department of Oral Surgery, Medical University of Lublin, the most frequently used method for oro-antral communication closure is the Wassmund-Borusiewicz technique, which, judging by the results of the study, is characterized by sealed soft tissue connection, very often uncomplicated healing which reduces the risk of reoperation. Later attempts to re-operate on oro-antral comunication, difficulty of the procedure increased due to damage to the neighboring soft tissue. However, the Wassmund-Borusiewicz technique has some disadvantages as well, such as poor blood supply to the mucosa of the flap and the difficulty or even impossibility of its use in instances of a shallow oral vestibulum. The most common complications observed during a follow up visit due to patients' complaints, and clinical examinations were: swollen cheek (11 cases), hematoma (6 cases), wound dehiscence (4 cases) and trismus (2 cases).

It is essential to have a radiographic examination before a planned extraction to determine the location of dental roots in respect to the maxillary sinus floor. Orthopantomogram or CBCT examination is being used for this purpose. CT scans have 2 times greater accuracy in detecting potential OAC. Orthopantomograms, which shows only one tissue layer, can give a false positive result. According to Arbel et al. (acc. [17]), the most common position of an alveolar recess relative to molar roots is between the palatal and buccal root. Such proportion can give a false picture of a connection between an alveolus and a sinus on X-ray [17].

Results of the study conducted on a group of Oral Surgery Department patients in Lublin showed some discrepancies with the results obtained by other authors. In contrast to other studies, the authors have found that OAC occurs most commonly among the group of patients under age 31. This can be related to the fact that molars were extracted in this age group much more often (72.83% of all the extracted teeth) than in other age groups (only 48.32% of all the removed teeth in the 31–50 age group and 41.53% in the 51+ age group). Participation of incisors and canines among the extracted teeth group increased with patient age.

There are also differences in the frequency of OAC occurrence among different sexes. In our study, oro-antral communication was much more common in women.

The issue of the occurrence or non-occurrence of oro-antral communication following dental extraction is, to some extent, determined by the variability of the anatomy as well as inside study groups, individual body composition, and variability among facial cranium [18]. In the authors' study, OAC most often occurred after the first, then second, and finally – third molar extraction. The higher a fraction of OACs after the extraction of wisdom teeth among papers by foreign authors may be associated with differences in the skull or teeth (being less massive among other races) of Asians [19]. It is important to note, however, that in each case study, a representative group cannot be classified as anthropologically homogenical. Thus, it becomes interesting to observe variability between other authors' findings against this study for the occurrence of OACs following dental extraction as a derivative of individual and population variability.

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