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CHRONIC OPEN LESIONS OF THE MAXILLARY SINUS

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Abstract:
Background. Open maxillary sinus lesions are conditions with a high incidence and involve distinct nosological entities: oroantral communication (OAC), oroantral fistula (OAF), and perforative sinusitis. The anatomical complexity of the region and the shared clinical spectrum of these pathologies necessitate interdisciplinary collaboration between dentists and otolaryngologists. Oroantral communication represents the accidental opening of the maxillary sinus during surgical interventions, initially manifesting in the absence of inflammatory phenomena. Data from the specialized literature highlight the relevance of this topic, which remains a subject of debate among specialists. Recent studies indicate that 1/5 of patients with oroantral communication are misdiagnosed, and therapeutic success after primary intervention is reported in only 1/3 of cases. Oroantral communication is considered a rare complication of oral surgery, with studies reporting various incidence rates ranging from 0.31% to 13%, while oroantral fistula presents a rate of 0.2%.
Objective of the study. To evaluate the clinical particularities of open sinus lesions based on current data from the specialized literature.
Materials and Methods. To achieve the proposed objectives, a synthesis analysis of the relevant medical literature was conducted, selecting clinical studies and review articles published in international databases.
Conclusions. The analysis of literature data proposes new diagnostic and therapeutic methods intended to complement and resolve the shortcomings of existing ones. It is essential to distinguish between OAC (primary, acute, non-infected lesion) and OAF (secondary, chronic lesion associated with an inflammatory process). A rigorous preoperative radiographic examination constitutes the determining factor in preventing these complications and ensuring therapeutic success.
Keywords: oroantral communication, oroantral fistula, maxillary sinus.

Introduction

Open maxillary sinus lesions (OMSL), whether acute or chronic, represent clinical entities with a significant incidence in oral and maxillofacial surgery practice. These encompass distinct nosological entities: oroantral communication (OAC), oroantral fistula (OAF), and perforative sinusitis (PS). The optimal

management of these pathologies necessitates a complex interdisciplinary approach, involving collaboration between oral and maxillofacial surgeons and otorhinolaryngology (ENT) specialists [1, 8-10, 17, 18, 24, 27].

From a structural standpoint, a communication represents a pathological, congenital, or acquired orifice that establishes a direct connection between two cavities (oral and sinus or oral and nasal) or between a cavity and the external environment [7]. Despite their frequency, data in the specialized literature offer divergent interpretations regarding definitions, classifications, and therapeutic strategies, which dictates a rigorous systematization of these concepts to ensure a correct diagnostic and curative attitude [1-33].

The frequency of OAC varies considerably depending on geographic, socio-economic, and cultural factors. The choice of therapeutic conduct is conditioned by multiple variables: the patient's age, systemic status, presence of comorbidities, sinus health, as well as the characteristics of the defect, including size, location, and relationship with adjacent tissues. Furthermore, the clinical experience and technical skills of the operating surgeon play a decisive role in the success of the intervention [1].

The primary etiology of odontogenic maxillary sinus morbidity resides in the traumatization of the alveolar process during tooth extractions or other invasive surgical procedures. Simultaneously, sinus pathology is frequently correlated with periapical conditions and technical errors in endodontic treatments of the maxillary teeth [1, 10, 18, 19].

A meta-analysis conducted by Arias-Irimia showed that 55.97% of odontogenic sinusitis cases are iatrogenic in nature, and within this group, oroantral fistulas represent 47.5% of the causes [12].

The relevance of this topic is supported by the variety of proposed plastic surgery methods, a subject that remains intensely debated in the specialized literature. Recent studies indicate that 20% of patients with OAC are misdiagnosed, and the healing rate after initial treatment is only 33% [25]. Although OAC is reported as a relatively rare complication, with an incidence varying between 0.31% and 13%, the transition to OAF, estimated at approximately 0.2%, represents in most cases the consequence of a diagnostic or therapeutic failure [3, 20].

The pathophysiological evolution is rapid. Small, uninfected communications (<3 mm) may close spontaneously, while defects exceeding 5 mm generally require surgical closure. In the absence of treatment, the persistence of the defect leads to the epithelialization of the tract and the formation of an oroantral fistula through the fusion of the oral epithelium with the Schneiderian membrane [15]. The risk of sinusitis is major, with literature reporting an incidence of inflammatory processes of approximately 50% within the first 48 hours and up to 90% within two weeks of the injury [17, 18].

In the specialized literature, terminological confusion persists between OAC and OAF, with various synonyms being used, such as bucco-sinus communication, oroantral communication, alveolo-sinus communication, or oroantral perforation for OAC, and bucco-sinus fistula, oroantral fistula, or alveolo-sinus fistula for OAF. The present paper aims to clarify these notions and to precisely define the diagnostic criteria for OAC, OAF, and PS. The development of individualized diagnostic, complex treatment, and prophylactic measures, along with active follow-up, represents the pillars of success in the rehabilitation of patients with open maxillary sinus lesions [1-33].

Objective of the study

The aim of the present paper is to perform a systematic and in-depth analysis of the specialized literature regarding the management of open maxillary sinus lesions (OMSL), exploring their clinical spectrum from the acute phases to the chronicity of the pathological process.

Results and discussions

In oral and maxillofacial surgery practice, open maxillary sinus lesions represent a highly relevant issue due to the inflammatory complications they generate. Literature analysis reveals that therapeutic success is directly proportional to the promptness of diagnosis. An oroantral communication (OAC) identified and treated immediately after its occurrence carries a favorable prognosis, with a tendency toward healing by primary intention. Conversely, the natural progression of an untreated OAC follows a predictable

pathophysiological course: contamination of the sinus cavity with oral microbial flora, the onset of perforative sinusitis, and, ultimately, the organization of the tract into a chronic oroantral fistula (OAF).

The etiology of these solutions of continuity is overwhelmingly dominated by iatrogenic factors, particularly surgical trauma occurring during odontectomies. Due to the anatomical proximity between the roots of the maxillary posterior teeth and the maxillary sinus floor, their extraction represents the primary cause, being reported in up to 92.63% of cases within elective or emergency interventions on the inferior sinus wall. This high incidence is often associated with factors such as maxillary tuberosity fractures, chronic dentoalveolar infections that thin the bony wall, or luxation maneuvers of molars whose roots protrude into the sinus cavity. The literature also mentions rarer but significant causes, such as dental implant displacement (4.47%), maxillofacial trauma (1.30%), or osteoradionecrosis processes [29].

Statistical data show considerable variations depending on the perspectives of the consulted authors. While some studies place the odontogenic factor at over 90%, other research indicates a more heterogeneous distribution, where dental extractions account for 50%, with the remainder attributed to tumor pathology (18.5%), osteomyelitis (11%), maxillary sinus surgeries (7.5%), trauma (7.5%), and dentigerous cysts (3.7%). Despite these discrepancies, the odontogenic factor remains the major determinant of maxillary sinus morbidity [33].

Although OMSLs are common, unified classifications are lacking. Fronie A. (2014) and other researchers [7, 16] propose a topographic division useful for clinical practice. Thus, defects can be classified by location into: "low-level fistulas," situated directly on the superior alveolar ridge in the premolar-molar region; "high-level fistulas," located at the level of the buccal vestibule; and palatal fistulas, which are rarer but difficult to treat due to anatomical particularities and the rigidity of the local mucosa.

Another fundamental classification is based on temporal and histological criteria. A distinction is thus made between acute OAC, representing a fresh wound without an epithelial component, and chronic OAF, in which the communicating tract is already epithelialized. Fronie [16] introduces a critical threshold of 15 days, considering that any communication persisting beyond this interval must be interpreted as a chronic fistula. This view is nuanced by Afanasiev A. (2019), who extends the threshold to 21 days, appreciating that only after three weeks is the alveolar epithelialization process and the formation of the fistulous canal complete [30]. These demarcations are relevant not only conceptually but also therapeutically, as acute communications can be treated using simple surgical techniques, whereas chronic fistulas require the excision of the epithelialized tract and reconstruction of the defect through various plastic surgery techniques.

The clarification of terminology represents a central aspect of this analysis, as medical literature highlights a persistent semantic confusion between the concepts of "communication" and "fistula." Timofeev A. (2007) introduced the notions of primary fistula, defined as a canal formed within 7–10 days post-extraction, and secondary fistula, representing the outcome of a failed plastic surgery intervention [32]. Simultaneously, definitions for Oroantral Communication (OAC) vary from a "pathological solution of continuity" [7] to an "abnormal connection" [4] or an "unnatural opening" [2, 24, 29]. However, some authors [8, 27] utilize the term "fistula" even for acute phases, which introduces an additional layer of terminological ambiguity. From a pathomorphological perspective, this equivalence is imprecise, as a communication designates the existence of a pathological orifice, whereas a fistula implies the organization of a conduit lined with epithelium.

For an adequate understanding of these lesions, an etymological and clinical analysis of the term "fistula" is essential. Derived from the Latin fistula ("tube," "pipe," "canal"), the term designates, according to Ida G. (2003), an abnormal canal established between two internal organs or between an organ and the body surface [14]. In the view of I. Coteanu (1998), a fistula is a canal formed accidentally or iatrogenically that establishes a link between a natural cavity, such as the maxillary sinus, and the exterior, serving for the drainage of physiological or pathological secretions [11]. Surgically, a fistula is not merely an orifice but an organized conduit that traverses several anatomical planes and terminates at the level of the mucosa or skin.

The constant presence of salivary or sinus fluids maintains the patency of this canal and hinders natural healing processes [23].

Another dilemma identified in the literature concerns the choice between the terms "oroantral communication" versus "oro-sinusal communication." Although both terms are frequently used, "oro-sinusal" appears more clinically and topographically appropriate, as it explicitly describes the pathological relationship between the oral cavity and the maxillary sinus. Consequently, this paper recommends the systematic use of the term oro-sinusal communication [30].

The transformation of an OAC into an oroantral fistula is a dynamic process dominated by the migration of the oral epithelium into the bony defect. This epithelialization, which can begin within the first 48–72 hours, significantly reduces the possibility of spontaneous closure [5]. While OAC may initially be non-infected in the acute phase, the persistence of the orifice frequently leads to sinus contamination and the onset of perforative sinusitis. Literature reports that 50% of patients develop sinusitis within the first 48–72 hours, with the percentage increasing to 90% after two weeks [13, 26].

The exact timing of epithelialization represents one of the most divergent aspects in the consulted data. Literature analysis allows for the demarcation of three orientative intervals for Oroantral Fistula (OAF) formation: Ultra-short phase (24–72 hours): Supported by studies showing that epithelial migration begins early and may prevent spontaneous closure [3, 5]. Medium phase (7–10 days): According to Sabo and Timofeev, this corresponds to the period when the wound acquires the appearance of a fistulous tract lined with stratified squamous epithelium [31, 32]. Late phase (over 14–21 days): The period when the fistula is considered completely mature and chronic [15, 16, 30].

Regardless of the accepted temporal threshold, the clinical implications remain the same: an untreated OAC leads to sinusitis within a very short interval and subsequently favors the organization of a chronic fistula. Therefore, the term oro-sinusal communication should be reserved for the primary, acute, and non-epithelialized phase, while oro-sinusal fistula should be used for secondary, epithelialized lesions, often associated with chronic inflammation of the maxillary sinus.

Research by Sabo [31] demonstrates that an average interval of 7–8 days may be sufficient for the tract to become completely lined with stratified squamous epithelium, presenting histological changes such as acanthosis. Once this fistulous tract organizes, the success rate of secondary treatment drops to approximately 67% [19], and healing is compromised by osteitis of the bone margins and chronic sinus infection. These data support the idea that OAC represents the primary, acute entity, whereas OAF constitutes the secondary, chronic, and epithelialized consequence of an initial diagnostic or therapeutic failure [20, 22, 30].

Conclusions

1. The in-depth analysis of the specialized literature necessitates the revision and clarification of existing nosological entities to implement diagnostic and curative methods that address the shortcomings of current protocols.
2. Oro-sinusal communication must be considered a primary, acute, and non-infected surgical emergency that should be treated before the patient leaves the dental office to prevent sinus contamination.
3. Oro-sinusal fistula represents a secondary pathological stage, marked by chronicity and inflammation, characterized by the epithelialization of the fistulous tract.

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RESTAURĂRI DENTARE PRIN TEHNICA DE INJECTARE *„INJECTION MOULDING"* LA GRUPUL FRONTAL DE DINȚI

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Rezumat

Introducere. În ultima perioadă, în cadrul restaurărilor aplicate grupului frontal de dinți, unde exigențele estetice și funcționale sunt deosebit de ridicate, a fost introdusă și perfecționată tehnica prin injectare *„Injection Moulding"*. Această tehnică integrează principii și elemente din metodele de restaurare directă și indirectă cu scopul de a obține rezultate echivalente dar într-un timp mai scurt.
Scopul lucrării. Analiza și integrarea în practica clinică a tehnicii *„Injection Moulding"* pentru restaurarea estetică a dinților frontali.
Material și metode. În cadrul studiului au fost examinați 28 de pacienți, dintre care 16 de femei și 12 bărbați, cu vârsta între 20 și 50 de ani. Toți pacienții aveau nevoie de un tratament terapeutic ca rezultat al evoluției afecțiunilor de tip carios și necarios pentru restabilirea morfo-funcțională și estetică a grupului frontal de dinți. Restaurările au fost realizate utilizând materialele compozite fluide precum: *Clearfil Majesty ES Flow* și *Brilliant Flow.*
Rezultate. Conform datelor obținute, tehnica *„Injection Moulding"* necesită un timp operator de aproximativ 30 minute, în timp ce restaurarea directă prin stratificare solicită, în medie, 50 minute. Această diferență poate fi explicată prin faptul că tehnica *„Injection Moulding"* dispune de cheia de silicon transparentă care imită forma restaurarării finale, excluzând modelarea manuală precum în cazul restaurării directe prin stratificare.
Concluzii. Structurarea unui protocol clinic destinat restaurării dinților frontali prin tehnica *„Injection Moulding"* a confirmat aplicabilitatea acestei metode în obținerea unor restaurări stabile, bine adaptate și armonizate morfologic cu structurile adiacente.
Cuvinte-cheie: *Injection Moulding*, restaurare dentară, dinți frontali.