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Prevalence of post-extraction alveolar osteitis: Global trends and the situation in Russia

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Abstract

Post-extraction alveolar osteitis (dry socket) is the most common inflammatory complication of tooth extraction. Reported prevalence rates vary widely, which hampers comparison of data and assessment of the true burden of the complication. The aim of this review is to summarise current understanding of the prevalence of post-extraction alveolar osteitis worldwide and in the Russian Federation and to analyse the reasons for the observed variability. It is shown that after routine tooth extraction the incidence of alveolar osteitis is predominantly 0.5–7.3%, whereas after removal of impacted mandibular third molars the pooled prevalence reaches 6.7%, and up to 30–45% in selected samples. Between-study variability is determined mainly by the type and traumatic nature of the extraction, patient case mix (smoking, oral contraceptive use, diabetes mellitus) and differences in diagnostic criteria rather than by geography. In the Russian literature direct population-based estimates are scarce: according to official statistics the incidence does not exceed 1%, while up to 55–70% of cases are associated with tooth extraction against the background of exacerbation of chronic periodontitis. Russian prevalence studies are virtually absent from international bibliographic indices. The lack of standardised, including regional, data necessitates further epidemiological studies based on unified criteria and the development of effective preventive and therapeutic agents.

Keywords: dry socket, alveolar osteitis, prevalence, epidemiology, risk factors, tooth extraction, third molar, Russian Federation

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Распространенность постэкстракционного альвеолита: мировые тенденции и ситуация в Российской Федерации

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Резюме

Постэкстракционный альвеолит (сухая лунка) – наиболее частое воспалительное осложнение операции удаления зуба. Приводимые в литературе показатели его распространенности характеризуются значительным разбросом, что затрудняет сопоставление данных и оценку истинного бремени осложнения. Цель обзора – обобщить современные представления о распространенности постэкстракционного альвеолита в мире и в Российской Федерации и проанализировать причины наблюдаемой вариабельности. Показано, что при рутинном удалении зубов частота альвеолита составляет преимущественно 0,5–7,3%, тогда как при удалении ретенированных нижних третьих моляров суммарная распространенность достигает 6,7%, а в отдельных выборках – до 30–45%. Установлено, что межисследовательская вариабельность в большей степени определяется типом и травматичностью удаления, составом пациентов (курение, прием оральных контрацептивов, сахарный диабет) и различиями диагностических критериев, нежели географическим фактором. В отечественной литературе прямые популяционные оценки немногочисленны: по данным официальной статистики частота

альвеолита не превышает 1%, при этом до 55–70% случаев связано с удалением зубов на фоне обострения хронического периодонтита. Российские исследования распространенности практически не представлены в международных библиографических индексах. Дефицит стандартизированных, в том числе региональных, данных обуславливает необходимость дальнейших эпидемиологических исследований на основе унифицированных критериев, а также разработки эффективных средств профилактики и лечения.

Ключевые слова: постэкстракционный альвеолит, сухая лунка, распространенность, эпидемиология, факторы риска, удаление зуба, третий моляр, Российская Федерация

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INTRODUCTION

Tooth extraction remains one of the most common procedures in outpatient surgical dentistry, and alveolar osteitis is its most frequent inflammatory complication, substantially reducing the patient's quality of life in the postoperative period and increasing the number of repeat visits [1; 2]. Despite a long history of study, estimates of the prevalence of post-extraction alveolar osteitis differ by an order of magnitude or more between publications, which complicates both the comparison of individual studies and the rational planning of preventive and therapeutic measures [1; 3]. One reason is the absence of unified diagnostic criteria and the predominance of single-centre studies performed on heterogeneous samples [4; 5]. A separate problem is the shortage of systematised Russian data, which precludes an objective assessment of the burden of the complication in the Russian Federation and its regional features [6].

AIM

To summarise current data on the prevalence of post-extraction alveolar osteitis worldwide and in the Russian Federation and to analyse the main reasons for the observed variability.

RESULTS

Methodological Notes

This work is a narrative review. Publications were searched in international (PubMed, and using the Consensus analytical system) and Russian (eLibrary, CyberLeninka, Google Scholar) databases using the keywords: *alveolar osteitis*, *dry socket*, *prevalence*, with subsequent selection of systematic reviews, meta-analyses and original epidemiological studies.

Terminology and Diagnostic Criteria

Post-extraction alveolar osteitis (dry socket) is defined as postoperative pain in and around the socket, increasing between the first and third days after removal and accompanied by partial or complete disintegration of the blood clot with exposure of the bony walls, with or without halitosis [2]. The terms *dry socket* and *alveolar*

osteitis are used synonymously [1; 5]. The long-standing absence of unified diagnostic criteria remains one of the key factors limiting the comparability of epidemiological data: different investigators apply their own threshold definitions – for example, assessment of pain on a visual analogue scale combined with absence of the clot and presence of necrotic debris on the third postoperative day – which directly affects the recorded incidence [1; 4].

Prevalence after Routine Extraction

According to pooled observational data, the incidence of alveolar osteitis after routine (non-surgical) tooth extraction lies predominantly within 0.5–7.3%; individual cohorts reported 0.5, 1.0, 1.7, 2.3, 3.75, 5.7, 6.83 and 7.3% [4; 7]. When samples heterogeneous by extraction type are combined, the range becomes even wider – from 0.3 to 26% [8]. Such marked variability in routine procedures reflects case mix, differences in surgical technique and diagnostic criteria rather than true between-population differences [7; 8].

Prevalence after Third Molar Removal

The highest and at the same time most reproducible rates are naturally associated with the removal of impacted mandibular third molars. In a meta-analysis of 41,859 such procedures the pooled prevalence of alveolar osteitis was 6.7% with marked statistical heterogeneity [3]. Reviews report a range of 5–30% for this group, and up to 45% in selected publications [1]. At the same time, systematisation of studies of impacted mandibular third molar removal shows that in about half of the studies the rate does not exceed 6%, with an overall range of 0.33–19.14% [9]. Direct comparative data confirm the predominance of the complication in the mandible and after surgical extraction: 31.1% versus 8.7% for the mandible and maxilla, and 41% versus 13.6% for surgical and non-surgical extraction, respectively [10].

The Problem of Cross-Country Comparison

Comparison of data from different countries reveals a wide scatter of rates, which, however, mostly reflects differences in case mix rather than geographical fea-

tures. Thus, in routine extractions a multicentre study reported about 1%, whereas in third-molar cohorts the rate reached 20–41%, and in patients with diabetes mellitus it was 20% [7; 11; 12]. Constructing a valid comparative “map” of prevalence by country is hindered because the vast majority of studies are single-centre and procedure-specific, and differences in inclusion and diagnostic criteria preclude regarding the samples as comparable [3; 7].

High-Risk Groups

Groups at high risk, in which the observed rates significantly exceed the average values, deserve particular attention. Thus, in a single-centre study of mixed extractions the overall incidence of alveolar osteitis was 6.83%, decreasing to 4.3% in non-surgical procedures [4], whereas in patients with diabetes mellitus it reached 20% [12]. Such differences between the general population and individual clinical subgroups further complicate direct comparison of aggregate prevalence rates and underscore the need to stratify data by risk factors [3; 12].

Determinants of Variability

The key determinants of the observed variability are the type and traumatic nature of the extraction, tooth location, and a number of patient-related factors. Smoking is one of the most reproducible risk factors: according to a systematic review, smokers show a more than threefold increase in the odds of alveolar osteitis, with a pooled incidence of 13.2% versus 3.8% in non-smokers [13]; in observational studies the odds ratio reached 3.5 after adjustment for confounders [14], and in a prospective study of third molar extraction it was 6.41 [11]. Proposed mechanisms include nicotine-mediated vasoconstriction and impaired clot formation, with a dose-dependent association in a number of studies [13; 15]. Oral contraceptive use, acting through oestrogen-dependent activation of fibrinolysis, approximately doubles the risk according to meta-analyses – relative risk 1.98 and 1.80 in two independent syntheses [16; 17]; a higher incidence of the complication among contraceptive users is also confirmed in individual clinical studies [18]. Substantial contributions are also made by surgical trauma and extraction difficulty [10; 19], comorbidity, primarily diabetes mellitus [12], and, particularly important for epidemiological comparisons, differences in the diagnostic criteria applied [1; 4].

Demographic Factors

The role of demographic characteristics is assessed ambiguously. Data on the influence of age and sex on the risk of alveolar osteitis are contradictory: a number of studies found no statistically significant differences, and the observed effect of female sex is largely mediated by oral contraceptive use rather than by sex as such [1; 4; 16]. This underscores the need to account for confounders when interpreting epidemiological data and points to the limited informativeness of rates that are not stratified by key risk factors.

The Situation in the Russian Federation

In the Russian literature, direct population-based estimates of the prevalence of post-extraction alveolar osteitis are scarce. According to official statistics of municipal dental institutions, the incidence does not exceed 1% of tooth extractions [6]. At the same time, a number of authors provide data on the structure of the complication: up to 70.4% of cases develop after extraction of teeth for exacerbation of chronic periodontitis [20], while other studies report this figure as 55.7% [21]. A predominance of the complication after removal of mandibular molars is also noted, whose anatomical features of location and formation are associated with increased risk [22]. A significant problem is the almost complete absence of Russian data in international bibliographic indices: available systematic reviews and meta-analyses do not include domestic prevalence studies [3]. This limits international comparisons and underscores the need for standardised regional epidemiological research [6; 22].

Clinical and Organisational Consequences

Although alveolar osteitis is not a life-threatening condition, its high frequency in certain types of procedures creates a noticeable burden on the outpatient setting. The complication is accompanied by severe pain, often radiating to adjacent areas, requires repeat visits for socket debridement and dressing changes, and increases the need for analgesics, which is of both clinical and organisational-economic importance [1; 2; 5]. For this reason, accurate estimation of prevalence in specific clinical settings acquires practical significance that goes beyond purely statistical interest.

Clinical Significance and Prospects

The practical significance of accurate prevalence estimation lies in the fact that epidemiological data underpin the planning of preventive measures and the rational allocation of resources. Among local preventive agents, chlorhexidine has the strongest evidence base, its efficacy confirmed in systematic reviews [23]; the search continues for targeted antiseptic compositions with a favourable biocompatibility profile, including those based on polyhexanide [24; 25]. A reliable assessment of the burden of the complication, in turn, is impossible without unification of diagnostic criteria and the accumulation of comparable, including regional, data.

Directions for Further Research

A synthesis of the available data shows that further progress in estimating the prevalence of alveolar osteitis is associated primarily with the unification of diagnostic criteria and improvement of the methodological quality of studies. Priority should be given to prospective multicentre and regional studies with a clear case definition, stratification by extraction type and key risk factors, and separate reporting of rates for routine extractions and third molar removal [2; 3]. For the Russian Federation, obtaining standardised regional data comparable with international figures is

of particular relevance, as it would allow an objective assessment of the burden of the complication and fill the existing gap [6; 22].

CONCLUSION

1. The prevalence of post-extraction alveolar osteitis varies widely – from less than 1% in routine extractions to 6.7% and higher in the removal of impacted mandibular third molars, reaching 30–45% in selected samples.

2. The observed between-study and inter-regional variability is determined more by the type and traumatic

nature of the extraction, case mix and differences in diagnostic criteria than by geography as such.

3. In the Russian Federation, direct epidemiological data are scarce and heterogeneous; according to official statistics the incidence does not exceed 1%, and Russian studies are virtually absent from international indices.

4. The lack of standardised, including regional, data necessitates further epidemiological studies based on unified diagnostic criteria, as well as the development of effective preventive and therapeutic agents, including targeted antiseptic compositions [23; 24].

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