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Intraoral odontogenic abscesses in patients of The Department of Oral Surgery at the Pomeranian Medical University in Szczecin: 7 years of observation

Wewnątrzustne ropnie zębopochodne u pacjentów Zakładu Chirurgii Stomatologicznej Pomorskiego Uniwersytetu Medycznego w Szczecinie- obserwacje 7-letnie

Authors' Contribution:
A Study Design
B Data Collection
C Statistical Analysis
D Data Interpretation
E Manuscript Preparation
F Literature Search
G Funds Collection

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Summary

Introduction: Intraoral abscesses are mainly odontogenic abscesses which need ambulatory treatment, which often involves the extraction of the causal tooth.

This is a clinical analysis of occurrence and treatment of an odontogenic abscess in patients of The Department Oral Surgery at the Pomeranian Medical University in Szczecin treated between 2010-2016.

Material/Methods: The estimate made was based on medical records between the years 2010-2016. Research applied to 327 patients, comprising 183 males and 144 females. The age of the patients ranged from 3 to 87. In the data analysis the patients' demographic data, treatment, location and causes of abscess were taken into account.

Results: The largest age group in which abscesses occurred was comprised of people between the ages of 21-30. Abscess occurrence was more common in males. The molar was the most common causal tooth in permanent as well as primary dentition. The most common abscess location was vestibule of the oral cavity.

Conclusions: Due to hygiene negligence, a large amount of odontogenic tissue inflammation and intraoral abscesses have been found to require surgical intervention despite widespread access to dental care. The most important in abscess treatment is surgical incision; pharmacotherapy should be additional treatment. The most common antibiotic used for inflammation treatment was clindamycin.

Keywords: odontogenic abscess • intraoral abscess • dental infection

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Abbreviations: **CBCT** – Cone Beam Computed Tomography, **OPG** – Orthopantomogram

INTRODUCTION

Inflammations of odontogenic origin are one of the most common emergencies that occur in the dental office [1]. An abscess is the localized collection of pus formed as a result of acute inflammation that is usually caused by bacteria and their toxic products [18]. Odontogenic abscesses result from the carious destruction of a tooth, pulp diseases, periodontal diseases, trauma and sometimes as a complication after a tooth extraction [9,11,15,18]. The majority of odontogenic infections are caused by a dental pulp infections, periodontal disease or odontogenic cysts. This accounts for 90 % of the dental abscess causes. They are dangerous, as they can spread to neighboring regions directly and can progress rapidly. This can cause life-threatening conditions, such as Ludwig's angina, cavernous sinus thrombosis, brain abscess, meningitis, mediastinitis or the occurrence of sepsis [2,5,7]. That is why an immediate diagnosis along with treatment is very important [3,14,17,18]. A diagnosis is possible by taking into account a thorough consideration of the present illnesses along with a clinical examination. Local symptoms of an abscess are pain, oral erythema, regional lymphadenopathy, trismus, dysphagia, a bad taste or a bad mouth odor, soft tissue swelling and tooth sensitivity from heat or cold [4,10,12,17]. This can lead to difficulty in eating or drinking. Systemic symptoms are fever, tachycardia, loss of appetite, sleeplessness and general sick feeling [3,11,17].

Bacteria which cause infections in the oral cavity are part of the normal oral flora: aerobic and anaerobic gram-positive cocci and anaerobic gram-negative rods. Abscess localization is determined by the thickness of the bone near the apex and the relationship to the muscle attachments. Before abscess formation, odontogenic infections pass through two stages: inoculation and cellulitis stage. During the first three days, patients feel mild to moderate pain and there is a tender, small swelling in the oral cavity. After 3 days the pain starts to become severe, the oedema is larger and more tender. The oral mucosa is reddened. After 5 days the pus underlying the mucosa becomes yellow. This is the final stage of odontogenic infection, which is called an abscess. The outline of abscess treatment has been presented in Figure 1.

MATERIALS AND METHODS

Analysis of data was conducted on the basis of medical records of 327 patients with abscesses and 223 patients with tooth pain from The Department of Dental Surgery at the Pomeranian Medical University in Szczecin ambulatory treated between 2010-2016. For this purpose, medical records consisting of medical history, results of x-ray examinations and photographic documentation were used. The studied group (Abscess group) of patients contains 183 males and 144 females aged 3 to 87, with the average age being 44.2. Males were 55.9% and females were 44 % of the treated patients. Patients between the age of 21-30 were the largest age group (20.5%) (Table 1). Underaged patients (41 pers.) accounted for 12.5% of the total, while children under the age of 12 (15 pers.) accounted for 0.6% of the total. Statistical analysis was obtained with the program Statistica (version 13). Statistical analysis was performed using T Test, Chi-square test and Fisher's exact test.

RESULTS

Between the years 2010-2016, 183 males and 144 females with intraoral abscesses. Patients with extraoral abscesses required hospitalization and for the purpose of this study, weren't included in the research. The con-

Table 1. Division into patients age-groups

Age-groups							
≤20	21-30	31-40	41-50	51-60	61-70	71-80	>80
41 (12.5%)	67 (20.5%)	59 (18.0%)	42 (12.8%)	49 (15.0%)	40 (12.2%)	20 (6.1%)	9 (2.8%)

Table 2. Groups characteristics

Group	male	female	
Abscess	183	144	327
%	55.96%	44.04%	
Control	113	110	223
%	50.67%	49.33%	
Sum	296	254	550
Statistics	Chi-square	df	p
Chi^2 Pearson	1.493169	df=1	p=.22173

df – degree of freedom

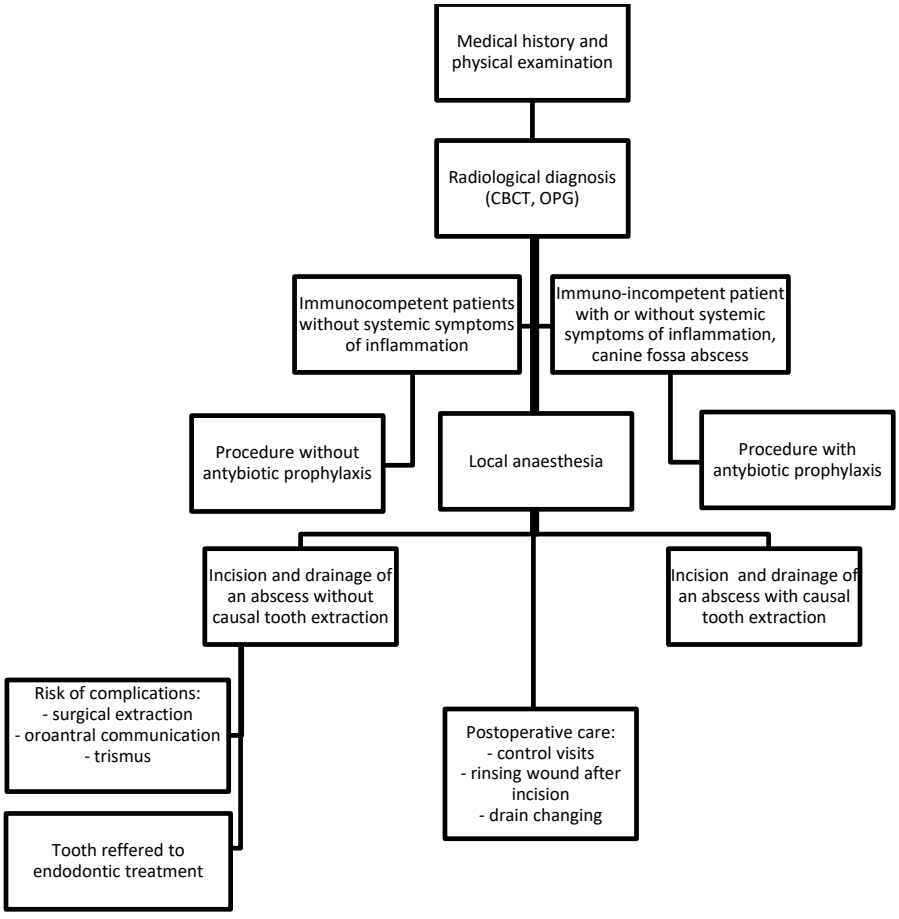

Fig. 1. Algorithm of an abscess treatment

trol group consisted of 223 randomly patients with pain but without any sing of an abscess.

Statistical analysis shows that there was no significant difference regarding female and male distribution between control group and the group with abscesses (p=0.222) (Table 2).

The results show that there were significant statistical differences between the patient's age among abscess and the control group: A – 42.3±19.9, C – 45.7±19.9 (p=0.046) (Table 3).

The most common localization of intraoral abscesses is the vestibule of the oral cavity (80.1%), the palate of the mouth (3.7%) and then the canine fossa (6.1%) (Table 4). The molar was the most common causal tooth in permanent as well as primary dentition. The statistical analysis was conducted using the Yates' chi-square and Fisher's exact tests. It has shown that

Table 3. Comparative analysis regarding patients' age in two groups

Variable	Group 1: Abscess Group 2: Control							
	Mean A	Mean C	df	p	Group A	Group C	SD A	SD C
Age	42.27217	45.73543	548	0.045671	327	223	19.90043	19.92185

df – degree of freedom, SD – Standard deviation, A – Abscess group, C – Control group

Table 4. Intraoral abscesses division, grouped on the basis of the demographic data, localization and applied treatment

Intraoral abscesses						
Localization	Number of patients		Applied treatment			
	Male	Female	Antibiotic therapy	Extraction	Incisionand drainage	Punction
Vestibule	147	115	210	130	207	3
Palate	11	11	17	6	19	1
Sublingual	3	2	4	1	3	1
Canine fossa	12	8	19	10	18	-
Cheek	10	8	17	9	15	-

there was no relationship between gender and abscess localization (p=0.993).

In the maxilla, 162 permanent teeth (51.8%) were diagnosed as a probable source of infection. The largest group was premolars – 51 (31.5%). Then, the molars – 48 (29.6%), incisors – 33 (20.4%) and canines, which numbered 30 (18.5%). In the mandible, like in the maxilla, incisors were the least numerous – 13 (8.6%). The largest group was molars – 82 (54.3%), then premolars – 41 (27.2%) and canines – 15 (9.9%). The frequency of abscess occurrence was significantly higher in molars (p<0.05). In total, the mandible had 151 (48.2%) permanent teeth that were diagnosed as a probable source of infection (Table 5). Among milk teeth, the youngest patients had been diagnosed with 8 (57.1%) abscesses in the maxilla and 6 (42.9%) in the mandible. The largest group was molars - 12 (85.7%) and canines (14.2%) (Table 6). There was no statistically significant relationship between a causal teeth localization in upper and lower jaw (p=0.527). No incisor was diagnosed as a source tooth among deciduous teeth. Depending on the localization of the intraoral abscess, the most frequent source teeth were singled out. The right first molar was the main cause for vestibular abscesses in both the maxilla as well as the mandible (Table 7).

The statistical analysis did not show any evidence of significant differences between tooth localization in abscess and control group (p=0.099) (Table 8).

The main treatment methods used for an abscess are extraction of the causal tooth, an abscess incision, drainage with a rubber drain and pharmacotherapy. Extraction was done in 156 cases, mainly due to significant caries causing destruction of the tooth. In the cases where drainage through an alveolus was impossible, an abscess incision, by means of pus evacuation and drainage with a rubber drain was needed (262 cases). In 106 cases, only an incision was used and in another 4 cases an abscess puncture was used.

In 48 cases, the condition of the tooth did not require an extraction. Those patients were referred to conservative treatment (endodontic), while one patient was referred to periodontal treatment. Pharmacotherapy was implemented in 267 patients. Six patients from the research group did not consent to the suggested treatment, i.e. casual tooth extraction and the need for surgical intervention through soft tissue incision for the purpose of abscess decompression (Table 6).

All Surgical procedures were performed with local anesthesia, which induced a numbing sensation in a specific part of the body, while keeping the patient completely conscious. This method is the most common way of applying anesthesia in oral surgery. Keeping the patient conscious increases the safety aspect of surgical procedures, by allowing improved dialogue between patient and doctor, thereby improving cooperation. In 308 cases, a lidocaine hydrochloride 2% with noradrenaline (Lignocainum 2% c. Noradrenalin 0.00125% WZF) was used; this particular local anesthetic mixture is one of the most basic compositions used in oral surgery. The addition of noradrenaline results in accelerating and extending the anesthetic effect [4,6].

Table 5. Percentage of maxilla and mandible permanent teeth in intraoral abscesses formation

Permanent casual teeth							
Maxilla: 162				Mandible: 151			
Incisors	Canines	Premolars	Molars	Incisors	Canines	Premolars	Molars
33 (20.4%)	30 (18.5%)	51 (31.5%)	48 (29.6%)	13 (8.6%)	15 (9.9%)	41 (27.2%)	82 (54.3%)

Table 6. Number of maxilla and mandible deciduous teeth in intraoral abscesses formation

Deciduous casual teeth			
Maxilla: 8		Mandible: 6	
Canines	Molars	Canines	Molars
1	7	1	5

Table 7. Abscesses localizations and the most common casual tooth in each localization

Most common casual teeth			
Maxilla		Mandible	
Localization	Number of casual tooth	Localization	Number of casual tooth
Vestibular abscess	16	Vestibular abscess	46
Palatal abscess	12	Buccal abscess	46
Canine fossa abscess	13, 14		

Table 8. Causal tooth localization

	Group		
	Tooth localization Mandible	**Tooth localization Maxilla**	**Sum**
A	157	170	327
%	48.01%	51.99%	
C	123	100	223
%	55.16%	44.84%	
Sum	280	270	550
Statistics	Chi- square	df	p
Chi^2 Pearson	2.708094	df=1	p=.09984

Table 9. Applied treatment and number of patients treated each way

Method / number of patients	
Extraction of casual tooth	156
Abscess incision and drainage	262
Punction of abscess	5
Pharmacotherapy	267
Referrence to endodontic treatment of the casual tooth	48
Reference to periodontal treatment	1
No consent for treatment	6

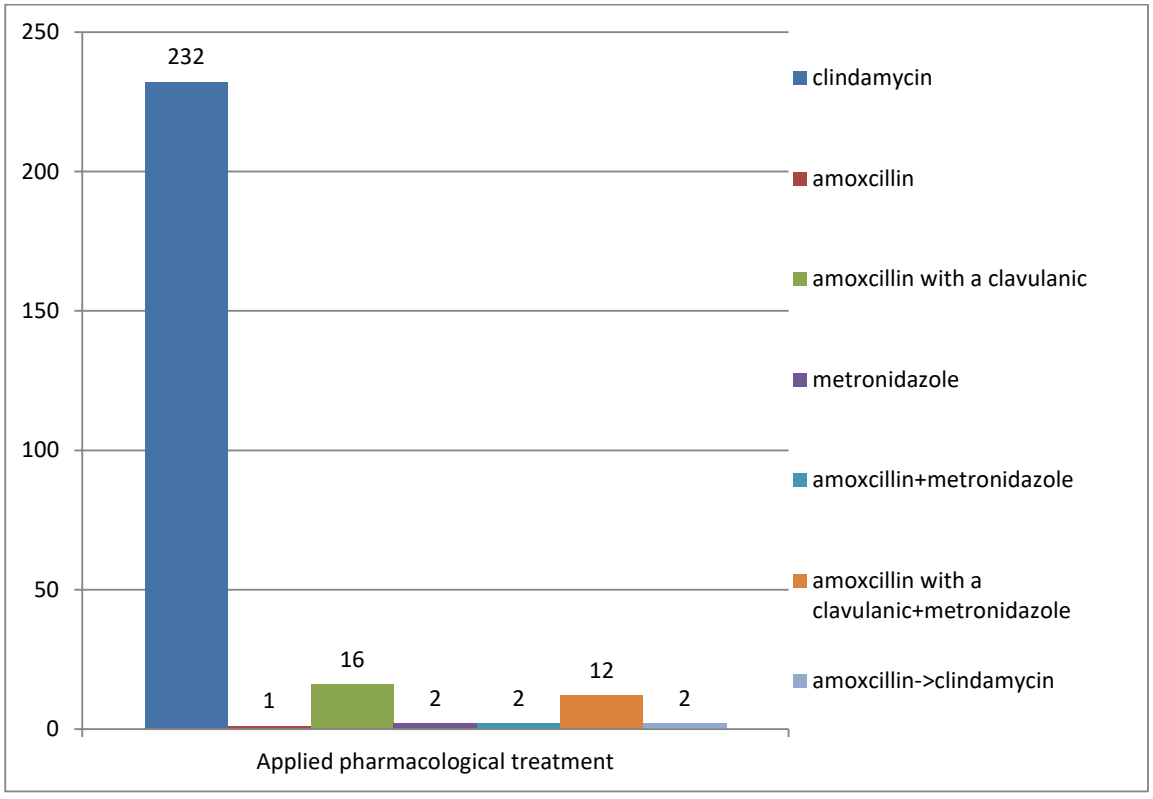

Fig. 2. Number of patients and recommended antibiotics

In 11 cases, the substance used was articaine hydrochloride with adrenalin (Citocartin 100). Articaine was used to anesthetize the youngest patients due to its higher safety and because its less likely to cause an allergic reaction.

Pharmacotherapy is needed in cases of severe, rapidly deteriorating infections complicated by patients being in a generally bad condition and who have a lower resistance to disease and other metabolic syndromes.

The most frequently used antibiotic was a clindamycin (232 cases) (Fig.2). Clindamycin is one of the most commonly prescribed medicines in oral surgery, mainly due to its ability to thoroughly penetrate bone tissue and due to its spectrum of activity, which covers pathogens causing odontogenic infections. It was mainly used on adults in oral doses of 600 mg every 12 hours (180 cases) or 300 mg orally every 8 hours (52 cases) for 5-6 days. In 16 cases an amoxicillin/amoxcillin with a clavulanic acid in doses of 1000 mg were given orally every 12 hours.

In the cases with a resistant infection along with an anaerobic flora, a metronidazole was given orally with a 250 mg dose every 12 hours. In 12 cases, an amoxicillin/amoxcillin with a clavulanic acid was used together with a metronidazole (Fig.2); this combination is highly recommended for treating mixed bacterial flora infections. Additionally, painkillers and anti-inflammatory drugs with the local use of antiseptics (chlorhexidine) were required for the patients.

The average number of visits per patient (2.47) was calculated based on the number of examined patients and based on all the visits contained in the medical records. The total treatment time for all patients includes 807 visits. In the most severe cases, 10 visits were necessary to improve the patient's clinical condition. Eligibility for a one-time visit was sufficient in only 95 cases, and 6 patients did not consent to the suggested treatment. Treatment includes more than one visit in 232 cases (Fig.2). On additional visits an abscess cavity was rinsed with a solution of sodium chloride 0.9% and the rubber drain was changed to a new one. Those procedures were on purpose in order to facilitate wound debridement for faster wound healing [1,9].

DISCUSSION

An abscess (*lac. abscessus*) is the localized collection of pus in a limited cavity on in anatomical space. A proteolytic enzyme of granulocytes takes part in teeth etiopathogenesis of a dental abscess, causing the disintegration of tissue. According to the literature, 70-90% of those inflammations are odontogenic infections [3]. Treatment is based on the localization of an odontogenic abscess. Intraoral abscesses are mainly treated locally by extraction of the causal tooth, if it does not qualify for endodontic or conservative dental treatment. Removing the source of infection and draining the respective pus are essential for successful therapy. When drainage through an alveolus is impossible or insufficient, an

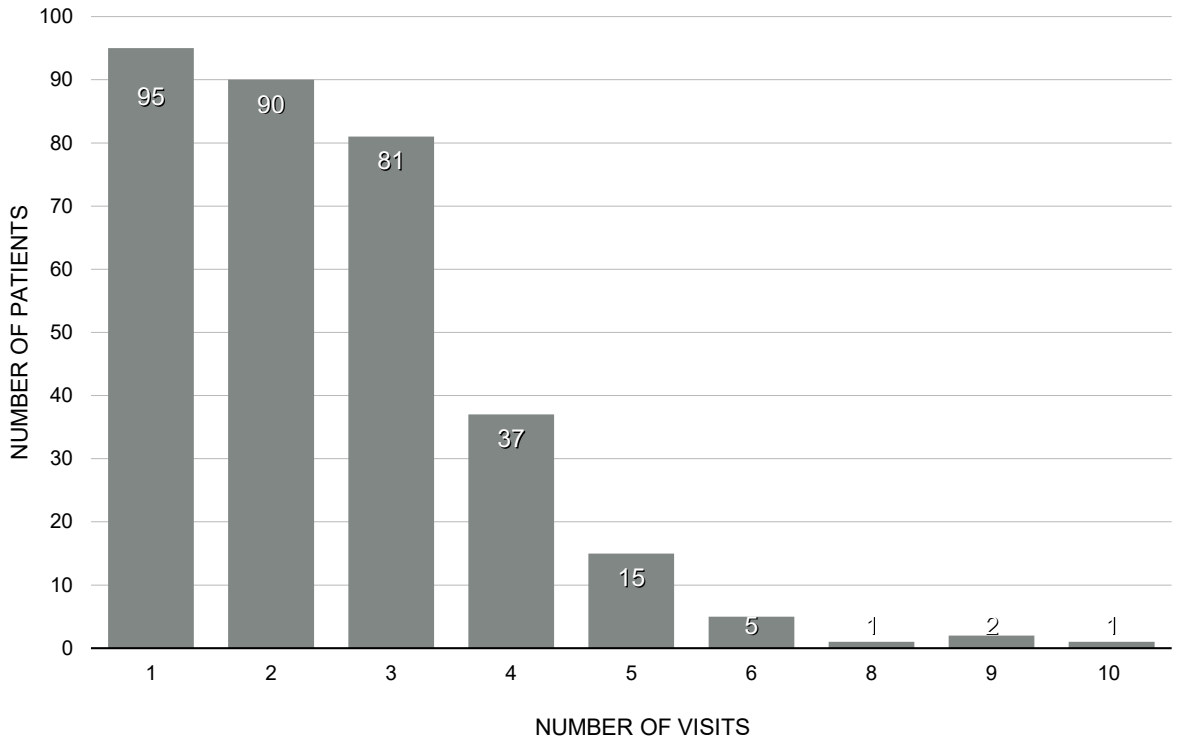

Fig. 3. Relation between the number of patients and the number of patients visits

abscess incision, by means of pus evacuation and drainage with a rubber drain along with local anesthesia is needed. We can use a puncture in the case of small, well-limited abscesses [3]. Drainage strengthens the bodies defensive mechanisms by reducing tissue tension and increasing local blood flow. This study also confirms that early incision of an abscess is a significant factor in treatment. Surgical treatment can be used alongside pharmacological therapy. Pharmacotherapy is needed in the case of severe, rapidly deteriorating infections, cases where surgical treatment is impossible and with patients who have a lower resistance to disease. Penicillins continue to be the therapy of choice for odontogenic infections, as they are empirically effective in the treatment of odontogenic infections after incision therapy. In this study, the most effective and most useful antibiotic was clindamycin. There are several dental abscess complications mentioned in the literature. They can be divided into two groups: general and local (Table 10). Every complication, excluding delayed healing after incision, should be treated in hospital wards.

Table 10. Abscesses complications [7]

General local	
1.Respiratory obstruction	
2.Endocarditis	
3.Pericarditis	
4.Sepsis	
5.Systemic Inflammatory Response Syndrome (SIRS)	
6.Phlegmone	
7.Necrotizing fascitis	1.Delayed healing
8.Descending mediastinitis	2.Osteomyelitis
9.Spondylitis	3.Orbital abscess or phlegmone
10.Thoracid empyema	4.Angina Ludovici
11.Lemierre's syndrome	5.Thrombophlebitis
12.Thrombocytopenia	
13.Hematogenous dissemination to distant organs	
14.Coagulation abnormalities ranging from thrombocytopenia to a fulminant state of disseminated intravascular coagulation (DIC)	
15.Cavernosus sinus thrombosis	
16.Brain abscess	
17.Meningitis	

According to this study, there were no complications noticed during abscess treatment. In the study by Pourdaneslu et al., the complication during treatment was minimal but the mortality rate was 1% [13]. The number of visits after the incision and tooth removal was similar and in most cases did not exceed 4. Delayed healing has occurred only in four patients after tooth extraction, which resulted in more control visits. In 6 cases no consent was given for treatment and the patients did not attend control visits. The highest prevalence of dental abscesses was in the second age group – between 21-30 years old, and this is in accordance with the literature [13].

CONCLUSION

Between the years of 2010-2016, 35,280 patients were treated at the Department of Dental Surgery at the Pomeranian Medical University in Szczecin. 327 patients,

including 183 males and 144 females with intraoral abscesses, were reported to the department. Molars were the frequent source teeth among permanent as well as deciduous teeth, with it mainly being the first molar, due to its complex anatomical structure. In most patients, surgical intervention such as extraction of the causal tooth, an abscess incision, drainage with a rubber drain and pharmacotherapy was necessary. The most frequently used antibiotics were clindamycin, amoxicillin with clavulanic acid and metronidazole. Patients were recommended to take ketoprofen along with local use of a chlorhexidine solution to relieve pain and to reduce the inflammation. In 6 cases, despite having systemic and local symptoms (pain, soft tissue swelling, oral erythema, general sick feeling), patients did not consent to the suggested treatment, and were put off by the risk of dangerous systemic complications. Negligence in hygiene and a lack of caries prevention were the main cause of intraoral abscess formation, despite widespread access to dental hygiene products, literature, internet and dental care.

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