
PREVALENCE OF FIBRINOLITIC ALVEOLITIS AND INFECTION IN DENTAL SURGERY

Prevalência da alveolite fibrinolítica e infecção em cirurgia bucal

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Abstract

This is a prospective cross-sectional study on the incidence of fibrinolytic alveolitis (FA) and infection (IN) in dental surgeries. This study evaluated 202 surgeries. The patients ranged in age from 12 to 79 years old, with a mean age of 38.8 ± 16.4 years. The incidence for FA was 1% (2 cases), and the incidence for IN was 1% (2 cases). A chi-square test showed no statistically significant differences between all the predictive factors evaluated. The results showed that being a smoker, conducting surgery over the impacted or partially impacted tooth position, and doing osteotomy can be risk factors for developing an infection. A binary logistic regression model showed significant interactions ($p=0.006$; CI 95%) for the FA development when the variable's gender (female), alcohol and tobacco consumption, daily medicine consumption, doing a flap, and tooth sectioning are taken together.

Keywords: Fibrinolytic alveolitis; Dry socket; Alveolitis sicca; Orall surgery; Oral infection.

Resumo

OBJETIVOS: Estudo transversal prospectivo a respeito da incidência de alveolite fibrinolítica (FA) e infecção (IN) em cirurgia bucal. **MATERIAL E MÉTODO:** 202 cirurgias foram avaliadas, em pacientes com idades de 12 a 79 anos (idade média $38,8 \pm 16,4$ anos). **RESULTADOS:** A incidência de FA e de IN idêntica (1%, 2 casos de cada). O teste chi quadrado não demonstrou diferenças estatisticamente significantes entre todos os fatores preditivos avaliados. Pacientes fumantes podem apresentar maior risco de desenvolvimento de infecções em casos de cirurgia de dentes inclusos ou parcialmente inclusos. **CONCLUSÃO:** Modelo binário de regressão logística demonstrou interações significativas ($p=0.006$; CI 95%) para o desenvolvimento de FA quando as variáveis sexo (mulheres), álcool e fumo, consumo de medicamentos, efetuando cirurgia a retalho e osteotomia apresentam-se conjuntamente.

Palavras-chave: Alveolite fibrinolítica; Alvéolo seco; Alveolitis sicca; Cirurgia bucal; Infecção bucal.

INTRODUCTION

Fibrinolytic alveolitis (FA) is a common condition caused by partial or total loss of the post-dental-extraction blood clot; the result is severe pain, usually starting 1 to 3 days postoperative. FA is associated with the presence of exposed bone, necrotic debris and halitosis (1, 2, 3). Several other terms have been used in referring to this complication, such as alveolar osteitis, dry socket, localized osteomyelitis, postoperative alveolitis and alveolitis sicca.

The etiology of FA is still unclear, and the most widely accepted theory is that the blood clot is disintegrated by increased fibrinolytic activity. Many precipitating factors for FA have been suggested, such as age, gender, oral contraceptives, smoking habit, length of operation, state of teeth eruption, difficult or traumatic extractions, pre-existing infection or pericoronitis, overzealous irrigation or curettage of the socket after extraction, low operator experience, mandibular teeth, use of excessive amounts of local anesthetic with vasoconstrictor, and menstrual cycle (3, 2, 3, 4, 5, 6). The reported incidence of FA ranges from 1% to 45%, and high scores are mainly related to mandibular third molar surgeries (2, 5, 4, 5, 6, 7, 8).

Infections following odontogenic procedures (IN) can occur and are habitually multi-microbial with a strong aerobic and

anaerobic component. Several procedures, including single and multiple dental extractions, entail a risk of infection in healthy subjects. Individuals at risk for local or general infection also must be considered, such as patients who are immuno-depressed, malnourished, or have an uncontrolled associated systemic disease. The surgeries performed at this site are considered to be clean-contaminated surgeries (not counting the rich oral microflora), and the mouth infection rate ranges from 2.7% to 4.4% after teeth extraction (9, 10, 11).

The aim of this study was to evaluate the incidence of FA and IN in dental surgeries performed by undergraduate dentistry students and to search for possible aetiological and/or precipitating factors for these conditions.

MATERIAL AND METHODS

This is a prospective cross-sectional study for incidence of FA and IN in dental surgeries. The postoperative dichotomous outcomes were compared to the predictive variables in cross-tables, allowing the application of the chi-square (χ^2) and relative risk (RR) tests. The study was carried out at the multidisciplinary clinics of the School of Dentistry at the Oeste de Santa Catarina University (UNOESC), and all the procedures and outcomes were made under supervision of one of

the three oral and maxillofacial surgeons. All the procedures were conducted, and all the questionnaires were administered by the undergraduate students, and they were applied to the subjects before the surgery; the data regarding the procedure were collected soon after the surgery, and the patients were evaluated 7 days postoperatively or before or after this period when necessary. For the patients who did not return at day 7, a phone call was made to collect the outcomes. All procedures were performed under the most rigorous control of microbiologic contaminants and included sterile surgical apron, sheets and gloves. All dental hand pieces and surgical instruments were sterilized in an autoclave. Sterile saline solution was used for lavage of the alveolus socket and bur refrigeration when necessary. The absolute contra-indication for surgery and deciduous teeth surgeries were the excluding criteria applied to this research.

The diagnostic criteria for dry socket were made on a clinical basis and include constant radiating pain not easily relieved by analgesic accompanied by denuded socket or necrotic clot and fetid odor. The criteria for infection were also based on the clinical conditions characterized as purulent discharge or serosanguineous drainage associated with pain or tenderness. When present, those conditions were checked and confirmed by at least one of the oral and maxillofacial surgeons of the team. This study was submitted the UNOESC Ethical Committee for Human Research.

The data were analyzed by the BioEstat (version 4.0; Belém/Pará-Brazil), and descriptive statistics, *chi-square* tests and relative risk were used as appropriate at the critical level of significance, set at $p < 0.05$.

RESULTS

This study evaluated 202 surgeries with 262 teeth extracted; 37 questionnaires (surgeries) were excluded due to inconsistent or lacking information. From the total procedures, 119 (58.9%) of the patients were male. The age ranged from 12 to 79 years, with a mean age of 38.8 ± 16.4 years. The most prevalent self-reported ethnicity was white, with 164 (81.2%) cases. The majority of the surgeries performed involved a

single tooth removal (76.7%). The most prevalently extracted teeth were third molars, corresponding to 78 (38.6%) cases. Erupted teeth were 86.1% of the cases. The entire anesthetic used for the surgical procedures brought associated the adrenalin (1:100.000), and 170 cases (84.2%) had used up to 0.054mg of adrenalin (3 dental 1.8ml anesthetic tubes or cartridges). At the time of the surgery, 183 (90.6%) of the patients had normal blood pressure, 17 (8.4%) patients had hypertension, and 2 patients were reported to be in hypotension status.

The incidence for FA was 1% (2 cases), and the incidence for IN was 1% (2 cases). A *chi-square* test showed no statistical significance between any of the evaluated predictive factors and the outcomes. The results showed that being a smoker (RR 6.2), conducting surgery over the impacted or partially impacted tooth position (RR 6.2) and doing osteotomy (RR 4.3) can be risk factors for infection development. Those factors, when taken together, showed a 51.65% probability of IN development. The cross-tabulation description of the predictive factors for FA and IN development (*chi-square* tests) as well as the relative risk (RR) for the conditions evaluated can be viewed in Table I.

Conducting surgery over the impacted or partially impacted tooth position (RR 6.2), doing osteotomy (RR 4.3) and tooth sectioning (RR 4.9) seem to increase the risk of FA development; taking daily medicines (RR 2.9) and alcohol consumption (RR 3.0) also seem to increase the risk of FA development. Any isolated factors showed significance in the *chi-square* analysis. For the FA development, a model of binary logistic regression showed significant interactions ($p = 0.006$; CI 95%) between the variable's gender, alcohol and tobacco consumption, daily medicine consumption, doing a surgical flap and tooth sectioning. In this sample, being female and having these conditions showed a 98.25% probability of FA development.

TABLE 1 - Variables studied and their relation to the development of infection (IN) and fibrinolytic alveolitis (FA)

VARIABLES	INFECTION (IN)		RELATIVE RISK (IN)		FIBRINOLYTIC ALVEOLITIS (FA)		RELATIVE RISK (FA)
	YES	NO	CHISQUARE (TEST CI 95%)	YES	NO	CHISQUARE (TEST CI 95%)	
Sex							
Male	1	118	0.8	0.7 (NS)	0	119	0.09
Female	1	82		1.4 (NS)	2	81	
Age							
Up to 39 years	2	108	0.2	*	2	108	0.2
(mean)							
More than 39 years	0	92		*	0	92	*
Anxiety							
Light to medial	2	186	0.67	*	2	186	0.67
Moderate to severe	0	14		*	0	14	*
Menstruation (when applied)							
Yes	0	3	0.85	*	0	3	0.78
No	1	77		*	2	76	*
Systemic disease							
Yes	0	27	0.6	*	0	27	0.6
No	2	173		*	2	173	*
Taking any medicines daily							
Yes	0	51	0.42	*	1	50	0.42
No	2	149		*	1	150	2.9 (NS)
Tobacco consumption							
Yes	1	27	0.14	6.2 (NS)	0	28	0.57
No	1	173		0.16 (NS)	2	172	*
Alcohol consumption							
Yes	0	50	0.41	*	1	49	3.0 (NS)
No	2	150		*	1	151	0.32 (NS)
Mate tea consumption							
Yes	0	117	0.09	*	2	115	0.23
No	2	83		*	0	85	*
Surgical Flap (denuding bone)							
Yes	1	81	0.79	1.4 (NS)	1	81	0.79
No	1	119		0.68 (NS)	1	119	0.68 (NS)
Osteotomy							
Yes	1	37	0.26	4.3 (NS)	1	37	0.26
No	1	163		0.23 (NS)	1	163	0.23 (NS)
Tooth sectioning							
Yes	0	34	0.52	*	1	33	4.9 (NS)
No	2	166		*	1	167	0.2 (NS)
Report of difficult surgery							
Yes	0	42	0.47	*	0	42	0.47
No	2	158		*	2	158	*

TABLE 1 - Variables studied and their relation to the development of infection (IN) and fibrinolytic alveolitis (FA) - Continued

Pericoronitis present (mouth)	Yes	0	3	1.0	*	0	3	1.0	*
	No	2	196		*	2	196		*
Periodontal disease present (mouth)	Yes	0	53	0.4	*	0	53	0.4	*
	No	2	147		*	2	147		*
Oral hygiene	Good	2	113	0.22	*	2	113	0.22	*
	Poor	0	87		*	0	87		*
Dental decay present (mouth)	Yes	1	89	0.88	1.2 (NS)	0	90	0.2	*
	No	1	111		0.8 (NS)	2	110		*
Small flaws in aseptic control	Yes	0	16	0.68	*	0	16	0.68	*
	No	2	184		*	2	184		*
Mouthwash before procedure	Yes	2	183	0.68	*	2	183	0.68	*
	No	0	17		*	0	16		*
Antibiotic prophylaxis indicated	Yes	0	13	0.71	*	0	13	0.71	*
	No	2	187		*	2	187		*
Postoperative mouthwash	Yes	2	144	0.38	*	2	144	0.38	*
	No	0	56		*	0	56		*
Postoperative antibiotic prescription	Yes	0	21	0.63	*	1	20	0.065	*
	No	2	179		*	1	180		*
Evident purulent discharge at the surgical site	Yes	0	7	0.79	*	0	7	0.79	*
	No	2	193		*	2	193		*
Face surgical accident (root fracture, etc)	Yes	0	15	0.69	*	0	15	0.69	*
	No	2	185		*	2	185		*
Tooth position (root fracture, etc)	Erupted	1	173	0.14	0.16 (NS)	1	173	0.14	0.16 (NS)
	Partially erupted/impacted	1	27		6.2 (NS)	1	27		6.2 (NS)
Adrenalin (1:100.000) in anesthetic solution	Up to 0.054mg	2	184	0.68	*	2	184	0.68	*
	More than 0.054mg	0	16		*	0	16		*
Procedures' time	Up to 41 minutes	1	122	0.75	0.64 (NS)	2	121	0.26	*
	(mean) More than 41 minutes	1	78		1.5 (NS)	0	79		*

DISCUSSION

This study searched prospectively for the incidence of FA and IN development in routine dental extractions and the predictive factors for these outcomes. Though FA and IN are common complications in dental surgeries, prospective data and well-controlled studies are scarce (12, 13). The incidence of FA (2, 6, 7, 8, 14) and IN (15, 16, 17) found in this research has similar or lower incidence compared to the reviewed literature.

Adeyemo et al. (16) evaluated the role of using and not using sterile gloves in FA and IN development and found that there were no statistical differences between using and not using sterile gloves. In general, they got 8.6% of dry socket and 1.9% of infection. Comparing our results with those of Adeyemo et al. (16) we found an incidence for IN nearly 2 times higher and an incidence for FA 8 times higher. Also, it is difficult to state that there were no statistical differences between both groups in that study since the development of FA and IN are multifactorial conditions (17), and we can individually assess the age, health and nutritional status (18-21), surgical locale status (5, 22), habits (1), pathogen microflora²³, and the type, location and extension of the surgical procedure (17, 24, 25). Our study showed that, when some independent conditions are evaluated, we could not find significance for the FA development. However, if we analyzed the interactions among gender, alcohol and tobacco consumption, daily medicine consumption, doing a surgical flap and tooth sectioning, we found a strong significance for FA development. However, our results must be examined very carefully since we saw only 2 cases of FA from this sample set of 202 teeth removal surgeries, and this is a very small sample size to reach any answer.

Although we could not find any statistical significance between the isolated predictive conditions and the IN development until now, our results suggest that tobacco consumption, having a partially or impacted tooth position and conducting osteotomy carry a higher risk range of 4.3 to 6.2, and those predictive factors have already been reported by other studies (17, 25) and thus given support to this research methodology.

It is important to notice that 34 (16.8%) patients in this study have received antibiotics, which could also have led to the small number of FA and IN cases found. The criteria for antibiotic prescription, although empirically based (17), were applied following some rules isolated and sometimes added, including the following: (a) American Society Association (ASA) classification III or higher, (b) blood test indicating abnormality like anemia (even borderline) and low white blood cell count (neutrophils and lymphocytes counts), (c) age (65 years old or higher), and (d) factors related to the surgical procedure that include surgical complications (root fracture, alveolar or tuber fracture and large flap laceration), long time spent and large amount of bone removal and local status condition (when the site was already infected). When untreated or poorly treated diseases or abnormal blood tests were identified, the patient was first referred to the physician.

Interestingly, Blum² wrote a review that reported that the incidence of FA following routine dental extractions has been 3% to 4% and that the studies claiming 1% lack clinical credibility. We could not find any scientific or logical evidence in his paper to support this statement. Gathering knowledge about the pathophysiology of FA and IN can help on to reduce or even eliminate these conditions under controlled circumstances. A sensitive anamnesis and by routinely performing blood tests in the dentistry school clinics, we have identified important and sometimes life-threatening conditions in patients who could have easily undergone dental surgery and who also might have increased the numbers of IN or FA.

CONCLUSION

The incidence of FA was 1% (2 cases), and the incidence of IN was 1% (2 cases). When taken together, the interaction among sex (female), alcohol and tobacco consumption, daily medicine consumption, doing a flap and tooth sectioning was found to be associated with FA development. Being a smoker, conducting surgery over the impacted or partially impacted tooth position and doing osteotomy can be risk factor for infection development.

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