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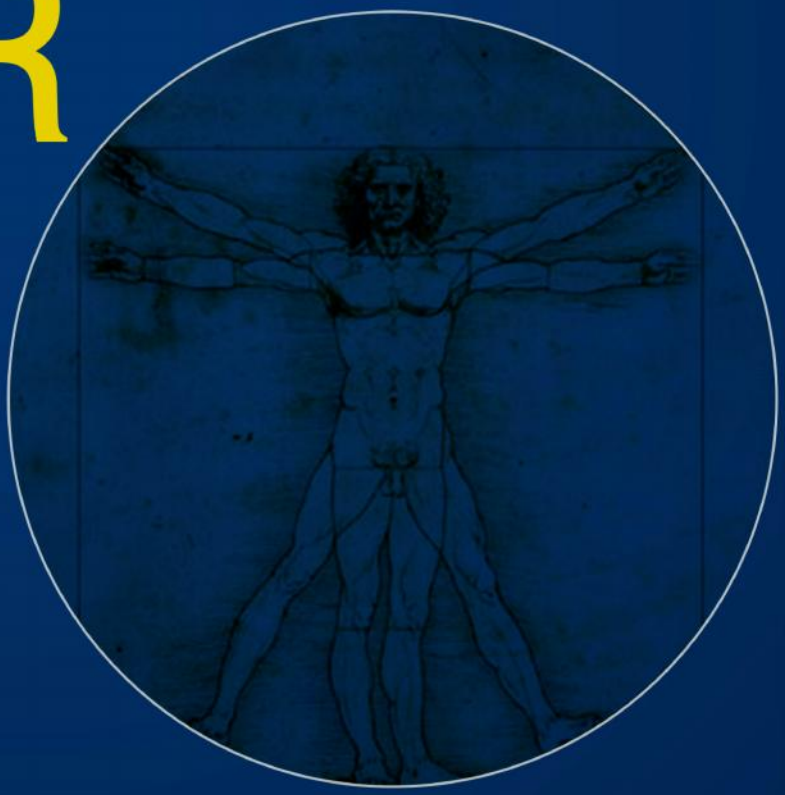

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Editorial

Prezado leitor,

Disponibilizamos a décima terceira edição, volume dois, do periódico ***Brazilian Journal of Surgery and Clinical Research – BJSCR****.*

A ***Master Editora*** *e o* ***BJSCR*** *agradecem aos Autores que abrilhantam esta edição pela confiança depositada em nosso periódico. O* ***BJSCR*** *é um dos primeiros "Open Access Journal" do Brasil, representando a materialização dos elevados ideais da* ***Master Editora*** *acerca da divulgação ampla e irrestrita do conhecimento científico produzido pelas Ciências da Saúde e Biológicas.*

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Sumário summary

ORIGINAL STUDY

CASE REPORT

LITERATURE REVIEW

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INCREASING IN THE CASUISTRY OF ETIOLOGICAL TREATMENT BENEFITS IN CHRONIC CHAGAS DISEASE PATIENTS FROM EPIDEMIOLOGICAL SURVEILLANCE AREA IN SOUTHERN BRAZIL

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ABSTRACT

Currently there is no consensus to support the routine use of the etiological treatment in chronic phase of Chagas disease. The decrease of title in the conventional serologic methods and negativity in parasitological or molecular techniques in treated patients is useful to convince clinicians to perform the etiological treatment in this phase. This study aimed to evaluate changes in conventional serology and parasitological and molecular methods results of 36 chronic Chagas disease patients from epidemiological surveillance area in Southern Brazil, before and 10 years after treatment with benznidazole. Negative serologic conversion of indirect immunofluorescence (IIF) and enzyme-linked immunosorbent assay (ELISA) was not observed in patients studied. However, there was a significant relationship between treatment and the decrease of IIF titers (p=0.0095). Furthermore, mean antibody titers exhibited a significant reduction (p<0.0001) when compared before and 10 years after treatment. A decrease from 2 to 4 titers of IIF and negative hemoculture was observed in 44.4% patients and a decrease from 2 to 4 titers of IIF and negative polymerase chain reaction (PCR) was observed in 38.9% patients after treatment. This study collaborates with literature data and increases the casuistry towards benefits of the etiological treatment in the chronic phase of Chagas disease.

KEYWORDS: Chagas disease, chemotherapy, serologic diagnosis, hemoculture, polymerase chain reaction.

1. INTRODUCTION

Although Latin American countries have made enormous efforts to control the infection by *Trypanosoma cruzi* (etiological agent of Chagas disease), approximately 5 - 6 million people remain infected[1]. Moreover, due to infected individuals' migration to non-endemic countries this disease is becoming a global health problem[2].

Currently, there are only two drugs for the treatment of Chagas disease, nifurtimox and benznidazole, but neither of them is considered ideal[3].The etiological treatment with benznidazole in chronic Chagas disease, despite low cure rate and side effects, is recommended by several authors due to evidence in preventing or minimizing tissue lesions, improving clinical progression and prognosis of patients[4,5,6,7,8].

Parallel to the absence of a fully effective medicine, serological methods (indirect immunofluorescence, IIF; and enzyme-linked immunosorbent assay, ELISA) used for efficacy of etiological treatment evaluation have limitations, with results remaining positive years after treatment[9]. However, a significant decrease of the antibodies titers in IIF detected in long-term follow-up of patients treated etiologically suggest that eventually the titers will be negative, which is a sign of cure[5,9,10]. Furthermore, IIF titers of 160 or lower in treated patients can indicate a tendency to a cure, due of the low frequency of these titers in patients with Chagas disease who were not treated etiologically[11].

Parasitological methods (hemoculture and xenodiagnosis) are considered less sensitive, but positive results are unquestionably valuable to monitor therapeutic failure after etiological treatment[12]. Although the polymerase chain reaction (PCR) is highly sensitive for detecting *T. cruzi* DNA in samples from infected patients and animals[13,14,15,16], it is a complex method and is dependent of patient's parasitemia as well as the parasitological methods. PCR has been recommended only for alternative diagnostic support[17,18] or as a confirmatory proof in post-therapeutic monitoring of Chagas disease patients[19,20,21,22].

Although currently there is no consensus to support the

routine use of etiological treatment in the chronic phase of Chagas disease[23,24], association of the title decrease in conventional serologic methods and negativity in parasitological or molecular techniques in treated patients is useful to convince clinicians to perform the etiological treatment in chronic Chagas disease patients.

In this context, this study aimed to evaluate changes observed in conventional serology (IIF and ELISA), parasitological method (hemoculture), and molecular method (PCR) results in chronic Chagas disease patients from epidemiological surveillance area in Southern Brazil, before and ten years after benznidazole treatment.

2. MATERIAL AND METHODS

Patient Patients and ethics

Thirty-six patients with chronic Chagas disease from Southern Brazil were evaluated at the Chagas disease Laboratory at **State University of Maringa** (Universidade Estadual de Maringá - UEM). The patients had been treated with benznidazole (Rochagan-Roche) at doses from 5 to 7 mg/Kg/day, for 30 consecutive days, ten years previously. Of the participants, 20/36 (55.6%) were female and 16/36 (44.4%) male, ages between 32 and 70 years old (mean age of 47.2 ± 9.8 years).

After the purpose of the study was explained to patients, all signed a free and informed consent form approved by the Permanent Committee of Ethics in Research Involving Human Beings - UEM, protocol number 375/2007.

Serological Tests

Venous blood sample (5mL) was collected from each patient, and the anti - *T. cruzi* IgG-class antibodies were assessed by IIF and ELISA according to manufacturers' recommendations. For IIF we used the Imunocruzi antigen (Biolab®, Rio de Janeiro, Brazil) and anti-human immunoglobulin G (IgG)-fluorescein conjugate (Biolab®, Rio de Janeiro, Brazil), and for ELISA the Chagatest-ELISA recombination v.3.0 diagnosis kits (Wiener®, Argentina) and Chagas Test Elisa III (Bioschile® Ingenieria Genética S.A, Chile). For IIF, titers ≥ 40 were considered positive, and for ELISA, sera with equal or higher than the cutoff plus 10% absorbency were considered reagent. The indeterminate zone was defined by the values of absorbency found between the cutoff ± 10%, and results in this zone were considered doubtful. The samples were tested in duplicate and in case of doubtful results or when there was a disagreement between the two ELISA diagnosis kits or between ELISA and IIF, the samples were repeated in duplicate. Results that remained discordant between IIF and ELISA and/or for both ELISA diagnosis kits were considered inconclusive. These procedures were executed for all 36 patients, before and ten years after treatment. For both serological methods, positive and negative controls for Chagas disease were included.

Hemoculture

Venous blood sample (30mL) was collected from each patient in vacuum tubes (BD Vacutainer®, USA) containing sodic heparin. Blood was distributed in Falcon tubes (Labcon®, USA), and hemocultures were processed immediately in LIT (liver infusion tryptose) medium and incubated at 28°C, according to Chiari *et al.* (1989)[25] with modifications. The samples were homogenized twice a week and examined after 30, 60, 90, and 120 days. Hemoculture was performed for all patients before and ten years after treatment.

Polymerase Chain Reaction (PCR)

Ten milliliters of blood was collected from each patient in an equal volume of Guanidine-EDTA (6 M Guanidine-HCl; 0.2 M EDTA; Sigma Chemical Company®, USA) pH 8.0. DNA extraction, conditions of PCR reaction and amplified products revelation of were performed as described by Gomes *et al.* (1998)[13].

To control contamination, PCR steps were carried out in separate rooms with exclusive reagents, materials and equipment for each working space. In the DNA extraction step and PCR step, negative controls with uninfected individuals blood samples, and positive controls of patients with Chagas disease were used. To exclude the possibility that negative PCR results were due to presence of reaction inhibitors, 10 pg of total DNA extracted from *T. cruzi* culture was added to the negative samples and a new amplification was executed. PCR was realized in duplicate for all the patients ten years after etiological treatment and in 14/36 (38.8%) of these patients before treatment, because during this period, PCR method was being implemented in the laboratory and evaluated as a tool for post-therapy monitoring.

Statistical Analysis.

The statistical analysis of the relationship between the antibodies titers in IIF (titers of 160 or lower) and the treatment (before and ten years after etiological treatment), was performed by the McNemar Chi-square test. For the comparison of mean antibody titers of the patients before and after etiological treatment, the values were transformed by applying the formula $\log_2 T/10$ (T = titers of antibodies in IIF) and analyzed by Mann-Whitney test. Data were compared using Statistica 8.0 Software, at a significance level of 5%.

3. RESULTS

Conventional serology revealed absence of negative serologic conversion in all chronic Chagas disease patients. However, 15/36 (41.7%) patients demonstrated before etiological treatment IIF titers of 160 or lower and ten years after etiological treatment 33/36 (91.7%) patients showed these titers values (Table 1), i.e., there was a significant relationship between treatment and decrease of IIF titers (p=0.0095). Furthermore, the mean of IIF titers ex-

hibited a significant reduction (p<0.0001) when compared before (258.84) and ten years after treatment (98.90) (Figure 1).

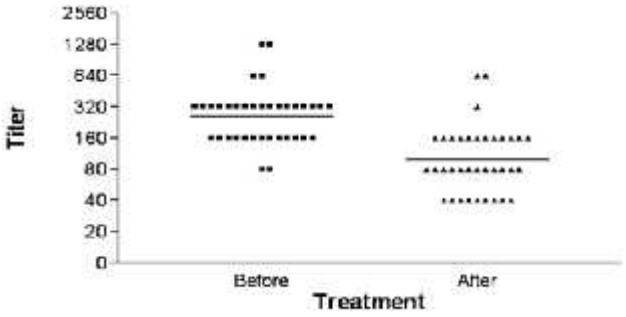

Figure 1 - Chronic Chagas disease patients (n=36) and indirect immunofluorescence (IIF) titers before and ten years after etiological treatment with benznidazole. Each symbol (■ and ▲) represents a serum sample from one patient. The solid horizontal lines represent the mean antibody titers before treatment (258.84), and after treatment (98.90) (p<0.0001).

Table 1. Laboratorial data of chronic Chagas disease patients before and ten years after treatment with benznidazole.

	Tests before treatment				Tests ten years after treatment				
Patient	IIF	ELISA	HC	PCR	IIF	ELISA Wiener® kit	ELISA Bios-Chile® kit	HC	PCR
1	160	R	P	P	40	R	R	N	P
2	320	R	P	P	80	R	R	N	N
3	640	R	N	N	40	R	R	N	N
4	320	R	N	-	640	R	R	N	N
5	1280	R	N	-	640	R	R	N	N
6	320	R	N	-	40	R	R	N	N
7	160	R	N	-	80	R	R	N	N
8	320	R	N	-	40	R	R	N	N
9	320	R	N	-	320	R	R	P	P
10	160	R	N	P	40	R	R	N	N
11	320	R	N	-	80	R	R	N	N
12	320	R	N	-	80	R	R	N	N
13	160	R	N	P	160	R	R	N	N
14	160	R	N	-	80	R	R	N	N
15	160	R	P	P	160	N/N[a]	WR/WR[a]	N	N
16	1280	R	N	-	160	R	R	N	N
17	320	R	N	-	160	R	R	N	N
18	320	R	P	-	40	R	R	N	P
19	160	R	N	P	160	R	R	N	N
20	80	R	N	-	40	N/I[a]	WR/WR[a]	N	N
21	320	R	P	-	160	R	R	N	N
22	320	R	P	P	160	R	R	N	P
23	80	R	N	P	80	R	R	N	N
24	320	R	P	P	40	R	R	N	N
25	320	R	N	P	80	R	R	N	N
26	640	R	P	-	160	R	R	N	N
27	320	R	N	N	40	R	R	N	N
28	160	R	N	-	160	R	R	N	P
29	160	R	N	-	160	R	R	N	P
30	160	R	N	-	160	R	R	N	P
31	160	R	P	-	80	R	R	N	N
32	320	R	N	P	80	R	R	N	N
33	320	R	N	-	80	R	R	N	N
34	160	R	P	-	80	R	R	N	N
35	160	R	N	P	80	R	R	N	N
36	320	R	N	-	160	R	R	N	N

ELISA - enzyme-linked immunosorbent assay; IIF - indirect immunofluorescence; HC -hemoculture; PCR - polymerase chain reaction; R - reagent; P - positive; N - negative; I - inconclusive; WR - weak reagent; – not realized. [a] Results that remained discordant between IIF and ELISA and/or for both ELISA diagnosis kits were considered inconclusive.

In 34/36 (94.4%) patients, IIF and ELISA were positive and in 2/36 (5.6%) patients these results were inconclusive after treatment. Of these cases, one patient (patient 15, Table 1) showed positive IIF, negative ELISA in two reactions by Wiener® diagnostic kit and weakly reagent in two reactions by Bioschile® diagnostic kit. The other patient (patient 20, Table 1) showed positive IIF and three different results for ELISA, negative and inconclusive in reactions by Wiener® diagnostic kit and weakly reagent in two reactions by Bioschile® diagnostic kit. These patients presented negative results in hemoculture and PCR after etiological treatment, and one of them (patient 15, Table 1) showed positive hemoculture and PCR before treatment.

Hemoculture was negative for 35/36 (97.2%) patients, including 10/36 (27.8%) who showed positive hemoculture before treatment. However, 1/36 (2.8%) patient with negative hemoculture before treatment presented a positive result after treatment (Patient 9, Table 1). PCR was negative for 29/36 (80.5%) patients and positive in 7/36 (19.5%). Furthermore, 10 (83.3%) individuals of 12 that presented PCR positive before treatment showed negative result ten years after treatment (Table 1).

The relationship between decrease of antibodies titers in IIF and results of hemoculture and PCR in chronic Chagas disease patients ten years after etiological treatment with benznidazole was demonstrated in Table 2. A decrease from 2 to 4 titers of IIF and negative hemoculture was observed in 16/36 (44.4%) patients and a decrease from 2 to 4 titers of IIF and negative PCR was observed in 14/36 (38.9%) patients.

Table 2. Relationship between decrease of indirect immunofluorescence (IIF) antibody titers and results of hemoculture and polymerase chain reaction (PCR) in chronic Chagas disease patients, ten years after etiological treatment with benznidazole.

Decrease of IIF titers in relation to beginning of treatment	Hemoculture		PCR	
	Negative n/%	Positive n/%	Negative n/%	Positive n/%
2 to 4	16/44.4	0/0.0	14/38.9	2/5.6
≤1	19/52.8	1/2.8	15/41.6	5/13.9
Total	35/97.2	1/2.8	29/80.5	7/19.5

n - number of patients; % - percentage.

4. DISCUSSION

In view of the diagnosis methods limitations for chronic Chagas disease patients post-treatment monitoring and complexity of the disease progress, in this study 36 patients were evaluated before and ten years after etiological treatment by the laboratory methods: conventional serology (IIF and ELISA), parasitological (hemoculture), and molecular (PCR).

Although chronic Chagas disease patients assessed presented positive or inconclusive results in conventional serology (IIF and ELISA) ten years after treatment it was observed a significant relationship between etiological treatment and decrease of IIF titers (titers of 160 or lower). Luquetti *et al.* (2008)[12] reported that titers of 160 or lower in treated patients can indicate a tendency toward cure, since these titer levels occur infrequently in untreated patients with Chagas disease. Moreover, the comparison of

mean antibody titers detected by IIF before treatment was significantly higher than ten years after treatment etiological. Other studies[26,27] have also observed a lower mean of antibody titers detected by IIF when groups of treated patients in relationship to untreated patients were compared, and the titers decline is accepted and recommended by other authors as a sign of cure[11,12].

The evaluation of serology methods showed two samples of patients with inconclusive results, due to results disagreement between IIF and ELISA or/and between Wiener® and Bioschile® ELISA diagnostic kits. The results difference may be related to, the kind of antigen used in each technique (different kind of soluble antigens in ELISA test and the entire parasite in IIF); *T. cruzi* genetic diversity (existence of various proteins in this parasite which cause differences in its immunogenicity)[17,28,29], and host's immunological response[30]. This disagreement in results among the serological methods corroborates with other studies[5,31], which demonstrate the challenge of using only these diagnostic techniques to follow patients etiologically treated[31].

Differences in hemoculture sensitivity have been reported[25,33]. Such differences may be related to distinct levels of parasitemia that depend on the disease phase, the parasite strain and the host immune response[21]. In the present study, ten years after treatment it was observed negative hemoculture in 35/36 (97.2%) patients, including those who showed positive results before treatment 10/36 (27.8%). Negative results in most of the hemocultures indicate that this technique has low sensitivity to monitor cure in chronic Chagas disease[34]. However, these negative hemoculture results could be related to parasitemia decrease in treated patients who previously had positive hemoculture results.

Due the long persistence of anti-*T.cruzi* antibodies after chemotherapy and the low sensitivity of most parasitological methods, PCR has been used to be a higher sensitivity method than hemoculture and a very useful tool for treated patients follow-up[35,36]. According to PCR results, therapeutic failure were observed in 7/36 (19.5%) patients evaluated ten years after etiological treatment. However, PCR results was negative in 29/36 (80.5%) patients and in 14/36 (38.9%) patients hemoculture and PCR were negative associated to decrease of 2 to 4 titers in IIF, indicating etiologic treatment benefits.

One patient showed negative hemoculture before treatment and, positive hemoculture and PCR after treatment. These different results may be related to the intermittent parasitemia that occurs in the chronic phase of Chagas disease, which can influence parasitological and molecular methods results. Due to positive hemoculture and PCR, the patient received a second treatment with benznidazole (doses from 5 to 7 mg/Kg/day, for 30 consecutive days), which resulted in persistent positive serology and PCR six months after the end of treatment. Although, the period of time between the second treatment and the post-therapeutic evaluation was short, the persistence of positive results could be explained by the presence of strain resistant to the drug, several investigations reported the existence of *T. cruzi* strains that are naturally resistant to chemotherapeutic agents[37,38]. Moreover, some investigators continue to emphasize the host-parasite interaction importance for success or failure of therapy[20].

5. CONCLUSION

In the present study, despite the absence of an untreated control group, important results were obtained when samples of patients were compared before and ten years after etiological treatment. There was decrease of IIF titers in a high percentage of patients, and PCR and hemoculture negative were associated to decreasing of 2 to 4 titers in IIF, indicating etiologic treatment benefits. In conclusion, this study collaborates with literature data and increases casuistry towards benefits of etiological treatment in chronic phase of Chagas disease[4,5,6,21,39]. Furthermore, according to Viotti *et al.* (2014)[7] greatest challenge now is changing the mindset and habits of health professionals, biased by the old paradigm in which most doctors prescribe for Chagas disease patients' only symptomatic treatment of cardiomyopathy and digestive symptoms, avoiding antiparasitic drugs.

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MICROBIOLOGICAL RESEARCH IN APPLES; EFFECTIVENESS EVALUATION OF HYGIENE METHODS WITH WATER AND SANITIZING WITH VINEGAR AND CHLORINE

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ABSTRACT

The search for healthy habits have become increasingly common among the population fruit consumption is part of a healthier diet since fruits are sources of vitamins and have low calorie. However, the intake of fruits without proper cleaning can be a vehicle for the transmission of micro-organisms that may be harmful to health, which cause food poisoning. The bacteria *Staphylococcus aureus* and *Escherichia coli* are commonly involved in food poisoning outbreaks. In the domestic environment disinfecting fresh fruits is normally done with water solution and addition products such as chlorine or vinegar. The aim of our study was to evaluate the presence of *S. aureus* and *E. coli* in apples and effectiveness of water, vinegar and chlorine in sanitizing fruit. 9 apples were acquired in a city trade Timoteo - MG. Apples in all microbiological analysis were performed without cleaning after they were divided into three groups: immersed in water, immersed in a vinegar solution and the chlorine solution. The result was that the chlorine was more effective in eliminating the bacteria observed in the samples before cleaning.

KEYWORDS: *S. aureus. E. coli*. Apple. Sanitation.

1. INTRODUCTION

The cultivation of apple has agricultural and economic global importance; Brazil is the tenth leading producer of apples in the world. It is cultivated in the country mainly in the southern states, where the climatic conditions are more favorable. The states of Rio Grande do Sul and Santa Catarina are the largest Brazilian producers, with annual production of 1.1 million tons of apples.

In recent years the production chain of apple in the state of Minas Gerais developed significantly, which allowed a more competitive position of the State in the national market[1,2].

Importantly the high nutritional value of apple, especially for its high content of vitamin B complex, vitamin C and E and the mineral potassium. Compound of fibers, particularly of pectin, provides approximately 10% of the daily requirements fibers. The daily intake of pectin is showing efficacy in controlling blood glucose levels, helping diabetics to have better health. Pectin also helps in reducing bad cholesterol, fiber adheres to the intestinal wall and prevents the absorption of cholesterol and other fats in this way also helps in losing weight[3].

The choice and the proper application of chemical sanitizer in fruits is essential for food. As apples are products ready for consumption must be free of pathogens. Thus, it becomes necessary to sanitization step of this fruit, to obtain a product microbiologically safer[4,5].

The washing of a food only with good water, can reduce about 90% of the microbiota present in fresh food, however, there is still the risk of having a contaminant in the food; therefore, it is important to perform sanitization[6].

Sodium hypochlorite is the group of sanitizers compounds most widely used due to the low cost, product availability and increased antibacterial activity. This sanitizing interferes with the transfer of nutrients, reacts with membrane proteins from microbial cells and thus causes reduction of microbiological cell constituents[4,5,7].

The vinegar, comprising an acetic acid solution has antibacterial characteristics due to reduced cell internal pH which hinders the transport through the cell membrane and inhibit the glycolytic pathway[8].

The foodborne illnesses are mostly related to the quality of food which can be contaminated by pathogenic and opportunistic micro-organisms or toxins produced by them, that produce symptoms such as vomiting, diarrhea and abdominal pain[9].

The bacterium *Escherichia coli* is an important microorganism associated with cases of food poisoning, apart from being a marker of faecal contamination, because the bacteria inhabiting the intestine of warm-blooded animals

such as man. *E. coli* has the ability to ferment sugar into carbon dioxide, acids and alcohol, is aerobic and facultative anaerobic. His ideal temperature for growth is between 30 and 37 °C and optimum pH between 7.2 and 7.5. The presence of *E. coli* suggests contamination by sewage or feces, also indicates the failure in handling or packaging, which in turn compromises the quality of food and consumer health[9,10,11].

The bacterium Staphylococcus aureus is commonly associated with diseases transmitted by contaminated food. The poisoning occurs due to heat-stable enterotoxins produced by bacteria while it multiplies in foods. It is a bacterium that has no requirements for growth, can grow at a pH above 4.8 and a minimum temperature of 8-9ºC. Most strains are able to produce one or more types of enterotoxins that cause gastrointestinal symptoms during infection, usually occurring between 1 and 6 hours after ingestion of contaminated food. Enterotoxins remain stable in the food surface without compromising the sensory characteristics of the product, making it difficult to identify the contaminated fruit and so the need for disinfection prior to consumption[10,11].

The objective of this study is to assess the antimicrobial efficacy of sanitizers commonly used in the domestic environment: vinegar and sodium hypochlorite and water in eliminating the bacteria *S. aureus* and *E. coli* in apples from a popular market.

2. MATERIAL AND METHODS

They used nine apples, from a commercial setting in the city of Timoteo - MG, all were kept in the establishment without any protection and at room temperature. The samples were placed in a plastic bag and taken to a laboratory located in Timoteo, Minas Gerais, where the analyzes were initiated on the same day. For the selection of apples the following characteristics were observed: color, uniform size, no stains or deterioration.

Research micro-organisms apples before cleaning and sanitization

The apples were submitted to tests for bacteria in a sterile environment. Moistened sterile swabs were used in 0.9% NaCl solution for sample collection. The swabs were passed across the top and sides of each apple, after, were immersed in the enrichment medium thioglycollate. It was then suitably incubated for 24 hours at a temperature of 35 ± 2 °C. The samples which received no growth in 24 hours incubated continued for another 24 hours. After the stipulated time was made a visual analysis of Thioglycolate environment in which it noted the turbidity of the medium. The turbid media were transferred to the culture media Agar MacConkey Agar and Mannitol Salt.

The study also examined water, sodium hypochlorite and the vinegar before being used for disinfection of samples in order to identify possible contaminants in solutions. A 1 mL aliquot of each was sown in thioglycolate medium enrichment and incubated at 35 ± 2 ° C for 24 hours. The samples which received no growth at 24 hours remained incubated for another 24 hours. After the stipulated time was made through a visual examination of thioglycolate was observed in the samples obtained turbidity of the medium or not.

For the research of bacteria were made seeding in liquid and solid media in accordance with the practices script classes Okura MH, Rende JC[12].

Micro-organism research after the sanitization of apples

The samples were separated into groups to be subjected to sanitization process and subsequent evaluation of the effectiveness of each sanitizing agent separately. The samples were divided into 3 groups: Group I was left immersed in 1L of water for 15 minutes; Group II was immersed in vinegar solution 60% for 15 minutes; and Group III was immersed in the sodium hypochlorite solution at 1.8% for 15 minutes. After that stage, it was conducted to collect a new sample with a sterile swab the surface of each apple. It was then suitably incubated for 24 hours at a temperature of 35 ± 2 °C.

The samples which received no growth at 24 hours remained incubated for another 24 hours. After the stipulated time was made a visual analysis of thioglycolate environment in which it noted the turbidity of the medium. The turbid media were transferred to the culture media Agar MacConkey Agar and Mannitol Salt. After the solutions used for sanitizing apples and water were sown at a rate of 1ml of each solution in thioglycolate medium enrichment. It was then suitably incubated for 24 hours at a temperature of 35 ± 2 ° C. The samples which received no growth in 24 hours incubated continued for another 24 hours. Following the stipulated time it was made a visual analysis of Thioglycolate environment in which it noted the turbidity of the medium.

Identification of micro-organisms that obtained growth

To verify the presence of bacteria was carried out the ringing samples grown in thioglycolate medium Mannitol Salt agar for the media, which is a selective medium for growth of Staphylococcus and for the detection of E.coli was used to MacConkey agar; it is a selective medium for Gram Negative.

Furthermore, we performed the positive control of *S. aureus* and *E. coli* with ATCC strains 25923 and 25922 respectively, provided by the National Quality Control Program (PNCQ). These samples were seeded in media used in research time and temperature equal to testing.

For the control of possible contaminants, sample collection of handler nasopharynx was performed. The analy-

sis was then likewise that analyzes apples, used the same culture media, supporting procedures and tests.

For identification of *S. aureus*, were made biochemical test catalase and coagulase. Through enzyme catalase bacterium possesses the capability of fermentation and formation of gas evidenced by the presence of bubbles in a glass slide post two drops of hydrogen peroxide and with the aid of a bacteriological loop adds the colony of the bacteria under study if there is the formation of bubbles the result is positive. After the catalase for the positive test is carried out coagulase test, based on the ability of the enzyme to induce coagulation of plasma. On a glass slide blends two drops of 1% rabbit plasma in sodium citrate and the colony of the bacteria under study; observed clot formation, if the result is positive[13].

To perform the identification of *E. coli* were made biochemical tests motility, lysine decarboxylation of glucose fermentation and gas production, hydrolysis of urea, production of hydrogen sulfide (H_2S), fermentation of sucrose, L-Tryptophan deamination (LTD) and Indole production[14].

To conduct these tests was used for person Rugai modified medium and Silva which is used to identify the major species of Enterobacteriaceae, for the identification of *E. coli* bacteria the following expected results: positive motility, lysine-positive decarboxylation, glucose fermentation-positive, positive gas production, hydrolysis of the urea-negative production of hydrogen sulfide (H_2S) -negative, fermentation of sucrose-negative, LTD-negative and production indole-positive[14].

3. RESULTS and DISCUSSION

According to Resolution (RDC) No. 12, January 2001 ANVISA (Brazil), it takes regular action in the sanitary control of food, and regulation of microbiological standards, so that is greater food protection. It is possible to find at the market several trademarks sanitizers chemically consisting of sodium hypochlorite, which due to its low cost and ease of acquisition, are most used in society[4,15]. Vinegar, consisting of acetic acid, has sanitizers features and its use is very common among the population due to its low cost and easy access. Are commonly found both facing commercial food service establishments and in the home environment[16,17].

According to the results of the sample handler, has verified that the handler is a carrier of the bacterium *S. aureus*, but in order to not be any kind of contamination, the practices followed biosecurity rules, with the use of Protective Equipment individual (EPI's) and the laboratory where the analyzes were carried contains all the Collective Protection Equipment (CPE's) required[18].

Analyzing the sanitizing the results show the presence of bacteria in all samples, as shown in Table 1. As can be seen, 66.6% of the samples indicated the presence of *S. aureus* and 44.4% of the samples indicated the presence of *E. coli*. With these results it is clear that the consumption of this fruit without any cleaning or sanitizing is a risk, since these are potentially pathogenic bacteria. Furthermore, *E. coli* is considered a health marker. What may indicate contamination in irrigation water, the presence of warm-blooded animal feces through the steps of planting, transport, storage and commercialization of samples.

Table 1. Microbiological analyzes apples without cleaning, Timoteo-MG, September 2015.

	Presence *S. aureus*	Presence *E. coli*	Presence Bacteria
Sample I	+	+	+
Sample II	+	+	+
Sample III	_	+	+
Sample IV	+	_	+
Sample V	_	_	+
Sample VI	+	_	+
Sample VII	+	_	+
Sample VIII	+	_	+
Sample IX	_	+	+

Although the goal of this work is not quantitatively assess the presence of *E. coli* in apples, the National Commission on Norms and Standards for Foods (CNNPA) regulates the presence of up to 2x102 / g fresh fruit. However, the committee says, "*should be made determinations of other micro-organisms and / or toxic substances of microbial origin, in all kinds of fruit, each time you make it necessary to obtain data on the hygienic and sanitary conditions of this class food, or when there are food toxi-infections*" so whenever there is suspicion of fruit contamination it can be decontaminated if properly used effective sanitizer[19].

As can be seen the sanitized apples with water only obtained the elimination of *S. aureus* and *E. coli*, however, was not good at removing other bacteria that can also be potentially pathogenic. Although the water does not have sanitizers property should take into account that according to Ordinance 36 of January 19, 1990 the Ministry of Health free chlorine value in all drinking water distribution points should be 0, 2 mg / L, and thus may have been an influence in our results[20].

The results of the samples which have passed through the cleaning process with water, Group I, can be observed in Table 2.

Table 2. Microbiological analyzes apples, Group I (sanitized with water), Timoteo-MG, September 2015.

Group I	*S. aureus*	*E. coli*	Bacteria
Sample I	_	_	_
Sample II	_	_	_
Sample III	_	_	+

The results of analysis of samples of Group II, sanitized with vinegar, showed growth of bacteria, as can be seen in Table 3. It is possible to observe the development

of *S. aureus* in two of the three samples, concluding that vinegar notIt was effective in sanitizing fruits. By comparing the results in Tables 2 and 3 it can be seen that both water and vinegar were ineffective in eliminating the bacteria present in the analyzed apples.

Table 3. Microbiological analyzes apples, Group II (sanitized with vinegar), Timoteo-MG, September 2015.

Group II	*S. aureus*	*E. coli*	Bacteria
Sample IV	+	_	_
Sample V	_	_	_
Sample VI	+	_	_

Table 4. Microbiological analyzes apples, Group III (sanitized with sodium hypochlorite), Timoteo-MG, September 2015.

Group III	*S. aureus*	*E. coli*	Bacteria
Sample VII	_	_	_
Sample VIII	_	_	_
Sample IX	_	_	_

The results of the samples passed the sanitization process with sodium hypochlorite, Group III are shown in Table 4. In this group sanitization was performed with sodium hypochlorite and can be observed that in sample there was no bacterial growth. Thus, the sodium hypochlorite was effective in the sanitization, which makes it safe for consumption fruits, microbiological standpoint.

Even with the sensed control possible contaminants, the search was performed on the bacteria used sanitizer solutions before and after use of the solutions. The results of this research can be seen in the Tables 5 and 6.

Table 5. Microbiological analysis of sanitizers before use, Timoteo-MG, September 2015.

Sanitizers	*S. aureus*	*E. coli*	Other Bacteria
Water	_	_	_
Vinegar	_	_	_
Sodium hypochlorite	–	–	–

As can be seen the results in Table 5, the water, sodium hypochlorite and vinegar did not show any contamination with microbial agent, validating the use of these agents in the analysis.

The results showed (Table 6) that there was no bacterial growth in the water after being used in the washing of apples. Thus, the possibility that the absence of bacteria in apples as shown in Table 2 is due to migration of the micro-organisms into the liquid fruit can not be demonstrated. On the other hand, there are two possibilities for elimination of bacteria by water: Water used the city's drinking water distribution system contains sodium hypochlorite that even at very low concentrations, can justify this absence to eliminate bacteria; or cell populations is unsatisfactory for growth in the media used. As with water, it is believed that there was a dilution of bacteria in vinegar solution precluding its growth in culture media, as can be seen in Table 6.

Table 6. Microbiological analysis of sanitizers after use, Timoteo-MG, September 2015.

Sanitizers	*S. aureus*	*E. coli*	Other Bacteria
Water	_	_	_
Vinegar	_	_	_
Sodium hypochlorite	–	–	–

In addition, the sodium hypochlorite also no bacterial growth after its use, but, given that there was no bacteria after sanitizing the apples with this product, it is clear that this is effective in eliminating the bacteria under study.

4. CONCLUSION

The selection of the sanitizing product to be used should be taken into account prior to any food consumed fresh, once the ingestion of contaminated food can lead to a great poisoning the small to the very high degree of severity. The sanitization step of the food being consumed is of utmost importance because it largely eliminates some or all of your microbial load making it safer for consumption. In this study, sodium hypochlorite was more effective in sanitizing the apples than vinegar or cleaning only with water, so only the cleaning with water as and seen widespread in society, is a risk, it should be followed by sanitization process. As an ineffective sanitizing vinegar as shown in this study, the optimal choice is sodium hypochlorite.

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SPLIT CREST: IMMEDIATE EXPANSION RIM TECHNIQUE FOR REHABILITATION OF ATROPHIC MAXILLA – A CASE REPORT

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ABSTRACT

While the deploy planning, we come across morphological changes in the intervention area and the bone volume, which is extremely important for the treatment outcome. The objective of this study is to describe the technique "Split-Crest" through a clinical case in which success was obtained. Demonstrate indications and advantages of the technique in order to gain a significant increase in bone density to achieve an excellent aesthetic and functional result. Female patient, leucoderma, 46 years old, attended the Dental Clinic of Specialization in Implantodontics of ESAMAZ, with report of early teeth loss and poorly adapted prosthesis in the upper anterior region of the pre jaw. During the clinical evaluation was observed Edentulism in the anterior arch of the jaw. Total tomographic filming was done on the jaws, the initial diagnosis was a severe resorption present in the premaxilla requiring regenerative process to achieve bone gain. During surgery the patient had immediate installation of previous implants in the region of the elements 12 and 22 through the technique of "Slplit-Crest", which consisted of two vertical cuts on the vestibular cortical portion and longitudinal osteotomy followed by the shift vestibular cortical-spongy plate. Eight weeks later, the patient had clinically significant bone gain, proving the viability and success of the technique. A minimally invasive surgical procedure with well executed manipulation of tissue grafts and accelerates the clinical outcome, the working hours by the end of the treatment is smaller, has lower morbidity and lower operating costs.

KEYWORDS: Dental implants, split crest, osteotomy, rehabilitation, atrophic maxilla.

1. INTRODUCTION

The rehabilitation of patients with insufficient bone quantity has been one of the challenges of implant dentistry. After the loss of enamel organ begins the alveolar ridge remodeling process. This remodeling affects first the bone thickness, which can compromise the prosthetic rehabilitation on dental implants[1].

In an attempt to increase lip volume, certain surgical procedures may be performed before or simultaneously with the implant placement. The technique of division and expansion of the residual ridge has been used as an alternative method to prepare the atrophic maxilla and mandible for implant insertion. Originally developed by Tatum in 1986, and later modified by Simon *et al*., in 1992 the technique achieves an immediate increase in the thickness of the alveolar ridge with simultaneous placement of implants[2].

The techniques commonly used for correction of horizontal defects of the alveolar crest are guided bone regeneration (GBR) with xenografts and membrane; autografts, that may be of intra oral origin and the region of mento or the jaw branch and extra oral taken from the iliac crest or skullcap; Horizontal Bone distraction that will be documented in this clinical case[1].

This scientific article aims to present and report the technique of Split Crest, which has been achieved successful treatment with increased thickness of the front edge and immediate implant placement, showing indications and benefits for a significant increase in bone density. The technique consists in making a longitudinal fracture on the edge, dividing it into two parts. This procedure involves the preparation of a partial osteotomy of the vertical ridge, following the palatal cortical which, being denser, limits the amount of expansion. The cortical bone is easily expanded, being moved laterally with the consequent increase of the ridge width[3].

It is required, for the use of this technique, an interposition between the cortical cancellous bone buccal and lingual/ palatal, to facilitate the introduction of instruments between the two cortical. Medullary bone ensures elasticity to the bone tissue, which is important during the

surgery time in order to occur so-called "green stick fracture" and not a total possible fracture of the bone cortex[4].

The empty space obtained from cortical, diastase, can be filled with particulate autogenous bone tissue, biomaterial or only with blood clot. The main factor for the choice of material that will be used is the size of the space to be filled, since the bone defect created is extremely favorable to repair[5,6,7].

In a study by Scipioni *et al.* (1999)[7] it was discovered a great osteogenic activity in the expanded area. The authors suggested that the space created by osteotomy in the flange undergoes a spontaneous ossification, the new formed bone allows the consolidation of the buccal wall and the palatal/ alveolar tongue and that this surgical procedure favors an optimal bone formation expanded space.

The amount of expansion obtained should allow the installation of implants with appropriate size to receive a prosthesis contour and appropriate biomechanical properties[8,9]. Simultaneous installation of the implants results in shorter treatment duration, less morbidity and therefore less cost to the patient[10].

So the technique should be well suited to achieve the desired success of treatment with implant osseointegration, a suitable prosthesis and patient satisfaction.

2. CASE REPORT

Patient O.E.A.S., 46 years old, female, systematically healthy sought care in Clinic of Implant Dentistry Specialization at ESAMAZ (Escola Superior da Amazônia) to make prosthetic rehabilitation with dental implants in the jaw region. In the clinical evaluation was observed edentulism in the anterior maxillary arch and the presence of the lower dental elements.

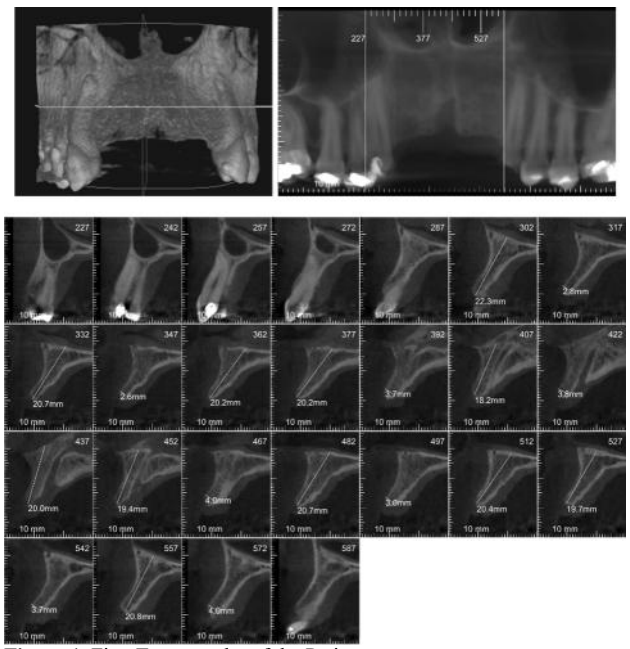

Figure 1. First Tomography of the Patient.

Total tomographic filming of the jaws was done, the initial diagnosis was a severe resorption present in the premaxilla requiring regenerative process was conducted in order to achieve bone gain. Despite the wide crest to be insufficient and the rim present a significant buccal defect, the cortical plates, vestibular and palate had interposition of medullary tissue, which characterizes a situation favorable to employment of the proposed technique.

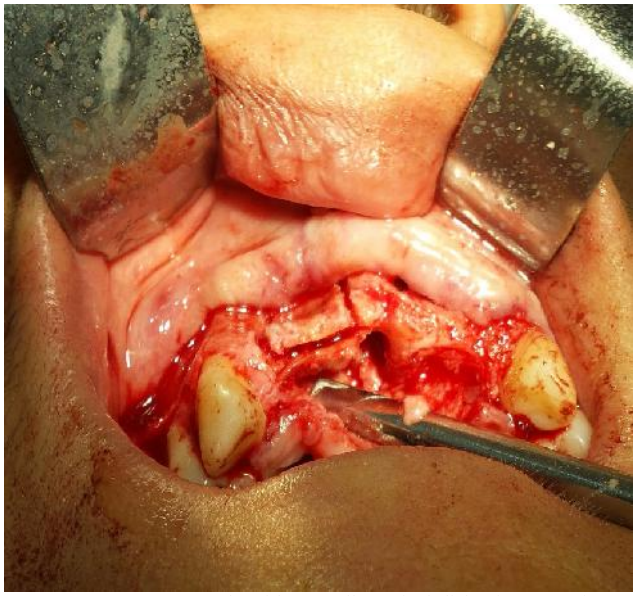

Figure 2. Osteotomy made with a small surgical disk of 3mm, using as reference the incisive canal and extending to the distal 3mm of the canine tooth.

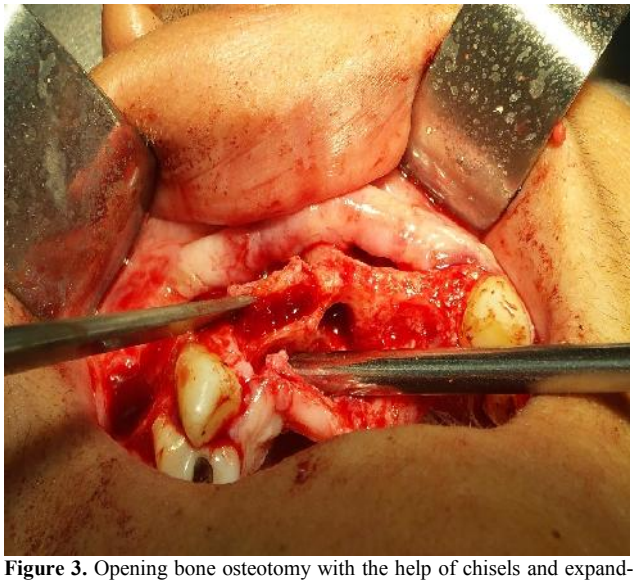

Figure 3. Opening bone osteotomy with the help of chisels and expanders building on the piriform cortex nasal cavity.

The mobile prosthesis was used as a temporary prosthesis and two were made of the same for the purpose of using one as a surgical guide. The surgical technique consists primarily of oral intra antisepsis with chlorhexidine 0.2% and local infiltration anesthesia. The local anesthesia

with the benzodiazepine Alprazolam 0.25 mg (Salutas Pharma GmbH, Barleben, Alemanha) was also performed for patient comfort. After local anesthesia with 4% Articaine (DFL LTDA, Rio de Janeiro-RJ, Brazil), an incision was made along the edge of the crest, in keratinized mucosa, providing the displacement of the flap in its local thickness. In this shift, as well as muscle insertion, especially for college entrance flange, the procedure is the displacement of the palatal mucosa intended to facilitate the viewing of its anatomy.

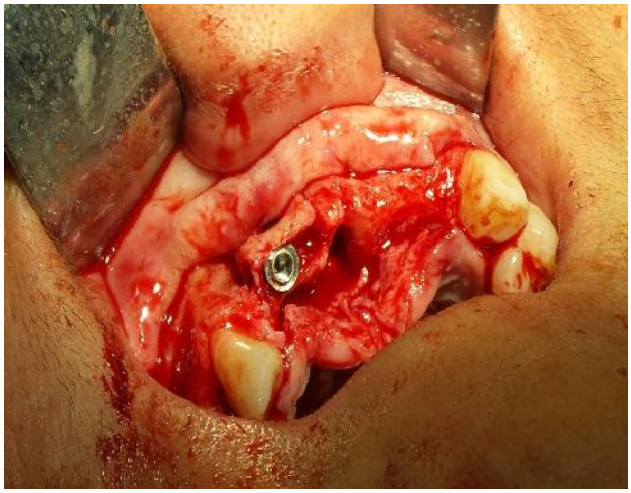

Figure 4. The implant 1 mm beyond the bony ridge in the 12 region, set in primary stability Titanium Fix® of 3.75x15.0 mm External Hexagon platform.

In this surgical time we have tried to remove fibrous inserts in the bone surface. To start the osteotomy was used a small surgical disk 3mm, using as reference the incisive canal and extending to distal 3mm canine patient. Then we proceeded to the bone osteotomy gap with the help of chisels and expanders building on the piriform cortex nasal cavity.

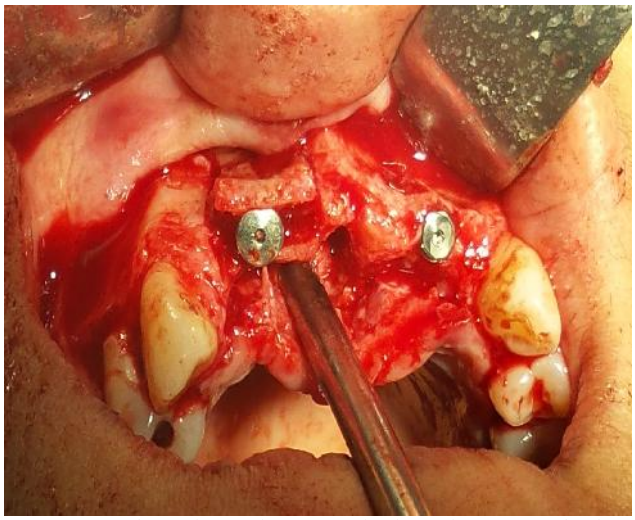

Figure 5. In the region region 22 a Titanium Fix® AS Technology (manufactured in São Jose dos Campos, São Paulo, Brasil) de 3.3x15.0 mm implant.

The advancement of the blade, through the bone, was carried out with the aid of a hammer deep enough to move the coronal cortical and have access to medullary bone. The length of the osteotomy along the edentulous ridge, extended beyond the area of the planned implants, allowing the expansion needed for insertion of the implants.

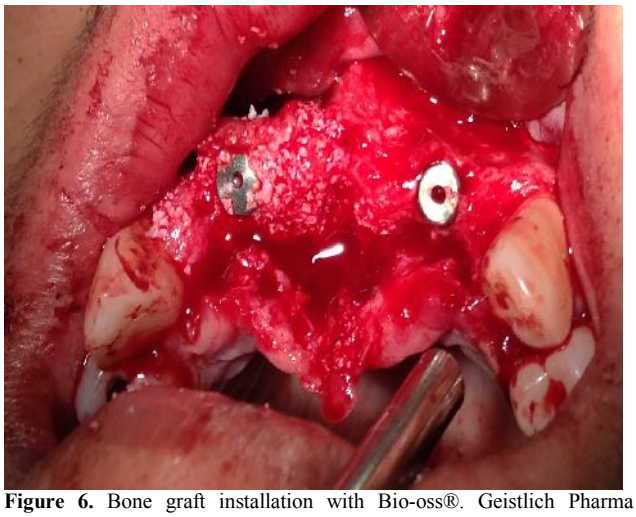

Figure 6. Bone graft installation with Bio-oss®. Geistlich Pharma Spongious Granules 0.25mm-1mm in bone apertures.

Finished the osteotomy, they used the thin chisels to promote the separation of cortical and start gentle ridge split. With the edge already expanded, we performed the conventional protocol to prepare the receptor site, 3mm to 4mm of intact bone in the apical region, for the installation of the implant in region 12 and 22. Before insertion of implants, a depth gauge was used to detect any drilling, fenestration or dehiscence of the cortical bone. The insertion was performed gradually, in a slow and careful way to expand the rim and accommodate the diameter of the planned implant.

Figure 7. Cover with collagen membrane Gen-derm® Baumer S\A Biological membrame of bovine origin – small 20x20mm.

The preparation of surgical alveolus was performed at 1200 rpm under continuous cooling with saline. We obtain

a minimum distance of 3mm from the mesial root of the canine, respecting the bone limit. The direction of drilling has taken into account the direction of a guide, favoring the biomechanics of future rehabilitation and the desire of the prosthesis. There was an undersizeddrilling and subsequently increased the surgical alveolus with bone expanders.

Figure 8. Initial appearance of the patient.

The implants were installed at low rpm to 48 rpm, with the parameter of settlement level at 1mm beyond the bone crest. On the tooth region 22 a Titanium Fix AS Technology implant of 3.3x150 mm (manufactured in São José dos Campos, São Paulo, Brazil) was inserted and on the tooth region 12 a Titanium Fix of 3.75x15.0 mm external hexagon platform. Then the procedure was followed by bone graft installation with Bio-oss. Geistlich Pharma (Bahnhofstrasse 40 6110 Wolhusen Switzerland) Spongious Ganules 0.25mm-1mm in bone gaps and cover with collagen membrane Gen-derm Bauner S/A (Mogu Mirim, São Paulo, Brazil) Biological membrane of bovine origin - small 20x20mm. After two months, when the patient returned, one can already clinically notice bone gain in the operated area.

Figure 9. Appearance of the patient's rim two months after surgery.

3. DISCUSSION

The surgical expansion technique of the rim can be a useful method the reconstruction thickness of the residual ridge, for installation mediately or immediately implants. This technique is considered less invasive, require a shorter rehabilitation and has a lower cost compared to bone grafts and membranes.

The reason may lie in the type of bony ridge where this technique can be applied, which should be considered to increase the rim only occur horizontally. The technique should only be applied when the buccal and lingual / palatal walls are separated by medullary bone[7,11,12,13,14,5,16].

Therefore, the indications are more limited when compared to other techniques. For proper installation of the implants it is important to use surgical guide that can help prevent unfavorable inclinations and achieve primary stability. Some authors state that, for the implant to achieve perfect primary stability, it is necessary to prepare from 3mm to 4mm of intact bone in the apical region[2,17].

The literature states that the flange can be expanded with the use of various techniques and surgical osteotomies instruments. The most prevalent technique studied was that of longitudinal fracture in "green stick" or "Split crest" of the buccal bone wall, where two parallel bone incisions in the buccal bone wall were joined by an incision in the bone crest[5,18,19].

The case presented used the expansion technique of the alveolar ridge combined with bone grafts and/ or membranes as reported by authors such as Simon *et al.* (1992)[2], Engelke *et al.* (1997)[18], Wijs & Cune (1997)[11].

The technique has many advantages over different techniques, it takes advantage of the inherent flexibility quality of cancellous bone. Jawbone is flexible and can be manipulated slowly to improve the quality (compression and corticalization) and expand to the desired width. It works fairly well the upper jaw bone as compared to the mandible, being more porous bone, especially D2, D3 and D4[20].

But there are some disadvantages to this technique. It cannot reach vertical bone height. For the surgeon performing the procedure is necessary skill and subtancial learning curve. It is more difficult to perform on a single tooth than in large toothless areas where the operator can take advantage of the elasticity of a long bone crest[20].

We consider this case a success because the implants are considered satisfactory if they presented no discomfort to the patient (such as pain), absence of peri-implant infection with suppuration, lack of mobility and radiolucency around the implant.

4. CONCLUSION

The Split crest technique is a bone enhancement procedure, trustworthy and reliable when properly indicated and well planned. The end result proved satisfactory,

achieving the desired objectives in the aesthetic and functional point of view. Reducing discomfort, morbidity, labor costs and providing quality solutions for the patient.

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RESORPTION INTERNAL WITH EXTERNAL COMMUNICATION: CASE REPORT

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ABSTRACT

The inner root resorption is a physiologic or pathologic process that starts within the pulp chamber and the root canal. As a result, it generates the loss of some mineralized structures such as dentin, cementum and alveolar bone, which may lead to impairment of the dental element. The evolution of this process can cause a perforation of the wall of the root canal leaving communication in pulp with the periodontal. Its pathogenesis is multifactorial, which is usually related to trauma, caries, pulpitis, orthodontic movement, deep restorations, among others. The diagnosis is only possible by routine radiographs, being asymptomatic. Usually it has a surrounding radiolucent image in the root canal or pulp chamber, clearly circumscribed. This paper reports a case of internal resorption with external communication, which aims to demonstrate that it is possible to obtain a satisfactory result that associated with the early diagnosis and correct treatment. We conclude that because of internal resorption be asymptomatic and unpredictable, from multiple sources, it is of paramount importance to establish an early and detailed diagnosis through radiographs and laboratory tests for a correct treatment planning and obtaining favorable results.

KEYWORDS: Root canal, pulp-inner-chamber, root resorption.

1. INTRODUCTION

According Soares & Goldberg (2001)[1], endodontics is the field of dentistry that studies the morphology of the pulp cavity, physiology and pathology of the dental pulp, and the prevention and treatment of pulp change and its effects on the periodontal tissues. Briefly, this specialty takes care of prophylaxis and treatment of endodonto and the apical and periapical region.

The endodonto is represented by dentin, pulp cavity and pulp, while the apical and periapical region are constituted by the tooth supporting tissues, which are cementum, periodontal membrane wall and the alveolar bone[2].

Paiva & Antoniazzi (1991)[3], state that "little by little the professionals come comprising the multiple problems of endodontic therapy and, therefore, convinced that no surgical or medical procedure is necessary outside the confines of the root canal".

The resorption is a loss of mineralized structures, the result of clastic cell action. As for location, it is commonly classified into internal and external, although the two types of communication can take place in one tooth[4,5]. The nature of the resorption process, Neville *et al.* (2004)[6] classified the injuries inflated tory resorption and replacement resorption.

According Lopes *et al.* (2004)[7], has the resorption occurrence and location is given by traumatic and / or infectious factors such as odontoclasts called cells, resulting generally from inflammatory cells and systemic factors. In fact, there are several factors that give rise to internal resorption where we can mention orthodontic movements, bruxism, decay, trauma, periodontal infection, iatrogenic procedures, among others.

In normal cases, the pulp wall is protected from the action of osteoclasts and by odontoblasts layer and pre-dentin, which prevents them from coming into contact with the mineralized dentin[8]. The cells involved are osteoclasts, multinucleated giant cells found in Howship gaps, which have signed only in the mineralized tissues, destroying these tissues, in case local conditions for it. As happens the trauma, a displacement of odontoblasts, where the mineralized dentin is exposed to the action of these cells resorptive[9].

In order to start the resorption process is necessary for the tooth introduce yourself with pulp vitality. Cease to pulp vitality also stops the growth of resorption, however total pulp necrosis can cause acute apical periodontitis and take the patient to the development of painful symptoms[10].

The internal resorption occur on the surface of the walls of pulp cavity, already affect the external walls of the root, specifically from the root in the root region, as well as the coronary portion. When the internal resorption is the image shows the increase of the channel light is typically a radiolucent area, symmetrical, ovoid or round-

ed, well-circumscribed and may involve one or more walls of the root canal. That is, it is confined within the channel, unless there is communication. These are the cases where untreated internal resorption can progress to the outer wall of the root and give thus rise to a combined internal-external resorption. The image that identifies the external is presented by a bone thinning[1,11].

The diagnosis of change requires a broad approach to the patient, such as physical examination, medical history, and laboratory tests. With interaction of these factors, it can identify the disease and thus establish a correct treatment plan. Early diagnosis is essential to achieving success in treatment. Another factor to be considered in the differential diagnosis is conducting several periapical X-rays from different angles, as the internal resorption tends to follow the beam, and the external, usually away from the x-ray beam. In the initial stage, the x-ray is not effective to diagnose root resorption[12].

The treatment of internal resorption consists in performing a pulpectomy, in which seeks the removal of the pulp and the remaining tissue, i.e. during biomechanical and subsequent preparation of shutter every portion of the channel, preceded the application of intra-channel medication, being one or several sessions in material a calcium hydroxide base, thus promoting necrosis of all clastic cells present at the site, due to the high pH material and the alkalization of the medium ceases, thus the resorption process[13,14]. The purpose of this paper is to report a case of combined internal-external resorption, considering the importance of the subject and its association with endodontics. Where the goal is to comment on its etiology and pathogenesis of combined resorption, as well as clarify the methods of diagnosis and a brief analysis on the treatment of this type of injury.

2. CASE REPORT

Male patient, 34 years old, attended a private dental office in the city of Umuarama, Parana State, Brazil, reporting the presence of a "ball of pus" in the upper right maxilla. During the interview, reported the history of a blow to the region, which took place five years ago. I never had any sensitivity in the region and noted the appearance of this "ball of pus" two weeks ago, seeking thus a professional help.

Was held radiographs and CT of the region through the TC in region of element 11, there has been a suggestive radiographic image of internal resorption in the middle third of the root area (Figure 1).

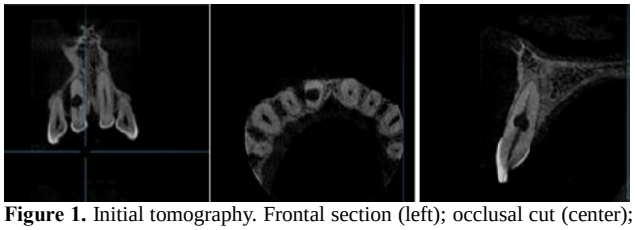

Figure 1. Initial tomography. Frontal section (left); occlusal cut (center); side section (right).

The patient has clinically, the presence of a fistula, which was screened using a cone of gutta percha accessory. After periapical radiography confirmed the origin of the pus (Figure 2). It was also carried out the pulp vitality test by heat test to cold, presenting negative for vitality. Thus, it shuts the diagnosis of an internal resorption with periodontal communication distal.

In the first session held after the prophylaxis and absolute isolation element involved only tooth 11, it was held, then the crown opening and obtained access to the mouth of the channel. Removing the pulp chamber ceiling was taken and carried to the path location operation of the channel element 11 with pre-bending maneuvers of endodontic files, it was possible location and operation of the entire length of the primary conduit of said element. (Figure 2).

Figure 2. Initial radiograph. Performing tracking fistula through an accessory cone gutta percha (left); location and operation of the whole length of the root canal (right).

Proceeded to maneuver chemi-mechanical root canal preparation using the S ProDesign files in sequence proposed by the manufacturer. As auxiliary chemical substance was used chlorhexidine gel 2%. After completion of instrumentation, we proceeded to energization of the auxiliary chemicals, carried out according to the protocol proposed by van der Luiss, but using different auxiliary chemicals that it uses only a power-maneuver, where employs uncertain of specific ultrasound for endodontics (Irisonic - HELSE, Stream - Black, Brazil) and stirred saline for 20 seconds, 17% EDTA for 20 seconds and again serum, 20 seconds.

After finishing the dentin qualification process, the insertion of the PA + propylene glycol Calcium hydroxide was performed as intracanal medication over a period of 15 days (Figure 3).

Thereafter, in the second consultation, the patient reported complete remission of the fistula, which was confirmed clinically. We proceeded then to a new dentin qualification, channel drying and its filling using MTA (Angelus, Londrina, Brazil) as filling material because it was

considered the material that has the best chemical, physical and biological properties for that contact direct with bloody tissues.

Figure 3. First session concluded with intracanal medication and provisional coronal sealing.

The MTA was handled with saline to the viscous consistency, where he was taken inside the conduit with the aid of a spiral Lentulus. They were held then periapical radiographs for evidence of complete filling of spaces (Figure 4).

After the final filling, the tooth was referred to the final restoration in composite resin and the six-month follow-up was carried out by X-ray examinations for a period of three years.

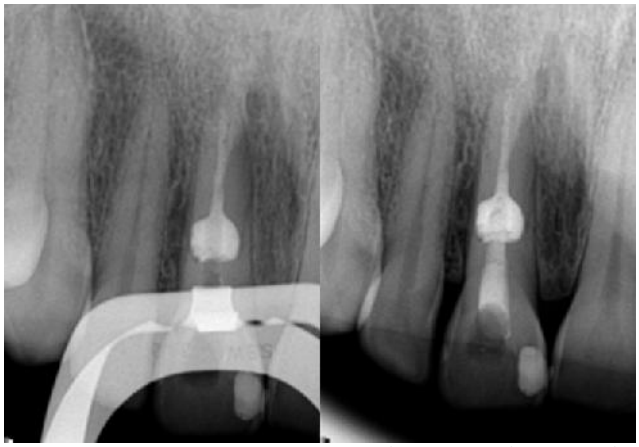

Figure 4. Final radiographs, immediately after the end of treatment for the complete filling of the canal confirmation.

After that, another x-ray and a CT scan was also performed to show the complete filling of dentin reabsorbed space, as well as bone formation in the affected region (Figures 5 and 6).

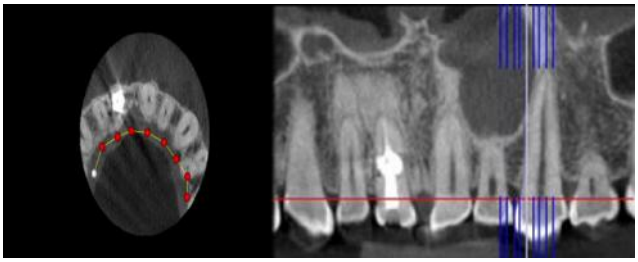

Figure 5. Final tomography.

Figure 6. Final radiography of the case.

3. DISCUSSION

The internal resorption is a pathology that rarely occurs, which affects one tooth[7,15]. Due to its location in the mouth, front teeth have a prevalence of 90% of internal root resorption, because they are more vulnerable to the impacts[16].

Such resorption is associated with several conditions, but based on the reviewed literature, most of the authors revealed that dental trauma is a major etiologic factor in internal resorption, and is asymptomatic and not showing clinical signs in most cases. In addition to trauma, other causes are suggested, such as periodontal infections, chemical injuries, occlusal forces and excessive orthodontic[17].

The endodontic treatment of teeth with internal resorption is complicated by the difficulty of removing clastic tissue cavity, where the walls are irregular and often with root perforations. With this, the remaining soft tissue may

invaginate, thus preventing scarring, only if

there is communication with the periodontium there is communication with the periodontium. However, this soft tissue can be dissolved by irrigation, but in our case it was done to neutralize the organic content of 2% chlorhexidine gel and the chlorhexidine has nonsolvent activity on tissues, however, this is overcome the gel form due to their rheological action capacity and lubricating of endodontic instruments during mechanical action of these. It can also be removed from that tissue invaginated by instrumentation and, starting from various intracanal medication switching, based on calcium hydroxide which in turn will promote the alkalization of the medium occurring death and elimination of osteoclasts and other resorptive cells in affected surface, also preventing a relapse reabsorption[18].

We chose this chemical auxiliary, as in CT examination revealed the conduit communicating with the periodontium in the middle third region of the root, which contra indicates the use of sodium hypochlorite because it could cause damage to the periodontal that region specific and also chlorhexidine in different concentrations, presents an antimicrobial activity of broad spectrum including Gram-positive bacteria, Gram-negative bacteria and fungi have their antimicrobial activity increased through the substantivity effect, biocompatibility is acceptable, relatively absence of cytotoxicity.

Ferraz *et al.* (2007 apud MARION *et al.*, 2013)[19] in their study showed that 2% chlorhexidine gel has many advantages over chlorhexidine 2%, while having antimicrobial properties and substantivity of biocompatibility and the like. The chlorhexidine gel lubricates the walls of the root canal, reducing the friction between the tool and the surface of the dentin, making the instrument easy, improving the performance of the instrument and reducing the risks of breaking this into the channel. Moreover, to facilitate the instrumentation, chlorhexidine gel improves the removal of organic tissue which compensates for its inability to dissolve them. The chlorhexidine gel leaves almost all open dentinal tubules because its viscosity keeps the debris in suspension, decreasing the formation of smearlayer, which does not occur with the liquid medium. Furthermore, the gel formulation can maintain the "active ingredient" of chlorhexidine in contact with the microorganisms for a long period by preventing its growth.

Chlorhexidine can be applied as an antimicrobial agent during all phases of root canal preparation, including disinfection of the surgical field during the instrumentation of root canals, chemical-mechanical preparation before clearing and foraminal enlargement (GOMES *et al.*, 2013 apud MARION *et al.*, 2013)[19].

Some authors recommend preceded calcium hydroxide exchanges for the purpose of forming a barrier to mineralized tissue which occurs less or no shutter on 20.21. A good condensation is considered essential to obliterate irregularities and defects of the channel. To this end, techniques thermoplasticized, has been recommended in the literature[22].

The resulting information of the diagnostic process directly influence clinical decisions, and with this survey data leads to better treatment plans and potentially a more predictable outcome. The accurate diagnosis of these injuries is critical to choose and successful treatment. It is highly desirable that the diagnosis is made at an early stage of development of the injury, but in many cases, can only be detected at a stage already evolved and may result thus in tooth loss[23].

Establishing the diagnosis, remove the pulp tissue immediately together with granulation, where the therapeutic is linked to the progression of resorption. It does not occur when the root perforation, it is recommended to immediate endodontic therapy, in order to paralyze the process. Drilling taking place below the bone level, it is advisable to attempt to remineralization with calcium hydroxide in the long run and subsequent root canal filling[24].

In our case, only one tooth was involved, where there was an internal resorption communicating with the periodontium after a physical trauma. The root canal filling was performed by the same technique that consists in filling the canal with MTA, providing the closing of pulpo-periodontal communication through its biocompatibility, bactericidal effect and good sealing. With this we obtained a favorable outcome.

In determining the prognosis of a tooth endodontically treated, especially in cases of resorptions, the dentist must in all cases notify the radiographic control convenience of the patient that must be carried out every six months, for at least two years. These periodic visits to the dentist is of prime importance to obtain a prolonged success of the case.

4. CONCLUSION

It is concluded that a history of the disease should be well elucidated for a good treatment. Early diagnosis of these injuries is decisive for the choice of treatment and prognosis, that is, the earlier the root resorption is diagnosed, the better the prognosis and successful treatment. This through a thorough medical history, and laboratory tests such as radiographs and vitality testing.

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REGRESSION OF INJURY PERIAPICAL EXTENDED THROUGH TREATMENT ENDODONTIC CONVENTIONAL: CASE REPORT

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ABSTRACT

The endodontics is the dental specialty concerned with the prevention, diagnosis and treatment of illness or injury of dental pulp, responsible for developing the tooth. The root canal treatment is a safe and effective means of preserving teeth that would otherwise be lost. This paper reports a case where the patient has a significant extension of apical periodontitis in the jaw region, reported the procedures and periods required for the conventional endodontic treatment obtain an effective result the injury front. Monthly exchanges of medications to intracanal calcium hydroxide base were performed, and a rigorous clinical and radiographic control, until it actually confirm the results. Faced with this, we suggest that this employee therapeutic protocol was effective to fight infection endodontic present in this case, successfully confirmed through monitoring, clinical, radiographic and biological silence.

KEYWORDS: Endodontic treatment, apical periodontitis, calcium hydroxide.

1. INTRODUCTION

The endodontics is the dental specialty that seeks the prevention, diagnosis and treatment of diseases or injuries of the dental pulp, responsible for the development of the tooth and also the periodontal apical region. The treatment of pulpal diseases and periapical regions is a safe and effective means of preserving teeth, otherwise, would be lost[1].

The chemical-mechanical preparation of the root canal system search, and shape this, sanitize it by removing the septic-necrotic content. Treatment should follow scientific and biological principles to follow a secure protocol, minimizing the chances of failures and accidents, because besides the microbial origin, errors may be due to factors like incorrect diagnosis, technical failures and lack of professional skill difficulties inherent in anatomy among others[2].

However, the development of technical and scientific knowledge, instrumental improvement and equipment and especially the professional development with the advancement of scientific research, have decreased the incidence of endodontic failures. When present, the resources for endodontic treatment are in many cases unsatisfactory in point of cases of tooth loss being reduced[3].

Thus, apical periodontitis is commonplace in endodontics and its treatment may be just the endodontic treatment with the use of specific intracanal medications for each case, not necessarily surgical, behold, this hypothesis is applied only to persistent injuries, where only the channel decontamination do not is sufficient for its successful treatment.

The intracanal medications also are paramount to the success of treatment, especially in necro-pulpectomy. Calcium hydroxide is highly used in endodontic treatment. By having an alkaline pH, it acts by contact preventing microbial growth and thus survival. In addition to this property, it serves as a physical barrier inside the root canals, making it even more bacterial growth. Another feature is that it has an anti-inflammatory action and creates favorable conditions for the repair of periapical tissues[4].

This paper presents the treatment of a wide apical periodontitis, the teeth 21 and 22, in patients with 31 (thirty-one) years, where intracanal medication changes were made (calcium hydroxide PA + propylene) in the course of approximately one year, on-the showed significantly positive responses to treatment.

The results underscore the importance of conventional endodontic treatment, and shows as the first line option to an apical periodontitis, with no need to resort to surgical procedures for resolution of the case, unless the retreatment is not successful, and infection, thus persists.

2. CASE REPORT

Patient 31 years old, male, attended the Dental Clinic

of UNIPAR Umuarama, Parana Satate, Brazil, reporting a spontaneous sensitivity in the left maxilla. During the interview, he reported that this sensitivity was with him for years and in recent months had been rising. Clinically, there was edema in the periapical region of the elements 21 and 22 which, during palpation, showed a softened tissue with bone involvement. These elements not responded positively to vitality test as scheduled. Radiographically, there has been a large periapical lesion involving the elements, being prompted for a cone beam CT scan to get a better picture of the injury, as shown in Figures 1a, 1b, 1c and 2.

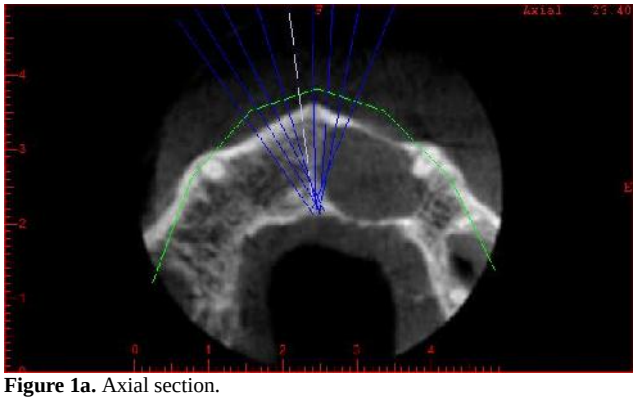

Figure 1a. Axial section.

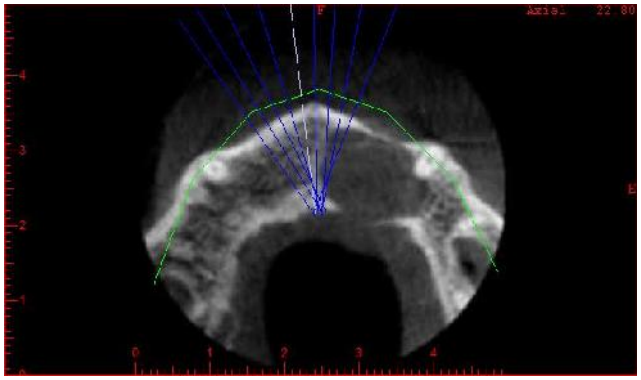

Figure 1b. Axial section.

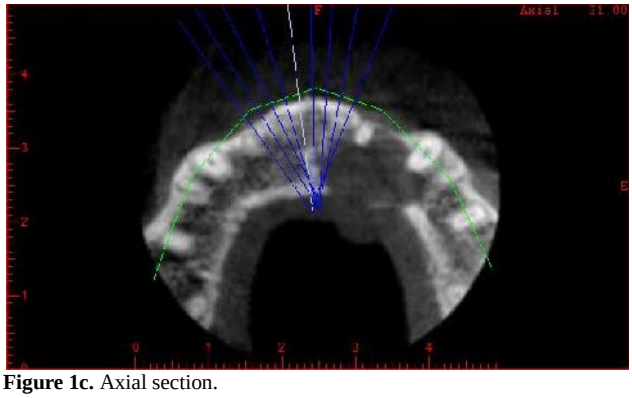

Figure 1c. Axial section.

The Figure 1a shows the extent of injury that at first calcium hydroxide exchanges were planned and later surgery. Due to the size of the lesion, we believed not be possible to resolve only with conventional treatment.

The Figure 1b shows the disruption of the palatal cortical therefore planned surgical treatment of the lesion to enucleation.

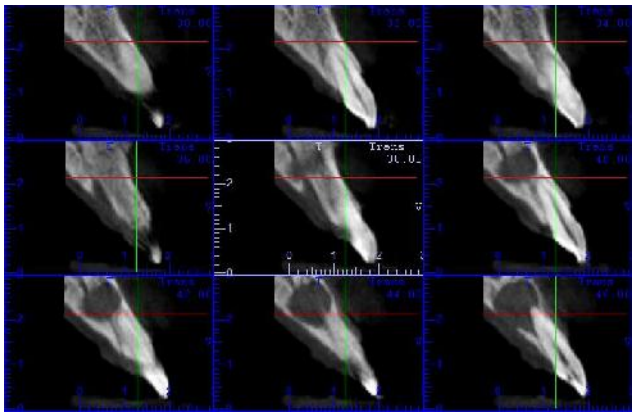

Figure 2. Sagittal section.

In the first session held after the prophylaxis of the elements involved, anesthesia of the area was carried out using two tubes of mepivacaine (DFL. RJ-RJ. Brazil), and absolute isolation from the elements. Was performed, then the removal of the filling material and obtained access to the mouths of the channels possible. The location was made and the exploitation of the conduits using hand files (Malleiffer, Dentsply - Switzerland). Then we performed the complete mechanical preparation, with the use of roundabouts ProDesign S (Easy, BH, Brazil), following the use of protocol recommended by the manufacturer.

A simple sequence of ProDesign S, consisting of 4 files, 2 files Orifice Shaper, 1 Lime apical patency and 1 lime finish was used. This system excludes the use of Gates glidden.

The first step was the pre-enlargement wave, with file # 30/10 (white) in 950 RPC, used in brushing movements, making lateral pressure down to mm, to the point of curvature. Always irrigating with sodium hypochlorite 1%.

We took the # 25 file / 08 (yellow) in 950 RPC, always brush movements within the conduits, 2mm beyond the first file (white). Always irrigating every file exchange.

Second step was to obtain the patent, which is done with file # 25/01 (red) in 350 PRC used in motion "short pecking" slow and short to reach to the foramen patency. Getting the estimated length of the channel, we performed odontometry with an apex locator.

The last step is a final shaping with file # 20/06 (Blue) in 350 PRC used in a brushing motion until the set working length.

Still in the first session, immediately after the biomechanical preparation, one dentin qualifying was held, alternating the use of EDTA 17% with sodium hypochlorite 1%. Performed to complete drying of the ducts and inserting an intracanal medication (calcium hydroxide PA + propylene glycol), which was intracanal for a period of 21

days. Successive changes of this medication were held for a period of four months, where it showed a positive response to the drug, and the injury had been regressing as shown in Figure 3.

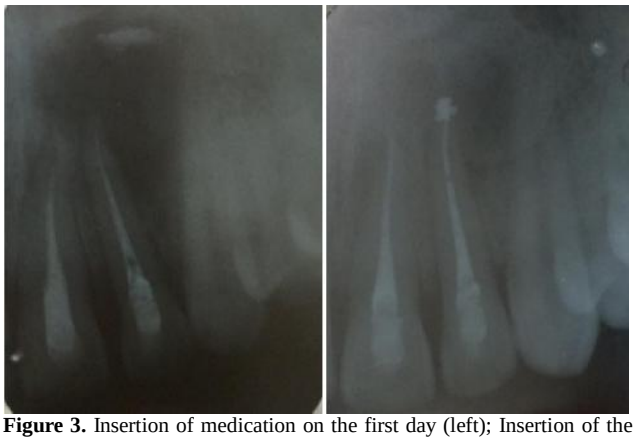

Figure 3. Insertion of medication on the first day (left); Insertion of the medication after 7 months (right).

Figure 3 (right) shows a significant regression of the lesion, being discarded surgical chance to resolve the case, and decided to continue with sudden changes of calcium hydroxide P.A.

After approximately one year, there was a significant regression of the lesion, opting for shutter elements with cement sealer 26, after five months, where completing one year of treatment Figure 4.

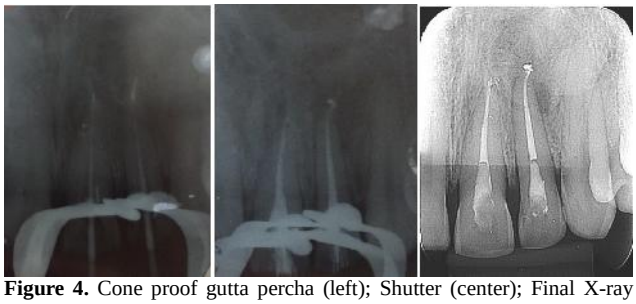

Figure 4. Cone proof gutta percha (left); Shutter (center); Final X-ray (right).

After 1 year, approximately conducted final X-ray (Figure 7) showing the effectiveness of the treatment, noting bone formation, demonstrating the success of the treatment in the clinical case without surgical intervention.

3. DISCUSSION

The apical periodontitis consists of a radiolucent image with sharp edges, found in the apex region. Usually these types of injuries do not show symptoms and are associated with teeth without vitalities in cases of endodontic origin, caused by bacteria that feed on the remains of necrotic dental pulp.

The discovery of these injuries usually happens with tests routines as periapical and panoramic radiographs, which is found radiolucent image in periapex region; then additional tests are required (in order to delimit extent of the injury) and computed tomography cone beam (CBCT) in order to define the full extent of the injury and so a correct diagnosis with the planning of appropriate treatment.

CBTC shows structural relations in depth, cuts showing images, which allows visualization of the bone and dental tissues with a striking setting, enabling the diagnosis of diseases on the three orientation planes: sagittal, coronal and axial.

In such cases of periapical lesions, the first treatment option is the endodontic treatment of necrotic teeth involved, in order to decontaminate the root canal. For a regression of the lesion in cases of failure, the option is surgical treatment, making an enucleation of the lesion and apicoectomy.

The conventional endodontic treatment has undergone constant changes in recent years, due to the great evolution scientific, technological and biological, leading to increasing levels of successacial[4].

The periapical lesions of endodontic origin, develops from the host response against microbial attacks in these regions, in order to eliminate the bacteria, the lesion forms.

After cleaning and mechanical preparation of the root canal, there is a decrease in the inflammatory process and starts a repair process with fibroblast activity begins the formation of a new tissue with the same architecture and function which was previously destroyed.

Calcium hydroxide is highly used in endodontic treatment. Due an alkaline pH, it acts by contact preventing microbial growth and thus survival. In addition to this property, it serves as a physical barrier inside the root canals, making it even more bacterial growth. Another feature is that it has an anti-inflammatory action and creates favorable conditions for the repair of periapical tissues[1].

The results obtained in the treatment is said truth about the priorities of PA calcium hydroxide; proving to be effective against the extensive injury presented in this case, where sudden changes of that drug were made, and succeeding and bone formation in the damaged area**.**

4. CONCLUSION

The success of predictability in a very extensive endodontic infection becomes complicated by the possible presence of an extra-root biofilm and also related to the response of the organism to aggression. Generally, conventional endodontic therapy is the first choice, complemented surgically when necessary. If all that we have a clinical and radiographic success only with conventional endodontic therapy, showing that this is still the first choice of treatment, with high success rates.

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THE ATMOSPHERIC POLLUTION AND REPERCUSSIONS ON HUMAN HEALTH: A BRIEF REVIEW OF TOXICOLOGICAL ENVIRONMENTAL EFFECTS ON RESPIRATORY SYSTEM

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ABSTRACT

Concern about the serious effects of pollution on human health was question paramount to the development of this study, such effects, demonstrated a significant relationship with the occurrence of respiratory tract diseases. This paper describes unsystematically, toxicological effects of air pollution caused in the body, based on other literary records. In general, disorders resulting from air pollution have been addressed since the time of the Industrial Revolution, when become new sources of pollutants due to burning fossil fuels in steel industries, as well as smoke from motor vehicles, which are launched in increasing quantities in the atmosphere. Thus, our goal is to describe the effects of air pollution on human health, specifically the respiratory system, thus give rise to new research involving these pollutants and show the relevance of having established criteria for monitoring air quality in order to be inspected, justified by the fact that breathing is an essential phenomenon for sustaining life.

KEYWORDS: Air pollution, respiratory diseases, air quality standards, toxicological effects, environmental exposure.

1. INTRODUCTION

Despite progress made in recent decades in search of improved air quality, the damage inherent to human health are shown inevitable, after smoking, air pollution requires greater attention to be a relevant factor and trigger for respiratory diseases causing harmful effects to the individual short and long term, as well as other human diseases.

The interaction between man and the environment has become today, above all, an essential factor for their survival, however, there are aspects that disadvantage that sustainable thematic causing an imbalance in their own half, actions such as removing, build, consume and discard, are part of this cycle and become increasingly difficult to apply without major consequences for the ecosystem and especially for man.

Due to these facts in several countries including Brazil, air quality standards have been established and maximum tolerated pollutants, from which the exposed population would suffer damage to health. In Brazil these standards have been established by the Brazilian Institute of Environment (IBAMA) and approved by the National Environmental Council (CONAMA) in 1990 through Resolution CONAMA 03/90[1].

Although there are limitations for emission of pollutants into the atmosphere, it is estimated that in Brazil, about 13 thousand people die each year due to respiratory complications associated with particulate matter, beyond this fact air pollution also contributes to increased morbidity from respiratory diseases, cardiovascular, infectious, lung cancer and other exacerbations in the body, such as in chronic diabetes[2].

Children and the elderly are the most affected by the action of pollutants in the body, since their immune systems are less developed and less efficient with respect to an adult, respectively. The effects caused by pollution on the human body depend on the agent, the intensity and location of aggression. These effects can appear either in the upper respiratory tract, as in the lower respiratory tract, with outcome in acute phase of transient events or the development of chronic diseases of the respiratory tract[3].

The aim of this study is to describe the effects of air pollution on human health, specifically the respiratory system, thus give rise to new research involving these pollutants and show the relevance of having established criteria for monitoring air quality in order to be inspected, justified by the fact that breathing is an essential phenomenon for sustaining life.

2. MATERIAL AND METHODS

Since a pool of reflection between air pollution and respiratory diseases an investigation has been generated in order to produce knowledge on the subject. In this study, the choice was a literature review with descriptive approach. The bibliographic data used were obtained from the Google Scholar search site, SCIELO and government

to the Ministry of Environment, as well as newspapers and periodicals magazines. They were selected for the research articles in Portuguese that cover the period from 2001 to 2015.

In the survey the terms used were: air pollution, respiratory diseases, respiratory system physiology, bronchitis, asthma, pneumonia, lung cancer and air pollution, the articles were selected according to the proposed objective. A descriptive data that refer to the parameters of air quality of the city of Ipatinga - MG was used obtaining information from the database of the Municipality of Ipatinga - MG. The study was conducted between July and November 2015.

The air quality index is done by arithmetic average of 24 hours and has variables such as upper critical value and lower critical value of the index, maximum minimum concentration and the measured concentration of the pollutants. The analyzes were based on strategies: to list the literature explored evidence about the risks of developing respiratory diseases related to pollution.

3. LITERATURE REVIEW

Anatomy and physiology of the respiratory system

The respiratory system consists of: external nose, inner nose and paranasal sinuses, pharynx, larynx, trachea, bronchi and lungs. Structures such as pleura, diaphragm, chest wall and muscles that assist in the movement of the ribs also make up this system and are essential for breathing, each structure has its function and together realize the system goal is gas exchange[4,5].

The respiratory system begins to develop in the prenatal phase of intrauterine life, its mechanism is complete only after birth in contact with the external environment at this stage is the maturation of pulmonary vessels capable of transporting carbon dioxide (CO_2) and oxygen (O_2) from the lungs and thus achieve an efficient gas exchange, however the respiratory system continues to develop until 7 years. After the development of the bronchial tree, pulmonary circulation is developed in parallel with the airway, a capillary bed is then formed around each well. Oxygen and carbon dioxide need to diffuse across the alveolar epithelium. Epithelial cells from these wells, basement membrane of capillary endothelial, interstitial tissue and your present, liquid together form a tissue barrier that determines the ability of oxygen and carbon dioxide to conduct gas exchange[6].

Diseases

In general, the analyzed studies report that children are more likely to develop complications of the respiratory tract, both acutely and chronically, because their immune system is not fully developed, secondly are the elderly who also suffer from the damage due to low efficiency of your immune system[3]. Among the main respiratory tract disorders are Bronchial Asthma, Pneumonia, Chronic Bronchitis or Chronic Obstructive Pulmonary Disease (COPD) and lung cancer, which are presented below in Table 1.

Table 1. Main diseases of the respiratory tract and its symptoms.

Diseases	**Where and how it occurs**	**Symptoms**	**Effects/ exposure**
Bronchial asthma	Inflammation and airway obstruction.	They are episodic as dyspnea, wheezing, chronic cough, chest tightness usually in the evening or early morning hours.	Acute
Pneumonia	Inflammation of the lungs (alveoli) where gas exchange occur.	Cough with sputum, chest pain and rheumatic fever which can reach 40 ° C, chills, ear pain and neck, wrist acceleration and wheezing.	Acute
Chronic bronchitis or chronic obstructive pulmonary disease (COPD)	Chronic inflammation of the bronchial tubes that can cause destruction of lung parenchyma (emphysema).	Chronic cough with mucus, wheezing, cyanosis, fever may be associated with an infection.	Chronic
Lung cancer	Chronic inflammation due induced by carcinogens, dispersed pollution.	Cough, dyspnea, wheezing, blood in sputum, chest pain.	Chronic

Source: Souza *et al.* (2010)[7].

These and other diseases affecting the respiratory tract have been the subject of research, especially the lower respiratory tract, because usually develop more slowly and are silent and can reach a chronic stage. As for the upper respiratory tract have been less studied in spite of treating acute diseases, on the other hand, the defense mechanisms of the organism, vary for each individual being that healthy persons can remove more easily inhaled particles that reach the upper airways while those with breathing problems are more vulnerable to inhalation of these particles end up coming to the bronchi and alveoli[8].

Effects of pollution on the respiratory system

Large portion of world's population suffers from the effects of human actions, for they live in large urban centers where there is a continuous progression and increase of contaminants in the atmosphere, which suggest be responsible for increased morbidity and mortality rates related to respiratory tract diseases on a global scale the consequences are aggravated by the fact that the respiratory system has very close contact with the external environment.

High concentrations of air pollutants such as particulate matter, nitrogen oxide and ozone are suitable agents to an inflammatory response when these particles come into contact with the respiratory epithelium occurs a release of

proteins such as chemokines and cytokines, by mediating cell to this answer and adhesion molecules, which is the result of oxidative stress caused by not destroying free radicals of oxygen and excess nitrogen in the airways. These free radicals are obtained exogenously from air pollution and damage cell structure and can take it apoptosis. The effects of the reaction depends on the agent, the intensity and location of aggression. These effects can appear either in the upper respiratory tract, such as runny nose, nasal congestion, cough, laryngospasm and vocal cord dysfunction, or in the lower respiratory tract, such as bronchitis, asthma, lung cancer, and other diseases[3,9].

The increased blood flow and vascular permeability is the first phase of the inflammatory process of the airways, inducing neutrophils and other leukocytes to the site in question. Cytokines and chemokines function as biochemical mediators that make the signaling cells through the increase of the proteins and glycoproteins on the cell surface. The lung does not have toxic substances and for being the organ with more contact with the external environment has mechanisms that filter out microorganisms. These mechanisms involve the nose is the first barrier to the passage of larger particles. The matter which passes by the natural nose filter suffer muscle and ciliary trachea and bronchi by expectoration leading stuff out. The particles that are able to go through these two mechanisms and reach the alveoli, will suffer the action of alveolar macrophages responsible for lung protection by stimulating the body's immunity to the action of neutrophils[10].

To Araújo (2011)[8], the Bronchial Asthma and other allergic diseases stand out with the highest prevalence in populations living in areas most polluted by particles from the burning of fossil fuels. In the same study conducted in the metropolitan region of the Steel Valley the quality parameters were discussed air based on the resolution of CONAMA (03/1990) and evaluation of chemicals based on World Health Organization standards (WHO), and correlated with the number of visits of respiratory tract diseases in the region.

According to the results presented it was noted that there is a correlation between the composition and concentration of these elements and steel activities and vehicle traffic in the area, which leads to stress the importance of studies of the relationship between climate and human health, focusing on is the multiplicity of aspects and surrounding environmental factors.

According Antoni *et al.* (2013)[11], above the recommended levels of pollutants in the atmosphere can lead patients to submit tachycardia and tachypnea as compensatory mechanisms for cellular hypoxia. Headache, nausea and vomiting are common symptoms. Syncope, pre-syncope and seizures are the result of cerebral vasodilation and cellular hypoxia also may cause cerebral edema. Angina, acute pulmonary edema and arrhythmias may result due to the increase in subsequent cardiac output. Heart disease or lung disease may have exacerbated his symptoms. The classic findings of cherry-red lips, cyanosis and retinal hemorrhages occur rarely.

In a study in the city of Paulo, conducted by Gouveia (2006)[12], involving children and the elderly can observe the association of increased concentration of pollutants with admissions for respiratory diseases are the most frequent asthma and pneumonia.

Pollutants found in the atmosphere

Carbon monoxide (CO) is the leading cause of death from poisoning and the most common worldwide. It is a colorless, odorless, flammable, and highly toxic. The exposure sources are formed of petroleum, gas, solid fuels and solvents which do not undergo complete combustion and can be found in large quantities in fire in automotive and release by industrial activity. When inhaled it goes into the bloodstream combining with hemoglobin and forming carboxyhemoglobin. This compound exhibits more affinity with hemoglobin for oxygen preventing the tissues and organs are oxygenated adequately. The negative effects caused by carbon monoxide poisoning depend directly on the concentration and duration of exposure to the substance[13].

Nitrogen dioxide (NO_2) is an air pollutant that has brown color and strong odor, being an oxidizing agent is very toxic. With motor car has its main source, the burning of fossil elements and industrial ovens in the form of nitrogen monoxide contribution is on a smaller scale. When released into the atmosphere it reacts with oxygen to form nitrogen dioxide. By having poor solubility reaches the most peripheral portions of the lung[8].

Ozone (O_3) is a colorless gas with a characteristic odor and that is formed by breaking of oxygen molecules by the effect of ultraviolet radiation. By having oxidant and germicidal action is commonly used in industrial activities and in water treatment. It is beneficial when produced naturally in the stratosphere by the photochemical action of ultraviolet rays having protective function against atmospheric pollution. But when harm has concentrated in the troposphere, the lowest layer of the atmosphere as a result of human action[14].

They are defined as very fine particles of solid particles suspended in the atmosphere with diameters less than 100 microns, corresponding to the diameters less than 10 microns are characterized as inhalable particles. Derived primarily of dust, fog, smoke, aerosol etc. They are classified according to size, with most clinically relevant materials with diameters of 10 m and 2.5 micrometre (PM10 and PM2.5). Particulate matter is the most studied compound and the relevant association between environmental pollution and respiratory diseases[15]. According to the Ministry of the Environment (2015)[16], studies indicate that the effects of particulate matter on health include cancer, arteriosclerosis, inflammation in the lungs, worsening

symptoms of asthma, increased hospital admissions and can lead to death.

The sulfur dioxide is one type of small particulate matter, toxic, colorless gas. Very soluble in water when inhaled SO_2 is absorbed into the most peripheral regions of the lung, and respiratory diseases triggering factor. Its main sources generating activities that are part of man's daily life as the use of cars and thermal as well as natural sources such as volcanoes. Are responsible for the worsening of symptoms of asthma, beginning as well as other pollutants to various respiratory problems[17].

According to Gomes (2002) below is the pathogenic effects caused by PM pollutants, NO_2, O_3, SO_2 and CO, its target organ and its mode of action:

Table 2. Pathogenic effects of inhaled particles.

Pollutant	Target organ	Action mode and disease
PM	Respiratory system	Exacerbates the response to other toxic pollutants
NO_2	Bronchi and alveoli	Irritation, inflammation, bronchitis, pulmonary edema and fibrosis
O_3	Bronchioles and alveoli	Irritation, inflammation, difficulty fibrosis and respiratory
SO_2	Bronchial tree	Activation of the bronchial receptors causing difficulty breathing and bronchitis
CO	Blood and living cells of all organs	Carboxyhemoglobin formation in erythrocytes

Source: Gomes (2002)[18].

Air Quality Monitoring

According to the Air Quality Index (AQI) the effect of toxic substances released is measured by capturing the concentration of pollutants in the atmosphere. This monitoring in the city of Ipatinga is done through booths located in four districts of the city (Bom Retiro, Cariru, Cidade Noble City and Veneza) who do the analysis and monitoring of these substances by means of sensors that determine the concentration of each pollutant, this It is in turn connected to a color scale. Through the possible effects on the population can be established that air quality is classified into: good, fair, poor, bad and very bad[19].

Due to increased motor vehicle fleet and intense industrial activity in the health region directly reflects the result of this contamination. Importantly, according to the World Health Organization health risks vary from place to place and can be interfered with by political and social factors in addition to the level of development and the ability to manage air quality[20].

They are defined by Resolution No. 3/1990 of CONAMA[21] standards for each type of pollutant and are classified as minimum and maximum limits. Total suspended particulates, respirable particulate matter, sulfur dioxide, carbon monoxide, ozone and nitrogen dioxide are the environmental parameters included in the monitoring network in the city of Ipatinga. These indicators were obtained by the Secretary of State for the Environment and Sustainable Development of Minas Gerais State, through the transparency portal.

The company responsible for the analysis of air quality in the city is Usiminas SA, which performs the measurement not only of pollutants emitted by it as well as the fleet of motor vehicles. The primary standards are equivalent to the maximum, ie, those who overcome will somehow cause harm to human health. As for the secondary standards are those corresponding to the minimum limits, ie those who are below cause the least possible effect the health of the population[22].

Monitored parameters in the city of Ipatinga-MG

It is shown below the concentration of air pollutants included in the monitoring network in the city of Ipatinga between the years of 2013 and first half of 2015 at stations located in Bom Retiro neighborhoods, Cariru, Veneza and Cidade Nobre.

Resolution 03 of the National Environmental Council (CONAMA), of June 28, 1990, establishes the national norms and standards to control pollution caused by industrial activities, automobiles and other various types of vehicles. The conservation of environmental heritage is carried out by all federal entities.

Table 3. Pollutants monitored in the city of Ipatinga in the period 2013 – 2015.

	Bom Retiro			Cariru			Veneza			Cidade Nobre		
Parameter	2013	2014	2015	2013	2014	2015	2013	2014	2015	2013	2014	2015
Total Particles	35,9	37,9	32,2	31,8	36,3	40,6	38,5	-	31	33,3	34,4	34,6
Inhalable Particles	21,5	22,9	21	18,8	21,3	22,7	22	23,3	21,5	21,5	23,4	22,2
Sulfur dioxide	6,8	5,7	5,7	3,1	1,83	3,1	2,8	2,8	2,8	4,4	2,3	2,3
Nitrogen dioxide	11,1	10,5	11,8	10,9	10,7	10,9	14,8	12,4	12,4	12,9	10,5	9,5
Carbon monoxide	2,1	2,34	2,07	5,89	13,41	2,57	3,31	2,41	2,7	3,9	3,16	1,86
Ozone	139,3	198,1	172,6	155	184,4	184,4	131,4	162,8	129,5	178,5	174,6	155

Source: Prepared by authors

However, rests with the Ministry of Environment to perform environmental licensing of shares of industrial activity, air quality management and monitoring of it. Environmental monitoring is the responsibility of municipalities and the Department of Motor Vehicles (DMV), through its state duties is responsible for assessing the emissions caused by motor vehicles[23].

On the concentrations defined as primary and secondary air quality standards, are presented in the following table:

Table 4. Air Quality Standards according to CONAMA.

Pollutant	Time to Sampling	Primary standard (µg/m³)	Secondary standard (µg/m³)
Total Particulate	24 h	240	150
Suspension (PTS)	MGA	80	60
Inhalable particles	24 h	150	150
(MP10)	MAA	50	50
Sulfur dioxide	24 h	365	100
(SO_2)	MAA	80	40
Nitrogen dioxide	1 h	320	190
(NO_2)	MAA	100	100
		40.000 (35 ppm)	40.000 (35 ppm)
Carbon monoxide	1 h	10.000	10.000
(CO)	8 hs	(9 ppm)	(9 ppm)
Ozone (O_3)	1 h	160	160

Source: CONAMA, 1990.[20]

4. DISCUSSION

The study by Araujo (2011)[10] years shows data according to the WHO about two million people die each year as a result of problems caused by environmental pollution resulting from the burning of fossil fuels, forest burning and by industrial activity. The pollutants emitted by these activities can be fine particles, sulfur dioxide, carbon monoxide, ozone, and many other pollutants, and even being found in low concentrations in the atmosphere cause respiratory illnesses.

Analyzing the data obtained in relation to the monitoring of air quality in the city of Ipatinga and comparing the data with the standards established by CONAMA Resolution nº 03/ 90, we see high levels of some of the monitored pollutants. The values found for Total Particles, inhalable particles, sulfur dioxide and nitrogen dioxide can be classified as suitable, as none of them exceeded the values stipulated as acceptable by CONAMA Resolution nº 03/ 90. In relation to carbon monoxide, only Cariru season was larger than recommended, reaching the value of 13.41ppm.

Ozone however, was content analyzed with a higher occurrence of above values considered as acceptable, representing annual average in 2013 of 179.5 mg/ m^3 in Cidade Nobre station, with its high values in all seasons in 2014, with Bom Retiro with values of 198,1 µg/ m^3; Cariru 184,4 µg/ m^3, Veneza 162,8 µg/ m^3 and Cidade Nobre 174,6 µg/ m^3, and with values of 172.6 µg / m^3 at the station Bom Retiro and 184.4 mg / m3 in Cariru station.

A study by Martins *et al.* (2002)[24] which investigated the relationship between the number of patients with influenza and pneumonia and air pollution in Sao Paulo, Brazil, showed that sulfur dioxide was associated with the number of visits, but it was the only pollutant that did not show up values acceptable values. Which brings us to associate that even the pollutants emitted into the atmosphere rates have not exceeded the limit values, the population of Ipatinga who is in daily contact with this material, may have increased susceptibility to develop diseases affecting the respiratory system.

5. CONCLUSION

Confirmed the deleterious effects of air pollution to respiratory just have to pay attention to the government about the enforcement measures in order to diminish the toxic damage caused by high concentration of pollutants. It is of paramount importance, the inclusion of professionals as pulmonologists and toxicologists in the adoption of environmental policies, since the organs of the respiratory system will be achieved by the air quality.

In all analyzed studies, the relationship with the increasing number of cases of respiratory diseases in people living in urban areas and are daily exposed to air pollutants that are released by industry and the burning of fossil fuels is each day more evident. Even though few studies specifically who demonstrate the effects that these pollutants cause in the body, we can see that every day more people are being affected by diseases of the respiratory system.

High levels of pollutants dumped into the atmosphere every day are enough to cause or aggravate any respiratory damage, however despite being below the acceptable concentration levels of air pollution can be harmful to health. This in fact draws attention to the need for other studies showing more precisely the relationship between the levels of pollutants and the effects that they can cause to human health.

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SYSTEMIC AND DENTAL ASPECTS IN CEREBRAL PALSY

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ABSTRACT

Cerebral palsy (CP) can be considered a group of disorders of movement and posture, and it is not attributed to progressive problems occurring in the brain during the fetal period and the baby, resulting in difficulties in functional abilities. These functional deficits, as a rule, cause affect the quality of oral health and quality of life of these patients. This article presents a literature review on the systemic and dental aspects of individuals with cerebral palsy, emphasizing conceptual, epidemiological and clinical aspects, in order to impart knowledge to health professionals and thus try to improve attention to overall health in this population group. However it was concluded that not just impart knowledge it is necessary also the implementation of public policies that address the promotion, prevention and improvement of specialized services for these patients, together with inter-actions of health that contribute to comprehensive care and improvement of services.

KEYWORDS: Socialization, oral health, prevention, movement disorders.

1. INTRODUCTION

Patients with special needs are people who have any kind of limitation that makes them need special service for a certain period of your life or even for their lifetime[1]. Within this group, are inserted patients with Cerebral Palsy (CP), those patients with brain lesions defined with nonprogressive disorders of movement and posture. Is commonly associated with epilepsy as well as abnormalities of speech, hearing, vision, and mental retardation[2].

The prevalence of CP hovers around one to two per 1,000 live births Individuals. Any agent capable of injuring the brain during the ripening process of the nervous system can cause CP[2]. Regarding prenatal factors in the general population, estimated to CP Occurs in 35% of cases, 45% perinatal, and postnatal 15%. Prenatal causes are related to injuries resulting from the time of fertilization until birth, can be determined by viral, parasitic and genetic malformations neuropathies. Concerning to neonatal causes have as causes neonatal anoxia, intracranial hemorrhage, infection, cranial trauma, prematurity and low birth weight. Regarding to postnatal causes, from birth to early childhood, predisposing factors are: meningeal infection, encephalitis, cerebral vasculitis and viral infections such as rubella, cytomegalovirus, herpes virus, among others[3].

Patients with CP present varying degrees of cerebral functional impairment, such change affects mainly manual dexterity consequently it fails properly to sanitize the oral cavity, which provides a greater plaque buildup. Therefore individuals with CP can be considered as high risk for oral diseases primarily for periodontal disease[4,5].

Intellectual impairment in individuals with CP makes them unable to understand the importance of oral hygiene for the control and prevention of oral diseases, preventing the necessary motivation for effective removal of plaque[6,7]. Researchers have suggested the creation of preventive educational programs, mainly for the control of periodontal disease through education of parents and guardians, motivating them to take care of oral hygiene, explaining the importance of reducing the accumulation of dental plaque to prevent the appearance of inflammatory periodontal disease[8].

Periodontal disease represent one caused multifactorial infection, often from the biofilm accumulation and, depending on its location in the oral cavity, can favor the proliferation of anaerobic microorganisms inside the formed bags in consequence this pathology results in a local production of cytokines, interleukins and prostaglandins as well as in the induction of synthesis of specific antibodies[9].

Long ago, it is related to periodontal disease and other systemic changes being considered, even as a risk factor for the onset of atherosclerosis and other cardiovascular diseases[10].

This study through the literature review is to emphasize the clinical and dental aspects of patients with cerebral palsy, emphasizing conceptual, epidemiological and clinical aspects, in order to impart knowledge to health professionals and thereby trying to improve health care overall this population group requiring special service.

2. MATERIAL AND METHODS

To conduct the Literature Review, extensive research was carried out in LILACS, BIREME, SciELO and MEDLINE, using the following search terms: cerebral palsy, dentistry, medical condition and cerebral palsy.

A total of 1,000 articles published among the years 1980-2013, however only 28 articles were selected found. It was used as inclusion criterion items that emphasized the conceptual, epidemiological and clinical features of patients with CP and had the purpose of transmitting knowledge to health professionals.

3. LITERATURE REVIEW

Systemic aspects of Individuals with Cerebral Palsy

In the last two decades, the great advances in imaging technologies and research in the basic sciences enabled researchers a different look at the brain of infants and children with CP. Bad structural formations, damage areas and genetic mutations associated with abnormal fetal brain development offers clues about what might be going wrong during brain development to cause changes that lead to the CP[11].

The CP can result from brain injuries that occur during the prenatal, perinatal or postnatal. Seventy to eighty percent of PC cases are acquired in the prenatal period and of unknown causes. Currently, it is estimated that approximately 6% of patients with congenital cerebral palsy occurred due to birth complications, including asphyxia[12].

Are considered neonatal risk factors for PC prematurity at birth less than 32 weeks gestation babies weighing less than 2.5 kg, delayed intrauterine growth, intracranial hemorrhage and trauma. About 10% to 20% of patients acquire cerebral palsy after birth, brain injury, mainly due to bacterial meningitis, viral encephalitis, hyperbilirubinemia, collision vehicle accidents, falls, or domestic violence, child abuse[13].

Cerebral palsy was classified according to their anatomical and clinical aspect, emphasizing the motor symptom, which is the main element of the clinical picture. According to the National Institute of Neurological Disorders and Stroke (2013)[12], we have the following breakdown: Spastic or Pyramid, Choreoathetosis or Extrapyramidal, Ataxic and Mixed[12].

Seventy to eighty percent of individuals with cerebral palsy with clinical features of spasticity with extensor muscle hypertonia and adductor of the lower limbs, increased deep tendon reflexes, tremors, weakness, and the spasticity of the lower limbs is very intense, results in the position scissor, to try to put the patient standing. The athetoid type or dyskinetic cerebral palsy affects 10-20% of patients with characteristic involuntary movements where can be observed changes in muscle tone of dystonia type, with variations more or less, during the move or in maintaining posture. Abnormal increase in slow movements and contortions of the hands, feet, arms or legs, are exacerbated during periods of stress and absent during sleep[4.14-17].

The rarest form is ataxic cerebral palsy, which occurs in 5 to 10% of patients and predominantly affect the balance and coordination. These patients roam with a broad base of gait and tremors that have complicated the performance of daily activities that require fine motor skills. In the ataxic forms there are important alterations of balance and motor coordination, associated with clear muscle hypotony. Mixed forms are characterized by different combinations of pyramidal, extrapyramidal motor disorders, ataxic-pyramidal or pyramidal, extrapyramidal-ataxic[17].

In addition to the loss of motor functions, most CP cases involving losses of intellectual, hearing, visual or sensory. In severe cases, the carrier rigidly assume the fetal position, presented in communication disability and total dependence. Already, other patients at a moderate level PC, have a mild lack of motor coordination. As for the intellectual involvement, 30% of those affected by CP have mental retardation, with intelligence quotient (IQ) below the mean, others may be educated reaching a satisfactory intellectual performance[16].

In order to have a development on activities that stimulate your potential, you need to motor stimulus, sensory, auditory and visual, and in this respect, the family is fundamental[18]. However, not always the family is prepared to take care of a patient with cerebral palsy. Mothers, who are usually the primary caregivers, can have a negative impact on their health and quality of life, but it is not yet possible to say whether the clinical and demographic factors are decisive for this loss. A recent study evaluated the quality of life related to health (QVRS) of mothers of children and adolescents with cerebral palsy (CP) compared to mothers with healthy children. Mothers of children and adolescents with CP have physical and mental negative impact on QVRS compared with mothers of healthy children and adolescents[19]. The higher the intensity of depressive symptoms, the greater the impairment in QVRS mothers. Maternal age, patient's age, maternal education, employment and some dimensions of QVRS son revealed association with maternal QVRS[19].

According to Miura (2007)[20] not only the family, but everyone involved in various areas such as Dentists, Physiotherapists, Speech Therapists, Psychologists, Doctors, Occupational Therapists, Teachers, social workers are essential to form a multidisciplinary team able to promote the greatest degree of possible independence, respecting the neurological potential of each.

The focus of rehabilitation treatment was recently transferred to the neurological rehabilitation in response to growing evidence of neuroplasticity. This approach aims to improve the development and function, taking ad-

vantage of the innate ability of the brain to change and adapt over the life of the patient. As the life expectancy of individuals with cerebral palsy is similar to the general population, therapies must be developed to meet the needs of older adults with this deficiency[21].

Dental Aspects

There is no specific oral diseases associated with CP. Frequent oral diseases are the same that afflict the population in general. They differ in the approach and the techniques to develop dental treatment[22]. Dental caries, gingival changes, occlusion problems, enamel hypoplasia, bruxism and dental trauma are some of the most frequent oral manifestations and severe in individuals with CP due to motor difficulties presented by the majority of these patients[23].

Altered dietary patterns, as frequent intake of carbohydrates and adding substances "thickeners" milk are common in the daily lives of individuals with CP. Other predisposing factors for tooth decay are: inability to perform their own oral hygiene, pasty diet, prolonged retention of food residues in the oral cavity by inability of language to promote the self-cleaning of the mouth after feeding, dental occlusion disorders and hypoplasia enamel[22,23,24].

In 2005 a group of 124 non-institutionalized patients with CP underwent assessment of primitive reflexes and pathological children and its effect on tooth decay and oral hygiene[25]. The presence/ absence of the primitive oral pathological reflexes of sucking, swallowing, biting and coughing was evaluated by observing the reaction of patients after a stimulus. The authors suggest that the more severe are the most frequent neurological damage is the presence of bite reflex and consequently the greater the risk of oral diseases in the population because of the difficulty in performing adequate oral hygiene[25].

Guerreiro & Garcia (2009)[2] conducted an epidemiological survey in order to determine the oral health status and associated factors in 41 children with cerebral palsy. The variables were socioeconomic factors, risk factors for the development of oral diseases, access to dental care, caries index, periodontal disease, malocclusion and dental fluorosis. The children assessed were aged from one to twelve years. The authors concluded that children with cerebral palsy showed high levels of gum damage and caries experience, mainly in the primary dentition and severe malocclusion in most cases. The study shows that in addition to quantitative need for care, it is also necessary to improve the quality of consultations of these patients. Almost all of the subjects who had access to dental care showed no satisfactory treatments. Take into account the difficulty of access and lack of resolution of accumulated demands, it is important that it be made available not only for this population, but for all persons with disabilities, appropriate location, and public action programs in oral health integrated with multidisciplinary actions[2].

Huang *et al*. (2010)[27] evaluated the state of oral health and treatment needs of institutionalized children with cerebral palsy in Taiwan. Were examined 345 children with cerebral palsy aged ≤ 18 years, residents in the institutions. The dental examination was performed according to the criteria of the World Health Organization protocol. The index of primary teeth decayed, extracted or filled (CPO-D) for children with cerebral palsy with 5 years of age was 7.00 ± 6 73, the rate of permanent teeth decayed, missing and filled (CPO-D), for ages from 12 to 18 years was 2.50 ± 3.17 and 7.42 ± 5.48, respectively. The need for dental treatment increased with increasing age and degree of disability. The researchers suggest the need to promote education in oral health of parents, cares and nurses, and integrate prevention programs from childhood, encouraging dentists to create a dental care system to this disabled population[27].

Patients with cerebral palsy have a reduced function of self-cleaning of the oral cavity because of the difficulty of swallowing his own saliva and abnormal movements of the tongue and facial muscles. To minimize this problem, one must give greater importance to the microbiological and clinical diagnostics to detect patients who have higher risk of developing periodontitis[25].

In a recent study evaluated the existence of an association between attention/executive functions and development of dental caries in individuals with cerebral palsy (CP)[28]. Seventy-six children with CP were selected from a physical rehabilitation center in a school that serves children with this disability. The control group consisted of 89 children without neurological impairment. The socioeconomic status, the presence of teeth with cavities, the degree of motor impairment and intellectual, executive functions and attention were evaluated. The average age of participants was 8.9 years (DP = 3.56). The CP group had a significantly lower performance ($p < 0.05$, Mann-Whitney test) compared to the control group. Based on clinical diagnosis (CP or control group), intellectual and motor impairment function, the important explanatory variables for the presence of teeth with cavities were evaluated in Complex Figure Rey Test (OR = 0.941) and the subtest of Digits Range of Wechsler Intelligence (OR = 0.581). The authors concluded that, after controlling intellectual function, clinical diagnosis and motor impairment, deficits in executive functions and attention increased the chances of tooth decay development in children with cerebral palsy[28].

4. CONCLUSION

After the moment that can classify the type of cerebral palsy that the person has the etiology and the problems associated with them, you can develop a plan of treatment and/or monitoring able to maintain oral and general health of these special patients.

However it was concluded that it is not just impart

knowledge it is also need to make the implementation of public policies that address the promotion, prevention and improvement of specialized services for these patients, together with inter-actions of health that contribute to comprehensive care and improvement of services.

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ELONGATED STYLOID PROCESS OF TEMPORAL BONE AND CALCIFICATION OF THE STYLOHYOID LIGAMENT: LITERATURE REVIEW

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ABSTRACT

The styloid process of the temporal bone corresponds to a thin bony projection located between the external and internal carotid arteries, after the larynx. Radiographically has radiopaque characteristic with length of 2.5 to 4 cm when exceeding this is considered the styloid ligament or the styloid process presents any changes. Some authors argue that stretching occurs through a hyperplasia stimulated by a previous trauma, such as tonsillectomy, others report that stretching would be an anatomical variation that starts his training early in life. The prevalence of this change in the population reaches a variation of 5-84%, with no predilection for gender and affecting more bilaterally when the stretch is accompanied by symptoms, it is characterized as Eagle syndrome. The most common symptoms are pain on either side of the throat, with or without radiation to the mastoid ear or region of the affected side, dysphagia, and foreign body sensation in the throat glossalgia, dysphonia, recurrent headache, carotidine, vertigo, visual disturbances and restrictions on neck movement. Considering the great importance of knowing the anatomy of the hyoid apparatus and their variations, knowing even identify them in radiographic examinations, this study aimed to conduct a literature review checking the etiology, prevalence, symptoms and classification.

KEYWORDS: Styloid process, temporal bone, calcification, stylohyoid ligament.

1. INTRODUCTION

The styloid complex or style-hyoid apparatus is formed by the styloid ligament, lesser horn of the hyoid bone and styloid process, the latter corresponds to a thin bony projection, included in the petrous portion of the temporal bone located between the external and internal carotid arteries later. It will larynx. They are inserted the stylopharyngeus muscles, styloglossus and stylehyoid ligament and the styloid walking toward the lower horn of the hyoid bone. It has embryological origin of cartilage tissue of Reichert's[1-4].

In radiographic analyzes, such as panoramic radiography, the styloid process can be viewed with a radiopaque image, after the external auditory canal, with a downward trend and former usually has a length of 2.5 to 3 cm, however presenting a change this length is considered an anomaly may be the very calcification ligament stylohyoid, stylomandibular or elongation of styloid process itself temporal bone[5-8].

The etiology may be related to three theories, two based on previous traumas that trigger a metaplasia and hyperplastic response and anatomical variation[1-4].

The prevalence of changes in the population reaches a variation of 5-84%, with no predilection for gender and affecting more bilaterally. Increased age is related to the presence of the styloid process elongation[1,5,6,11].

The majority of patients with this variation are asymptomatic, but when symptoms may have pain on either side of the throat, with or without radiation to the mastoid ear or region of the affected side, dysphagia, foreign body sensation and then called Syndrome Eagle[3,4,7,10-18].

Considering the great importance of knowing the anatomy of the hyoid apparatus and their variations, knowing even identify them in radiographic examinations, this study aimed to conduct a literature review checking the etiology, prevalence, symptoms and classification.

2. MATERIAL AND METHODS

The literature review of this work was conducted through a survey in the major databases: Pubmed, LILACS, BIREME and the CAPES periodical portal.

3. LITERATURE REVIEW

The styloid process is a cylindrical bone structure attached to the petrous portion of the temporal bone, following the base of the skull above the foramen stylemastoid. It is projected obliquely forward, downward and slightly to the mesial positioning between the internal and external carotid arteries, usually at the apex of this struc-

ture reaches the back edge of the jaw, in this area there is the insertion of muscles: stylopharyngeus, stylohyoid, styloglossus and ligaments: stylohyoid and stylomandibular. Along with the ligament and the lesser horn of the hyoid bone, the styloid process of the temporal bone, form the style-hyoid chain[1-4].

The style-hyoid chain have embryonic origin derived from Reichert cartilage where ossification of the styloid process is carried out: first through the formation of tympanic bone portion, which takes place before birth and becomes the basis of this structure, short It has appearance and fused portion petrous temporal bone; Following happens in the second stage, characterized by a distal ossification, forming the styloidal portion, which merges the tympanic, this step is completed in late adolescence. The third portion called ceratoial which is the ligament portion of the styloid chain and the fourth portion is the hyoid developing the lower horn of the hyoid bone, finalize the process[1-6].

The normal length of the styloid process reaches variations in literature 1.5 to 4.0 cm when these measures are exceeded we are facing the elongated styloid process or the mineralization of ligament styloidal complex, there are many controversies about the normal size of this structure. Authors confirm that this discrepancy between what would be considered normal is because of the lack of standardization at the time of measurement of these structures [1-3,6-10].

Several theories have been proposed and debated in an attempt to elucidate the etiology of this change. Both believe that a previous trauma such as tonsillectomy or pharyngeal trauma could stimulate ossification two distinct processes: the first called reactive hyperplasia, which is stimulation of the styloid process, causing a continuous ossification with the terminal portion of this bone invading the styloid ligament; the second, through a reactive metaplasia ossification induction some portions of the ligament styloid theories hyperplasia or reactive metaplasia could be the explanation for the presence of ossification in any age group, according to these theories, a second arc sheet branchial persists, with potential for cartilage or bone formation when stimulated. Due to the histological characteristics found in bone hyperplasia of the styloid process and styloid ligament metaplasia of the more appropriate term for this variation is ossification and no calcification. The third theory describes how an anatomical variation that starts during the styloid process of ossification and formation of the styloid ligament early in life, thus explaining the presence of this variation in young people[1-4].

Radiological tests such as panoramic radiography, play an important role to demonstrate these variations, most authors credited the panoramic sufficient efficacy radiography for the evaluation of stretching and calcification of the styloid ligament. From the evaluation of these tests Langlais images, Miles, and Van Dis, in the year performed the classification of the styloid process in normal elongated pseudo articulated and targeted, according to the authors the classification would be: Type 1: elongated presenting radiographic features in that is the integrity of change with radiopaque image of the styloid process, with a length of 28 mm; Type 2: called pseudo articulated where apparently the styloid process is with the styloid ligament by a single joint; Type 3: consists of short portions or discontinuous long ossification of the styloid ligament own[1-4].

The elongated styloid ligament may be symptomatic or not. When symptomatic is characterized as Eagle syndrome. The first styloid ligament calcification studies dating from the sixteenth century, however Eagle, between 1937 and 1949, studying 200 cases, detailed the symptoms of mineralization complex stylohyoid ligament, which later characterize a syndrome such as your name[3.10,13-18].

The most common symptoms are pain on either side of the throat, with or without radiation to the mastoid ear or region of the affected side, dysphagia, foreign body sensation in the throat glossalgia, dysphonia, recurrent headache, carotid, vertigo, visual disturbances and restrictions on neck movement can complete the clinical picture.

In its original publication, Eagle, presented two clinical possibilities of presentation of this pathology: the classic stylohyoid syndrome that would be related in most cases with tonsillectomies with persistent pain in the pharyngeal region radiating to the ears, and stylocarotideal syndrome not related to tonsillectomies, present only by stretching calcification and profise styloid there would be a compression of the external and internal carotid arteries, providing intense neck pain[3,10,13-18].

Studies of prevalence of elongated styloid process and ossification of the same name ligament are conducted mostly through panoramic radiographs as performed by Guimaraes *et al.* (2000)[11], who obtained results of 5%; Correll (1979)[1] using the same radiographic examination results reached 18.2%, and Tavares Freitas (2007)[6], achieved a percentage of prevalence of elongated styloid process in 32.4%, and the isolated ligament ossification of the styloid 39.5 %. Others studies also verified the occurrence of ossification of stylohyoid ligament in patients aged between 2 and 21 years, found that 40.7% patients had anatomical variation. Ferrario *et al.* (1990)[6], reported an overall prevalence 84.4%. More recently Kursoglu *et al.* (2005)[12] analyzed 55 panoramic radiographs of adult patients with results for prevalence of 83.6%. This wide range of prevalence is justified by the lack of standardization in the measures of the structures and the concept of what can be consider an elongated styloid process.

Regarding gender most affected the vast majority of studies did not show significant differences between female and male[1,5,6,12].

The relationship between the presence of ossification of the styloid ligament and elongation of the styloid pro-

cess and the increasing age was proven by several studies[6] disagreeing with Correll *et al*. (1979)[1].

With the popularity of imaging, it is extremely important that the dentist is aware of mandibular maxillofacial anatomy. Anatomical variations such as ossification of the styloid ligament or the extension of the styloid process, shows prevalence with great discrepancy being detected in routine radiographs and the possibility of the occurrence of symptoms, and then characterized as the Eagle syndrome, as it has symptoms similar to glossopharyngeal neuralgia and trigeminal, temporal arteritis, migraine, histamine headache, dysfunction myofascial pain syndrome, pain secondary to third molars unerupted or impacted, cervical arthritis, tumors and absent dental prosthesis, so as that the patient is not hurt by a wrong treatment.

4. CONCLUSION

The ossification of the styloid ligament and elongation of the styloid process has etiology based on previous trauma theories that trigger a reaction metaplastic and hyperplastic and anatomical variation.

The prevalence reaches a large discrepancy between 8% and 84%.

There is no preference for gender and age increases the chances of the presence of the styloid ligament ossification as the lengthening of the eponymous process.

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