

THE EFFECT OF SODIUM HYPOCHLORITE USAGE IN THE TREATMENT OF DENTAL SIMPLE GANGRENE

GABRIELA BOȚA¹, ALINA CRISTIAN², MONA IONAȘ³

^{1,2,3}“Lucian Blaga” University of Sibiu

Keywords:
microbial flora,
dental gangrene,
Gram staining,
sodium hypochlorite

Abstract: The main factor incriminated for the occurrence of dental gangrene is represented by the anaerobe and aerobic microbial flora. This comes from the salivary environment where normally nonpathogenic species can be found; once entered in the endocanalicular environment they increase their virulence and become pathogenic. Nowadays, modern techniques are used to detect the exact identity of bacteria. Hence, in the endodontic space there was revealed the presence of various pathogenic species of bacteria, such as Streptococci, Staphylococci, Fungi, Candida Albicans, and Escherichia Coli etc. However, the main target of the endodontic treatment besides the exact identification of pathogenic strains is represented by the sterilization of radicular canals. Root canal sterilization is performed during the mechanical treatment using antibacterial irrigating agents; one of the mostly used irrigation agents during the endodontic treatment is the solution of sodium hypochlorite, which more recently is applied by irrigation systems using negative pressure. The goal of this work is to research, within the private dental office, the strict presence of etiologic agents responsible of producing the pulp gangrene, as well as the sterilization degree of root canals at the end of mechanic treatment. The identification of the strains was performed in the microbiology laboratory, namely on the culture medium. Thus, in 40.9 % of the studied cases, Streptococcus developed on the cultivated growth medium. Staphylococcus was identified in 31.81 % of the cases. Enterococcus colonies developed on growth cultures in 18.18 % of the cases, while Escherichia Coli were found only in 9.09 % of the cases. Actual sterilization of the canals was carried out according to a preset protocol, which included for this purpose the sodium hypochlorite solution.

INTRODUCTION

According to recent studies, root canals' sterilization is possible in theory; in practice, many laboratory analyses are required, as well as precise criteria, research and qualitative pathologic material.(1,2,3,4)

The goal of the hereby study is to research – within the limits of the private dental office, including the analyses performed in the Microbiology Laboratory – the strict presence of etiologic agents incriminated for producing pulp gangrene, but also the presence of microorganisms encountered at the beginning of endodontic treatment, exactly at the opening of the pulp cavity, and the reducing or the absence of microorganisms at the end of the treatment.(5,6)

The obtained results – as compared to the specialized studies – revealed the presence of the most important and most resistant etiologic agents of pulp gangrene, respectively Streptococcus and Enterococcus faecalis.

MATERIALS AND METHODS

The study was carried out on a total of 22 patients of both genders, aged between 25 and 51 years, presenting simple pulp gangrene. These cases are the subject of a clinical-statistical study along with personal solutions.

The radiologic criteria was used in the identification of pulp lesions within the clinical-statistical study, while the growth cultures in the Microbiologic Laboratory were used to confirm the strains involved in the development of pulp gangrene.

The adopted protocol for complete and complex endodontic treatment consisted in the use of the following:(1,7,8,9,10)

- Sodium hypochlorite 2,5 % - antiseptic;
- EDTA – endocanalicular permeability agent;
- EndoVac – negative pressure irrigation system of root canals;
- ProTaper – mechanical preparation system.

In the microbiologic laboratory the following were used for detailed research:

- Amies medium tubes;
- Enriched media, nutrient Broth liquid;
- Solid growth cultures: blood Agar; gelose chocolate, gelose Cled;
- Identification agents by means of agglutination reaction of streptococcal strains.

Experimental research

In the first stage of the study, we collected pathologic material strictly from the root canals affected by dental gangrene. This pathologic product was collected with sterile paper points of appropriate size.

Figure no. 1. Medin paper points (11)



²Corresponding author: Alina Cristian, Str. Iuliu Maniu, Nr. 2, Sibiu, România, E-mail: alina_cristian24@yahoo.com, Phone: +40727 786461
Article received on 25.08.2016 and accepted for publication on 19.09.2016
ACTA MEDICA TRANSILVANICA September 2016;21(3):88-91

CLINICAL ASPECTS

Due to reduced quantity of available pathologic product, these paper points were deposited in tubes with Amies culture and transported to the laboratory.

Figure no. 2. Container for storing and transportation of collected pathologic product



In the laboratory, the paper points were placed in enriched media, nutrient Broth liquid.

Figure no. 3. Enriched medium with Broth nutrient



Subsequently, the pathological content was seeded on culture media prepared in Petri dishes:

- Blood Agar;
- Gelose chocolate;
- Gelose Cled.

The incubation took place at a 37° Celsius temperature, in aero biotic and microaerophilic conditions.

The microaerophilic conditions are destined strict to anaerobic bacteria, as the latter contain other bacteria that produce carbon dioxide and consume oxygen, necessary for their metabolism, thus allowing the development of anaerobic germs only.

In revealing the Gram positive Cocci, the reaction of latex agglutination is used to include the result in Streptococcus class and to highlight as accurate as possible the strains.

Figure no. 4. Identification agents through agglutination reaction of streptococcic strains



Also, in the dentist's cabinet the endodontic treatment was performed on the affected tooth according to a pre-established protocol, as follows:

- The mechanic treatment was performed using the ProTaper system.
- In parallel, there were performed washings with sodium hypochlorite 2.5 %, using approximately 100 ml of solution for about 20 minutes.

Figure no. 5. Estimated time of washings with sodium hypochlorite 2.5 %



After assessing the quality of walls and content of radicular canal, a new collection of this content was performed with paper points; the product was transported to the Microbiology laboratory and seeded on cultures, as well as the gangrene product.

The filling operation was performed in the same session.

CLINICAL CASE

Female patient H.E., aged 38 years old. She comes to the dental cabinet for a routine check.

Clinic examination: 4.4 – tooth with medium occlusive-distal obturations; modified tooth colour in gray.

No periapical structural modifications were found at the radiologic examination.(12,13)

Figure no. 6. Radiologic image



Diagnosis: Simple dental gangrene.

For the study of this case, two samples were taken with paper points. They were seeded in the Microbiology laboratory and analyzed after 24 hours. Small gray granular colonies of 0.1-0.5 mm in diameter were revealed both in blood agar and in gelose chocolate culture growth.

Figure no. 7. Blood Agar growth culture with small anaerobic colonies

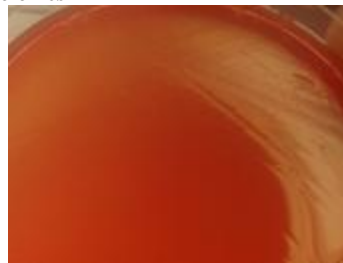
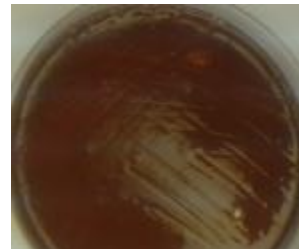


Figure no. 8. Gelose chocolate growth culture with fine small anaerobic colonies



CLINICAL ASPECTS

The microscopic examination was conducted from the microbial culture developed on solid cultures on the Gram coloured smear which revealed Gram positive cocci arranged in diplo and short chains.

Figure no. 9. Microscopic image revealing the presence of a chain of Gram positive cocci. Gram staining



The paper points collected after pharmaceutical and mechanic treatment with sodium hypochlorite 2.5%, using the EndoVac system, were seeded in the same conditions, both on enriched liquid media, as well as on solid culture media, at 37 °C incubation temperature, for 20 minutes. However, no bacterial colonies developed. This result certifies the efficiency and the extraordinary antiseptic properties of the sodium hypochlorite solution.(14,15,16)

Figure no. 10. Cled culture media, gelose chocolate and blood agar with no developed bacterial cultures



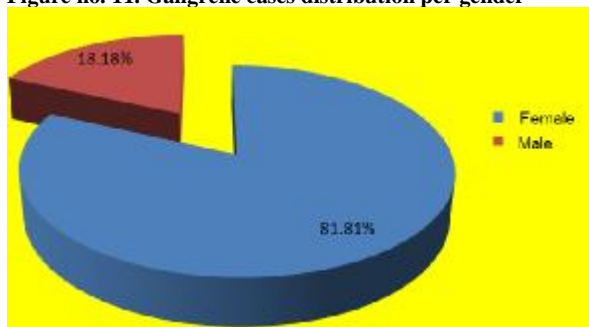
RESULTS AND DISCUSSIONS

Following the laboratory results, there were revealed strains of Streptococcus, Staphylococcus, Enterococcus and Escherichia Coli, thus asserting the top etiologic agent of simple dental gangrene. Following, a statistical study was conducted by distributing the cases on groups of age, gender and predominant bacterial strains.

Table no. 1. Gangrene cases distribution per gender

	Feminine	Masculine	Total
No of patients	18	4	22
Percentage	81.81 %	18.18 %	100 %

Figure no. 11. Gangrene cases distribution per gender

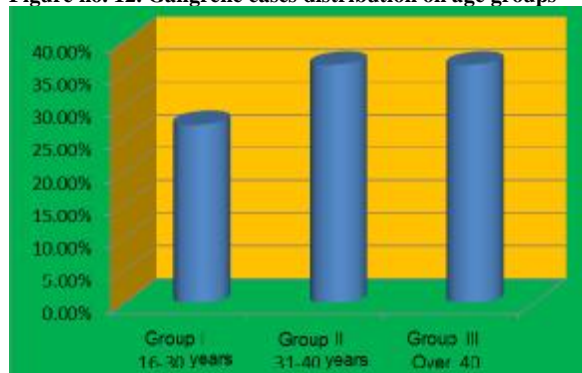


It can be observed that the study included 81.81% female patients with this dental condition, while the men covered a ratio of 18.18% of the total.

Table no. 2. Gangrene cases distribution on age groups

	Group I 16-30 years	Group II 31-40 year	Group III Over 40 years	Total
No of cases	6	8	8	22
Percentage	27.27 %	36.36 %	36.36 %	100 %

Figure no. 12. Gangrene cases distribution on age groups

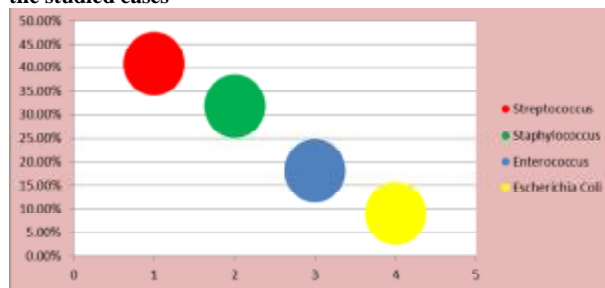


According to the above table, the predominant age groups affected by gangrene are situated between 31 to 40 years of age, and also over 40 years. A decrease in the number of recorded cases of gangrene was registered in young patients in the age group of 16-30 years.

Table no. 3. The share of bacterial strains encountered in the studied cases.

	Streptococcus	Staphylococcus	Enterococcus	Escherichia Coli	Total
No of cases	9	7	4	2	22
Percentage	40.90 %	31.81 %	18.18 %	9.09 %	100%

Figure no. 13. The share of bacterial strains encountered in the studied cases



Of the 22 studied cases, Streptococcus developed in 40.9% of cases on the growth cultures after seeding. Also in 31.81% of the cases, there was revealed the presence of Staphylococcus in dental gangrene. The colonies of Enterococcus grew on media in 18.18% of the cases, while E.coli developed in 9.09% of the cases.

CONCLUSIONS

1. The clinical researches conducted by different authors showed that almost complete sterilization of root canals can be achieved, when closely related to the use of antiseptic

- solutions, focusing systems, negative pressure systems, as well as the latest systems of mechanical preparation.
2. After consulting laboratory results, which revealed the presence of at least four etiologic agents responsible for simple dental gangrene, we reached the conclusion that the infection of the radicular canal is not quite accidental, as there is a certain relationship between the bacterial strains existing in the oral cavity and the ones involved in endodontic pathology.
 3. Nevertheless, despite the laboratory results revealing the presence of remarkably resistant streptococci and enterococci, the post-treatment results demonstrated the antimicrobial efficiency of sodium hypochlorite 2.5% solution in the sterilization of infected radicular canals.
 4. Naturally, a very important aspect must be mentioned: the sensibility and specificity of chemical agents is not exactly perfect, and also the entire process of culture development may be disturbed by insignificant factors, but with important effect on final results.

REFERENCES

1. Castellucci A. Endodontics, vol I, ed. II Tridente; 2009.
2. Castellucci A. Endodontics, vol.II, ed. II Tridente; 2009.
3. Cherlea V. Tratatul endodontic, ed. Național, ed. a II-a București; 2008.
4. Gafar M, Iliescu A. Endodonție clinică și practică, Editura Medicală, ed a II-a, București; 2005.
5. Buiuc D, Negut M. Tratat de microbiologie clinică, ediția a II-a, ed. Medicală București; 2008.
6. Mihalache M. Microbiologie. Curs pentru uzul studenților, Editura Universității Lucian Blaga Sibiu; 2000.
7. Bertrand M. Problematika smear layer în endodonție, Actualități stomatologice. 2004;21:6-13.
8. Câmpean S. Studiul microbiologic privind posibilitățile de tratament medicamentos în gangrena pulpară. Transilvania Stomatologică. 2002;4:39-45.
9. Morari I. Afecțiuni endodontice, ed. Techo Media; 2008.
10. Nica I. Tratat de endodonție, ed. Mirton, Timișoara; 2005.
11. <http://doriotdent.ro/ro/produs/conuri-hartie/>. Accessed 27.07.2016.
12. Burlibașa C. Chirurgie orală și maxilo-facială, Editura medicală, București; 2008.
13. <http://faculty.ksu.edu.sa/Dr.Hanan/BooksIngle/ch03.pdf>. Accessed on 01.08.2016.
14. Cohen S, Burns R. Pathways of the pulp, editia a 7-a; 2006.
15. Roman I, Bocskay Șt. Patologia și terapia cariei complicate. Endodonție, ed. University Press Tg. Mureș; 2009.
16. Trope M, Debelian G. Manual de endodonție pentru Medicul Dentist, Quintessance Medical Publishing, București; 2007.