

A Study of Streptococcus Viridans in the Maxillofacial Region

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Abstract:

Statement of Problem: Streptococcus viridans is one of the most important microorganisms in the establishment of infections leading to dental caries and heart valve damages. Therefore the diagnosis and prevention of these infections is critical in health care.

Purpose: The aim of this in-vivo study was to determine the prevalence of viridans streptococci in abscesses occurring in the maxillofacial region.

Materials and Methods: The study sample consisted of 39 patients with maxillofacial abscesses, referred to the Department of Oral Surgery Faculty of Dentistry Tehran University of Medical Sciences and Dr. Shariati Hospital, Tehran University of Medical Sciences. Extra-oral incision, drainage and pus collection followed by culture, staining and biochemical and sugar fermentation tests were carried out for all participants.

Results: In the present study %53.84 and 46.16% of the patients had negative and positive culture results, respectively. In the positive culture group, %2.5 of the viridans streptococci were streptococcus salivarius, %4.6 streptococcus sanguis and %17.9 were streptococcus mutans.

Conclusion: The findings of this study showed that viridans streptococci are an important factor in the development of metastatic and maxillofacial infections which can pose a significant threat to the patient's life.

Key Words: Streptococcus viridans; Dental abscess;

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INTRODUCTION

Viridans Streptococci are alpha hemolytic microorganisms that produce some degree of red blood cell hemolysis in blood agar culture environments. As a result, the microbial colony of these streptococci is surrounded by a green hallow [1-3].

Lancefield [4] divided and categorized the streptococci into serologic groups designated by letters, A, B, C, D, F and G on the basis of their antigens. Traditionally the viridans group includes those alpha-hemolytic streptococci that lack Lancefield group antigens and do not

meet the criteria for Streptococcus pneumoniae. According to Laskin, about %30-%60 of intra-oral microorganisms are streptococci and most of them are alpha- or non hemolytic, which include streptococcus sanguis, streptococcus salivarius and streptococcus mutans. The aim of the present study was to determine the prevalence and the role of viridans streptococci (alpha hemolytic) in dental abscesses [2,5].

The role of alpha hemolytic streptococci and especially viridans streptococci has been previously demonstrated, but the prevalence of

this microorganism has not been widely investigated.

Considering the fact that local abscesses caused by these streptococci have a damaging effect on the jaws, teeth and vital structures such as the mediastinum, pericardium, and the critical fascia of the neck, and that they may be a threat to the patient's life, the present study was designed to help prevent the side effects of these infections and to support social health [6-8].

It has been demonstrated that 30% of patients undergoing oral surgery, extraction or even routine dental procedures provoking minor bleeding, experience a transient bacteremia, afterwards. The most important agent in this phenomenon is streptococcus viridans [2,8]. In order to provide a helpful guide-line for better diagnosis and treatment of streptococcal infections, this study aimed at determining the prevalence and the role of viridans streptococci (alpha hemolytic) in dental abscesses.

MATERIALS AND METHODS

In this study, 39 samples were obtained from 39 patients with jaw abscesses. All patients were referred to the Department of Oral Surgery Faculty of Dentistry Tehran University of Medical Sciences and Dr. Shariati Hospital, Tehran University of Medical Sciences. The signs and symptoms were recorded for all participants. By using radiography and a complete clinical examination, the dental origins of the abscesses were confirmed. Considering that elimination of the normal oral flora could be very difficult, all incisions were designed to be administered extraorally. Therefore, samples that needed an intraoral approach were excluded from the study.

First, the area of the incision was determined on the patients. This was followed by disinfecting the skin of the fistulae (or incision area) and obtaining a sample from the pus,

using a swab. The samples were then transferred to a culture plate and sent to the laboratory for diagnosis.

Due to the fact that viridans streptococci are catalase-negative and are either aerobes or facultative anaerobes, each sample was transferred to two culture plates containing blood agar. One of the plates was placed in a 37° C incubator for 24-48 hours, and the other one was put in an anaerobic GasPak jar for 36 hours with the same temperature. At the end of each test period the culture plates were studied. Alpha hemolytic green microbial colonies were isolated and were identified by Gram stain. Gram positive cocci were further tested for catalase. Finally, the gram positive, catalase negative cocci were isolated and were transferred to skim milk culture media. Several hours later, the cocci were collected and kept in -20° C. Biochemical and diagnostic tests were employed for positive samples. The diagnosis of streptococcus viridans was based on the following tests: Hippurate Hydrolysis (HH), Esculin Hydrolysis (EH), Voges - proskauer (V.P.), Arginine - Dihydrolase (AD), and Carbo Hydrate test (CH).

RESULTS

The study sample consisted of 26 male (66.6%) and 13 female (33.3%) patients with an age range of 30-40 years. Most of the maxillofacial abscesses encountered in the 39 participants were in the submandibular and submental regions.

The results from Biochemical and diagnostic tests are summarized in Table I. Positive and negative cultures were identified in 18 (46.15%) and 21 (53.84%) patients, respectively. In the positive culture group, 7 cases (17.9%) were streptococcus mutans, 3 (7.6%) were streptococcus sanguis and 1 (2.5%) was streptococcus salivarius. In addition, 5 cases revealed staphylococci and two cases showed lactobacilli.

Table I: Results from Biochemical and diagnostic tests; the differentiation among viridans streptococcus.

Species	V P	A D	H H	Acid from	Dextran	Levan
Bovis I	+	-	-	+	+/-	+
Bovis II	+	-	-	-	-	-
Intermedius – milleri group	+	+	-	-	-	-
Mitis – oralis sanguis II group	-	-/+	-	-	+/-	-
Mutans	+	-	-	+	+/-	-
Sangis I	-	+/-	-	-	+	-
Salivarius	+	-	-	-	+	+

+ = 90% strains positive, - = 90% strains negative, +/- = variable (more often positive), -/+ = variable (more often negative).

DISCUSSION

The organisms included in the streptococcaceae are gram-positive cocci that are usually facultative anaerobes. Their role in human disease ranges from well-established and common to rare but increasing. The mouth contains large numbers of bacteria, with streptococcus being the predominant genus. The oropharynx contains a mixture of streptococci and a number of species of the viridans group can be isolated, including streptococcus mitis, streptococcus mutans, streptococcus milleri, streptococcus sanguis and streptococcus salivarius, The mutans groups have been shown to cause dental caries and infections in the oral and maxillofacial region. The prevalence of the viridans streptococci in the severe infections of this region is important for the prevention and treatment of these life threatening diseases [5]. Several epidemiologic studies on randomized selected populations revealed a positive relation between streptococcus viridans and dental caries [6,9]. According to these studies a remarkable proportion of vital microbes exist in carious fissures, whereas, in %70 of the healthy, non-carious fissures, vital streptococci could not be found. It should be noted that approximately %70 of the dental fissure caries contain vital streptococci. In addition most of the streptococci exist in proximal surfaces [9].

According to Lancfield [4], streptococci are classified into seven serotypes (A to G), but four of them are seen more commonly. Group D streptococcus mutans has almost exclusively been isolated from people with dental caries, whereas the C serotype has been separated from both healthy people and patients with dental caries [10]. Various kinds of microorganisms penetrate the dental pulp but the main one responsible for pulpitis has not been identified [11].

In this study %25-%30 of all isolated microorganisms were aerobic and the rest consisted of anaerobe streptococci, bacteroids, vionella and etc. The most common microorganisms existing in abscesses of the oral region include, %16 anaerobe microorganisms such as melaninogenicus and %57 aerobic streptococci especially streptococcus viridans [2,5]. It is notable that negative culture is due to the fact that pus mostly contains necrotic tissue and dead microorganisms.

The most effective microorganisms in Ludwig's angina are streptococci; however, excessive use of anti microbial agents has lead to the development of more mixed species, causing infections [12]. They also stated that the prevalence of anaerobe microorganisms, which like streptococci demonstrate resistance, are very high [3,12,13].

CONCLUSION

Based on the results of this study, viridans streptococci are the most effective factor of mild and severe abscesses of the oral and maxillofacial region. They cause local problems such as destruction of the soft and hard tissues and systemic involvement of the heart valves. Therefore the control and prevention of these infections based on the diagnosis of the microorganisms will increase health indices.

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بررسی حضور استرپتوکوک در آبسه‌های ناحیه فک و صورت

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چکیده

بیان مسئله: استرپتوکوک ویریدنس یکی از مهمترین میکروارگانیسم‌هایی است که در طی عفونت‌های منتهی به پوسیدگی دندان‌های همچنین آسیب‌های درجه‌ای قلب وجود دارد. بنابراین تشخیص و پیشگیری از چنین عفونت‌هایی از اهمیت بالایی برخوردار است.

هدف: هدف از این مطالعه تعیین شیوع استرپتوکوک ویریدنس در آبسه‌های ناحیه فکی - صورتی می‌باشد.

روش تحقیق: مطالعه بر روی ۳۹ بیمار مراجعه کننده به گروه جراحی دهان دانشکده دندانپزشکی دانشگاه علوم پزشکی تهران و بیمارستان شریعتی دارای آبسه‌های فکی - صورتی انجام گرفت. برای تمامی بیماران پس از برش خارج دهانی درناژ انجام گردید و از چرک جمع‌آوری شده کشت تهیه شد. تمامی نمونه‌ها رنگ آمیزی شده و آزمون‌های بیوشیمیایی و تخمیر قند برای همه آنها اجرا گردید.

یافته‌ها: در مطالعه حاضر ۴۶/۱۶٪ موارد واجد استرپتوکوک ویریدنس بودند. در گروه مثبت، در ۲/۵٪ نمونه‌ها استرپتوکوک موتانس مشاهده شد.

نتیجه‌گیری: یافته‌های مطالعه حاضر نشان داد، استرپتوکوک ویریدنس عامل مهمی در ایجاد عفونت‌های فکی - صورتی و متاستاتیک است که تهدیدی جدی برای حیات فرد به شمار می‌آیند.

واژه‌های کلیدی: آبسه‌های دندان؛ استرپتوکوک ویریدنس؛ استرپتوکوک موتانس

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