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INFECTIOUS ROLE OF BACTEREMIA IN THE FIELD OF ORAL AND MAXILLOFACIAL SURGERY - AN ORIGINAL RESEARCH

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Abstract
Background
This study is done to compare and correlate the factors that would affect the prevalence, intensity, nature of bacteremia during pre-operative, intra-operative and aftermath trans-alveolar extraction of impacted mandibular third molar.
Aim
The aim of this study is to study the prevalence, nature, and intensity of bacteremia among the patients with no antibiotics administered prior to trans-alveolar extraction, with and with-out periapical and periodontal infections.
Materials and methods
A prospective clinical study and microbiological assessment on blood culture was conducted in 50 patients who underwent surgical removal of impacted mandibular third molar teeth. Immunocompromised patients, patients having temperature greater than 100^0 F, bleeding disorders, patients on recent antibiotic medications were excluded from the study.
Results
On comparison of the pre-operative, intra- operative and post-operative intensity values, the intensity of bacteremia was significantly greater at the intra operative and post-extraction time than at the pre-extraction time.
Conclusion
We conclude that the incidence, prevalence and the intensity of bacteremia during trans-alveolar extraction increases as the patients age advances and the rate of incidence of periodontitis increases especially in patients with poor oral hygiene, which contributes to the occurrence and intensity of bacteremia associated with trans-alveolar extraction of third molar. We also found that the occurrence of bacteremia increased with duration of the surgery, as incidence of bacteremia was high when the surgery lasted more than 35 minutes in general.

Keywords- Bacteremia, impacted third molar, trans alveolar extraction, periodontal and peri-apical infections

Introduction

Most surface areas of human body harbor an indigenous microbial flora and the oral cavity is certainly no exception. The oral mucous membranes are colonized by stable, well defined bacterial flora. This microbial flora is characteristic of a particular site, in a majority of population it is referred to as the “indigenous” or “normal flora”(1). They live in complete harmony with the host without causing any damage to it. At birth the oral cavity does not contain detectable organisms. Beginning at about 8 hours following birth, number of detectable organisms in a newborn’s oral cavity increases rapidly and they are predominately aerobic(2)’. The bacterial composition of the oral microbiota varies considerably during the first few days of life, but streptococci are usually among the early oral inhabitants, and they persist throughout the

life. As the teeth erupt, site becomes available for anaerobic conditions to develop, mainly in the gingival crevicular and inter-proximal areas, which favors the microorganism to localize and flourish at these sites. While most organisms colonizing our bodies are beneficial to our health, and they exist in a state of homeostasis, where a balance state exists among the host, the environment, and the microorganism. Disease occurs when an imbalance exists, as some of them can transit from a commensal relationship to one of pathogenicity. These disease-causing bacteria are always present in a pathogenic state, but the commensal bacteria, which are more abundant, prevent the dangerous microbes from establishing a foothold[(3)]. Some elusive trigger from the oral cavity or temporal cue like, use of tooth pick or an electric sonicating tooth brushes can stimulate the activity of the bacteria, resulting in infection or disease.

It has been well established that host defense mechanisms are the major factors in determining the outcome of an infection, and it is made up of three major components namely local, humoral and cellular factors. They are interrelated closely with one another and they provide a unified protective mechanism for the host. Under normal conditions, the host factors namely the local, humoral and the cellular factors predominate. The more they predominate, the greater is the host reserve. If microbial factors increase or protective host factors decrease, the pathogenic potential increases(4) As this occurs, the host reserve diminishes until microbial factors predominate and the clinical infection supervenes. The relationship between the host and the microorganism are not static, and each day the microbes with various harmful qualities may invade the host or host may acquire breaks in defenses. This relationship therefore swings continuously, by changing the amount of host reserve. In oral cavity the oral commensals particularly those residing in periodontal niches, commonly exist in the form of biofilm on either non-shedding surfaces such as the teeth or shedding surfaces such as epithelial linings of gingival crevices or periodontal pocket(5). These bacteria gain entry into the blood stream from oral niches through a number of mechanisms and a variety of portals. First and most commonly, when there is tissue trauma induced by procedures such as instrumentation beyond the root apex and tooth extraction, a breakage in capillaries and small blood vessels that are located in the vicinity of the plaque biofilms leads to spillage of bacteria into the systemic circulation. A higher microbial load would facilitate such dissemination in the individuals with poor oral hygiene, are at a higher risk of developing bacteremia during oral manipulate procedures. Tooth extraction or exodontia and associated tissue trauma can cause bacteremia (6). The bacteremia incidence appears to be influenced positively by the presence of gingivitis, periodontitis and odontogenic infections such as dento-alveolar abscess Suggesting a direct relationship between an increased bacterial biofilm burden and bacteraemia. Other contributory factors for the phenomenon are the extent and duration of the surgical period and the magnitude of blood loss (5). When surgical incision is made to facilitate the extraction of teeth particularly impacted third molars. With subsequent insertion and removal of sutures may lead to bacteremia. In maxillo facial surgery, when surgeon cuts through the oral mucosa into the deeper tissues during transalveolar extraction, which leads to a breach in the oral mucosal barrier and place's the internal body environment in contact with a highly contaminated ecosystem, resulting in the penetration of microorganisms into the blood stream(2). Thus the microbes signals the host to mobilize both the defense mechanism namely the humoral and cellular factors. And the local accumulation of these factors prevents the dissemination of pathogen and thus allowing healing. Here we conducted a study to compare and correlate the factors that would affect the prevalence, intensity, nature of bacteremia during pre-

operative, intra-operative and aftermath trans-alveolar extraction of impacted mandibular third molar. The aim was to study the prevalence, nature, and intensity of bacteremia among the patients with no antibiotics administered prior to trans-alveolar extraction, with and with-out periapical and periodontal infections. Objectives were to evaluate the prevalence, intensity, nature of bacteremia before, intra-operative and immediately after trans-alveolar extraction of impacted mandibular third molar, to compare the prevalence, intensity and nature of bacteremia among patients with and without peri-apical and periodontal infection.

Materials and methods

A prospective clinical study and microbiological assessment on blood culture was conducted in 50 patients who underwent surgical removal of impacted mandibular third molar teeth. Inclusion criteria listed that the patient must have impacted lower third molar with normal hematological values. Patients were into the study regardless of the extent of their odontogenic and / or periodontal disease. Patients with partially and un-erupted third molar with dental caries. Exclusion criteria listed that patients who are immunocompromised such as patients with poorly controlled systemic disease, patients with temperature greater than 100 degrees Fahrenheit or above of non-odontogenic origin, patients who have had any manipulation of gingiva within 1 hour prior to the study, systemic complication like bleeding disorders, patients on recent antibiotic medications and patients with venous access unavailable in non-dominant arm. Clinical assessment included that all the patients were clinically examined both pre-op and post-op temperature recording was done using thermometer and Oral Hygiene index — S (Greene and Vermillion) was recorded. The OHI-S consist of two components: simplified debris index (DI-S) and a simplified calculus index (CI-S). Each component is assessed on a scale of 0 to 3 using mouth mirror and explorer. Six tooth surfaces that were examined in the OHI-S were the facial surfaces of the teeth 16,11, 26,31 and lingual surfaces of teeth 36 and 46. Oral debris index (DI-S) 0- No debris or stain present, 1- Soft debris covering not more than one third of the tooth surface, 2 - Soft debris covering more than one third but not more than two third of exposed tooth surface, 3 - Soft debris covering more than two third of the tooth surface. Calculus index(CI-S) 0- No calculus present, 1- Supra gingival calculus covering not more than one third of the tooth surface, 2- Supra gingival calculus covering more than one third but not more than two third of exposed tooth surface or the presence of individual flecks of sub gingival calculus around the cervical portion of the tooth,3- Supra gingival calculus covering more than two third of exposed tooth or continuous heavy band of sub gingival calculus around the cervical portion of the tooth The DI-S and CI-S score per person are obtained by totalling the score per tooth and dividing by the number of tooth examined. The OHI-S score per person is the total of DI-S and CI-S score per person. DI-S and CI-S OHI-S Good-0.0-0.6 Good-0.0-1.2 Fair -0.7-1.8 Fair-1.3-3.0 Poor-1.9-3 Poor- 3.1-6 Gingival index performed with Williams periodontal probe (Loe H. Silness). It is a noninvasive index performed using a blunt instrument such as periodontal probe to assess the bleeding potential of the gingival tissues. The six tooth surfaces examined in the gingival index are 16,21,24,36,41 and 44. Gingival status: 0 - Absence of signs of inflammation, 1- Mild to moderate inflammatory gingival changes, not extending around the tooth, 2- Mild to moderately severe gingivitis extending all around the tooth, 3- Severe gingivitis characterized by marked redness swelling, tendency to bleed and ulceration. Totaling of gingival status score per tooth and dividing by the number of teeth examined provides gingival score per person. Gingival scores Degree of gingivitis 0.1-1 mild 0.1-2 moderate 0.1-3 severe. Duration of surgery is noted. Type of impaction-Clinical assessment by Pederson’s difficulty index1) Spacial Relationship:

2)Depth Mesio angular (1)Horizontal (2) Level A: High occlusal level (1)Vertical- buccoverted (3a) Level B: Medium occlusal level (2)Vertical- Level C: Deep occlusal level(3)linguoverted (3b) Disto angular (4) (3)Ramus Relationship: 4)Pederson index:Class 1: Sufficient Space(1) Very difficult(7-10) Class 1: Reduced Space(2) Moderately difficult(5-6) Class 1: No Space(3) Slightly difficult(3-4) Radiologically by Winter's or WAR lines The position and depth of the impacted mandibular 3rd molar are determined using the Winter's Lines (WAR). This method was described by George winter. These are 3 imaginary lines (white, amber & red) "drawn" on the dental X-ray (IOPA/OPG). Application Mesio-Angular Disto-Angular Horizontal Vertical White Line The 'white' line of Winter is drawn along the occlusal surfaces of the erupted mandibular molars extended posteriorly over the third molar region; the axial inclination of the impacted tooth is immediately apparent. The occlusal surface of a vertically impacted tooth is seen to be parallel to 'white' line, whilst when a distoangular impaction is 26 present the occlusal surface of the tooth and the 'white' line are seen to converge as if to meet in front of the third molar. The relationship of the occlusal surface of the impacted tooth to those of the erupted molars may also be estimated by the use of the 'white' line and this provides an indication of the depth at which the tooth is lying in the mandible. Amber Line The second imaginary line, called for convenience the 'amber' line is drawn from the surface of the bone lying distally to the third molar to the crest of the interdental septum between the first and the second mandibular molars. The 'amber' line indicates the margin of the alveolar bone enclosing the tooth and so when soft tissues are reflected, only that portion of the tooth shown on the film to be lying above and in front of the 'amber' line will be visible, for the remainder of the tooth will be enclosed within the alveolar bone. Red Line The third or 'red' line is used to measure the depth at which the impacted tooth lies within the mandible. It is a perpendicular dropped from the 'amber' line to an 'imaginary point of application' for an elevator. With the solitary exception of distoangular impactions, the amelocemental junction on the mesial surface of the impacted tooth is used for this purpose. The more deeply embedded the tooth, the longer the 'red' line and the more difficult the extraction is to perform. Clinical experience reveals that every time that the length of the 'red' line increases by Imm, the extraction becomes about three times more difficult to complete. Patient sample selection was based on the status of the oral and gingival health the patients were divided into 2 groups. Group-I: Patient's with no chronic periodontitis and only pericoronitis Group-II: Patients with chronic periodontitis and pericoronitis. Procedure included a 2ml of venous blood is drawn preoperatively, after starting the procedure and immediately after completion of the procedure Out of these 3 sets of 2ml withdrawn during different times, lml of blood from each set is inoculated aerobically into brain heart infusion broth and the remaining Iml of venous blood is inoculated into anaerobic thio-glycollate broth. Both are incubated for a period of 24 hours at 37° C. They are then plated/ streaked on brain heart infusion agar plate for incubation at 37° C for 24 hours for aerobic organism and incubated in brain heart infusion blood agar plate at 37° C for 3 days for anaerobic organisms. If positive blood culture reported then biochemical characterization tests are carried out and identification of the isolates' one. Their microbial growth will be determined by measuring the colony forming per unit millilitre (cfu/ml) using colony counter. Proforma for case record included in the study incidence of bateremia in transalveolar extraction of impacted mandibular third molar-clinical study was op no: date: / name: age/gender / chief complaint / past medical history / intra-oral examination / temp, pre-op — post-op ohi-s index (greene & vermillion) / gingival index(silness &loe) / type of impaction 1)spacial relationship: 2)depth:| mesio angular(1) level a: high occlusal level(1)| horizontal(2)

level b: medium occlusal level(2)| vertical-buccoverted(3a) level c: deep occlusal level(3)| vertical-linguoverted(3b) | disto angular(4) | |3)ramus relationship: 4)pederson index: class 1: sufficient space(1) very difficult(7-10) class 1: reduced space(2) moderately difficult(5-6) class 1: no space(3) slightly difficult(3-4) diagnosis / patient assessment group / duration of surgery (mins) / blood culture finding / pre-operative intra-operative | post-operative / aerobic / anaerobic / photographs / armamentarium.

Results

The prevalence and intensity of bacteremia of dental origin were examined, in 50 adult patients following the trans-alveolar extraction of an impacted mandibular third molar, comprising of 30 male and 20 female patients. The study patients were divided into two groups based on their periodontal condition:

Group 1- Patients with no chronic periodontitis but only pericoronitis(n=25)

Group 2-Patients with chronic periodontitis and pericoronitis (n=25)

i)Distribution of bacteremia:

The organisms that were isolated are Micrococcus, Pseudomonas, E.Coli, Staphylococcus and Streptococcus

All cultures of blood samples taken pre-operatively in both the groups of patients (group I and II) were negative; however, during intra operative and post-operative time, the bacteremia was found in 8 of 50 patients examined. In group I, 3 patients reported with bacteremia, mainly the Micrococcus species in both intra operative and post-Operative aerobic blood culture. In group II, 5 patients reported with bacteremia. Out of these 2 patients with Pseudomonas aeruginosa (aerobe-gram negative bacilli). Then 1 patient with E. coli (gram negative bacilli) and 1 patient reported with Streptococcus viridans during intra Operative and post-operative aerobic and anaerobic blood culture. The blood culture reported in 1 patient was Staphylococcus aureus in intra operative aerobic blood culture and Streptococcus viridians (alpha hemolytic facultative anaerobe) in post-operative aerobic and anaerobic blood culture.

ii)Patients with positive cultures after trans-alveolar extraction in relation to age group

In group I and II the study of bacteremia was conducted in age groups between 20-25years, 26-30years,31-35years,36-40 years, and 41-45 years. In group I one patient reported bacteremia in age group of 20 - 25 years and 2 patients in age group26-30 years. In group II one patient each in all the age groups were reported. From the above table it is inferred that, the occurrence of bacteremia tended to increase with age of the patient which was statistically significant ($P<0.001$). The occurrence of bacteremia associated with trans-alveolar extraction increases with duration of surgery. It was noted, when the duration of the procedure lasted beyond 35 minutes.

iii) Patients with positive cultures after trans-alveolar extraction in relation to duration:

The occurrence of bacteremia was 33% in Group I and 37% in Group II which had the duration of 36-45 minutes. When the duration of the surgery ranged from 46-55 minutes only the 2 Group II patients (66%) showed bacteremia. Of the 150 specimens obtained, 13 were aerobes (8.6%), 3 (2%) facultative anaerobes. Aerobes were isolated nearly twice than facultative anaerobes. No organism was isolated during pre-operatively. The organisms isolated during intra operative period were 7 aerobes, and 1 anaerobe. In the post-operative period 6 aerobe and 7 anaerobes were isolated. The significance of number and type of microorganism was tested by means of the chi square test. The demonstration of x? =0.625 with P = 0.42 indicates a significant incidence of intra operative and post-operative bacteremia in Trans alveolar extraction of mandibular third

molar. The demonstration of x* =0.584 with P<0.0001 indicates a significant incidence of aerobic microorganism as compared to anaerobic microorganism.

iv) Patients with positive cultures after trans-alveolar extraction in relation to OHI index Of the 50 patients none had OHI index score that was rated excellent. Bacteremia was detected intra-operatively in 1 out of 17 patients whose OHI score was rated good, and 2 out of 8 patients whose OHI score was rated fair in Group I. Whereas in Group II bacteremia were reported in 4 of 22 patients whose OHI score was rated fair, and 1 of 3 patients whose OHI score was rated poor. Incidence of bacteremia was high with moderate to poor oral hygiene. Differences between the groups were highly significant(P<0.0001). Of the 50 patients, 1 out of 16 patients with mild gingivitis and 2 out of 9 patients with moderate gingivitis reported positive blood culture in Group I. Where as in Group II, 1 out of 4 patients with moderate gingivitis and 4 out of 19 patients with severe gingivitis showed bacteremia. It was inferred that the occurrence of bacteremia is high with group II. Differences between the groups were statistically insignificant (P=0.05).

v) Frequency of bacteremia

Of 150 specimens taken, 16 were positive for microorganisms. Of these 3 each, in group I and 5 each in group II were showed positive cultures during intraoperative and post-operative period. Comparing the 6 Positive cultures in group I to the 10 positive cultures in group II shows a significant increase in frequency of bacteremia following trans alveolar extraction in patient with periodontitis. The significance of the frequency of occurrence was tested by means of the chi square test. The demonstration of x? =27.35 with P =0.06 indicates an insignificant difference in the frequency of occurrence of intra operative and post-operative bacteremia between both groups.

vi) Intensity of bacteremia

Patients who underwent transalveolar extraction, 8 were positive for microorganisms. Of these 3, positive cultures were obtained in group I, and 5 in group II. A comparison of the 3 positive cultures in group I to the 5 in group II shows a significant increase in incidence of bacteremia following trans alveolar extraction in patient with periodonititis. Differences of incidence of bacteremia between the two groups following trans alveolar extraction of third molar were statistically insignificant (P=0.16). The intensity of bacteremia in 8(16%) patients with positive blood culture were measured by using colony counter. On comparison of the pre-operative, intra-operative and post-operative intensity values, the intensity of bacteremia was significantly greater at the intra operative and post-extraction time than at the pre-extraction time. Differences between the pre-operative, intra operative and post-operative intensity of bacteremia following trans alveolar extraction of third molar were statistically significant (P=0.0003) in both the groups.

vii) Incidence of bacteremia

A paired T test was conducted to analyze statically the incidence of bacteremia following transalveolar extraction of mandibular third molar in Group I. On comparing the incidence of bacteremia during pre-operative, intraoperative and post-operative time, it was found that there was a statistically insignificant increase of bacteremia during intra and post-operative times. A paired T test was conducted to analyze statically the incidence of bacteremia following transalveolar extraction of mandibular third molar in Group II. On comparing the incidence of bacteremia during pre-operative, intra-operative and post-operative time, it was found that there

was a statistically insignificant increase of bacteremia during intra and post-operative time. A paired 'T' test was performed to compare the difference in the occurrence of bacteremia between Group I and II following trans alveolar extraction of mandibular third molar. It was observed that in both the groups the incidence of bacteremia was higher in post-operative period than pre-operative period, suggesting an increase in bacterial load in the blood stream during post-operative period (P=0.008). In our study, 3 patients in Group I and 5 in Group II developed bacteremia during trans alveolar extraction of mandibular third molar. The frequency of positive blood cultures during dental extraction ranged from zero to 20%

viii) Distribution of aerobes and anaerobes

The positive blood culture observed were 13 isolates of aerobes, 3 isolates of facultative anaerobes and no isolates of anaerobe at all. The type of bacteremia reported in 3 cases of group I were only aerobes predominantly Micrococci, both during intraoperative and post-operative period. The types of bacteremia occurring in group II patients were both aerobes and facultative anaerobes in the ratio of 4:1 post operatively. Among the aerobes in the post-operative blood samples Pseudomonas aeruginosa were isolated in 2 patients and E. coli in 1 patient. Among the facultative anaerobes, Streptococcus viridians were isolated in 2 patients post operatively. The only one case Staphylococcus aureus an aerobe was isolated in group II intra operatively. There were no anaerobes isolated in any of the samples of group I and II during any time.

ix) Patients with positive cultures in relation to age and duration of procedure:

The mean age of patients reported with bacteremia in Group I was 26.7years and in Group II was 33.8years. And the occurrence of bacteremia in trans-alveolar extraction was high when the duration of the procedure lasted more than 35 minutes. The mean duration of occurrence of bacteremia in Group I was 30 mins, and in Group II patients was 36.15mins. The intensity of bacteremia in 8(16%) patients with positive blood culture was measured by using colony counter. On comparison of the pre-operative, intra- operative and post-operative intensity values, the intensity of bacteremia was significantly greater at the intra operative and post-extraction time than at the pre-extraction time. Differences between the pre-operative, intra operative and post-operative intensity of bacteremia following trans alveolar extraction of third molar were Statistically significant (P=0.0003) in both the groups, as the intra oral bacterial count is expected to be higher in group II.

Thus, in our study we conclude that the incidence, prevalence and the intensity of bacteremia during trans-alveolar extraction increases as the patients age advances and the rate of incidence of periodontitis increases especially in patients with poor oral hygiene, which contributes to the occurrence and intensity of bacteremia associated with trans-alveolar extraction of third molar. We also found that the occurrence of bacteremia increased with duration of the surgery, as incidence of bacteremia was high when the surgery lasted more than 35 minutes in general.

Discussion

A prospective clinical study on the factors that would affect the incidence of bacteremia following the transalveolar extraction of mandibular third molar was carried out among 50 patients. Patients with an impacted lower third molar, with normal hematological values and with regardless of the extent of their odontogenic and /or periodontal disease were included in the study. This study excluded the patients who were immune-compromised, with poorly controlled Systemic disease, bleeding disorders and body temperature greater than 100°F. Patients were

subjected to clinical evaluation, pre and post -operative temperature recording and duration of surgical procedure. The impacted mandibular third molar was assessed clinically with Pederson's difficulty index and radiologically with WAR lines. The quantum of dental plaque deposit, spontaneous gingival bleeding was recorded for evaluation of dental health. Based on the status of the oral and gingival health the patients were divided into 2 groups. Group I comprising need of patients with no chronic periodontitis but only pericoronitis, Group II comprising of patients with chronic periodontitis and pericoronitis. The patient's consent was obtained for the blood withdrawal during the procedure. A 2ml of venous blood is drawn once preoperatively, 15 minutes after starting the procedure and once immediately after completion of the procedure. Out of these 3 sets of 2ml withdrawn during different times, 1ml of blood from each set is inoculated aerobically into brain heart infusion broth and the remaining 1ml of venous blood is inoculated into anaerobic thio-glycollate broth. Both are incubated for a period of 24 hours at 37° C. They are then plated/ streaked on brain heart infusion agar plate for incubation at 37° C for 24 hours for aerobic organism and incubated in brain heart infusion blood agar plate at 37° C for 3 days for anaerobic organisms. If positive blood culture reported biochemical characterization and identification of the isolates were done. Their microbial growth was determined by measuring the colony forming per unit milliliter (cfu/ml) using colony counter. In this study, the incidence of bacteremia associated with transalveolar extraction of mandibular third molar was 'found in 8 patients (16%) out of 50 patients examined. Based on its incidence, bacteremia following extraction detected in studies of Okell (7)and Elliot et al (1935)[8]was 60.9%, Peter B Lockhart et al (2008)[9]observed that the incidence of endocarditis-related bacteria from all 6 blood draws was 0. 60% with the extraction-placebo groups. Shazia Akbar Ansari et al (2012)(10) conducted a study on incidence of bacteremia in different oral surgical procedure, and he reported bacteremia in (122)49% of patients after dental extraction. Thus, on comparing the above reported studies the incidence of bacteremia observed in our study was relativity low. The number of patients reported with bacteremia. In group I was 3 patients and in group II was 5 patients These results indicated a close relationship between the occurrence of bacteremia and the status of the oral and gingival health of the patients. Studies have been made to determine whether oral hygiene and health are related to the degree of bacteremia detected after oral surgical operations. A result has been supporting authors having recorded an increased prevalence of bacteremia with poorer oral health and contradicting other investigators who have reported no differences. Elliott et al (1935)[11] found that the occurrence and degree of bacteraemia after dental extraction depended upon the severity of gum disease. McEntegart and Porterfield (1949)[37] found that the incidence of post-extraction bacteremia was unrelated to the extent of oral sepsis. Lewis HJ et al (1987) (12)conducted a microbiological investigation of post-extraction bacteremia in 60 black patients and he detected bacteremia in 65% of patients after dental extraction and stated that there was no correlation between oral health Status and positive blood cultures after dental extraction; as majority of patients had poor 'oral hygiene and it was impossible to draw any definite conclusion about the relationship between oral health and post extraction bacteraemia. Heimdahl et al (1990)(13) observed bacteria in 100% of patients after dental extraction on lysis-filtration of bacteremia after different oral surgical procedures. Lockhart et al (1996)(9) studied the incidence and nature of aerobic and anaerobic bacteremia's following a single-tooth extraction and compared with its dental status, and concluded that single-tooth extraction can cause a bacteremia regardless of dental or periodontal status. Tomas et al (2007)[46] reported a higher incidence of bacteremia percentages at some point during the

study (sampling after 15 minutes and at one hour) subjected without spontaneous gingival bleeding. Breminand maharaj C et al (2012)(14) reported post extraction bacteremia in 27.8, 32.4 and 28.6% of black patients with good, fair and poor plaque index scores, and in 23.7, 35.3 and 30.6% of patients with good, fair and poor gingival index scores, respectively. Where as in our study the post trans alveolar extraction bacteremia was detected in 3(25%) patients with OHI score rated good and fair in Group I, and 5 (33%) patients with OHI score rated fair and poor in Group II respectively. Thus, the bacteremia reported in our study following transalveolar extraction was comparatively low A when compared to previous. Another contributing factor for incidence of bacteremia was age. This was probably because the occurrence of periodontitis is common in patients above 30 years of age. K. Okabe et al (1995)[(15)]in his study on factors affecting the occurrence of bacteremia, the positive blood culture was found in 12 (42.9%) under 20 years of age, and 33(86.8%) in patients above 60 years. Where as in our study patients with positive culture reported in 3 (15%) of 20 patients in Group I and 2 (18%) of 11 patients in Group IJ under 30years of age, whereas in patients 30 -45years it was found in 3(21%) of 14 patients in Group II and no patients in Group I, but the incidence was low in our study. In general, as the patient's age advances, the incidence of periodonititis increases, especially with poor oral and gingival condition and which contributes to the occurrence of bacteremia associated with trans alveolar extraction. Based on the type of isolates, Okell and Elliot et al (1935)(7) and Vargas B et al (1990)(16) Streptococcus viridians has been documented to be the most frequently encountered microorganism responsible for post-operative bacteremia. But in our study all positive blood culture in group I the microorganism isolated were Micrococci occurring six times. Gutverg and Haberman (1962)(17) isolated Pseudomonas from the periodontal pockets of 5 out of 231 patients who underwent extractions. Lockhart et al (1996)(9) reported that the majority of cultures yielded were gram-positive cocci, and polymicrobial organisms. K.Okabe et al (1995)(15) isolated mainly aerobes and facultative anaerobes than anaerobes. Chandramohan et al (2011)(18) reported that the Staphylococcus albus was the most frequently isolated micro-organism occurring fifteen times. He isolated Pseudomonas as pathogenic microorganism in 4.1% of blood samples of patients with periodontitis, but in our study in group II patients Pseudomonas(aerobe) were isolated, in 2 patients) both intra and post operatively wet to Streptococci (facultative anaerobe) and Staphylococci, which coincided with Gutverg and Haberman et al study(17). Various authors have conducted study on prevalence of bacteremia following tooth extraction and compared with the surgical duration. K.Okabe et al (1995)(15) stated that the occurrence of bacteremia was high when surgery lasted more than 100 minutes, and mean duration of surgery in patients with bacteremia was 49.3minutes.Rajasuo A et al(2004)(19) reported bacteremia in 88% (50% one minute after incision, 44% immediately after extraction), Robert et al(2006)[11] indicated that a post procedure bacteraemia is quenched within 12 min, and 96.2% after 30 sec., 20% after one hour, Tomas 1(2007)(2) On comparing the above studies the occurrence of bacteremia associated with trans-alveolar extraction; in our Study, occurred when the duration of the procedure lasted more than 35 minutes. The mean duration of occurrence of bacteremia in Group I was 30mins of duration; and in Group II patients was 36.15mins of mean duration which were comparable to K.Okabe et al(15), The intensity or magnitude of bacteremia observed in our study following trans alveolar extraction was 0.05-0.25x10° cfu/ml of blood in group) I and 0.03-0.75x10 cfu/ml in group II, which was low ¥ compared to Lockhart et al (2008)[6] study reported about 25 colony forming units (CFUs) per PCR reaction, corresponding to 10°-10° CFU/ml of blood. As intensity or magnitude of

microorganism is of x10® CFU/ml are needed to cause systemic bacteremia. On comparing the various factors contributing to the incidence, prevalence and the intensity of bacteremia during trans-alveolar extraction, we conclude that it increases with patient's age. As the patients age advances, the rate of incidence of periodontitis increases especially in patients with poor oral hygiene, which contributes to the occurrence and the intensity of bacteremia associated with trans-alveolar extraction of third molar. Most of the isolates observed were aerobes in group I and group II and 3 isolates was facultative anaerobe. There was no incidence of anaerobes in any of the samples of group I and II during any time of trans alveolar extraction of third molar. We also found that the occurrence of bacteremia increased with mutation of the surgery, as incidence of bacteremia was high when the surgery lasted more than 35 minutes in general. The intensity or the magnitude of bacteremia following the transalveolar extraction of third molar associated with pericoronitis and periodontitis in our study is of a low grade, to cause systemic bacteremia. It is difficult to assert the vulnerability of bacteremia resulting from transalveolar extraction of third molar unless these microorganisms are genetically isolated from the various end organ of the body as in oral cavity. A prospective clinical study on the factors that would affect the incidence of bacteremia following the transalveolar extraction of mandibular third molar was carried out among 50 patients comprising of 30 male and 20 female patients. Based on the status of the oral and gingival health the patients were divided into 2 groups. Group I comprise of patient with no chronic periodontitis and only pericoronitis and group II comprises of patient with chronic periodontitis and pericoronitis. The patients were subjected for blood withdrawal preoperatively, minutes after starting the procedure and completion of the procedure. Out of these 3 sets of 2ml withdrawn during different times, 1ml of blood from each set is inoculated aerobically into brain heart infusion broth and the remaining 1ml of venous blood is occulated into anaerobic thio-glycollate broth. The microbiological assessment of these blood samples was carried out. In our study, 3 patients of group I and 5 patients of group II developed bacteremia during trans alveolar extraction of mandibular third molar. The frequency of positive blood cultures during dental extraction was 16%. The positive blood culture observed were 13 isolates of aerobes, 3 isolates of facultative anaerobes and no isolates of anaerobe at all. The type of bacteremia reported were mainly aerobes, both during intra operative and post-operative period in group I. The types of bacteremia occurring in group II patients were both aerobes and facultative anaerobes in the ratio of 4:1 postoperatively and only aerobes during intra operative period. In group I the type of microorganism observed were predominately Micrococci. In group II among the aerobes in the post-operative blood sample Pseudomonas aeruginosa were isolated in 2 patients and E.Coli in 1 patient. Among the facultative anaerobe, Streptococcus viridans were isolated in 2 patients postoperatively. The only one case Staphylococcus aureus an aerobe was isolated in group II intraoperatively. There were no anerobes isolated in any of the samples of group I and II during any time. The mean age of patients reported with bacteremia in Group I was 26.7years and in Group II was 33. 8years.The occurrence of bacteremia in trans-alveolar extraction was high when the duration of the procedure lasted more than 35 minutes. The mean duration of occurrence of bacteremia in Group I was 30mins, and in Group I] patients was 36.15mins. The intensity of bacteremia in 8(16%) patient with positive blood culture was measured by using colony counter. On comparison of the pre-operative, intra- operative and post-operative intensity values, the intensity of bacteremia was significantly greater at the intra operative and post-extraction time than at the pre-extraction time. Differences between the pre-operative, intra operative and post-operative intensity of bacteremia following trans alveolar

extraction of third molar were statistically. Significant (P=0.0003) in both the groups, as the intra oral bacterial count is expected to be higher in group II. Thus in our study we infer that the incidence, prevalence and the intensity of bacteremia during trans- alveolar extraction were: - Mainly aerobes in group I and both aerobes and facultative anaerobes in group II No anaerobes were isolated in both the groups at any point of time during transalveolar extraction Increases with patients age and further as the patients as age advances, the rate of incidence of periodontitis increases especially in patients with poor oral hygiene. The poor oral and gingival condition contributes to the occurrence and the intensity of bacteremia associated with trans-alveolar extraction of third molar. The occurrence of bacteremia increases with the duration of the surgery, as incidence of bacteremia in our study was high when the surgery lasted more than 35 minutes in general. The intensity or the magnitude of bacteremia following the transalveolar extraction of third molar associated with pericoronitis and periodontitis in our study is of a low grade, to cause systemic bacteremia. It is impossible to determine the causality of bacteremia purported to be the result of transalveolar extraction unless the organism is genetically identified as same in the various end organ of the body as in the mouth.

References

1. FLYNN, Thomas R. *Management of infections of the oral and maxillofacial region* [online]. 1989. Dostupné z: doi:10.1016/0278-2391(89)90502-8
2. TOMÁS, I., M. ÁLVAREZ, J. LIMERES, C. POTEL, J. MEDINA a P. DIZ. *Prevalence, duration and aetiology of bacteraemia following dental extractions* [online]. 2007. Dostupné z: doi:10.1111/j.1601-0825.2006.01247.x
3. AVILA, Maria, David M. OJCIUS a Ozlem YILMAZ. The oral microbiota: living with a permanent guest. *DNA and cell biology*. 2009, **28**(8), 405–411. ISSN 1044-5498.
4. JOYNER, Michael J. a Daniel J. GREEN. Exercise protects the cardiovascular system: effects beyond traditional risk factors. *The Journal of physiology*. 2009, **587**(Pt 23), 5551–5558. ISSN 0022-3751.
5. PARAHITIYAWA, N. B., L. J. JIN, W. K. LEUNG, W. C. YAM a L. P. SAMARANAYAKE. Microbiology of odontogenic bacteremia: beyond endocarditis. *Clinical microbiology reviews*. 2009, **22**(1), 46–64, Table of Contents. ISSN 0893-8512.
6. LI, X., K. M. KOLLTVEIT, L. TRONSTAD a I. OLSEN. Systemic diseases caused by oral infection. *Clinical microbiology reviews*. 2000, **13**(4), 547–558. ISSN 0893-8512.
7. OKELL, C. C. a S. D. ELLIOTT. Bacteriæmia and oral sepsis with special reference to the ætiology of subacute endocarditis. *The Lancet*. 1935, **226**(5851), 869–872. ISSN 0140-6736.
8. ELLIOT, Andrew J., Markus A. MAIER, Arlen C. MOLLER, Ron FRIEDMAN a Jörg MEINHARDT. Color and psychological functioning: the effect of red on performance attainment. *Journal of experimental psychology. General*. 2007, **136**(1), 154–168. ISSN 0096-3445.
9. LOCKHART, P. B. An analysis of bacteremias during dental extractions. A double-blind, placebo-controlled study of chlorhexidine. *Archives of internal medicine*. 1996, **156**(5), 513–520. ISSN 0003-9926.
10. ANSARI, S. A., R. BAQAI, H. MEHDI, G. S. SAHITO a G. ALI. Incidence of Bacteremia and Antibiotic Sensitivity Associated with Oral Surgical Procedures Incidence of Bacteremia and Antibiotic Sensitivity Associated with … [online]. 2012. Dostupné z:

http://archive.jpda.com.pk/volume-21-issue-4/incidence-of-bacteremia-and-antibiotic-sensitivity-associated-with-oral-surgical-procedures/

11. MCENTEGART, M. G. a J. S. PORTERFIELD. Bacteraemia following dental extractions. *The Lancet*. 1949, **2**(6579), 596–598. ISSN 0140-6736.
12. LEWIS, H. J., G. A. CULLIGAN, E. POCHEE, F. A. DE WET a H. H. CREWE-BROWN. A microbiological investigation of post-extraction bacteraemia in black subjects. *The Journal of the Dental Association of South Africa = Die Tydskrif van die Tandheelkundige Vereniging van Suid-Afrika*. 1987, **42**(4), 205–208. ISSN 0011-8516.
13. HEIMDAHL, A., G. HALL, M. HEDBERG, H. SANDBERG, P. O. SÖDER, K. TUNÉR a C. E. NORD. Detection and quantitation by lysis-filtration of bacteremia after different oral surgical procedures. *Journal of clinical microbiology*. 1990, **28**(10), 2205–2209. ISSN 0095-1137.
14. MAHARAJ, Breminand, Yacoob COOVADIA a Ahmed C. VAYEJ. An investigation of the frequency of bacteraemia following dental extraction, tooth brushing and chewing. *Cardiovascular journal of Africa*. 2012, **23**(6), 340–344. ISSN 1995-1892.
15. OKABE, K., K. NAKAGAWA a E. YAMAMOTO. Factors affecting the occurrence of bacteremia associated with tooth extraction. *International journal of oral and maxillofacial surgery*. 1995, **24**(3), 239–242. ISSN 0901-5027.
16. VARGAS, Benjamin, C. Kenneth COLLINGS, Lucy POLTER a Sol HABERMAN. Effects of certain factors on bacteremias resulting from gingival resection. *Journal of periodontology*. 1959, **30**(3), 196–207. ISSN 0022-3492.
17. GUTVERG, Manuel a Sol HABERMAN. Studies on bacteremia following oral surgery: Some prophylactic approaches to bacteremia and the results of tissue examination of excised gingiva. *Journal of periodontology*. 1962, **33**(2), 105–115. ISSN 0022-3492.
18. CHANDRAMOHAN, P., Babu M. RAMESH a Swetha J. LAXMI. Bacteremia during periodontal flap surgery, with and without prophylactic antibiotic administration: a comparative study. *Indian Journal of Dental Advancements*. 2011, 643+. ISSN 2229-5038.
19. RAJASUO, A., S. NYFORS, A. KANERVO, H. JOUSIMIES-SOMER, C. LINDQVIST a R. SUURONEN. Bacteremia after plate removal and tooth extraction. *International journal of oral and maxillofacial surgery*. 2004, **33**(4), 356–360. ISSN 0901-5027.