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Assessment of Microbial Growth and Salivary pH in Patients Wearing Fixed Partial Denture

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The oral cavity is a moist environment with constant temperature (34 to 36°C) and a pH close to neutrality in most areas and thus supports the growth of a wide variety of microorganisms. Fixed partial Dentures provide a protected habitat, especially beneath the fitting surface, which results in colonization and growth by a range of bacteria . This paves for many other complications of oral cavity. To assess the microbial growth and salivary ph in patients wearing fixed partial denture. 20 partially edentulous patients desiring replacement with fixed partial denture were enrolled in the study after obtaining informed consent . A swab was used to collect the microbial samples and were cultured. The salivary ph was estimated using ph indicator strips. Patients were given FPD and oral hygiene instructions. Microbial samples were obtained after 2 weeks of denture wearing and same salivary ph and microbial parameters were estimated and compared.The microbial growth was expressed in colony forming units. The results were then analysed statistically. A dependent sample 't' test was used to estimate statistically significant differences . Results inferred a statistical significance difference between the klebsiella ,streptococcal and lactobacillus and spirochete species before and after fpd cementation with marked statistical significance in PH. Microbial colonization increased after wearing denture with drastic change in PH . Hence proper oral hygiene measures are to be followed to maintain a healthy oral cavity in denture wearers.

Keywords: Fixed partial denture, growth, microbes, salivary pH.

The normal microbial flora of oral cavity is complex and consists of large number of species of bacteria including mycoplasma, fungi and protozoa. This is because of fact that mouth has many distinct habitats including saliva and crevicular fluids, surface of soft tissues such as lips, palate, cheek, tongue, gums and hard surfaces of teeth [(1).] The moist condition is mainly due to the presence of saliva .Any increase or decrease in this salivary flow rate will result in the alternation of the microbes present in the oral cavity. Fixed prosthesis is a restoration of one or more missing teeth that cannot be readily removed by the patient . It is permanently attached to natural teeth or roots that furnish the primary support to the appliance. It provide a protected habitat, especially beneath the fitting surface, which results in colonization and growth by a range of bacteria . This paves for many other complications of oral cavity[(2).] Lesions of the oral mucosa associated with the wearing of dentures may represent acute or chronic reactions to microbial denture plaque, a reaction to constituents of the denture base material, or a mechanical denture injury. They include denture stomatitis, angular cheilitis, traumatic ulcers; denture irritation hyperplasia, flabby ridges, and oral carcinomas[(3).] It has been observed that the majority of denture wearers do not pay necessary

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attention to the cleanliness. This may be due to decreasing manual abilities due to an advanced age, the nature of design, lack of awareness, improper storage, and failure to maintain asepsis of dental prosthesis that leads to the growth of microbial agents and formation of biofilms, which are reservoirs of infection[4].Previous studies suggested that proper replacement of dentures will increase the salivary flow rate along with improved occlusal force at the same time it enhances the accumulation of dental plaque and bacteria on the surface of the denture [5,6].The bacteria which depend on hard surfaces for attachment and growth will in part recolonize the mouth if a denture is worn .Investigations and researches revealed that a number of pathogenic microorganisms which were present in the mouth when the patient was dentate, they were harboured in the oral cavity even when they are in the edentulous state [7]. The study was conducted to assess the salivary ph and microbial growth in patients wearing fixed partial denture before and after cementation.

MATERIALS AND METHOD

The study was carried out in Saveetha Dental College and hospitals, Saveetha University. The study consisted of 20 partially edentulous patients desiring replacement with fixed partial denture were enrolled in the study after obtaining informed consent. The sample collected was saliva. The swab was used to collect the microbial sample in the cervical margin of gingiva before FPD cementation and were cultured for different bacteria and salivary PH was estimated using PH indicator strip.Patients were given FPD and oral hygiene instruction. The microbial samples were obtained after 2 weeks of denture wearing and same salivary PH and microbial parameters were estimated and compared. The swabs were suspended in saline solution. The sample obtained from the patients were cultured in three different culture media namely lactobacillus, Mitis salivarius agar base and MHA medium. Lactobacillus medium: 67.15g of lactobacillus powder was suspended in 1000ml of distilled water. The media is then heated to dissolve the powder completely in water. The media is then autoclaved at 15 lbs pressure for 15 minutes. Once the process of autoclave is done, the suspension is mixed well and poured into sterile petri plates. Mitis salivarius agar base: 3 scoops of agar is heated for 15 minutes .The heated agar is then transferred to the plates after cooling it. The plates are then kept in autoclave for 4 hours . It is then kept in hot air oven for 20 minutes. Muller-Hinton agar: Suspend 38 gm of the medium in one litre of distilled water. Heat with frequent agitation and boil for one minute to completely dissolve the medium. Autoclaving is then done at 121°C for 15 minutes. Cool to room temperature. Pour cooled Mueller Hinton Agar into sterile petri dishes on a level, horizontal surface to give uniform depth. Allow to cool to room temperature and store the plates (Fig.1).

RESULTS

The microbial growth was expressed in colony forming units. A paired sample t test was used to estimate statistically significant difference at 5% significance level (±=0.05). Results inferred there is statistically significant difference between klebsiella species ($p=0.02,<0.05$) before and after cementation were $1.50x10^6$cfu and $1.70x10^6$cfu, spirochete ($p=0.015,<0.05$) were $1.50x10^6$cfu and $1.64x10^6$cfu, lactobacillus ($p=0.04,<0.05$) were $1.47x10^6$cfu and $1.73x10^6$cfu, streptococcus ($p=0.013,<0.05$) were $1.36x10^6$cfu and $1.52x10^6$cfu. There is a marked significant difference in salivary ph in oral cavity. They were represented in Table 1 and Fig.2.

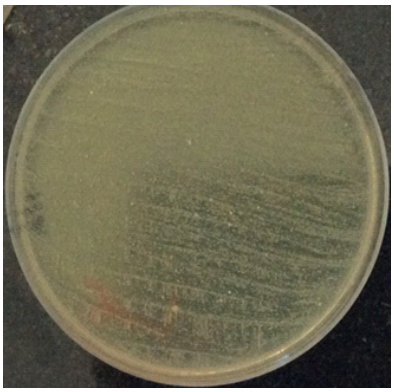

Fig. 1. Bacterial Culture

DISCUSSION

It has become very essential to know the oral micro flora so as to prevent and treat other systemic diseases caused by it. Previous studies suggested that with loss of teeth, bacteria associated with hard subjects, strict anaerobes generally found in periodontal pockets and very fastidious organisms tend to disappear from the oral cavity. Bacteria that depend on hard surfaces for attachment and growth will in part recognize the mouth if the denture is worn [8,9,10]. The normal range of salivary PH is 5.6-7 with an average of 6.7. Saliva buffers maintain the PH and offer protection in the mouth by preventing colonisation of potentially pathological microorganism ,by denying them optimisation of environmental conditions.Saliva buffers also neutralise the acids produced by acidigenic microorganism and prevent enamel demineralisation [11,12].Strep. mutans is a predominant microorganism isolated from mucosa and saliva of denture wearing subjects,it is common inhabitant to all oral sites(2). Staphylococcus is found to be present in elderly individuals.Lactobacillus in edentulous mouth is very low.Lactobacillus is found to contribute to 1% of the total microbial flora and Neisseria to be a commensal in the oral cavity [13,14]. In earlier studies, Klebsella and E.coli were described as transient commensal of the oral cavity [15,16]. In the present study a statistical significant difference were observed for streptococcus, lactobacillus, klebsiella and spirochete before and after denture fpd cementation. The rise in streptococcus after fpd cementation proved that it is found in close association with the tooth structure as

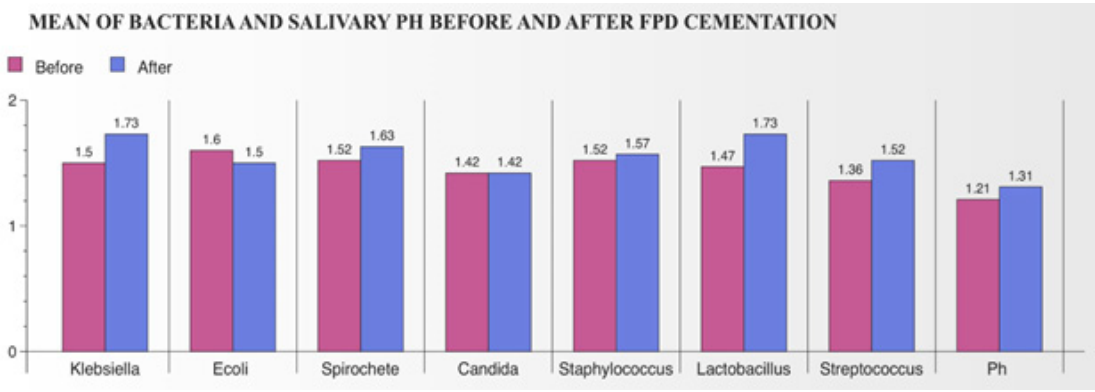

Fig. 2. Mean Of Salivary Ph And Microbes Before And After Fpd Cementation

Table 1. Paired Sample T Test

						95% confidence interval of the difference				
		Mean	N	Std.deviation	Std.error mean	Lower	Upper	t	df	Sig.(2-tailed)
Pair 1	Klebsiella before	1.5	20	0.512	0.114					
	Klebsiella after	1.7	20	0.47	0.105	-0.088	0.488	1.453	19	0.02
Pair 2	Ecoli before	1.68	20	0.512	0.117					
	Ecoli after	1.52	20	0.477	0.109	-0.448	0.132	-1.143	18	0.268
Pair 3	Spirochete before	1.52	20	0.499	0.113					
	Spirochete after	1.63	20	0.512	0.117	-0.211	0.422	0.697	18	0.015
Pair 4	Candida before	1.42	20	0.507	0.116					
	Candida after	1.42	20	0.507	0.116	-0.359	0.359	0	18	1
Pair 5	Staphylococcus before	1.52	20	0.507	0.116					
	Staphylococcus after	1.57	20	0.512	0.117	-0.287	0.392	0.325	18	0.749
Pair 6	Lactobacillus before	1.47	20	0.452	0.103					
	Lactobacillus after	1.73	20	0.512	0.117	-0.007	0.534	2.041	18	0.04
Pair 7	Streptococcus before	1.36	20	0.495	0.113					
	Streptococcus after	1.52	20	0.512	0.117	-0.244	0.559	0.825	18	0.013
Pair 8	Ph before	7.21	20	0.63	0.144					
	Ph after	7.31	20	0.749	0.171	-0.4	0.61	0.438	18	0.667

discussed above . There is also marked significance difference in salivary ph in oral cavity showing that there is difference in salivary ph before and after fpd cementation.

CONCLUSION

This study observed increased microbial colonisation following denture cementation. This could be attributed to compromised oral hygiene practices and surface characteristics of denture material used. Hence, meticulous oral hygiene measure and denture hygiene measures needs to be practised to minimise microbial colonisation and thus could promote improved oral health.

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