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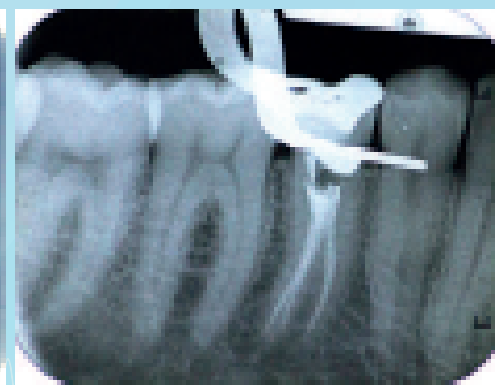
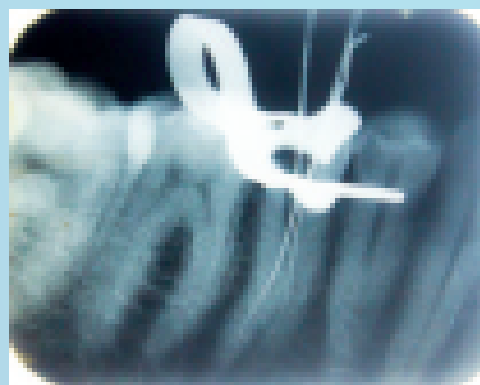
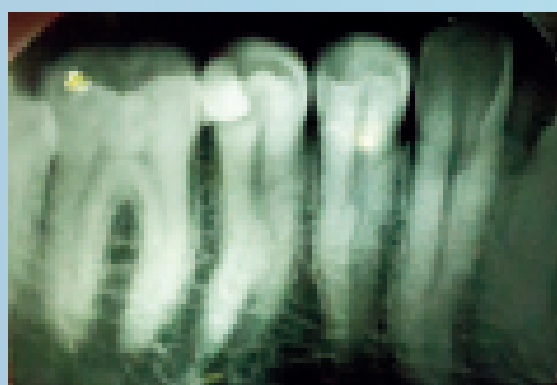
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MEDICAL JOURNAL

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- Haematological Parameters Including Platelet Indices in Vivax and Falciparum Malaria
- Ectodermal Dysplasia and Malocclusion – Retrospective study
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- Case Reports





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MEDICAL JOURNAL

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Editorial

Chettinad Health City Medical Journal is an International, peer reviewed, quarterly medical journal. This issue of the journal has a special section focusing on Dentistry. Dentistry is the branch of medicine that is involved in the study, diagnosis, prevention, and treatment of diseases, disorders and conditions of the oral cavity. There are nine specialties in dentistry namely Oral Medicine and Radiology, Oral and Maxillofacial surgery, Public Health Dentistry, Oral and Maxillofacial Pathology, Pedodontics and Preventive dentistry, Orthodontics and Dentofacial Orthopedics, Periodontics, Prosthodontics and Crown and bridge, Conservative dentistry and Endodontics.

This issue carries original articles, review articles and case reports. The original article on Ectodermal dysplasia and malocclusion focuses on cranio maxillofacial deformation associated with it. A study on the knowledge, attitude and practice of prisoners in central India revealed that 75% of prisoners were deprived of dental treatment. Another article focuses on the role of untreated caries in school children and designing the interventional strategies with a view to attend to oral health care needs of children. Another article is an eye opener on malaria revealing that low platelet count is an additional diagnostic tool.

A review article discusses the usefulness of dental stem cells in regenerative therapies. The article on limitations and scope of orthodontic treatment in medically compromised patients revealed the implications of cardiovascular, endocrine and respiratory diseases on orthodontic treatment. A stitch in time saves nine states that periodontal diseases act as a focus of infection for many systemic diseases due to dissemination of microbial products to distant parts of the body. Another review article focuses on the oral health management of geriatric patients with common systemic disorders. Piezoelectric surgery is a minimally invasive osseous surgical technique developed in Periodontics to reduce the risk of damage to surrounding tissues.

The case reports are on Sickle beta Thalassemia, Endodontic Management of mandibular second premolar with two roots and three canals, McInnes solution for fluorosis stains and Warty Dyskeratoma which is a benign epidermal proliferation. An interesting ECG and medical updates complete the issue. We hope you will find this issue interesting. Please do give your valuable suggestions.

Dr. Anitha V

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Opinion

Menstruation : A Sign or Symptom of Physiology or Failed Physiology? – A Hypothesis

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Menstruation is of unknown evolutionary significance¹. It is not clear why women are one of the very few species that menstruate^{1,2}. In fact, menstruation may even be harmful to women's health by causing blood loss which may in turn lead to anaemia and this is associated with morbidity and mortality^{3,4}. Menstruation remains a gynecological or reproductive endocrinological enigma.

Menstruation is widely believed to be a physiological function of all reproductive age women⁵. However, in recent times, we have an increasing concern about this assumption. I would like to propose a hypothesis that menstruation is a sign or symptom of failed function.

Menstruation occurs due to the shedding of the secretory endometrium after ovulation, when pregnancy fails to occur^{5,6}. It may also occur after shedding of proliferative endometrium when ovulation fails to occur i.e patient has irregular menstruation, indicating failed ovulation⁷.

It is observed that menstruation only occurs when:-

- 1) Ovulation occurs but fertilization and implantation does not occur, indicating that the physiological purpose of ovulation has failed – leading to menstruation^{5,6}.
- 2) Menstruation occurs when there is anovulation – leading to failure of oocyte release, uncontrolled growth of the proliferative endometrium and eventual irregular shedding of the unsupported endometrium⁷.

Menstruation is one of the proximate causes of endometriosis. The body's defense mechanism may be able to tolerate few episodes of retrograde menstruation. Relentless menstruation as occurs in most women until pregnancy may predispose a genetically prone and immunologically susceptible woman to endometriosis^{8,9}.

Endometriosis requires estrogen action and a functioning endometrium and menstruation¹⁰. Endometriosis is rare in pre menarchal years and post menopausal years where menstruation does not exist and the ovarian function is waning. Patients with Turner's syndrome and dysgenetic gonads do not normally develop endometriosis¹¹. It is also very uncommon in patients with Mullerian agenesis¹². Patients with mullerian agenesis, though they have fully functional ovaries, do not menstruate and hence do not develop endometriosis^{11,12}. Therefore, it can be reasonably concluded that endometriosis is caused by menstruation and a functioning ovary; the absence of either or both is unlikely to cause endometriosis. It clearly indicates that persistent menstruation in an estrogenic woman who is immunologically susceptible and genetically prone leads to endometriosis.

Therefore, I would like to propose that menstruation is a sign of failed physiology or function. This acceptance is not just for semantic purposes but also may help us understand many of the menstruation related pathologies in humans like endometriosis.

Acknowledgement

I thank Dr. Siddharth, Fellow in Clinical Andrology for helping me in researching the references and structuring the article. I also thank the peer reviewers for their valuable feedback and constructive criticism which has helped improve the article.

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Original Article

Haematological Parameters Including Platelet Indices in Vivax and Falciparum Malaria

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Abstract

Introduction - In India, malaria is still one the main diseases causing morbidity and mortality after HIV/AIDS. This study has been done to note the changes in haematological parameters like leucopenia, relative neutropenia, lymphocytosis, eosinopenia and presence of reactive lymphocytes in cases of malaria with special reference to platelet indices. The platelet indices include plateletcrit(Pct), platelet distribution width(PDW) and mean platelet volume(MPV).

Materials and methods - In this retrospective study, the haematological parameters in 110 patients with smear positive malaria cases were analysed with an equal number of healthy controls. Cell counts were done using haematology analysers. The haemoglobin, haematocrit, RBC count, mean corpuscular volume, mean corpuscular haemoglobin, mean corpuscular haemoglobin concentration, total and differential leucocyte count, platelet count, mean platelet volume, platelet distribution width and plateletcrit were recorded. Malarial parasites were detected, species identified, parasite density assessed on stained smears.

Results - There was statistically significant leucopenia, relative neutropenia, lymphocytosis, monocytosis, eosinopenia. The platelet count and plateletcrit showed a statistically significant reduction, while the mean platelet volume and platelet distribution width showed an increase.

Conclusion - A history of fever with chills and rigor are sensitive indicators of malaria, but lack specificity. The identification of additional criteria would be helpful in diagnosing malarial infections. Low platelet count had a higher predictive value for malarial infection in addition to leucopenia, relative neutropenia, monocytosis, reactive lymphocytes and eosinopenia as was seen in our study. In addition a low MPV, high Pct and PDW were predictive of malarial infections.

Key Words: Low WBC, Leucopenia, Eosinopenia, Thrombocytopenia, Platelet indices.

Chettinad Health City Medical Journal 2014; 3(3): 95 - 100

Introduction

In India, malaria is still one the main diseases causing morbidity and mortality after HIV/AIDS. The case load, averaging around 2 million cases annually in the late nineties, has shown a declining trend since 2002. Malaria cases have consistently declined from 2.08 million to 1.06 million during 2001 to 2012. The Slide Positivity Rate (SPR) has also shown gradual decline from 3.50 in 1995 to 0.98 in 2012. The reported *Plasmodium falciparum* cases have declined from 1.14 million in 1995 to 0.53 million cases in 2012. However, the percentage of *Plasmodium falciparum* infections has gradually increased from 39% in 1995 to 50.01% in 2012¹.

According to the National Vector Borne Disease Control Program, in 2013 (upto May) the total malaria cases were 190150; there were 115672 cases of falciparum malaria and 51 deaths due to malaria¹.

The number of reported deaths has been levelling around 1000 per year. The Annual Parasite Incidence (API) rate has consistently come down from 2.12 per thousand in 2001 to 0.88 per thousand in 2012 but confirmed deaths due to malaria have been fluctuating during this period between 1707 and 519¹.

The various treatment and preventive strategies adopted by India has helped reduce the falciparum malaria from 0.734 million cases in 2010, a reduction from 1.14 million cases reported in 2000². India, Myanmar and Indonesia still account for approximately 94% of the reported malaria cases in South East Asia in 2008, with India still reporting 65% of the cases. So, India still carries a high burden of the disease³.

The haematologic changes associated with malaria, namely anaemia, thrombocytopenia and monocytosis are well known^{4,5,6,7}. Other parameters are also affected, the values of which may affect the diagnosis and treatment of the disease. This study has been done

on 110 malaria positive cases and 110 healthy controls, to study the changes in other haematological parameters like low normal white blood cell (WBC) count, relative neutropenia, lymphocytosis, eosinopenia and presence of reactive lymphocytes with special reference to platelet indices. The platelet indices include plateletcrit (Pct), platelet distribution width (PDW) and mean platelet volume (MPV). In our study, the MPV and PDW were increased, while the Pct was reduced indicating thrombocytopenia and presence of giant platelets and platelet aggregates. These can be added as flagging parameters in haematology analysers and further refine our search for malarial parasite in the peripheral blood.

Materials and methods

In this retrospective study, the haematological parameters in 110 consecutive patients with smear positive malaria cases in a semi-urban area of Tamil Nadu were analysed between Jun 2010 to Dec 2010. 220 patient samples, 110 being positive for malaria were used as positive cases and 110 healthy patients negative for malaria were used as control for the study. The control population included the patients coming for 'Master Health Check-up' to the hospital during the same period.

The inclusion criteria included any patient with smear positive malaria. The demographic criteria including age and sex were noted. The age of the patients ranged from three years to 62 years and 101 patients were males and nine patients were females.

Venous blood samples were collected in EDTA vacutainers. Cell counts were done using the AcT 5 Diff (Coulter) and HMX (Coulter) Cell Count haematology analysers. Daily controls were run on the counters to ensure consistent results. The haemoglobin, haematocrit, RBC count, mean corpuscular volume, mean corpuscular haemoglobin, mean corpuscular haemoglobin concentration, total and differential leukocyte count, platelet count, mean platelet volume, platelet distribution width and plateletcrit were recorded. Thick and thin smears were made and stained with Giemsa and Leishman's stain respectively. Malarial parasites were detected, species identified, parasite density assessed. The microscopic findings were confirmed by another pathologist. The differential WBC count, presence of reactive lymphocytes, toxic granulation in neutrophils, eosinopenia and monocytosis was assessed manually. Platelet count, giant platelets and the presence of platelet aggregates were also noted on smear.

IBM SPSS statistical software version 21 was used for statistical analysis. Red blood cell parameters like hemoglobin, packed cell volume, RBC count, mean corpuscular volume, Mean Corpuscular hemoglobin, Mean Corpuscular hemoglobin concentration, white blood cell parameters like Total count, DC-Polymorphs, Lymphocytes, monocytes, eosinophils, platelet parameters like platelet count, mean platelet volume, plateletcrit, platelet distribution width were taken as explanatory parameters. Malaria status and type of malaria were taken as outcome variables. Descriptive analysis of all the explanatory and outcome parameters was done. All the categorical

variables were presented in frequencies and percentages & the numerical variables presented in Means and Standard deviations. The association between explanatory and outcome parameters was assessed by calculating Mean, Mean difference and their 95% CI and p-value by Independent T-test or Paired T-test analysis.

Results

In our study of 110 positive malaria cases, 94 were positive for vivax malaria, 10 cases were positive for falciparum and 6 cases were positive for dual infection, i.e, vivax and falciparum malaria. An equal number of healthy controls, 110 patients, were enrolled for the study.

Table 1 shows haemoglobin and red cell parameters in the malaria and control groups. The haemoglobin level, with a mean of 12.24g/dl in the malaria group and 12.56g/dl in the control group showed no statistical difference (p value = 0.157, mean difference 0.32). The packed cell volume, with a mean of 37.40% in the malaria group and 36.71% in the control group did not show any statistical difference (p-value 0.349, mean difference 0.32). The red blood cell count (RBC count) with a mean of 4.31×10^{12} in the malaria group and 4.32×10^{12} did not show any statistical difference (p-value = 0.265). The mean corpuscular volume, with a mean of 85.92 fl in the malaria group and 85.05 fl in the control group, did not show any statistical difference (p-value 0.009). The mean corpuscular haemoglobin with a mean of 28.49 pg in the malaria group and 29.32 pg in the control group did not show any statistical difference (p-value=0.967). The mean corpuscular haemoglobin concentration with a mean of 33.11g/l in the malaria group and 34.31g/l in the control group showed statistical difference with a 95% confidence interval (CI) of -1.47 to 0.94 (p-value=0.000) and a mean difference of -1.21. Overall, the RBC parameters except MCH & MCHC, did not show any statistical difference between the malaria and control groups.

Table 2 shows white cell parameters in the malaria and control groups. The total leucocyte count was significantly reduced in malaria cases with a mean of 5.17×10^3 /cu mm of blood versus 8.22×10^3 /cu mm of blood in the control group and a mean difference of -3.05, with a 95% CI of -3.50 to -2.61 and a p-value of 0.000 indicating that there is a significant low normal WBC count in the malaria group. The differential count showed a reduction in neutrophils with a mean of 51.07% of blood in the malaria group compared with 61.38% in the control group and a mean difference of -10.31, with 95% CI of -13.84 to -6.78 (p value=0.000) indicating that there is a significant neutropenia in the malaria group. There was lymphocytosis with 36.65% in the malaria group versus 28.55% in the control group and a mean difference of 8.10, with a 95% CI of 4.63 to 11.57 and a p-value of 0.000. There was monocytosis with a mean of 9.98% in the malaria group compared with 2.82% in the control group and a mean difference of 7.16, with a 95% CI of 6.09 to 8.24 and a p-value of 0.000. There was a significant eosinopenia with a mean value of 2.37% in the malaria group and 7.26% in the control group and a mean difference of -4.89 with a 95% CI between -5.26 and -4.51 and a p-value of

0.000. Overall, there was a significant low normal WBC count, relative neutropenia, lymphocytosis, monocytosis, and eosinopenia. Reactive lymphocytes and toxic granulation of neutrophils was also seen in the peripheral smear examination of some patients with malaria.

Table 3 shows a comparison of the platelet parameters in the malaria and control groups. The platelet count showed a statistical difference in the platelet count (p-value=0.000) and a mean of $65.98 \times 10^3/\text{cu mm}$ in the malaria group and $271.38 \times 10^3/\text{cu mm}$ in the control group with a mean difference of -205.40 and a 95% confidence interval (CI) of -215.78 to -195.03. However, the platelet count did not correlate with the parasite density. The mean platelet volume (MPV) was higher in the malaria group (mean 9.31fl) than in the control group (mean 7.47fl) with a mean difference of

1.85, which was statistically significant (p-value=0.000) with a 95% CI of 1.53 to 2.16. The plateletcrit (Pct) was lower in the malaria group (mean 0.07%) than in the control group (mean 0.21%) with a mean difference of -0.15 which was statistically significant (p-value 0.000) with a 95% CI between -0.16 and -0.13. The platelet distribution width (PDW) was higher in the malaria group, (mean 18.48) than in the control group (mean 12.10) which was statistically significant (p-value 0.000) and a mean difference of 6.37, with a 95% CI between 5.45 and 7.30. Overall, the platelet count and plateletcrit showed a statistically significant reduction indicating thrombocytopenia, while the mean platelet volume and platelet distribution width showed a significant increase which indicated the presence of larger platelets together with normal sized platelets and platelet clumps in cases of malaria.

S. No	Parameters	Malaria status	Mean	Mean Difference	95% CI		p-value
					Lower	Upper	
1	Haemoglobin(g/dl)	Malaria	12.24	-0.32	-0.76	.12	.157
		No Malaria	12.56				
2	Packed cell volume(%)	Malaria	37.40	0.70	-0.76	2.15	.349
		No Malaria	36.71				
3	RBC count (10^{12})	Malaria	4.31	0.00	-.15	.14	.967
		No Malaria	4.32				
4	Mean Corpuscular Volume(fl)	Malaria	85.92	0.87	-.66	2.41	.265
		No Malaria	85.05				
5	Mean corpuscular Haemoglobin (pg)	Malaria	28.49	-0.83	-1.46	-.21	.009
		No Malaria	29.32				
6	Mean corpuscular haemoglobin concentration (g/l)	Malaria	33.11	-1.21	-1.47	-.94	.000
		No Malaria	34.31				

Table 1: Comparison of Red blood cell parameters in malaria patients and control group

S. No	Parameters	Malaria status	Mean	Mean Difference	95% CI		p-value
1	Total count $\times 10^3/\text{cu mm}$	Malaria	5.17	-3.05	-3.50	-2.61	.000
		No Malaria	8.22				
2	DC-Polymorphs(%)	Malaria	51.07	-10.31	-13.84	-6.78	.000
		No malaria	61.38				
3	Lymphocytes(%)	Malaria	36.65	8.10	4.63	11.57	.000
		No Malaria	28.55				
4	Monocytes(%)	Malaria	9.98	7.16	6.09	8.24	.000
		No Malaria	2.82				
5	Eosinophils(%)	Malaria	2.37	-4.89	-5.26	-4.51	.000
		No malaria	7.26				

Table 2: Comparison of white blood cell parameters in malaria patients and control group

S. No	Parameter	Malaria status	Mean	Mean Difference	95% CI		p-value
1	Platelet count ($10^3/\text{cu mm}$)	Malaria	65.98	-205.40	-215.78	-195.03	.000
		No Malaria	271.38				
2	Mean Platelet volume(fl)	Malaria	9.31	1.85	1.53	2.16	.000
		No Malaria	7.47				
3	PCT(%)	Malaria	0.07	-0.15	-.16	-.13	.000
		No Malaria	0.21				
4	Platelet distribution Width	Malaria	18.48	6.37	5.45	7.30	.000
		No Malaria	12.10				

Table 3: Comparison of platelet parameters in malaria patients and control group

S. No	Parameters	Malaria parasite	Mean	Mean Difference	95% CI		p-value
1	Platelet count ($\times 10^3/\text{cu mm}$)	PF	65.18	-.929	-20.877	19.019	.927
		PV	66.11				
2	Mean Platelet volume(fl)	PF	8.947	-.4272	-1.2679	.4135	.316
		PV	9.374				
3	PCT(%)	PF	0.058	-.00968	-.0494	.030101 5	.631
		PV	0.068				
4	Platelet distribution Width	PF	18.853	.4391	-2.0960	2.9742	.732
		PV	18.414				

Table 4: Comparison of platelet parameters between *Plasmodium vivax* (PV) and *Plasmodium falciparum* (PF) patients

Discussion

In our retrospective study of 110 patients with malaria infection and an equal number of healthy control patients we noted no significant changes in the RBC parameters except mean corpuscular haemoglobin concentration (MCHC). There was low normal white cell count, relative neutropenia, lymphocytosis, monocytosis, the presence of reactive lymphocytes, eosinopenia and thrombocytopenia. The platelet parameters-the mean platelet volume and platelet distribution width were increased while the platelet count and plateletcrit was reduced. All these changes were similar in the vivax and falciparum infection. Mixed infections (vivax and falciparum) were not analysed as the numbers were small (6 out of 110 patients) and no statistical difference could be arrived at.

Anemia has been documented to occur in malaria because of RBC destruction of both parasitized and unparasitized RBCs, decreased RBC production due to tumour necrosis factor, anaemia of chronic disease and splenic pooling, though in our study we did not find any significant lowering of haemoglobin and the other RBC parameters except MCHC⁴. In sub-Saharan African children and pregnant women infected with *P. falciparum*, it was seen that they had severe anaemia. This is in contrast to our study, where there was no decrease in haemoglobin levels. The anaemia in other studies could be attributed to nutritional status of the patients and co-existing haemoglobinopathy^{5,6}. Two studies have also noted a poor correlation between parasite counts and anaemia. They also attribute the anaemia to haemoglobinopathies and red cell enzyme defects^{6,7}. Our study was also confined to an older age group with three patients less than 16 years of age. The MCHC was reduced in the malaria group (33.11g/l versus 34.31g/l, mean difference -1.21, p-value 0.000). This parameter has not been discussed in most studies. MCHC is defined as haemoglobin in gms /L x 1000 divided by MCV in femtolitres x RBC count in millions/L and maybe lowered as cells become hypochromic. Table 4 shows a comparison of the platelet count, mean platelet volume, plateletcrit, platelet distribution width between the vivax and

falciparum malaria groups and showed no statistical difference. Thus, the platelet count, mean platelet volume, plateletcrit, platelet distribution width did not differ in the vivax and falciparum infections. This denotes the nutritional status of the patient, which could be low in patients infected with malaria.

Total WBC counts have varied in different studies, some showing a leucocytosis while others have shown leucopenia. Our study shows low normal white cell count in contrast to other studies where no difference in total leucocyte counts was seen and they attribute the difference in total WBC counts to immunological status, environmental factors or socioeconomic status⁴. An increase in total WBC count has been seen though it was not statistically significant (p-value 0.27)⁶. White blood cell (WBC) counts during malaria were low to normal, as was noted in our study. It is hypothesized that the leucopenia could be because of localization of leukocytes away from the peripheral circulation and to the spleen and other marginal pools, rather than actual depletion or stasis⁸. A study analyzed and compared the WBC counts of 1,310 inpatients presenting with uncomplicated *P. falciparum* and *P. vivax* malaria. Before-treatment, a statistically significant negative correlation was found between initial WBC count and highest temperature on admission. Before and during treatment, WBC counts were significantly lower in *P. falciparum* than *P. vivax* infection on days 0 and 7⁹. This is in contrast to our study where we found low normal white cell count with both vivax and falciparum infections.

Contrary to our study, a decrease in lymphocyte count was seen⁵. A difference in granulocyte, lymphocyte, monocyte, eosinophil and basophil count was not seen which is in contrast to our study where we noted neutropenia, lymphocytosis, reactive lymphocytes, monocytosis and eosinopenia⁴. An increase in neutrophils, monocyte counts and a reduction in lymphocyte and eosinophil counts in patients with falciparum infections has been noted⁶. This is partly in concordance with our study where we noted monocytosis, lymphocytosis, with the presence of reactive lymphocytes and eosinopenia in malaria patients. However, we noted a decrease in neutrophil

counts. A study of thirty-eight patients with *P. vivax* malaria compared with 20, apparently healthy controls noted that at diagnosis, the patients had lymphopenia, marked eosinopenia (the eosinophil count being correlated with the platelet count) and thrombocytopenia which is partly in concordance with our study as our patients had lymphocytosis, eosinopenia and thrombocytopenia¹⁰.

A higher number of band forms in both vivax and falciparum infections though more with falciparum infections was seen. Toxic granulation of neutrophils was seen in falciparum infections which was associated with severity of the disease¹¹.

Thrombocytopenia has been consistently noted in all studies of malarial infection^{4,5,6,7}. In our study too we noted thrombocytopenia, the levels of which were not different in vivax and falciparum infections. Profound thrombocytopenia (6,000/cu mm of blood) was seen in 4 patients with vivax infections and one patient with falciparum infection. The degree of parasitemia did not correlate with the platelet counts. A positive correlation between the degree of parasitaemia and platelet counts has been noted⁵. They hypothesize a peripheral platelet destruction and consumption leading to thrombocytopenia. Immune complexes formed between malarial antigen and platelets leading to sequestration of the injured platelets by macrophages in the spleen. Another postulated cause for thrombocytopenia was platelet consumption due to disseminated intravascular coagulation seen in complicated *P. falciparum* malaria, which we did not see in our patients. Platelets could be destroyed due to activation of platelets by adhesion to parasitized RBCs leading to their destruction⁵. An inverse relationship was seen between parasite density and platelet counts- the platelet counts being low with increased parasite density which is in contrast to our study^{4,6}. But platelet counts returned to normal with treatment which is in concordance to ours' as well as other studies.

Our study showed platelet dysfunction resulting in platelet aggregates leading to increased MPV and PDW. The MPV (mean platelet volume) increased as the platelet count decreased which has also been seen in other studies which could be because of platelet aggregates and giant platelets^{5,6}. Abnormalities in platelet structure and function with invasion by malarial parasites have been reported in some cases. Thrombopoietin (TPO) is the main growth factor for platelet production and is elevated in states of platelet depletion. TPO serum levels have been shown to be significantly higher in subjects with severe malaria, normalizing within 14-21 days of therapy⁸. Two types of changes in platelet dysfunction are seen in malaria. Initially there is platelet hyperactivity, this is followed by platelet hypoactivity. Platelet hyperactivity results from various aggregating agents like immune complexes, surface contact of platelet membrane to malarial red cells and damage to endothelial cells. The injured platelets undergo lysis intravascularly. The release of platelet contents can activate the coagulation cascade and can contribute to disseminated intravascular coagulation¹². Platelet production is not decreased as the megakaryocytes in the marrow are found to be usually normal or increased^{13,14}.

An increase in MPV with decrease in platelet counts irrespective of whether or not the patients were infected with malaria has been seen⁶. This could be because of the presence of giant platelets which are released by the bone marrow because of platelet destruction.

Larger platelets are metabolically and enzymatically more active. In severe sepsis large numbers of platelets are released by the spleen and bone-marrow leading to increased MPV. Studies in humans and rats showed that large platelets are functionally more active and have a lower threshold for aggregation and activity¹⁵. In all of these studies, the platelet activation was considered the main mechanism inducing the elevation of MPV and PDW. The PDW (platelet distribution width) was increased, which could be due to variation in size of platelets, some giant platelets and the other normal sized and due to platelet aggregates¹⁵. PDW has been seen to be linearly correlated with MPV in normal individuals¹⁶.

Thrombocytopenia (<150x10⁹/l) and leucopenia may be used as probable indicator for malaria. Higher MPV (>8 fl) and PDW of 6-10 also show considerable sensitivity for malarial infection. In addition, thrombocytopenia (<150x10⁹/l) and higher MPV (>8 fl) was more sensitive for vivax infection while PDW 6-10 was more sensitive for falciparum infection¹⁷.

A history of fever with chills and rigor are sensitive indicators of malaria, but lack specificity or positive predictive value. "Positional parameters" like the standard deviation (SD), volume of lymphocytes and monocytes would help in screening patients for malarial infection in the laboratory using Coulter GEN.S haematology analyser¹⁸.

Conclusion

A history of fever with chills and rigor are sensitive indicators of malaria, but lack specificity or positive predictive value. The identification of additional criteria would be helpful in diagnosing malarial infections. Low platelet count (<65.98X10³/cu mm) has a higher predictive value for malarial infection in addition to low MCHC (<33.11 g/l), low normal WBC count (<5.17 X10³/cu mm, relative neutropenia (<51.07%), lymphocytosis (>36.65%), monocytosis (>9.98%), reactive lymphocytes and eosinopenia (<2.37%) which was seen in our study. Also, low platelet count (<65.98 cells/cu mm of blood), a low MPV (<9.31fl), high Pct (>0.07%) and PDW (>18.48) were predictive of malarial infections. There were no differences in the platelet parameters in falciparum and vivax infections. These parameters could be added as flagging parameters in haematology analysers for review of slides to detect malaria parasite.

Conflict of Interest

The authors declare no conflict of interest.

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Original Article

Ectodermal Dysplasia and Malocclusion – Retrospective study

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Abstract

Aim: The aim of this article is to find out the malocclusion and cranio-maxillofacial deformation in patients with ectodermal dysplasia.

Methods: A total of 10 patients (6 males and 4 females, aged 5–26 years) with ectodermal dysplasia underwent clinical examination and treatment.

Results: Most of the patients had a short face with an abnormal facial concavity, a maxillary retrognathism, mild mandible prognathism, with thin or scanty hair, very smooth, dried out skin. Depending on age and malocclusion, patients were treated with prosthodontic and orthodontic approaches or implant treatment.

Conclusion: Aesthetic dental interventions in patients with ED assist in improvement of a positive self - image and on the whole oral health is maintained.

Key Words: Ectodermal Dysplasia, Oligodontia, Anodontia, Malocclusion

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Introduction

The ectodermal dysplasias (EDs) contain a large, heterogeneous group of inherited disorders that are defined by major defects in the development of two or more tissues derived from developing ectoderm¹.

ED patients show the clinical traits like hypotrichosis, hypohidrosis, and cranial abnormality. Patients frequently have markedly small face because of frontal bossing, and a low nasal bridge. The absence of sweat glands results in very smooth, dry skin and/or hyperkeratosis of hands and feet. Oral effects may be noticeable as anodontia, hypodontia, conical teeth, and lack of alveolar ridge development².

ED is considered a reasonably uncommon disorder, with a reported incidence of 1 in 10,000 to 1 in 100,000 births². Many genetic material defects can cause ectodermal dysplasia². The most common form of ectodermal dysplasia frequently affects men. Other forms of the disease affect men and women uniformly². Dental treatment of the clinical manifestations of ED can have intense impact on these patients, because the ability to appear and behave like their peers is vital to their psychosomatic development². The article shows that management is not only required to develop patient's functional and esthetics, but also considerably increases their self confidence and self-respect². Depending on their age and abnormality, periodontal therapy, caries management, and prosthodontic or orthodontic treatment were assessed^{3,4,5}.

Materials and Methods

This retrospective study was carried out over the period of two years on 10 patients (6 males, 4 females, aged 5–26 years) with a diagnosis of ED, in the Department Of Orthodontics, Chettinad Dental College and Research Institute. Clinical and radiographical examination for diagnosis and therapy were conducted and it included the skull, face, hair, jaws, teeth, nails, skin, and sweat glands⁶.

Results

All major symptoms of ED were studied, such as thin hair (trichodysplasia) (Fig 1), smooth skin (hypohidrosis), unusual finger and toe nails, skull and facial abnormalities and the family history of the patients were considered. The hair is usually light colored and scanty. Hypotrichosis and partial or total alopecia are commonly reported. Body hair follicles are frequently scanty or missing⁷. Some patients had dystrophic, hypertrophic, unusually keratinised, thickened, discolored, striated, split or fragmented nails. The epidermis was dry, fine and smooth (Fig 2), hypopigmented, with patches of hyperkeratosis or eczematous⁷. Oligodontia (Fig 3) or anodontia are very frequent features, but undeveloped or conical teeth and enamel dysplasia may be noticed⁸ (Table 1).

Steiner analysis was used to determine the dento-facial abnormalities. The mean value of Steiner's analysis is as follows: SNA Angle (Sella Nasion and Point B Angle) (76.60), SNB Angle (Sella Nasion and Point B Angle) (820), ANB Angle (Point A to Nasion to Point B)

(-5.50), SND Angle (Sella – Nasion to Point D) (82.30) and SN to Go-Gn Angle (Sella – Nasion to Gonion – Gnathion) (29.60) which is depicted in the tabulation (Table 2). Steiner analysis revealed a mean SNA of 76.60 which shows an incidence of maxillary retrognathism. Mean value of 820 for SNB shows a relatively normal position of mandible. Additional results found were facial concavity which was reflected in ANB value of -5.50, however increased SND value of 82.30 shows chin prominence. Retrognathism is more prominent in the maxilla. Skeletal class III patients usually show high angles and large gonial angles on the mandible; however; these patients showed low angles of 29.60 because of missing teeth.

Discussion

Steiner analysis revealed a low mandibular plane angle and facial concavity in five of the affected patients (patients no 3,4,5,6,9) which are enlisted in table 1. Most of the patients had maxillary retrognathism and mandibular prognathism. Skeletal class III patients typically show high mandibular plane angles on the mandible, however; our patients showed low angles as of missing multiple teeth. As an outcome of retrognathism of the maxilla and mandible, the soft tissues also showed retrusion.

Ten patients in this study had hypodontia. Four patients had fewer than 10 teeth, and six patients had more than 10 teeth (Table 1). ED usually affects the hair, teeth, nails, and/or skin of the patients⁹. Most of our ED patients had partial or complete lack of certain sweat glands, causing lack or less sweating, heat intolerance, and sometimes fever; abnormally sparse hair (hypotrichosis) and absence of teeth (anodontia) and abnormality of certain teeth¹⁰. Our patients with ED also had typical facial abnormalities with prominent forehead, sunken nasal bridge (so called "saddle nose") abnormally thick lips, and a large chin¹¹. The skin of most of the patients was abnormally thin, dry, and soft with abnormal lack of pigmentation (hypopigmentation)¹¹. The affected infants and children exhibited underdevelopment (hypoplasia) or absence (aplasia) of mucous glands in the respiratory and gastrointestinal tracts and in a few cases there were decreased function of immune system, causing an increased susceptibility to certain infections and/or allergic conditions¹². Several affected children experienced recurrent attacks of wheezing and breathlessness (asthma)¹². Certain children with this disease had difficulty in controlling fevers. Affected adults were not capable to tolerate a humid environment and require unique actions to maintain a normal body temperature¹².

Table 1: Clinical summary of ED subjects evaluated

PATIENT NO's	AGE (Years)	SEX	NO. OF TEETH PRESENT	PROSTHETIC TREATMENT	PEG SHAPED CONICAL TEETH
1	5	Male	6	Removable Denture	Yes
2	9	Male	11	No Denture	Yes
3	17	Female	8	Removable Denture	Yes
4	21	Female	3	Fixed Denture	No
5	26	Female	24	Fixed Denture	Yes
6	18	Male	17	Removable Denture	Yes
7	12	Female	26	Removable Denture	Yes
8	6	Male	14	No Denture	No
9	21	Male	9	Removable Denture	Yes
10	15	Male	15	Fixed Denture	Yes

Table 2: Summary of the results of Steiner cephalometric analysis performed on severely affected patients.

Cephalometric parameters	Normal values	Patient 3	Patient 4	Patient 5	Patient 6	Patient 9
SNA	82 ± 2°	74°	72°	79°	75°	77°
SNB	80 ± 2°	80°	84°	87°	81°	80°
ANB	2°	6°	12°	8°	6°	3°
SND	76°	81°	87°	90°	84°	81°
SN to Go-Gn	32°	35°	38°	33°	29°	31°
Skeletal relation	I	III	III	III	III	III

In some patients hypoplasticity or absence of oral and mucous gland and even salivary glands were noted¹³. The absence of the salivary glands may lead to dryness of mouth (xerostomia). Dysphagia was also seen¹³. Malformation of the enamel was seen in all patients, resulting in dental caries and altered contour of the teeth, leading to pegged shaped appearance and accessory cusps^{14,15}. The nails of all the affected patients were normal. The hypodontia vary in each case, but usually 5 to 7 permanent teeth (Table 1) are present, the teeth are slightly smaller than normal, and the eruption was frequently delayed for all patients.



Fig 1: ED patient with sparse hair



Fig 2: Smooth skin and patches of hyperkeratosis



Fig 3: ED case with oligodontia

Conclusion

Dental management is required in patients with ED and a few children should wear dentures as early as 2 years of age^{15,16}. It is essential to visit dentist opinion for

safeguarding the alveolar ridge for later dental intervention. Various sets of denture replacements are regularly considered necessary as the child grows, and dental implants may be an option in adolescence, once the jaws are completely developed¹⁶. Prosthetic teeth are implanted in adults for mastication and speech^{16,17}. Importantly, aesthetic dental interventions in patients with ED assist in improvement of a positive self - image and on the whole oral health is maintained¹⁷.

Conflict of Interest

The authors declare no conflict of interest.

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Are smartphones smart enough to detect skin cancer?

In Caucasians, skin cancers (melanoma and non-melanomatous cancers) are among the commonest types of cancer. Most of them, especially non-melanomatous lesions, are curable if they are detected early. Several commercially available smartphone applications ("UMSkinCheck", "Mole Detective") have been designed based on well-known clinical algorithms to detect these lesions early. But how effective are these in practice? Several studies have examined this question and their conclusions are similar: these applications can accurately pick up early lesions (all types) only in 81% of cases and may altogether miss melanoma (a particularly aggressive skin cancer) in nearly 30% of cases. So using them alone without consulting a dermatologist to decipher a suspicious skin lesion is a bad idea as it may lead to delayed detection and treatment. So, smart phones are not there yet, when it comes to skin cancer. Calling something "smart", does not make it one! (Whiteman, H. (2014, November 19). "Skin cancer: how effective are smartphone apps for early detection?" <http://www.medicalnewstoday.com/articles/285751.php>.)

- Dr. K. Ramesh Rao

Original Article

Clinical Assessment of Effects of Untreated Dental Caries in School Going Children Using PUFA Index

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Abstract

Objective: To assess the effects of untreated caries in school children and designing the interventional strategies with a view to attend the oral health care needs of children.

Study design: A total of 250 school children of age range 5-16 years were examined for the presence of pulpal involvement, ulceration, abscess and fistula. Effect of untreated caries was evaluated according to PUFA index between three age groups of 5-8, 9-12 and 13-16 years. The data was analysed using Paired t test, One way ANOVA and Tukys HSD test ($p < 0.05$).

Results: The pufa index for the primary dentition was 1.71, and the PUFA index for the permanent dentition was 0.3. Significant differences were seen among the three age groups but not between the males and females. The main component of PUFA/PUFA was pulpal involvement.

Conclusion: The pufa index is an epidemiological tool complementary to existing caries indices aimed to assess dental caries.

Key Words: Caries, Fistula, Dental Abscess, Pulp involvement, Traumatic Ulceration.

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Introduction

Dental caries is a global oral health problem which can be effectively prevented and controlled through a combination of individual, community and professional efforts. In order to prevent and control dental caries, one should know its exact nature of occurrence and distribution in the community. Prevalence studies on dental caries in India have shown results ranging from 31.5% to 89%¹. According to national oral health survey caries prevalence in India was 51.9, 53.8 and 63.1% at ages 5, 12 and 15 years, respectively².

Most of the dental decay remains untreated with significant impact on general health, quality of life, productivity, development and educational performance³. Research suggests that untreated caries can have an effect on children's growth and their general health, therefore the consequences of untreated caries often presents as children with under body weight and failure to thrive^{4,5}.

The classical DMFT/dmft index provides information on caries and restorative and surgical treatment but fails to provide information on the clinical consequences of untreated dental caries, such as pulpal involvement and dental abscess, which may be more serious than the caries lesion it self⁴. A deep caries cavity with pulpal

involvement is usually considered under the code 'caries of dentin'⁶ and pulpal involvement is not mentioned at all in the caries scoring system in the latest addition of oral health surveys – basic methods WHO⁷. Thus the objective of the study was to determine the clinical effects of untreated caries in children using PUFA/pufa index.

Materials and Methods

The study was conducted on 250 school children aged 5-16 years. The sample consisted of 119, 78 and 53 children in the 5-8, 9-12 and 13-16 years age-groups, respectively. An attempt was made to include equal number of male and female subjects in a sample. Consent for examining of the children was obtained from the respective heads of the schools.

Inclusion criteria were children with the presence of either a visible pulp, ulceration of the oral mucosa due to root fragments, a fistula or an abscess. Lesions in the surrounding tissues that were not related to a tooth with visible pulpal involvement as a result of caries were not recorded. The children were examined in their respective schools seated on an ordinary chair, in broad day light facing away from direct sunlight. All examinations were carried out by a single examiner.

Caries was scored according to classical DMFT/dmft index by WHO criteria and by using PUFA/pufa index. The assessment was made visually without the use of an instrument. Only one score was assigned per tooth. In case of doubt on the extent of odontogenic infection, the basic score (P/p for pulp involvement) was given. If both the primary and its permanent successor tooth showed stages of odontogenic infection, then both teeth were scored. Upper case letters for permanent and lower case for primary dentition were used for scoring.

Following are the codes and criteria⁴:

P/p: When opening of pulp chamber visible or coronal tooth structure is destroyed by caries process and only root or root fragments are left then pulp involvement is recorded. No probing is performed to diagnose pulpal involvement (fig 1a,b).

U/u: When the sharp edges of pulpally involved dislocated tooth cause traumatic ulceration on surrounding soft tissues. e.g. tongue or buccal mucosa (fig 2 c).

F/f: When pus releasing sinus tract related to pulpal involvement is present then fistula is scored (fig 3 d, e).

A/a: Abscess is scored when a pus containing swelling related to a pulpally involved tooth is present (fig 4 f,g).

The PUFA/pufa score per person is calculated in the same way as DMFT/dmft index.



Fig 1 -Clinical picture 'a' and 'b' shows pulpal involvement P/p respectively.

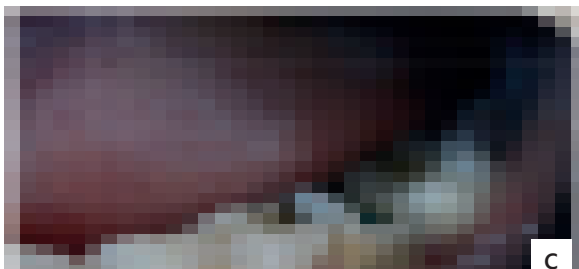


Fig 2 -Clinical picture 'c' shows ulceration u.

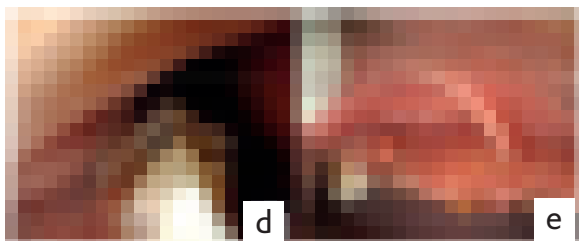


Fig 3 -Clinical picture 'd' and 'e' shows fistula F/f, respectively.

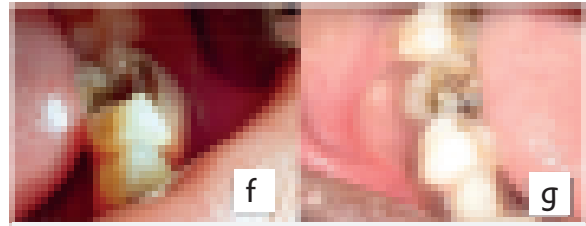


Fig 4 - Clinical picture 'f' and 'g' shows abscess A/a, respectively.

Statistical method

The recorded data of untreated caries in terms of PUFA/pufa index were analysed using SPSS 21 software. Paired t-test was used to assess PUFA/pufa value between males and females and one way ANOVA followed by TukysHSD test was used to assess PUFA/pufa value among different age groups.

Result

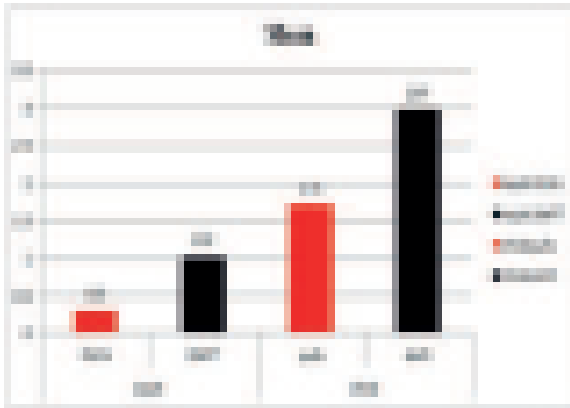
Two hundred fifty children (124 boys and 126 girls) with an age range of 5-16 years were included in the study. Caries experience in the primary dentition was 2.97 dmft. The permanent dentition presented 1.02 DMFT (Table 1, Graph 1). The pufa index for the primary dentition was 1.71, and the PUFA index for the permanent dentition was 0.3 (Table 1, Graph 1). The main component of PUFA/pufa was pulpal involvement (Table 1).

Two hundred fifty children were divided into three age groups comprising 119, 78 and 53 children of 5-8 years, 9-12 years and 13-16 years, respectively and the PUFA/pufa value was compared between these age groups. Result shows significant difference between them with PUFA value of permanent dentition was 0.07 in 5-8 years, 0.18 in 9-12 years and 0.99 in 13-16 years (Graph 2). The pufa value of primary dentition was 2.63 in 5-8 years, 1.17 in 9-12 year and 0.46 in 13-16 year (Graph 2).

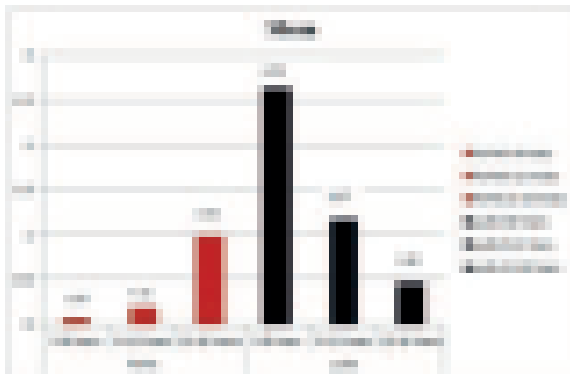
Out of two hundred fifty children, 124 were boys and 126 were girls. No significant difference was seen in the PUFA/pufa value between males and females (Graph3).

	5-16 year old (n=250)
Mean PUFA	0.3(0.66)
Mean DMFT	1.02(1.85)
Mean pufa	1.71(1.90)
Mean dmft	2.97(2.8)
Mean P	0.28(0.65)
Mean U	0.004(0.04)
Mean F	0.008(0.08)
Mean A	0.004(0.04)
Mean p	1.52(1.86)
Mean u	0.016(0.12)
Mean f	0.032(0.17)
Mean a	0.13(0.40)

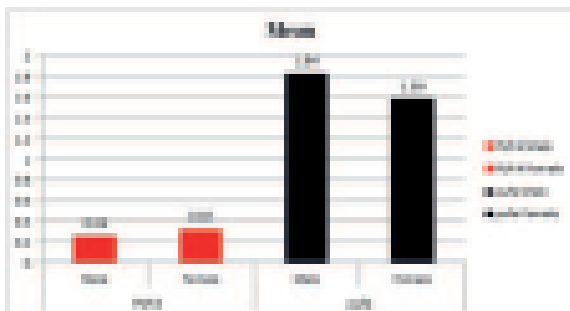
Table 1 - Mean caries experience (SD) and mean PUFA/pufa experience (SD) of 5-16 yrs age group.



Graph 1 - Comparison between DMF and PUFA/pufa and dmft scores



Graph 2 - PUFA/pufa value in different age groups.



Graph 3 - PUFA/pufa value between males and females.

Discussion

During the last decade, studies on caries epidemiology have focused on the development of more sensitive diagnostic criteria to allow for assessment of the initial stages of caries⁸. However in low and middle income countries, the prevalence of caries is still high, affecting the general health and quality of life of children^{9,10,11}. The classical DMFT/dmft index fails to provide information on clinical consequences of untreated dental caries¹², therefore a new index called PUFA/pufa index was developed in Philippine National Oral Health Survey 2006, determining the extent of odontogenic infections from untreated caries⁴.

In the present study clinical effect of untreated caries by using, PUFA/pufa index was seen in two hundred fifty school children of age 5-16 years. The mean PUFA and pufa values are 0.3 and 1.71, respectively (Graph 1). The data revealed that untreated caries results in pulpal

involvement more in primary dentition as compared to permanent dentition. Children were divided into three age groups of 5-8, 9-12 and 13-16 years, respectively. Among them PUFA value was higher in 13-16 years old whereas pufa value was higher in 5-8 years (Graph 2). Results show an increase in the pulpal involvement in children with primary dentition emphasizing the need for awareness and proper preventive measures for caries in the early childhood. In permanent dentition increased pulpal involvement is seen at 13-16 years when all the permanent teeth come into the oral cavity. The main component of the PUFA/pufa value of this study was pulpal involvement. Figueiredo et al¹³ (2011) determined the prevalence and severity of clinical consequences of untreated dentine carious lesions in children from a deprived area of Brazil and reported that Code 'p' was the most prevalent.

Various research shows that an untreated caries affects the quality of life and general growth in children; Benzi et al³ (2011) reported that children with odontogenic infections have increased risk of below normal BMI as compared to children without odontogenic infections.

In the present study no significant difference was found for PUFA/pufa value between males and females.

This information gathered by PUFA/pufa for untreated caries will provide health planners with relevant information about severity of disease and help in planning measures to treat dental caries according to severity. It will also help in evaluating access to emergency treatment and exposure to fluoride as component of basic package of oral health care (BPOC)¹⁴.

What this paper adds:

- The classical caries indices do not provide the severity of dental caries.
- This paper has presented the clinical consequences of untreated caries like pulp involvement and other effects using PUFA index.

Why this paper is important to a pediatric dentist:

- The pufa index is an epidemiological tool complementary to existing caries indices aimed to assess dental caries.
- This study assessed the effect of untreated caries, thus indicating the need for proper preventive measures and treatment planning.

Conflict of interest:

The authors declare no conflict of interest.

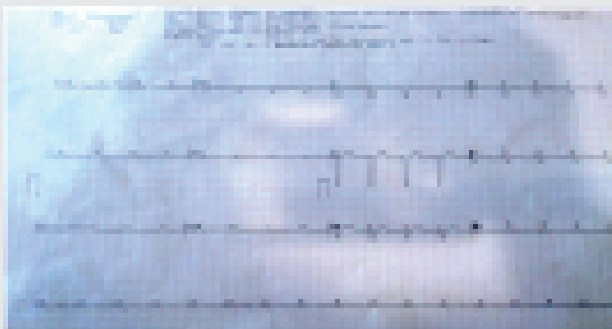
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Diagnose the condition

Mr.M. 58 yrs old came with complaints of intermittent chest pain for past 10 days.



ECG 1 - Initial ECG

ECG 2 - Taken 10 days after 1st ECG

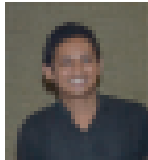


Original Article

Oral Health in Correctional Facilities: A Study on Knowledge, Attitude and Practice of Prisoners in Central India

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Abstract

Objective: The prisoners represent a population group that is disadvantaged, socially deprived underprivileged and needs immediate attention in regards to provision of necessary oral health care, health promotion and motivation, tobacco cessation. This study makes an effort to assess the prisoners' knowledge, attitude and practice towards oral health and barriers faced to oral health care in the jail.

Study design: A cross-sectional study was conducted in 5 Central Jails of Chhattisgarh State in a sample of 506 prisoners. The data collection process involved the selected prisoners in groups and a pre-tested, close ended questionnaire was administered in the form of extensive face to face interview covering socio-demographic details, past dental attendance, tobacco consumption habits, duration of incarceration, knowledge, attitude and practice towards oral health and barriers to oral health. Descriptive statistics was used to analyze the data.

Results: 52.1% of the prisoners were aware that tooth brushing helps in preventing gum diseases. 88.5% reported that they had some or the other dental problems during their stay in the jail. A majority of the prisoners (64.82%) reported consuming tobacco can cause gum disease. 63% prisoners never consulted a dentist. 75% prisoners did not get proper dental treatment for their problem. When inquiring the form of tobacco being used 26.98% reported of smoking, 43.80% used tobacco only in the chewable form and 29.22% were indulged in consuming tobacco in both forms i.e. smoked as well as chewed. 30% were bidi smokers and 70% were into cigarette smoking.

Conclusion: Prisoners form the isolated and weaker sections of the society, but it is the responsibility of every health care worker to serve them as the incarceration period can give an ideal opportunity to improve and promote good oral health. An urge persist for the development of a basic oral health care package that for all inmates.

Key Words: KAP, India, Oral Health, Prison, Tobacco.

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Introduction

Health is a fundamental human right. Oral health has been considered as the mirror of general health by Sir William Osler and is recognized as important as the general health¹. An individual's health is governed by a wide variety of factors which may include congenital, hereditary, environmental and behavioral factors; the behavioral and environmental factors are most crucial in promotion and maintenance of the oral health of the people². The high prevalence of dental diseases, apart from leading to ill effects on the health of the people afflicted, also causes economic loss and significant absenteeism¹. Keeping in consideration their high prevalence and incidence, oral diseases tend to qualify as a major public health problem in all parts of the world. Because of the high costs of dental treatment, they mostly affect the underprivileged and socially deprived population. In India, dental caries experience and distribution remains high and skewed in all age groups and increases as the age advances. Secondly, the prevalence of components of periodontal disease (bleeding, calculus, pockets) was found to be as high as 80%². Also tobacco consumption in any form has shown to have detrimental effects on oral health

and is an established causative factor for oral cancer. This indicates an immediate, high priority for treatment, but with prime attention to the prevention and control of oral diseases which may be done through a combination of high risk and whole population strategy to achieve the greatest benefits³.

In Canada the Corrections and Conditional Release Act mandates the provision of dental care to prisoners in federal facilities, and CSC's (Correctional Service of Canada) policies define dental care as an essential health service and their reports suggest that a functioning dentition is a basic necessity for prisoners². The provision in Article 12 of the International Covenant on Economic, Social and Cultural Rights (United Nations, 1966) establishes "the right of everyone to the enjoyment of the highest attainable standard of physical and mental health". This applies to prisoners just as it does to every other human being⁴.

The prisoners represent a population group that is disadvantaged, socially deprived and underprivileged, which need immediate attention in regards to

provision of necessary oral health care, health promotion and motivation, tobacco cessation⁵. The Indian Criminal Justice System has three main constituents and prison institutions are one of them. With evolving and changing times a considerable change has occurred in the social perceptions towards the prisoners, with prisons no longer being called as punishment places instead are referred to as correctional facilities or an alternate training school, where attention is paid towards alleviating the prisoners' condition so that it has a healthy effect on the prisoners. The composition of Indian prison population is demographically skewed, and is an important determinant of health needs. They are predominantly male and contain disproportionately high numbers of people from ethnic minorities, poorer backgrounds and groups with lower literacy rates⁶. Usually people from criminality are the people who are educationally and socioeconomically deprived. Hanratty and colleagues recommended that in order to assess the availability of a health service across socioeconomic groups, one should consider it in relation to the different groups' level of health needs⁷. They are also more likely to practice health damaging behaviours such as smoking, drinking and recreational drug use that contribute to poorer oral and general health. People from lower social classes show a tendency towards irregular dental attendance and are more likely to visit the dentist only when in pain⁸. Very little literature supports investigating prisoners' knowledge, attitude and practice towards oral health and barriers faced to oral health care in the jail.

Alcohol, smoking, tobacco consumption and substance misuse also contribute to poor oral health. Excessive alcohol consumption and tobacco use increase the prevalence and severity of periodontal disease and are by far the greatest risk factors for oral cancer⁴. Smoking and tobacco consumption by the prisoners are the issues which seems to be completely neglected by the health care sector and also these two things are invariably related to oral health deterioration and economic loss which needs an estimation. No correctional facility has been given consideration by the National anti-tobacco strategies⁹.

As per the Crime Records Bureau-India, at present, there are 1382 prisons in India with a total available capacity of 3, 32,782 against the total number of inmates 3,72,926 bringing the occupancy rate to 112.1% in 2011. In Chhattisgarh state, the overcrowding of jail comes out more strikingly, since the available capacity is of 5430 which is accommodating 13%, 918 prisoners making up the occupancy rate to 256.7 which is indeed alarming⁶.

A challenge in terms of providing health care to the prisoners comes in the way that hardly any health professionals choose to work in the prison system. A lack of health concern, facilities and expertise further deteriorates the health of inmates. This explains the reason for such limited studies conducted in the prison system, especially in India. Several studies have reported higher prevalence of dental caries and periodontal diseases among incarcerated individuals¹⁰.

India is on the fast track of development but in terms of oral health problems of prisoners and barriers to oral health, has received a very little attention which makes the information sparse. There are very few studies conducted on prisoners' oral health in India^{6,10} and as per our search, there is no such study reported in Chhattisgarh state, so this study makes an effort to probe into, and assess the prisoners' knowledge, attitude and practice towards oral health and barriers faced to oral health care in the jail.

Materials And Methods

The Central Jails in Chhattisgarh is a mix of remand and convicted prisoners¹¹. A cross-sectional study was conducted in 5 Central Jails of Chhattisgarh State from September 2013 to March 2014, following ethical approval from the Ethical Committee of Rungta College of Dental Sciences and Research. Prior permission for the study was taken from all the jail authorities. Informed consent was taken from prison inmates and the participation in the study was totally kept voluntary.

Sample Size

The sample size was calculated based on the pilot study conducted previously in one of the Central Jails situated in Durg District of Chhattisgarh state, India. Based on the results of the pilot study the sample size required was 506. Totally 5 Central Jails were selected randomly by a lottery method and from each of the 5 jails, the prisoners were randomly included in the study making a total of 506 participants in the study.

Inclusion Criteria

- Prisoners who were present on the day of examination were included in the study.
- Prisoners who agreed to give the consent for participation in the study.

Exclusion Criteria

- Prisoners with the history of systemic disease like epilepsy etc.
- Mentally or physically challenged prisoners.
- Those prisoners who are not willing to take part in the study.
- Prisoners absent on the day of study.

Training

The investigator was trained and calibrated for conducting the interview, under the guidance of a senior faculty member. Calibration of examiner was done on 20 individuals who were interviewed twice using the pre-tested, close ended questionnaire on successive days, and then the results were compared to know the variability. Agreement for assessment was 90 percent.

Data Collection

The data collection process involved the selected prisoners in groups to the interview by investigator (previously calibrated). The interviewers offered reassurance to the participants about their anonymity. Each prisoner was individually interviewed, and was asked to return to the cell block on completion of the examination. Each interview lasted between 10 to 15 minutes.

Questionnaire survey

Questionnaire: A pretested, close ended questionnaire was administered in the form of extensive face to face interview keeping in mind the restriction due to illiteracy among the inmates, to assess the prisoners' knowledge, attitude and practice towards oral health and the barriers faced to oral health care in the jail. The questionnaire was prepared covering socio-demographic details, tobacco consumption habits, duration of incarceration, knowledge, attitude and practice towards oral health and oro-dental problems, past dental attendance and barriers to oral health.

Statistical Analysis

The data were then entered manually into the computer, tabulated and analyzed. Descriptive statistics using the Statistical Package for Social Sciences, IBM (SPSS) version 16 was used to analyze the data.

Results

Socio demographic characteristics of the respondents (Table 1) : A total 506 prisoners were included to be part of the study out of which the population of males in the prison was 87% (n=440) and that of female prisoners was 13% (n= 66). The mean age of the total sample size was found to be 35.84. 70.4% (n=356) of the total population of the prison inmates were married. The educational status of the prisoners was

not uniform as 19.8% (n=100) of them were illiterate. Those among the educated were 20% (n=101) who just had primary school education, 47% (n=239) had high school education and 13% (n=66) were graduates.

Oral health knowledge

A majority of the prisoners (74.5%) knew that tooth brushing helps in preventing caries, and 52.1% of the prisoners were aware that tooth brushing helps in preventing gum diseases. A substantial number of prisoners (86.1%) were not aware that dental floss helps in preventing caries. A majority of the prisoners (64.82%) reported that consuming tobacco can cause gum disease. (Table 2)

TABLE 1: Socio demographic characteristics of the respondents		
Mean Age = 35.84 N = 506		
Variables	Frequency	Percentage (%)
Gender		
Male	440	87
Female	66	13
Age Group		
18-40 years	352	69.6
41-60 years	136	26.9
≥ 61 years	18	3.56
Marital Status		
Single	150	29.6
Married	356	70.4
Education		
Illiterate	100	19.8
Primary	101	20.0
High school & Higher	239	47.2
Secondary		
Graduate	66	13.0
Duration Of Stay In Jail		
0-2 years	223	44.1
3-5 years	144	28.4
6-9 years	100	19.8
≥10 years	39	7.7

Table 2 Frequency table for question and answers

S.No.	Question	Response	Number	Percentage
1	Do you know whether tooth brushing helps in preventing caries?	Yes	377	74.50
		No	128	25.5
2	Do you know whether tooth brushing helps in preventing gum diseases?	Yes	264	52.17
		No	242	47.83
3	Do you know whether dental floss helps in preventing caries?	Yes	436	86.16
		No	70	13.84
4	Does consumption of tobacco cause gum disease?	Yes	328	64.82
		No	178	29.83
5	Do you want to know more about how to keep your teeth clean?	Yes	495	97.82
		No	11	2.18
6	Do you know what to do after dental injury?	Yes	448	88.53
		No	348	11.47
7	Who is responsible for your dental treatments?	Yourself	160	31.62
		Jail authority	346	68.37
8	Do you think oral health is as important as general health?	Yes	414	81.81
		No	92	18.18
9	Do you clean your teeth with a toothbrush and dentifrice?	Yes	480	94.86
		No	26	5.13
10	How many times in a day do you brush your teeth?	Once	303	59.88
		Twice	203	40.11

11	Have you consulted any dentist before?	Yes No	318 188	62.84 37.15
12	After moving out of here will you visit to a dentist regularly?	Yes No	485 21	95.84 4.16
13	Were any dental check up camps organized for you in last 6 months?	Yes No	333 173	65.81 34.19
14	Do you think dental camps should be organized for you regularly?	Yes No	495 11	97.82 2.18
15	Have you experienced dental problem during your stay in the jail?	Yes No	448 58	88.53 11.46
16	If you experienced dental problem during your stay in the jail what did you do for it?	Medication Dental visit Ignored	179 76 193	39.96 16.96 43.08
17	Did you get proper dental treatment for your problem?	Yes No	112 336	25 75
18	What was the reason for not getting proper dental treatment for your problem?	No Facility Ignorance by authorities Self Ignorance	251 40 45	74.70 11.90 13.40
19	Have you experienced sensitivity in your teeth to hot or cold?	Yes No	330 176	65.21 34.78
20	What did you do for the sensitivity in your teeth to hot or cold?	Treatment Ignored	270 60	81.81 18.18

Oral health practice

A very strong agreement came in case of using a tooth brush and a dentifrice for the cleaning of teeth as it was used by about 95% (n=480). 59.88% of the respondents reported that they cleaned their teeth once daily and 40% of the prisoners reported brushing twice daily. Most of the inmates reported that they performed horizontal brushing technique for cleaning their teeth.

63% (n=319) among the prisoners were the ones who have never consulted a dentist till date. When difference with regards to number of dental visits was observed, the educated prisoners tend to have more dental visits than the uneducated.

Another question was instilled asking, 'after moving out of here will you visit to a dentist regularly?' to which 95.84% prisoners replied with a 'Yes', which highlights a positive attitude towards future dental care among the prisoners. (Table 2)

Barriers faced towards oral health in jail (Table 2)

Facility provided for dental care was assessed by asking if there were any dental check up camps organized in the last 6 months. 66% answered with a 'No'. Another question which relates to the prisoners' realization of importance and need of conducting dental treatment and check up camps regularly was asked as, 'do you think dental camps should be organized for you regularly', to which 98% of the prisoners answered a 'Yes'. This shows a high need and demand for dental treatment facility by the prison inmates.

Out of the 506 prisoners surveyed 88.53% (n=448) reported that they had some or the other dental problems during their stay in the jail for which 39.96% took medication to resolve the dental problem, 16.96% asked for a dental visit and the rest 43.08% prisoners

somehow ignored their dental problem either due to lack of dental treatment facility or lack of motivation toward oral health care. 75% (n=336) of the total prisoners having dental problems (n=448) said they did not get proper dental treatment for their problem which was due to several factors (Figure.1).

Dentinal hypersensitivity was one of the major finding i.e. 65.21% of the total prison inmates suffered from dentinal hypersensitivity. For which 81.81% opted for ignoring the condition whilst only 18.18% took the dental treatment. Figure 2 shows the Barriers faced by the prisoners.

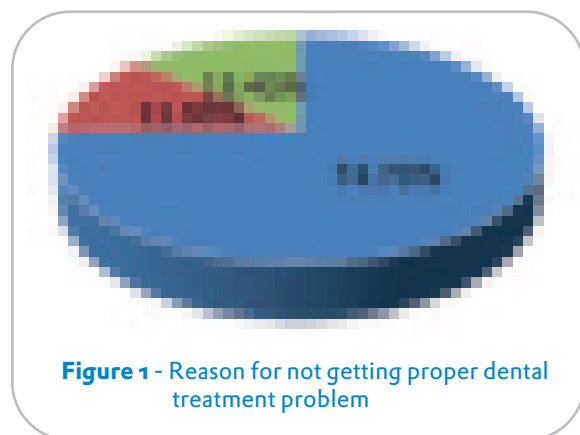
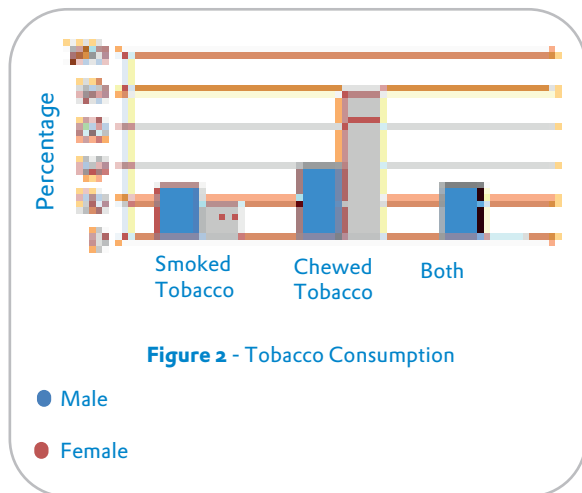


Figure 1 - Reason for not getting proper dental treatment problem

- No dental treatment facility
- Ignored by the authorities
- Didn't think dental treatment was important



Tobacco Consumption

About 62.25% prisoners had consumed tobacco in some or the other form in their lifetime. When inquiring the form of tobacco being used 26.98% reported smoking, 43.80% used tobacco only in the chewable form and 29.22% indulged in consuming tobacco in both forms i.e. smoked as well as chewed (Figure 2). Among smokers, 30% were beedi smokers and 70% were into cigarette smoking.

Discussion

Very few studies have been carried out on the knowledge, attitude and practice towards oral health and the barriers faced to oral health care in the jail. But many studies carried out in other parts of the world show that the oral health of the prisoners is much more deteriorated than that of the general population¹². The prisoners do differ from the general population invariably in many senses that may be in terms of level of education, psychosocial factors, economical factors or it may be related to substance abuse, attitude towards health¹³. Overcrowding, neglect towards oral health, ignorance by the authorities, social deprivation or it may be the disliking and rejection by the society or family. All these factors predispose them to psychological stress¹⁴. All these factors can be associated with the high detrimental effect on general and oral health, in the prisoners' population than the whole general population.

It is already proven that the prisoners have significantly greater oral health needs than the general population. Many prisoners are unemployed before being sentenced and come from communities with a high level of social exclusion. There is a need and demand for emergency, urgent and routine care due to the nature of prison stays. An increase in number of prisoners has led to increase in demand for prison dental services and for being more responsive to their clinical needs⁴.

The tooth brush and tooth paste for cleaning the teeth were provided by the jail authorities to all the inmates and that can be the reason for the prisoners' ability to use them in their routine oral hygiene. Tooth brush and tooth paste was used by 95% of the prisoners to

clean their teeth and these results match the study reports by Shah et al¹⁵. The low attendance for a previous dental visit can be attributed to the illiteracy, lack of motivation and knowledge towards oral health, access, cost and anxiety as coinciding with the study reports¹⁶, many of these barriers can be overcome by providing sound education to the prisoners and by incorporation of oral health screening into the general health screening; the same was suggested by Jones et al¹⁷.

66% of the inmate population reported that there had not been any dental check-up camps conducted in the last six months to satisfy their dental needs, 98% responded that dental check-up should be done regularly and majority of the inmates (88.5%) had some or the other dental problems during their jail stay; all these contribute to their perceived needs and high demand for dental treatment. This high perceived need for dental treatment matches with the previous study reports¹⁸. The major need for dental care in the prison was established by the fact that 88.5% of the inmates had suffered from some or the other dental ailment and majority (75%) of the inmates facing dental ailment during their stay in jail reported that they could not get proper treatment, the barriers as reported by the prisoners themselves were: no dental treatment facility in the jail premises, ignorance by the jail authorities and self ignorance. This highlights a major issue of lack of oral health care facility in the jail premises and negligence by the jail authorities for the provision of necessary oral health care.

A high prevalence of tobacco consumption (61%) was observed from the study reports, which is in fact considered a major quantifying factor in causing morbidity and mortality in case of general health and oral health. Chewable/smokeless tobacco consumption among the inmates is previously established in the literature reports as a known etiological factor in the causation of pre-cancerous lesions, precancerous condition and oral and pharyngeal cancer^{19,20}. Also oral and pharyngeal cancers cause significant morbidity and mortality; data on the annual global estimates show an incidence of about 275000 cases of oral cancer and 130300 cases of pharyngeal cancer in the developing countries²¹.

There is no provision for a dentist in Indian jails to look out for and serve the dental needs of the prison population. When considering correctional institutions a health professional plays a vital role in leadership and management of correctional institutions. As a leader, health professional who is involved in an administrative position can contribute to the health of the inmates by virtue of his knowledge about the correctional programs. A health professional should work to develop effective and rational programs for patients dealing with any sort of addiction²².

Conclusion

Our findings suggest several recommendations for policy relevance. Firstly they indicate lack of dental treatment facility for the prisoners' population, and also an absence of provision for a dentist in the prison serves as the prime barrier to the utilization of dental services.

Secondly, there were a majority of inmates who never had consulted any dentist even once in their life time; this can be attributed to the lack of access, illiteracy, high cost, fear and very low motivation towards oral health care. Lastly prisoners form the isolated and weaker sections of the society, but health for all being the prime concern, it is the responsibility of every health care worker to serve them, as the incarceration period can give an ideal opportunity to improve and promote good oral health. An urge persists for the development of a basic oral health care package that for all inmates and to be more attentive to oral health promotion in the inmates as eventually many of them will be returning to their respective communities and be a part of the main stream.

Conflict of Interest

The authors declare no conflict of interest.

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Review Article

Piezoelectric surgery: A novel approach in Periodontics

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Abstract

Piezoelectric surgery is a minimally invasive osseous surgical technique developed in recent years in response to lessen the risk of damage to surrounding soft tissues and important structures such as nerves, vessels and mucosa. Periodontitis is a multi factorial disease of tooth supporting structures. Various treatment modalities are based on removal of etiologic factors and preserving bone architecture. Recently this novel surgical approach has gained popularity in many fields of dentistry. This article reviews its treatment application in periodontics.

Key Words: Piezoelectric surgery, periodontitis, ultrasonic device.

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Introduction

The periodontium is an entity and managing a periodontal environment is a permanent challenge for the periodontist. Different techniques and surgical protocols have been proposed to treat periodontal disease due to bone loss, infection, trauma or placing dental implants. Most of these protocols involve bone surgery techniques¹.

The success of any treatment modality depends on following a precise biological criteria which includes using atraumatic surgical procedures, minimal risk to surrounding tissues, improved visibility, hemostasis and post operative conditions². Most of the instruments used are either manual or motor driven but in bone surgeries they do not help to achieve the above criteria because they are difficult to control in dense bone and generate significant amount of heat in the cutting zone during osteotomies causing overheating, ultimately hampering the healing response³.

These days precision instruments are available for periodontal and implant surgery involving hard tissue. Piezosurgery is one such innovative surgical approach developed with its application in dentistry.

Basics of Piezosurgery

Piezoelectric surgery also known as Piezosurgery was developed in the 1980's. The basics of this technique is based on the principles of "Piezo electricity" which was discovered by Jacques and Pierre Cury in the nineteenth century⁴. Piezo electricity is found in some crystals such as quartz, Rochelle salt and certain types of ceramics. Piezoelectric transducer used is an ultrasonic device which converts an oscillating electric field applied to the crystal into mechanical vibration. These devices are used over an entire frequency range and particular shapes available are chosen for

particular application eg: disc shape produces plane ultrasonic waves.

There is also another concept called inverse Piezoelectricity wherein the crystals when subjected to alternative electric charge expand and contract alternatively producing mid-frequency mechanical oscillation and ultrasonic waves. These ultrasonic waves through a phenomenon of agitation induce disorganization, fragmentation of different bodies. These two concepts form the basis of Piezosurgery which is used in dental field^{5,6}.

Piezo electric device

The Piezoelectric device uses patented, controlled, three dimensional ultrasonic unit with the frequencies of 10, 30, 60 cycles up to 29 KHz. This low frequency allows safe and precise cutting. Power can be adjusted from 2.8 to 16 watts depending on the bone density⁶. It consists of a hand piece and foot switch connected to main power unit. There is a holder for the hand piece with the irrigation fluids which cools the surgical site (Figure 1). The Piezosurgery tips produces vibration ranging from 20µm to 200 µm^{6,7} which allows clean cutting and precise incision. The tips work in linear, back and forth, piston like motion ideal for surgery. They provide advantage of more cycles per second, less heat generation, light weight and adequate water cooling^{7,8}.

Clinical application in dentistry

Piezosurgery is used in different procedures which includes periodontal surgery, periapical surgery⁹, removal of impacted tooth, implant surgery, ridge expansion procedures, bone regeneration techniques⁶, orthognathic surgery¹⁰, sinus lift procedures and

inferior dental nerve lateralization and trans positioning¹¹.

Therapeutic implications:

1. Micrometric cut: Superior precision to limit tissue damage
2. Selective cut: Sectioning of mineralized tissues without damaging the adjacent soft tissues
3. Cavitation effect: This phenomenon results in clear surgical site with the oscillating tip driving the cooling irrigation fluid making it possible for effective cooling and higher visibility⁸.

Clinical application in Periodontology

1. Autogenous bone grafting: Autogenous bone has been harvested by different methods. Bone procured using manual or motor driven instruments may not be suitable for grafting because of the absence of osteocytes and predominance of non-vital bone. The Piezosurgery inserts used for bone harvesting produces a vibration with a width of 60 to 210µm in oscillation controlled module. The use of ultrasonic vibration makes micrometric bone cuts resulting in controlled osteotomies in mobilizing block graft in contrast to rotary burs or reciprocation saws¹². Stubinger et al in his analysis reported increase in levels of bone morphogenic protein (BMP-4) and transforming growth factor (2 proteins) in the bone harvested¹³. The osteotomy makes a narrow cut and increase in temperature is avoided reducing the risk of bone damage and best results can be obtained in terms of bone regeneration⁷.

2. Periodontally accelerated orthodontics : In this treatment modality small vertical bone incisions were made between the teeth which allowed more expedient orthodontic movement. The corticotomy performed by piezosurgical saw reduced the treatment time by 60 to 70 % with accepted degrees of pain and discomfort. Surgical control for piezosurgery was reported to be easier than conventional surgical burs for selective alveolar corticotomies¹⁰. Another alternative technique to corticotomies was proposed by Sebaoun et al¹⁴ in which piezocision, minimally invasive flapless procedure combining micro incision, piezoelectric incision and selective tunneling showed better results compared to the earlier techniques used.

3. Scaling and root planing : The piezosurgery device with a vibrating tip used for removal of debris, calculus and stains uses cavitation effect and microstreaming, which disrupts the bacterial cell wall and subgingival environment¹⁵. The inserts used are placed vertically parallel to the long axis of the tooth and is moved continuously providing better calculus removal and patient comfort.

4. Curettage: Piezosurgery device can be used for debriding the epithelial lining of the pocket wall resulting in microcauterization. With thin tapered tips and altered power setting piezosurgery device can be used for efficient removal of root calculus and residual soft tissue compared to manual instruments⁷.

5. Sinus grafting in implant surgery : The piezoelectric device used for sinus elevation procedure comprises of handpiece fitted with the insert and irrigation fluid which removes debris from the cutting area. The microvibrations produced ranges from 60-200mm/sec with the modulating frequency 25-30 khz. Piezoelectric osteotomies cuts mineralized tissue without damage to the scheinderman membrane allowing easy separation and is raised with piezoelectric elevators without perforation and the space between the bone and membrane filled by new graft. There is no risk of injury to the adjacent structures and effect of cavitation cleans the working area improving the visibility^{17,18}. This technique offers favourable repair and better comfort compared to rotational bur.

6. Ridge split procedure for implant placement : Classic ridge split procedures involves razor sharp bone chisels and rotator or oscillating saws. This is time consuming and requires technical skill. Rotating saws used damage soft tissues such as tongue, cheek and the vertical incisions require more effort and care but with Piezoelectric surgery, the split crest procedure used is technically less sensitive and horizontal and vertical incision is made without damaging the adjacent structures¹⁶.

Other procedures such as Osteoplasty, Ostectomy and crown lengthening requires careful removal of bone without damaging the adjacent structures and by using piezosurgery device, positive architecture is created for better flap closure and bone support⁷.

Advantages of Piezosurgery:

1. The device enables hard tissue incision with superior precision for safe cutting action with minimum bone loss¹.
2. The piezosurgery hand piece operates with ultrasonic frequency which is safe providing greater control of surgical device and enhanced operator sensitivity¹².
3. There is minimal bleeding of bone tissue and this provides good visibility of the operating site. The reason is due to the cavitation effect creating bubbles leading to implosion which generate shock waves causing micro-coagulation¹⁵.
4. Selective cutting and specificity to the surgical site reduces the risk of damage to the soft tissue including arteries, nerves and risk of perforation to the sinus membrane is eliminated¹⁸.
5. Less risk of post-operative necrosis accelerates bone regeneration^{3,19} unlike conventional burs.
6. Decrease in post-operative pain since the cutting action is less invasive producing less collateral damage which results in better healing⁷.
7. Less noise is produced in comparison with the conventional motor driven devices so fear and psychological stress is reduced¹⁴.

Limitations

1. Operating time is increased for osteotomies compared to traditional methods^{16,20}.

2. The ultrasonic waves generates mechanical energy and in case of increased working pressure which impedes the vibration of device that convert vibrational energy in to heat so damage is incurred to the tissues^{16,21}.
3. The technique is highly sensitive.

Conclusion

Piezosurgery is truly an innovative osseous surgical technique in field of dentistry compared to the traditional hard and soft tissue methods that uses manual or rotary instruments. The handling characteristics of the technique offer advantages such as minimal risk of injury to the soft tissues, bloodless surgical field, comfort and precision to the surgeon, minimum postoperative pain, faster healing and the limitation being increased operating time and technique sensitivity.

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Review Article

Limitations and scope of Orthodontic treatment in medically compromised patients

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Abstract

Increasing number of medically compromised children and adults are likely to seek orthodontic care as improved medical management creates more long-term survivors. While for majority, treatment of orthodontic problems is possible, but individual precautions like medical consultation, maintaining a current knowledge of drug therapy, and modification in chairside procedures, are needed. Since orthodontic treatment can provide positive benefits it should not be denied solely due of the presence of a serious medical problem. Fixed appliance therapy can be done for most of these patients by applying appropriate management practices. This article discusses the implications of cardiovascular, endocrinal and respiratory diseases on orthodontic treatment.

Key Words: Orthodontics, Medically Compromised Patients, Systemic Disorders,

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Introduction

Changed lifestyles and patient awareness has increased the number of patients seeking orthodontic care. Likewise patients with medical disorders are becoming an increasing part of modern day orthodontic practice¹. A medically compromised patient is one in whom the underlying medical condition warrants a special consideration/modification in a routine treatment plan. An orthodontist who is treating medically compromised patients should have a working knowledge of the multitude of medically complex problems. Treatment plan should be modified according to effect of the particular disease in the oral cavity. As a rule, general medical problems can affect orthodontic treatment and care should be taken while managing medically compromised patients as it is not an absolute contraindication². The purpose of this article is to review cardiovascular, endocrinal and respiratory conditions and associated guidelines of orthodontic management.

I. Cardiac Disorders

a. Infective Endocarditis

Infective endocarditis (IE) is an infection of the endocardial surface of the heart, which may include one or more heart valves, the mural endocardium, or a septal defect. Its intracardiac effects include severe valvular insufficiency, which may lead to intractable congestive heart failure and myocardial abscesses³. The transient bacteremia usually results on the lining of mouth, intestinal tract, and minor cuts from our day to day activities, e.g, brushing teeth or chewing. Although very rare, endocarditis is important because,

despite antimicrobial therapy, it can result in serious complications such as stroke or even death⁴.

Orthodontic considerations:

1. An endocarditis risk assessment must be done with the consultation of patient's cardiologist. The orthodontic treatment should be initiated only after establishing a good oral health. Informed consent requires that a patient is aware of any significantly increased risk.
2. Prior to orthodontic procedure 0.2% Chlorhexidine mouthwash to be used.
3. Antibiotic prophylaxis should be used if required and orthodontist must be vigilant for any deterioration of oral health^{5,6}.
4. Bonding should be preferred than banding⁷.
5. Antimicrobial mouthwash should be prescribed for plaque control.
6. Prevention of gingival bleeding by maintaining good oral hygiene.
7. Chronic irritation from orthodontic appliance may cause bleeding and special effort should be made to avoid any form of gingival or mucosal irritation.
8. Even though Elastomeric modules accumulate more plaque they should be used instead of wire ligatures, the reason being that there is increased chances of transient bacteremia due to mucosal cuts with the use of ligature wire. Likewise special care is required to avoid mucosal cuts when placing and removing the archwire⁸.

b. Hypertension

High blood pressure is a trait as opposed to a specific disease and represents a qualitative rather than a quantitative deviation from the norm. Elective dental treatment for uncontrolled hypertensive patients should be deferred until control is achieved. There is no contraindications, however to provide orthodontic care for well-controlled hypertensive patients⁹.

Orthodontic considerations:

1. Minimizing stress is important¹⁰.
2. Appointments should be less than one hour to minimize stress.
3. Maintaining periodontal health and good oral hygiene, educating the patient, and recommending specific oral hygiene aids and devices.
4. Calcium channel blockers can cause gingival hyperplasia in addition to the irritation caused by the fixed appliance. Depending on the condition, the patient should be referred back to his physician or cardiologist, to prescribe an alternative therapy¹⁰.

II. Endocrinal Disorders

A. Diabetes Mellitus (DM)

The orthodontist should be aware of the significance of diabetes in relation to susceptibility to periodontitis. Delayed skeletal maturation and decreased cephalometric linear and angular parameters are common in patients with juvenile diabetes, and it should be considered during planning of orthodontic treatment. Factors that may contribute to oral complication in diabetes include decreased polymorphonuclear (PMN) and leukocyte function and collagen metabolism. In addition, impaired neutrophil chemotaxis and macrophage functions add to impaired wound healing in diabetes patients¹¹.

Orthodontic considerations:

1. The orthodontist should be aware of the significance of diabetes in relation to susceptibility to periodontal breakdown and orthodontic treatment should be avoided in patients with poorly controlled Insulin-dependent DM.
2. Periodontal condition should be evaluated before initiating the treatment and should be monitored in every visit and the patient should maintain good oral hygiene as they are prone for gingival inflammation due to impaired neutrophil function.
3. Xerostomia is seen in many diabetic patients. Daily rinses with fluoride mouthwash can provide further benefits.
4. Diabetes related microangiopathy can occasionally occur in the periapical vascular supply resulting in unexplained odontalgia, percussion sensitivity, pulpitis or even loss of vitality. Hence periodical checkups are advised¹².
5. Check for HbA_{1c} or contact the patient's physician to verify the control of the disease.

6. Only light orthodontic forces should be applied. Vitality of the teeth involved should be checked on a regular basis.
7. Early appointments, preferably after breakfast or insulin dose, should be given to avoid hypoglycemia.

B. Adrenal insufficiency (cortical crisis)

Acute adrenal insufficiency is associated with peripheral vascular collapse and cardiac arrest. Therefore, the orthodontist should be aware of the clinical manifestations and ways of preventing acute adrenal insufficiency in patients. There are two types of adrenal insufficiency -

- i. primary adrenal insufficiency (Addison's disease)
- ii. Secondary adrenal insufficiency (secondary to the use of exogenous glucocorticosteroids).

Orthodontic considerations:

1. Physician consultation to determine whether the patient's proposed treatment plan suggest a requirement for supplemental steroids.
2. Minor oral surgery procedures should be performed under steroid coverage¹³.
3. Use of a stress reduction protocol and profound local anesthesia minimizes the physical and psychological stress associated with therapy and reduces the risk of acute adrenal crisis. Hydrocortisone 200 mg (IV/IM immediately pre-operatively or orally 1 hour preoperatively) and continue normal dose of steroids post-operatively.

C. Thyroid and Parathyroid Disorders

Orthodontic therapy can be carried out with minimal alterations in patients with effectively managed thyroid and parathyroid disease. Thyroid dysfunction is a relative contraindication for the use of IV sedation. Hypothyroid patient are particularly sensitive to CNS depressants such as sedative hypnotic, antianxiety agents, and narcotic analgesic. Hyperthyroid patient, on the other hand, is very extremely difficult to sedate due to the high metabolism and heart rate. Atropine and scopolamine therefore should be avoided in these patients. Common oral findings in hypothyroidism include macroglossia, delayed eruption, poor periodontal health and delayed wound healing.

Orthodontic considerations:

1. Treatment procedures such as banding and bonding should have brief appointments and stress management is important for patients who have hyperthyroidism.
2. Adrenaline should be used judiciously due to the spread of infectious foci¹⁴
3. Treatment should be discontinued if signs or symptoms of a thyrotoxic crisis develop and access to emergency medical services should be available.
4. After treatment it is important that patients

continue taking their thyroid medication as prescribed.

- Excessive radiation exposure should be avoided. Thyroid collar should be used while taking patient X-rays¹⁵.

III. Respiratory Disorders

A. Bronchial Asthma

Asthma is a diffuse chronic inflammatory obstructive lung disease with episodes of chest tightness that causes breathlessness, coughing, and wheezing all of which are related to bronchiole inflammation. It is associated with hyper reactivity of the airways to a variety of stimuli and a high degree of reversibility of the obstructive process¹⁶. Patients with asthma have a greater rate of caries development than the non-asthmatic counterparts because of antiasthmatic drugs induced xerostomia and the common habit of mouth breathing in asthmatic patients and immunological factors leads to gingival inflammation.

Orthodontic considerations:

A) Before treatment

- Assess risk level by reviewing the medical history of the illness; ascertain the frequency and severity of acute episodes, the patient's medications and determining the specific triggering agents.
- Preventing a sudden episode of airway obstruction is essential when treating an asthmatic patient¹⁷.
- Elective orthodontics should be performed only on asthmatic patients who are asymptomatic or whose symptoms are well controlled. To minimize the risk of an attack, the patient's appointment should be in the late morning or the late afternoon.
- Dental materials and products like dentifrices, fissure sealants, tooth enamel dust (during interproximal slicing) and methyl methacrylate are known to exacerbate asthma. Therefore, fixed appliances and bonded retainers without acrylic are preferable.
- Oxygen and bronchodilator should be available during treatment. Dental local anesthetics with vasoconstrictors should be used with caution in asthmatic patients, as many vasoconstrictors contain sodium metabisulfite, a preservative that is highly allergenic.
- Anxiety is a known 'asthma trigger', so the orthodontist should reduce the stress level of the patient.

B) During treatment

- Improper positioning of suction tips, fluoride trays or cotton rolls could trigger a hyper reactive airway response in sensitive subjects¹⁸.
- Eliciting a coughing reflex should be avoided.
- Prolonged supine positioning, bacteria-laden aerosols from plaque or carious lesions and ultrasonically nebulized water can provoke asthma triggers in the dental setting.

- In case of acute attack, following steps should be taken -
 - Discontinue the procedure and allow the patient to assume a comfortable position.
 - Maintain a patent airway and administer bronchodilator via inhaler/nebulizer.
 - Administer oxygen via face-mask. If no improvement is observed and symptoms are worsening, administer epinephrine subcutaneously (1:1,000 solution, 0.01 milligram/kilogram of body weight to a maximum dose of 0.3 mg)¹⁹
 - Alert emergency medical services. Maintain a good oxygen level until the patient stops wheezing and/or medical assistance arrives.
- Post treatment NSAIDs include ketorolac, ibuprofen and naproxen should be avoided as these may trigger allergy and drug of choice should be acetaminophen.

Conclusion

Many patients seeking dental care have significant medical conditions that alter both the course of their oral disease and the therapy provided. Treatment of medically compromised orthodontic patients should be directed towards the prevention of oral complication that could be life threatening and hence special precautions are usually required. With appropriate management, successful orthodontic treatment can be done with minimal physical damage and maximum treatment outcome.

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Smoke early to feel the pain!

The need to keep the weight down, the peer pressure and the lack of self-esteem are some of the cited reasons that apparently spur the teenage girls in western countries to take up smoking. By one estimate, more than 35% of all teenage girls in US are smokers. Whether they derive any benefit out of it or not, many of them end up with periodic pain they never bargained for. In a prospective cohort study conducted in Australia involving 9067 young women, the researchers explored the relationship between smoking and dysmenorrhoea. They found that the women who started smoking before the age of thirteen and were active smokers at the time of the survey, had 60% greater chance of suffering from chronic dysmenorrhoea that lasted longer than 2 days, compared to non-smokers. The smoking may induce pain by causing relative ischaemia or by affecting menstrual hormones. Quitting smoking may provide the relief.

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- Dr. K. Ramesh Rao

Review Article

Oral Health Management of Geriatric Patients with Systemic Disorders

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Abstract

There is an increased demand for skilled professionals to treat the geriatric community who are more prone to various systemic disorders. Dentist apart from treating the oral cavity should be aware of various complications of the systemic disorders and dental management in emergencies. They should also know how these systemic disorders affect the oral cavity and about the various drug interactions. This article briefly explains the oral health management of geriatric patients with some common systemic disorders in this article.

Key Words: Oral health care, Geriatric dentistry, Systemic disorders, General health, Dental management

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Introduction

Oral health care is an integral part of general healthcare management in elderly patients. India currently ranks fourth among countries of the world in the size of aged population is approximately 77 million. The life expectancy of an Indian has increased to 62.36 years for males and 63.39 yrs for females compared with 23.8 years for both in 1901¹. The studies have concluded the need for exclusive geriatric oral healthcare management clinics in India to meet the requirements of the elderly patients. Geriatric patients affected by systemic disorders show oral symptoms which the dentist should have a thorough knowledge of for proper diagnosis and management (Table 1). Improving the oral health will significantly enhance the physical, social & mental well being of the geriatric adults. This review is about the dental management of geriatric adults with various systemic disorders.

Table 1 - Leading chronic conditions in adults aged 65yrs and older²:

Rank	Chronic conditions	Rate/1000 persons
1	Arthritis	502
2	Hypertension	364
3	Heart disease	324
4	Chronic sinusitis	151
5	Diabetes Mellitus	101
6	Allergic Rhinitis	80
7	Mental Disorders	64

Systemic conditions & its Oral consideration in elderly adults:

Arthritis

It is a form of joint disorder that involves inflammation of one or more joints. The prevalence in Indian population as reported by Mahajan et al 2003 is around 23.9%³. Most of the medications for rheumatic disorders may have side effects including dry mouth, mouth sores, nausea & anaemia.

Patients with rheumatoid arthritis may have restricted manual dexterity resulting in compromised oral hygiene maintenance. Electric toothbrushes or specially modified brushes (bigger handles, friction) are preferred for easier grip and usage.

Short appointments in the morning or early afternoon are preferred. Small neck pillow may need to be repositioned throughout appointment and a rolled towel for lumbar support. Antibiotic prophylaxis and corticosteroid therapy should be considered before invasive dental treatments in arthritis patients.

Infections of the prosthetic joints are usually caused by non oral microorganisms like staphylococci and infections of oral origin are reported rarely. Thus there is no reliable evidence on antibiotic prophylaxis before dental procedure in patients with prosthetic joints⁴.

American Dental Association along with American orthopaedic surgeons recommend antibiotic prophylaxis in following circumstances of patients who received new joints within last two years, previously infected joints, immunocompromised adult's respectively⁵.

Diabetes

The International Diabetes Federation (IDF) estimates the total number of people in India with diabetes to be around 50.8 million in 2010 rising to 87.0 million by 2030⁶.

Studies have shown that diabetes is one of endocrine diseases that influence oral health of patients. Hyperglycemia results in changes in microflora, disturbances in healing process resulting in frequent infection. Other symptoms include hyposalivation, changes in salivary composition, decreased immune function respectively. The most common oral manifestations in diabetic patients include xerostomia, increased plaque and calculus, candidiasis, periodontitis, periapical abscess and burning mouth syndrome which can influence the quality of life of diabetic patients^{7,8}.

Studies indicate diabetic patients did not show acceptable oral health status and to some extent, oral problems affected oral health related quality of life⁹.

One of the problems associated with treating diabetic patients is, hypoglycaemia as dental disease and treatment may disrupt the normal pattern of food intake. The dentist can avoid this by administering oral glucose just before the treatment if the patient has taken his medication but skipped the meal¹⁰.

Diabetic patients are usually immune compromised and hence dentists have to treat them with specific antibiotics. Amoxicillin and NSAID's can be used safely. Tetracyclines and Corticosteroids should be avoided since they disturb diabetic control.

Geriatric patients with well controlled diabetes usually tolerate routine dental procedures. Insulin dependent patients can undergo minor surgical procedures within 2 hours of eating breakfast and receiving their morning insulin injection. Patients with uncontrolled diabetes and those who need invasive procedures should be referred to an oral surgeon after consultation with his physician^{11,12}.

Hypertension

Blood Pressure is variable and there is a circadian rhythm. It is lowest during the night and high when the patient is anxious. It increases with age. A blood pressure of under 140/90 mm Hg is considered normal. Patients with blood pressure consistently above 160/90 mm Hg are defined as Hypertensive and should take extra care during dental treatment since they have increased risk of bleeding, stroke, heart failure and myocardial infarction.

Almost 50% of the hypertensive patients are uncontrolled and many are undiagnosed¹³. Hence all the geriatric patients attending the dental clinic has to be checked for hypertension.

It is important to treat a patient with hypertension without anxiety and pain. The BP should be controlled before the dentist begins elective dental treatment.

If the patient has a persistently high BP, the patient

should be referred to his physician before further dental treatment. While treatment if the patient's BP increases, the dentist should discontinue the treatment and place the patient at rest in supine position. The BP is rechecked after 5 min, if it still is high dentist should call the physician for assistance¹⁴.

Heart Disease

Ischaemic heart disease is common in the general population and frequently occurs in dental office. Most patients will have either angina or myocardial infarction. Angina affects around 1% population, the prevalence increasing with age. It is usually caused by coronary artery disease and angina pain is precipitated when there is inadequate supply of oxygen.

Geriatric patients with history of heart disease should be treated after getting opinion from his cardiologist. The patient should take their daily dosage of medicines on the day of dental procedure and should get the medications to the dental office. Patients with cardiac history are treated better in late morning or early afternoon appointments since cardiac events are more commonly occurring early in the morning¹⁵.

Stress reduction protocol should be followed with good analgesia and controlling the dosage of adrenalin in LA to 0.036mg (2 carpules of LA with 1,00,000 epinephrine)¹⁶.

If the patient experiences an angina attack in the chair, the treatment should be stopped and sub lingual glyceryl nitrate tablet should be administered. Adjunctive oxygen therapy may be used. After the attack has passed it will normally be safe to continue dental treatment if the patient wishes¹⁷.

Prolonged chest pain may suggest myocardial infarction. The pain experienced during myocardial infarction is usually severe and not relieved by GTN. Patient may be feeling cold, clammy, nauseous and frightened. This is a medical emergency and immediately ambulance should be called. The first line of drug should be 300mg of aspirin. Oxygen is helpful, and if possible the practitioner can gain a venous access¹⁷.

In patients with valvular disorders, the two main concern during dental treatment are:

1. Risk of infective endocarditis
2. Risk of bleeding due to anticoagulants

The risk of endocarditis is more likely to occur in patients after dental treatment who have previous endocarditis and those with cardiac lesions. The risk for patients with prosthetic valve is about 2% per annum for aortic valve replacement and 0.5% per annum for mitral valve replacement.

American Heart Association's Endocarditis committee recommends antibiotic prophylaxis only for highest risk of adverse outcomes for endocarditis including Prosthetic cardiac valve, previous endocarditis, certain congenital heart disease and cardiac transplantation recipient¹⁷.

Antibiotic Prophylaxis Regimen: 2g of oral amoxicillin / 1g of cefazolin IM or IV / Clindamycin 600mg 30 min prior to procedure

The risk of Bleeding: Patients with native valve disease can often stop or reduce their anti coagulants, but those with prosthetic valves should not discontinue their regimen without consulting their cardiologist.

Anticoagulants Therapy: Apart from Warfarin and aspirin other anti-platelet drugs like persantin, clopidogrel are commonly prescribed for many cardiac disorders. During dental procedures an INR targets of 2.5 is sufficient to continue dental treatment without stopping anti coagulant therapy¹⁸.

Blood loss during and after minor surgical procedures in patients taking anticoagulants can be controlled by local application of an antifibrinolytic mouthwash containing tranexamic acid(4.5%), gelatine sponges, oxidised cellulose and microcrystalline cellulose respectively¹⁹.

Mental Health

The most common mental disorders of the elderly patients are dementia and depression.

Dementia

Dementia is a collection of symptoms characterized by the development of multiple cognitive deficits (including memory impairment and atleast one of the following cognitive disturbances aphasia, apraxia, agnosia or a disturbance of executive functioning). Dentist should do a comprehensive and preventive oral rehabilitation of the patient since they develop reduced cooperation towards the treatment as disease advances. Informed consent has to be taken from the relative or guardian of the patient.

Dentist should always prefer non pharmacological management of the dementia patients whenever possible. Newer communication techniques like Rescuing, Distraction, Bridging, Hand over hand etc can be utilized for their effective management²⁰.

The patients may forget dental appointments and may not follow proper oral hygiene instructions. Hence the dentist should involve a caregiver or family member in their treatment. To avoid aspiration and postural hypotension, the patient should be treated while sitting upright in the dental chair or slightly reclined^{21,22}.

Depression and Mood disorders

Dentist must exhibit great tact, patience and a sympathetic manner in handling patients who are depressed. Studies report that more than 25% of the geriatric adults are depressed due to various reasons. Dentist should take special considerations while prescribing antibiotics and analgesics to these patients under treatment for depression.

Any central nervous system depressant especially opioids and phenothiazines given to patients to patients

who are taking monoamine oxidase inhibitors or within MAOIs withdrawal may precipitate a coma. Acetaminophen can inhibit the metabolism of tricyclic depressants²³.

Conclusion

In conclusion systemic diseases in geriatric patients have a significant impact on the tissues throughout the body, including the oral cavity. Early intervention and management of these oral manifestations help to prevent the development of long term complications of the systemic disorders in oral cavity. The future will include a greater need for dental and medical practitioners to communicate and manage the patients effectively. There is a need for highly skilled geriatric dentists as specialists to serve the senior adults.

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Moderate activity may prevent Parkinson's

Paralysis agitans (Parkinson's disease) is a progressive neurodegenerative motor system disorder that affects individuals older than 50 years of age. Until now only consumption of caffeinated drinks and smoking (!!) have been shown to have some protective effect against its development. Now in a new prospective study conducted in Sweden, 43000 men and women were followed up for more than 12 years. During that period, all information related to physical activity was collected from each study subject until it was interrupted by development of Parkinson's in the participant or his death or his departure from the country. When the information was statistically analysed, it was found that the study subjects who spent more than 6 hours daily in moderate physical activity (routine household activity, commuting etc.) had a 43% lower risk of developing Parkinson's compared to those who spent only 2 hour a day in similar activity. Leading a physically active life appears to be the key to stall this dreaded disease. (Physical activity and risk of Parkinson's disease in the Swedish National March Cohort, Fei Yang et al., *Brain*, doi:10.1093/brain/awu323, published online 19 November 2014)

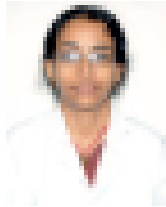
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Review Article

Dental Stem Cells

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Abstract

Stem cells are pluripotent cells that can divide and multiply for an extended period of time, differentiating into specialized cell types and tissues. Dental decay which is the commonest dental disease needs proper dental treatment. Dental origin stem cells could be used for regenerative therapies. Dental tissue replacement, pulp regeneration, alveolar bone augmentation using stem cells may become the common modes of treatment in years to come.

Key Words: Stem cells, Pulp regeneration

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Introduction

The term "stem cell" was proposed by Russian histologist, Alexander Maksimov in the year 1868. Stem cells are capable of self renewal, potent multi lineage differentiation and have plasticity. For a cell to undergo plasticity there should be a tissue injury or stress which can up- regulate stem cells and release chemo attractants and growth factors. We have progressed a long way in treatment from surgical model to medical model and now a biological model of treatment. Dental pulp stem cells could be considered as a major site for mesenchymal cell collection. It could be collected from a child, adult or from a wisdom tooth. Stem cells have given us a biological way of treating a disease. Unlike blood, muscle, nerve cells, stem cells can divide and replicate themselves. They can differentiate and perform special function.

Types of Stem Cells

Based on plasticity they can be classified as totipotent, pluripotent, and multipotent. Embryonic cells within the first couple of cell divisions after fertilization are the only cells that are totipotent. They have greatest differentiation potential. Cells from the early embryo are totipotent while blastocysts and fetal stem cells are pluripotent. Pluripotency refers to a stem cell that has the potential to differentiate into any of the three germ layers endoderm, mesoderm or ectoderm. Umbilical cord cells are multipotent. They have gene activation potential to differentiate into multiple but limited cell types. Adult or post natal stem cells produce the cell kind in which they are present.

Dental stem cells

Pulp contains three zones. The outer part of dental pulp is the odontoblastic zone containing odontoblasts

which lays down dentin, beneath is the cell-free zone (of Weil) containing numerous bundles of reticular fibers. Under the cell-free zone is the cell-rich zone made up of numerous fibroblasts. Undifferentiated mesenchymal cells differentiate into odontoblasts, fibroblasts or macrophages. Reparative dentine is formed by differentiation of new odontoblasts from these multipotent cells of the pulp. Stem cells isolated from teeth are :

- Dental pulp stem cells (DPSC): The special environment housing the stem cells is called as niche. In pulp, mesenchymal cells are present in perivascular niche¹. Adult dental pulp contains precursors capable of forming odontoblasts under appropriate signals. Dental pulp stem cells were isolated by Gronthos et al². The isolated cells had the ability to regenerate dentin-pulp like complex composed of matrix of dental tubules lined with odontoblasts and fibrous tissue containing blood vessel. This arrangement was similar to dentin-pulp complex of normal human teeth.
- Dental follicle Stem Cell (DFSC): Dental follicle surrounding the developing tooth germ has been considered a multipotent tissue. This is due to the fact that from the follicle cementum, bone and periodontal ligament forms. DFSC have been isolated from follicle of human third molars. They are able to form cementum in-vivo³. Handa et al found that bovine -DFC contained cementoblast progenitors that were able to differentiate to cementoblasts in vivo⁴. These cells were morphologically distinct from bovine alveolar osteoblast and bovine periodontal ligament.
- Periodontal ligament stem cells (PDL-SC): The PDL is a specialized tissue located between the cementum and alveolar bone and has a role in maintenance and support of the teeth. The

characteristic heterogeneity of PDL and remodeling is due to presence of progenitor cells. PDL contains progenitors, which can regenerate other tissues such as cementum and alveolar bone. Seo et al reported that under defined culture conditions, PDLSCs differentiate into cementoblast-like cells, adipocytes, and collagen-forming cells⁵. When PDLSC cells are transplanted into immune compromised rodents, cementum/PDL-like structure was found. These findings suggest that PDL contains stem cells that have the potential to make cementum/PDL-like tissue in vivo. This finding has potential to be used in reconstruction of tissues destroyed by periodontal diseases.

- Stem cells from the apical part of the papilla (SCAP): It exhibits higher proliferative rate and appear more effective than PDLSC for tooth formation. Sonoyama et al found that SCAP are capable of forming odontoblast like cells⁶. SCAP cells could be considered as a primary cell source for formation of root dentin. SCAPs can only be isolated at an earlier stage of tooth development. Yet they have a greater capacity for dentin regeneration than DPSCs because the dental papilla contains a higher number of adult stem cells compared to the mature dental pulp.
- Bone marrow derived mesenchymal stem cells (BMSC): These cells are able to form in vivo cementum, PDL and alveolar bone after implantation into defective periodontal tissues. They have lower odontogenic potential than dental pulp stem cells⁷. STRO-1 is a cell surface protein expressed by bone marrow stromal cells and erythroid precursors. Yu et al found that STRO-1 DPSCs consist of several subpopulations which can differentiate into odontoblasts, osteoblasts, and chondrocytes⁸.
- SHED (Stem cells from human exfoliated deciduous teeth) cells – are isolated from deciduous teeth. Mesenchymal cells from human deciduous incisors exhibits a high plasticity, they could differentiate into neurons, adipocytes, osteoblasts and odontoblasts. SHED cells are distinct from DPSCs by having higher proliferation rate, osteoinductive capacity^{9,10}. Miura et al found that SHED could not differentiate directly into osteoblasts^{11,9}. Induction of new bone formation occurred by creating a template and with murine osteogenic cells. SHED cells, holds a promise as they are easier to procure, the tooth from the child could be used for future regenerative purpose.

Application of stem cells in dentistry

- Pulp regeneration: Dental pulp stem cells (DPSCs) are capable of forming dentin and associated pulp^{11,12} when seeded in a collagen scaffold supplemented with dentin matrix protein.
- Bone augmentation: Stem cells are used for alveolar ridge augmentation and regeneration of oral tissues. Using tissue engineered osteogenic material, comprising platelet rich plasma and autologous mesenchymal cells, alveolar cleft

autologous mesenchymal cells, alveolar cleft osteoplasty was done in a 9 year old girl^{13,14}. It showed regenerative bone covering the cleft walls¹⁵.

- Entire tooth regeneration: Human SCAP and periodontal ligament stem cells (PDLSCs) transplanted into pig model led to generation of tissue which was tooth like in strength and appearance. Tooth could be bioengineered with tooth derived stem cells, growth factors and scaffold matrix¹⁶.
- Stem cell markers: Alteration in stem cell marker has been found with oral lichen planus and oral hyperkeratotic lesions. Lichen planus is a T cell mediated auto immune disease¹⁷. Ding G proposed that mesenchymal stem cells can be utilized to treat oral lichen planus patients via systemic infusion or local application^{18,19}.
- Salivary gland regeneration: Stem cells isolated from mouse salivary glands have shown to increase saliva production in experimentally induced, irradiated salivary glands^{20,21}. This has a promise to be translated in a human model.

Conclusion

Stem cells have created a new field of regenerative dentistry. Dental stem cells has a novel approach in treating periodontitis, dental caries, auto immune diseases, bone regeneration and many more. These dental origin stem cells appear to be in experimental stages and many procedures require validation in human studies. It holds promise to translate the research into a clinical setting.

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Eat trans-fat and pay with your memory

Plant oils are partially hydrogenated to improve the shelf life and reduce the need for refrigeration. They are used as cheaper alternative to semisolid oils like palm oil. But hydrogenation leads to formation of trans- fat. Consumption of excessive amounts of trans-fat is associated with increased risk for cardiovascular disease, obesity, diabetes mellitus, aggression etc. In a new study conducted in University of California, San Diego, 700 men and 300 post-menopausal women were evaluated for memory performance after obtaining detailed information about their dietary habits (particularly about the consumption of trans-fat). Analysis of the results of the memory performance showed, that in men younger than 45 years of age, higher consumption of tras-fat was associated with poorer memory. Such individuals recalled 10-11% less words than those who ate less trans-fat. Similar association was observed in post-menopausal women. Trans-fats produce their effects by increasing the oxidative stress and adversely affecting the cell energy. So, if you want to remember what you ate, don't eat trans-fat! [Paddock, C. (2014, November 20). "High consumption of trans fats linked to poorer memory in men." <http://www.medicalnewstoday.com/articles/285775.php>]

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Review Article

A Stitch in Time Saves Nine!

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Abstract

Periodontitis is a chronic inflammatory disease affecting the tooth supporting structures which leads to mobility and eventual tooth loss. Periodontitis acts as a foci of infection or gate way for many systemic infections due to the dissemination of microbial products in distant body parts. Oral health and general health are not separate entities. Prevention of periodontal inflammation is of utmost importance for the over all general health. The aim of this review is to bring to light the systemic problems for which periodontitis act as a risk factor.

Key Words: Periodontitis, foci of infection, myocardial infarction, stroke, preterm low birth weight, cardiovascular disease, diabetes mellitus, cognitive impairment, rheumatoid arthritis, respiratory disease.

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Introduction

Periodontitis is a chronic inflammatory disease affecting the tooth supporting structures which leads to mobility and eventual tooth loss. Dental Plaque and calculus leads to inflammation of the gingiva which if left untreated progresses to the bone resulting in periodontitis. The mouth of the human body contains more number of microbes (10^{14}) than the somatic cells (10^{13}). Oral cavity forms an ideal niche for colonization of pathogenic micro organisms¹. Foci of infection is the dissemination of the microbes and microbial products to distant body parts.

A stitch in time saves nine! Prevention of periodontal inflammation at the earliest is of utmost importance to prevent the systemic problems elsewhere in the body. Periodontitis being a gram negative bacterial infection acts as a foci of infection or gateway causing many systemic problems as shown in figure 1. The aim of this review is to bring to light the systemic problems for which periodontitis act as a risk factor.

History

In 1891 Miller in his article on, 'The human mouth as a focus of infection', stated that micro-organisms and their waste products may enter various parts of the body adjacent to or remote from the mouth. The oral bacteria was found to cause diseases like osteitis, osteomyelitis, septicemia, pyemia, meningitis, disturbance of alimentary tract, pneumonia, gangrene of the lungs, diseases of the maxillary sinus, actinomycosis, noma, diphtheria, tuberculosis, syphilis and thrush².

In 1900, William Hunter, a British Physician developed



Figure 1: Periodontitis as a risk factor for systemic diseases

the idea that the oral micro organisms are responsible for wide range of systemic conditions which he stated in his paper on, "Oral sepsis as a cause of disease"³. In 1911 Frank Billings, Professor of Medicine and head of the focal infection research team at Rush Medical College and Presbyterian Hospital in Chicago, replaced the term oral sepsis with "focal infection". There was a widespread practice of so called "preventive" or "therapeutic edentulation," including extraction of otherwise healthy teeth, in attempts to treat or prevent various systemic diseases^{4,5}.

The concept of focal infection, while shifting in and out of favor as a pathogenic mechanism, has always been recognized as being potentially causal in bacterial

endocarditis. The evolution of evidence based dentistry provides an excellent association of oral and systemic problems. Mattila and coworkers reintroduced the association between oral infection and systemic disease using sound, scientific methods⁶. Later studies by Offenbacher et al provided exciting support that periodontitis may confer independent risks for systemic conditions, in particular cardiovascular disease and preterm low birth weight. At the 1996 World Workshop in Periodontics, Offenbacher introduced the term, "periodontal medicine," as a discipline of periodontology focusing on the new data establishing a strong relationship between periodontal health or disease and systemic health or disease⁷.

Oral bacteria can cause systemic diseases by remote infections caused by translocation of bacteria, metastasis of bacterial toxins which spread by blood flow and bacterial induced immune changes in remote inflammations by circulating specific antibodies from blood, forming macromolecular complexes⁸.

Apparently, an old concept is seeing new light as growing number of studies and research unfolds the concept of two way association of periodontal infections and systemic problems.

Pathogenesis

Periodontitis though a chronic and low grade bacterial infection may have an acute exacerbation of the disease during the course. The disease induces the host immune inflammatory response and the release of cytokines and acute phase markers like C - reactive protein, haptoglobin, α - 1 anti trypsin and fibrinogen. This chronic inflammation, along with acute phase markers and pro inflammatory cytokines induces the systemic response.

Periodontitis and cardiovascular disease

A number of studies have shown an association between periodontitis and cardiovascular disease (Figure 2). Mattila and co workers in 1989, indicated that poor dental health and myocardial infarction were associated with an odds ratio (OR) of 1.3 i.e., subjects with poor dental health were 1.3 times more likely to experience myocardial infarction as compared to individuals with good dental health which was independent of known risk factors like age, total cholesterol, triglycerides, hypertension, smoking and the presence of diabetes⁶.

Patients with periodontitis have shown higher risk of coronary heart disease. The amount of bone loss was found to be associated with coronary artery disease⁹⁻¹². The increase in the severity of bone loss was found to correlate with the increase in the risk of myocardial infarction¹³.

In addition, Zambon et al.¹⁴ isolated DNA sequences specific for periodontal pathogens like *Porphyromonas gingivalis* and *Actinobacillus actinomycetemcomitans* from human atheroma specimens using polymerase chain reaction (PCR) techniques. Similarly periodontal

pathogens like *Actinobacillus actinomycetemcomitans* and *Prevotella intermedia* were isolated from major arteries affected by atherosclerosis¹⁵. Atheroma formation is induced by dental plaque bacteria through various mechanisms; either by activation of innate immunity, as a result of dental treatment or direct involvement of mediators activated by dental plaque antigens in atheroma processes. Dental plaque induces production of cytokines and heat shock proteins and certain common predisposing factors^{16,17}.

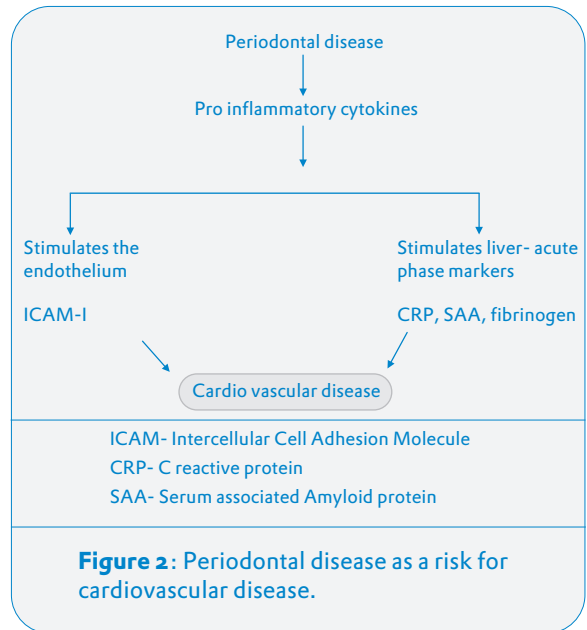


Figure 2: Periodontal disease as a risk for cardiovascular disease.

Periodontitis and Preterm low birth weight infants

Premature low birth weight (PLBW) is defined as an adverse pregnancy outcome where the infant weighs less than 2,500 g. Infection is now considered one of the major causes of premature low birth weight deliveries, responsible for ~30-50% of all cases¹⁸. Chronic bacterial challenge of the periodontium can increase the release of pro inflammatory cytokines, Lipopolysaccharide, Tumor Necrosis Factor- α , Prostaglandin E₂ which in turn cause premature contraction of uterine smooth muscles or premature rupture of membranes (Figure 3). Increased severity of periodontal disease was found to be associated with increased risk of preterm birth^{19,20}. Ig M specific antibodies against the periodontal pathogens like *Porphyromonas gingivalis* and *Bacteroides forsythus* were detected in placental blood of these patients²¹.

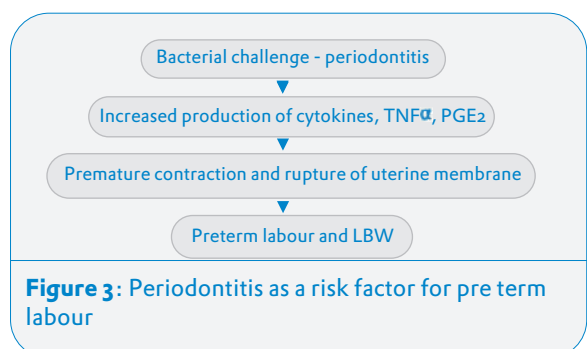


Figure 3: Periodontitis as a risk factor for pre term labour

Periodontitis and Diabetes Mellitus

Though periodontitis is considered as a sixth complication of diabetes²², it certainly has negative impact on glycemic control due to increased production of pro inflammatory cytokines. Various studies have shown the two way relationship of diabetes and periodontitis²³. Diabetes and its complications like retinopathy, neuropathy, end stage renal disease and cardiovascular complications are strongly associated with severity of periodontitis²⁴⁻²⁷.

Periodontitis and cognitive impairment

Periodontitis is associated with impaired or delayed memory and calculation²⁸. Tooth loss affects the ability to consume recommended levels of many foods and nutrients and vitamins. Pro-inflammatory factors derived from the body's response to a chronic periodontal infection may enter the brain through systemic circulation leading to cognitive function²⁹.

Periodontitis and rheumatoid arthritis

The prevalence of rheumatoid arthritis is higher in periodontal patients compared to individuals without periodontal disease. Higher serum levels of antibodies against disease-causing periodontal bacteria were observed in Rheumatoid arthritis(RA) patients compared to a control group in a case-control. Moreover the concentrations of autoantibodies that are related to RA and C-reactive protein are also higher in people with *P. gingivalis* infections. Gram negative bacilli infections can cause systemic infections anywhere in the body. Periodontal pathogens were found to induce rheumatoid arthritis in genetically susceptible host^{30,31}.

Periodontitis and *H. pylori*

Deeper periodontal pockets are most likely to colonize *H.pylori* compared to patients with normal gingiva. Subgingival plaque in individuals with periodontitis act as *H. pylori*. (Riggio Lennon 1999, Bruce et al 2002)^{32,33}

Periodontitis and respiratory diseases

Periodontitis may influence the initiation of pneumonia and chronic obstructive lung disease. Periodontal pathogens and the enzymes released by them can modify the respiratory mucosa by colonizing the respiratory pathogens; the increased production of cytokines by periodontitis promote the colonization and infection by respiratory pathogens^{34, 35}.

Conclusion

A spark of fire can light the whole forest. Hence the prime focus of this article is to enlighten the medical practitioners the role of periodontal disease in causing systemic problems. Periodontal disease does not just affect the dental health of the patient, but affects the systemic health. Hence the oral health care is of utmost importance in the overall health care of the patient. Diagnosis and prevention of the periodontal disease at the earliest should be encouraged as a part of general health care management.

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Case Report

Sickle Beta⁺ Thalassemia

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Abstract

Sickle beta thalassemia is a disorder which represents the double heterozygous state for the Hb-S and the beta-thalassemia genes. The clinical and hematological manifestations of sickle beta thalassemia are highly variable due to existence of two types of genes, beta⁰ thalassemia gene and beta⁺ gene. Beta⁰ gene leads to complete absence of Hb-A levels, whereas beta⁺ gene leads to production of Hb-A levels 10-30%. This disorder is diagnosed by levels of Hb-S, Hb-A₂ and Hb-F in Hemoglobin Electrophoresis. We are presenting one such patient with features of Sickle Beta⁺ thalassemia who presented with anemia, splenomegaly and characteristic features in Hb Electrophoresis.

Key Words: Sickle Cell Anemia, Beta Thalassemia, Hb Electrophoresis, Hemoglobin A, Hemoglobin S

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Introduction

Hemoglobinopathies are a group of genetic disorders of hemoglobin in which there is abnormal production or structure of the hemoglobin molecule. These hereditary disorders are major public health problem in many parts of the world including India. The clinical spectrum of the disorders varies from asymptomatic conditions to serious disorders like thalassemia major that requires regular blood transfusions and extensive medical care.

As per World Health Organization (WHO) report, around 7% of the global population carries an abnormal haemoglobin gene¹.

Population screening has identified the prevalence of - thalassemia carrier status as high as 17% in certain communities in India². The prevalence of hemoglobinopathies varies in different parts of India. Sickle beta thalassemia prevalence was found to be relatively low in contrast to the prevalence of beta thalassemia trait in various studies³⁻⁹. Sickle beta thalassemia is a disorder which represents the double heterozygous state for the Hb-S and the beta thalassemia genes.

The overall prevalence of sickle beta thalassemia in India is 0.02% with highest prevalence in Bangalore (0.06%). The overall prevalence of beta-thalassemia trait in India is (2.78%) with highest prevalence in Kolkata (3.64%). The overall prevalence of HbS trait in India is 0.70% with highest prevalence in Vadadora (2.94%). The overall prevalence of HbE trait in India is 3.63% with highest prevalence of 23.9% in Dibrugarh³. This case is presented due to uncommon occurrence of sickle beta⁺ thalassemia.

The clinical and haematological manifestations of sickle beta thalassemia are highly variable. Variability is due to existence of two types, one characterised by complete absence of Hb-A due to the presence of a beta⁰ thalassemia gene and the other with Hb-A levels of 10-30% due to a beta⁺ gene. This disorder is diagnosed by the levels of HbS, HbA₂ and HbF levels in Haemoglobin Electrophoresis, Peripheral smear, and Reticulocyte count.

Case report

A 23 year old man from Kolkata, West Bengal presented with acute onset of intermittent fever with chills, rigor and vague abdominal fullness of 2 days duration. He did not have any other symptoms suggestive of cardiac, respiratory and haematological disorders. He takes mixed diet and has no significant family or personal history.

On examination he was conscious, oriented, and mildly icteric with mild pallor. He had a single axillary, non tender lymph node of size 1.5x1cm. His abdominal examination revealed moderately firm splenomegaly (7cms). Other systems examinations were unremarkable.

His complete blood count revealed anaemia Hb 8.6 gm%, RBCs 3.5 million/cubic mm, MCV 77.3 fl, with normal Total count, and marginally low platelets (83,000) with ESR 13mm/hr. Peripheral smear showed microcytic hypochromic RBCs with target cells with elliptocytes, fragmented RBCs with polychromatic cells with no heamoparasites. Reticulocyte count was 3%.

His biochemical investigations showed mild haemolysis with Total Bilirubin 2.93 mg/dl (Indirect bilirubin-2.80mg/dl), Lactate dehydrogenase (LDH)-1387 IU with normal liver function tests and Urine Urobilinogen were normal.

Serological tests like Coombs direct and indirect, ELISA for HIV and Dengue were negative. FNAC of the node showed a reactive infiltrate. Serum ferritin was 191.6ng/ml. Bone marrow biopsy study showed erythroid hyperplasia with mild megaloblastic changes and dyserythropoiesis. Iron stores were increased.

In view of anemia and splenomegaly and raised LDH, negative coomb's test and in the absence of hemoparasites, patient was investigated further to find the cause for hemolysis and hence sickling test was ordered. Sickling test came positive with Hb electrophoresis revealing HbS 72.8%, HbA level 4.6%, HbA₂ 5.2%, HbF- 15.3%, suggestive of a hemoglobinopathy.

Discussion & Conclusion

Differentiation of sickle cell anaemia and some of the sickle beta thalassemia syndromes has to be done carefully due to close similarity of symptoms and laboratory features. Mean corpuscular volume (MCV) may be normal or low in all thalassemia syndromes.

Symptoms and blood picture of patients with HbS beta⁰ thalassemia are similar to those of homozygous sickle cell disease (HbSS) with microcytosis, marked hypochromia, target cells and sickle cells in the peripheral smear and can be differentiated only by Hb electrophoresis.

The Haemoglobin Electrophoresis pattern of the sickle-beta⁰ thalassemia consists almost totally of Hb-S with a mild increase in Hb-F and Hb-A₂ and absent Hb-A¹⁰. They also have similar symptoms of homozygous sickle cell disease like frequent painful vasoocclusive crises, hand-foot syndrome and aseptic necrosis of bone with autosplenectomy.

The beta⁺ thalassemia type consists of Hb-S, along with 10-30% of Hb-A and a mild increase in Hb-F and Hb-A₂. Patients with HbS beta⁺ thalassemia are characterized by mild anemia associated with moderate splenomegaly, in contrast to autosplenectomy of sickle cell anemia¹¹.

Sickle beta⁺ thalassemia patients have Hb-S composition of approximately 60-70%, Hb-A 25%, and an elevated level of Hb-A₂¹². They also can have few symptoms like occasional vasoocclusive crises and aseptic necrosis of the bone.

Patients with HbS-HPFH (HbS & Hereditary Persistence of Fetal Hemoglobin) are asymptomatic and not anemic.

HbA₂ levels are elevated above 3.5% in HbS beta thalassemia and are low or normal in patients with HbS-HPFH. HbF level in patients with HPFH are generally more than 20%¹³.

Thus a careful evaluation of symptoms and signs along with Hb electrophoresis helps us to distinguish between various sickle beta thalassemia syndromes.

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Answer to : **Diagnose the condition**

ECG 2 -shows Wellens syndrome also referred to as LAD coronary T-wave syndrome. Rhinehart et al (2002) describe the following diagnostic criteria for Wellens' syndrome:

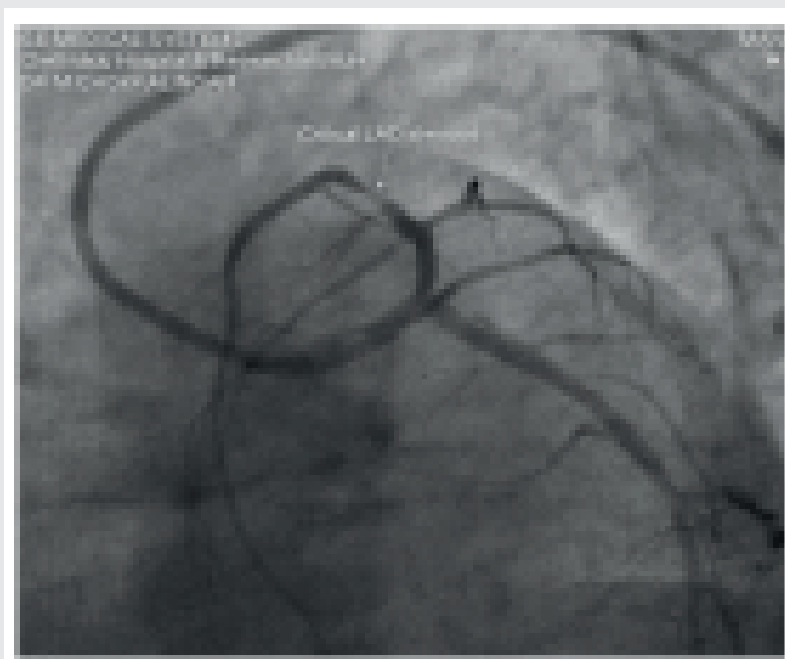
- Deeply-inverted or biphasic T waves in V2-3 (may extend to V1-6)
- Isoelectric or minimally-elevated ST segment (< 1mm)
- No precordial Q waves
- Preserved precordial R wave progression
- Recent history of angina
- ECG pattern present in pain-free state
- Normal or slightly elevated serum cardiac markers

Recognition of this ECG abnormality is of paramount importance because this syndrome represents a preinfarction stage of coronary artery disease (CAD) that often progresses to a devastating anterior wall MI.

Associated with critical stenosis of the proximal left anterior descending (LAD) coronary artery.

Our patient had 99% stenosis of LAD for which he underwent successful PTCA with stenting to LAD.

Prompt identification is important as it prevents major acute MI.



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Case Report

Endodontic Management of a Mandibular Second Premolar with Two Roots and Three Canals

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Abstract

The mandibular premolars exhibit variations in the number of roots and root canals. This presents with diagnostic difficulty and subsequent endodontic flare ups and failure. Precise location of additional canals is the key to successful endodontic management. In this article, we report a rare case of mandibular second premolar with two root canals and three roots in which a nonsurgical endodontic treatment was completed.

Key Words: Mandibular second premolar, Two roots, Three canals.

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Introduction

The knowledge and understanding of the normal root canal system and variations are of vital significance to clinicians. Accurate location, negotiation, cleaning, shaping and obturation of root canals determines the success of endodontic therapy¹. Endodontic failure is common in mandibular premolars due to undetected additional canals as evidenced in literature¹. Hoen and Pink reported 42% incidence of missed canals or roots in teeth requiring endodontic treatment². This case presents the successful detection and endodontic treatment of a mandibular premolar with two roots and three canals.

Case report

A 38 year old male was referred for endodontic treatment by a general practitioner. The patient complained of pain in the left posterior part of his lower jaw since 3 weeks. The pain aggravated on drinking hot fluids and he had two episodes of nocturnal pain for a period of one week, which subsided on taking over-the-counter analgesics. Intra oral examination revealed a temporary filling in 35 with tenderness on percussion. Radiographic examination revealed a large distal cavity in 35 filled with a radioopaque filling material, involving the pulp (Fig 1A). The tooth showed two roots, mesial and distal, dividing at the mid root level. The mesial root exhibited a continuous radiolucent line suggesting one root canal. The distal root revealed a disappearing radiolucent line suggesting the presence of more than one canal. Widening of the periodontal ligament space was seen in relation to 35 (Fig 1A). The different root

morphology in tooth 34 was also noted in the Xray. After conducting clinical vitality tests, the diagnosis of acute irreversible pulpitis with apical periodontitis was made in 35. Root canal treatment was planned. Patient consent for the treatment was obtained. The tooth was anesthetized with 2% lidocaine solution by way of inferior alveolar nerve block on the left side. Subsequently, the tooth was isolated with rubber dam. The temporary restoration and remaining carious dentin was removed. Endodontic access was initiated with a high speed air-rotor handpiece and round diamond point. The canals were explored using size -08 K file (Dentsply Maillefer; Ballaiques, Switzerland). A mesial and a distal canal was promptly identified. Angulation of the file in the distal root seemed eccentric which necessitated further exploration. The exploration revealed that the distal root had two canals identified as distobuccal and distolingual (Fig 1B). The working length was determined with the help of an apex locator (Root ZX; Morita, Tokyo, Japan), which was confirmed with a radiograph. The canals were cleaned and shaped by the crown down technique with rotary ProTaper (Dentsply Maillefer, Ballaigues, Switzerland) with copious irrigation with 2.5% sodium hypochlorite and 17% EDTA. The canals were dried and a sterile cotton pellet was placed in the orifice and sealed with Cavit (Espe, Germany). One week later, the tooth was completely asymptomatic. The canals were irrigated with 17% EDTA and finally with 2.5% hypochlorite, dried and obturated with laterally condensed gutta-percha and AH Plus sealer (Dentsply, Maillefer). A final radiograph was taken to assess the quality of obturation (Fig 1C).



Fig 1 A - Pre-operative radiograph

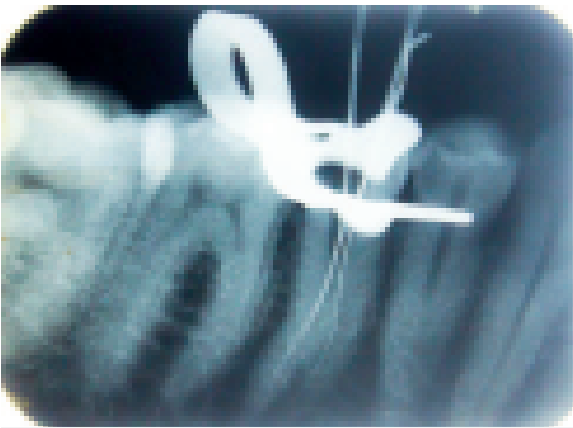


Fig 1 B - Three canals located

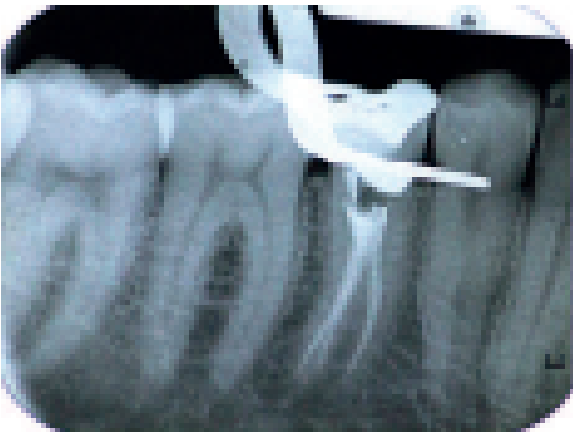


Fig 1 C - Obturation done with Guttapercha and AH PLUS sealer

Discussion

The root canal morphology of the mandibular second premolars can be highly variable and can often be challenging to the clinician even though it is typically described as a single rooted tooth with a single canal system^{3,4,5}. Root canal studies by Vertucci et al reported that the mandibular second premolars had one root canal at the apex in 97.5% of the teeth studied and two canals in 2.5% ;the incidence of three root canals were scarce⁶. A literature review of eight anatomic studies of 4019 mandibular second premolar teeth by Cleghorn et al (2007) reported 99.6% with a single root, 0.3% with two roots and 0.1% with three roots which was rare and documented in case reports³. A review of eleven anatomic studies of root canal

systems comprising 3063 teeth show that 91% of teeth had one canal and two or more canals were present in 9% of the teeth³. Kottor J et al(2013) performed a systematic review and reported that 99.28% of mandibular premolars have a single root with a single canal (86.9%),two roots were found in 0.61% of the mandibular premolars studied.Variations were attributed to ethnicity of populations, gender predilections and possibly genetics^{5,7}. In their review they enumerated the second premolar variations in thirty six cases stating that they presented with one root and 3,4,5 canals, 2 roots with 2,3,4 canals and a case with 4 roots with 4 canals. Only eleven out of the studied thirty six teeth had two roots and three canals as presented in this case. Various diagnostic methods were used in the case reports to assess the anatomy of root canals⁷.Simple, cost effective techniques like intraoral periapical radiographs to more sensitive techniques CBCT: cone beam computed tomography, Micro-CT: microcomputed tomography, SCT: spiral computed tomography have been used^{7,8}. The present case was diagnosed by careful study of the intra oral radiograph and its interpretation of disappearing canal space to suspect more than one canal. Tactile exploration and clinical indications such as file direction in the canal helped in locating the canals. The use of rotary instruments helped in producing the final shaping of the canals⁹.

Conclusion

Mandibular second premolar tooth with anatomic variations in the root canal system can be effectively diagnosed with high quality radiographs taken at different horizontal angulations and proper interpretation, visual inspection of the floor of the chamber and careful tactile exploration under good illumination. The use of magnification and aids such as CBCT, Spiral CT and Micro-CT can help in understanding the presence of anatomic variations to a great extent facilitating successful endodontic treatment.

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Hand Dryers or Paper towels?

When you visit a public toilet, do you dry your hand with warm air hand dryer or with lowly paper towels? You might be tempted to say "hand dryers" as they seem apparently clean. But you might be wrong. In a new study conducted in University of Leeds, employing a cleverly designed experiment, the investigators found that bacterial counts around Hand Dryers were 27 times higher than the counts in the air around paper towel dispensers. Even among the hand dryers, jet air hand dryer was much worse than warm air hand dryer. In addition, the bacteria were found to persist for up to 15 minutes in the air around hand dryers. So, next time you visit a public toilet, use paper towel to dry your hands. If you choose hand dryers, you might be inadvertently spreading the bacteria. (E.L. Best, P. Parnell, M.H. Wilcox. Microbiological comparison of hand-drying methods: the potential for contamination of the environment, user, and bystander. Journal of Hospital Infection, 2014; DOI: 10.1016/j.jhin.2014.08.002)

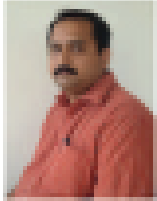
- Dr. K. Ramesh Rao

Case Report

Mclnnes solution - The Forgotten Entity for Fluorosis Stains

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Dr.K.Sadasiva currently working as Professor in Conservative Dentistry and Endodontics, Chettinad Dental College and Research Institute, graduated from Tamilnadu Govt. Dental College and finished his Masters from the same College in 2001. He has several National Publications to his credit. He has paper presentations in international laser conference and Ministry of Health in Saudi Arabia. His areas of interest are bleaching of teeth, endodontics, full mouth rehabilitation and currently involved in ICMR Project of Silver Amalgam recycling.

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Abstract

Dental fluorosis is one of the major endemic diseases affecting the musculo-skeletal system and teeth. It is characterized by yellowish to brownish stains and pitting of teeth according to the severity of the disease. These intrinsic stains severely affect the confidence of the patient, making them hide their smile, which is a major expression of happiness. This case series reports, a total of five cases with mild to moderate fluorosis with aesthetic stain, treated successfully using Mclnnes solution. This report emphasizes that Mclnnes solution has to be considered in cases with fluorosis stains as an economic, effective and conservative option in relevant situation.

Key Words: bleaching; fluorosis; Mclnnes solution; tooth Stain

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Introduction

Fluorosis causing intrinsic discoloration of teeth is a common problem in clinical dental practice. Removal of intrinsic stains is absolute necessary in atleast, anterior teeth for its psycho social effects on the affected individuals, especially the younger ones. Although many new treatment modalities are available such as veneering, porcelain crowns, in most instances, they are not affordable for all the patients. In such cases, Mclnnes solution provides a viable and economic alternative for the effective management of intrinsic stains caused by fluorosis and is also very conservative in nature^{1,2,3}. This case series reports, five cases of mild to moderate fluorosis successfully treated using Mclnnes solution and highlights its clinical usefulness in the relevant situation, which seems to have been forgotten in the modern days.

Case series report

Patients with fluorosis attending the outpatient department at Chettinad Dental College and Research Institute were screened, and five cases of mild to moderate fluorosis in accordance to Deans index^{4,5}, were selected for treatment using Mclnnes solution (Figure 1-5A).

Patients were explained in detail about the treatment procedure and its outcomes (i.e. hypersensitivity and little stains and pits) and approximate amount of time and number of sittings. Preoperative photographs were taken before proceeding with the treatment for each individual case.

Oral prophylaxis was done before bleaching, using pumice paste to remove surface stains/ debris. Orabase gel applied sufficiently over the adjacent mucosa to prevent any injury from the Mclnnes solution.

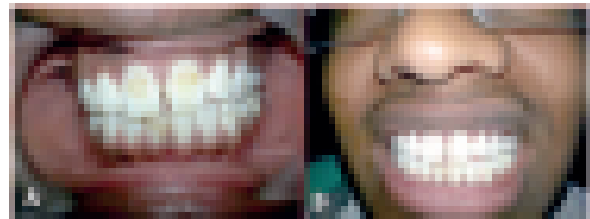


Fig 1a: Preoperative (Fluorosis stains with pits)

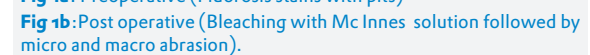


Fig 1b: Post operative (Bleaching with Mclnnes solution followed by micro and macro abrasion).

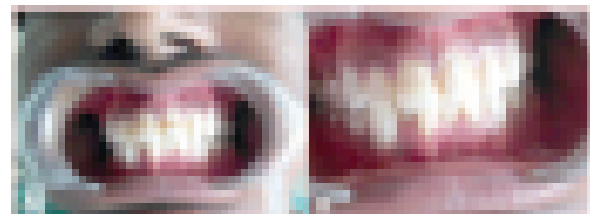


Fig 2a: Preoperative (Fluorosis stains)

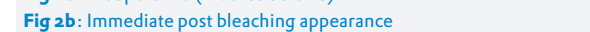


Fig 2b: Immediate post bleaching appearance

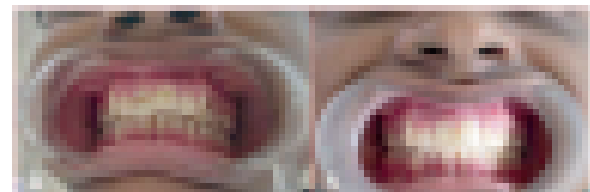


Fig 3a: Preoperative Fluorosis stains

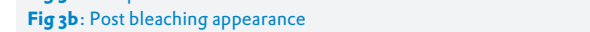


Fig 3b: Post bleaching appearance



Fig 4a: Preoperative (Fluorosis stains)

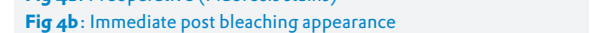


Fig 4b: Immediate post bleaching appearance

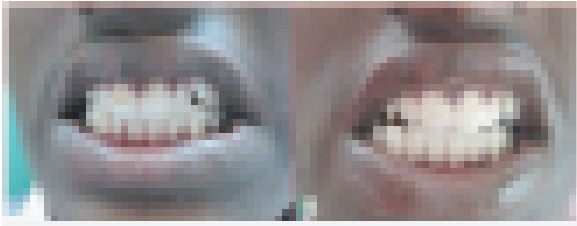


Fig 5a: Preoperative (Fluorosis stains)

Fig 5b: post bleaching

Application of rubber dam was done, dam retained with wedjets, and isolation was achieved along with low volume suction.

McInnes solution was freshly prepared, just prior to bleaching procedure, to maintain the potency of the solution. Following are the components, which makes the McInnes solution⁶.

- i) 5 parts of 35% of hydrogen peroxide - Will bleach the enamel
- ii) 5 parts of hydrochloric acid 36% - Etches the enamel
- iii) 1 part of diethyl ether removes facial debris

After the isolation of tooth, McInnes solution was applied on the stain region, for 5-10 minutes with intervals. Small gauze pieces were cut and kept over the stain for saturating the solution over the stain. Copious irrigation was done with saline, rubber dam was removed. Polishing was done with polishing paste. The small pits remaining in Case number one (Figure 1A&B) were removed by macro abrasion using flame shaped grit, followed by slow speed micro abrasion⁷.

After the successful completion of treatment, post operative photographs were taken (Figure 1-5 B). GC tooth mousse (GC, Japan) for assisting in remineralization of tooth was prescribed for all the patients⁸ and desensitizing tooth paste was advised for symptomatic relief in cases, reported with transient sensitivity.

Discussion

The treatment results in our selected cases, provides clinical evidence for the effectiveness of McInnes solution in treatment of cases, with mild to moderate fluorosis (Deans index).

The treatment results depend mainly on the etiology, proper diagnosis and selection of appropriate bleaching technique. The main advantages using McInnes includes inexpensiveness, less chair side time and immediate treatment results. With the rubber dam isolation, the McInnes solution can be utilized for the removal of stains involving either the entire dental arch or the isolated tooth^{2,3}. Also the easy control over the process of solution application facilitates continuing or terminating the treatment at any time by the dentists.

The acidic nature of the solution may cause mild demineralization of teeth structure, and this can be prevented by prescribing GC tooth mousse as it was in our cases⁸. Also precision in application of solution is

essential to prevent adjacent soft tissue injury. Metallic taste sensation and post operative sensitivity are the side effects reported by some patients, but they are transient in nature. Desensitizing tooth paste also can be prescribed in an appropriate situation.

Conclusion

McInnes solution is relatively safe, comfortable, conservative and less expensive in the treatment of intrinsic stains. Based on our treatment results, we highly recommend McInnes solution for use in routine clinical dental practice for mild to moderate fluorosis stains.

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Case Report

Warty But Not Warts

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Abstract

Warty dyskeratoma (WD) is a benign epidermal proliferation characterized by a reddish-brown or skin colored solitary papule or nodule with central follicular plugging. It is usually limited to the scalp, neck and face but has occasionally been reported on oral and vulval mucosae. Herein we report a female patient presenting with multiple verrucous papules on the scalp diagnosed clinically and histopathologically as warty dyskeratoma. The etiology of WD is unknown, but ultraviolet light, autoimmunity, viral infections, chemical carcinogens, and smoking have been postulated to play a role. Besides the characteristic histopathological features, the clinical appearance of WD is distinctive and is composed of discrete papules or nodules.

Key Words: Warty dyskeratoma, Verrucous

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Introduction

The skin of the scalp has several unique features that aid in its critical role of protecting the head. The follicular density is much higher, creating a dark, warm and moist environment. These unique features of the scalp make it susceptible to various infections, inflammations and tumors. A clear understanding of each disease process and its unique manifestations is key to developing an accurate differential diagnosis.

Warty dyskeratoma (WD) is a benign epidermal proliferation characterized by a reddish-brown or skin colored solitary papule or nodule with central follicular plugging.

It is usually limited to the scalp, neck and face but has occasionally been reported on the oral and vulval mucosae¹.

Case Report

- A 56 year old woman presented to our out patient department with 5 years history of asymptomatic raised skin lesions on the scalp.
- The lesions were insidious in onset. The number of lesions were increasing gradually since one month. Oral mucosa, genital mucosa and nails were normal. She had no other dermatological or systemic disease and no history of preceding trauma.

On examination well demarcated erythematous and hyperpigmented verrucous papules of 0.5-2cm with yellowish plug were seen on the left parietal scalp. (Fig. 1 & 2)

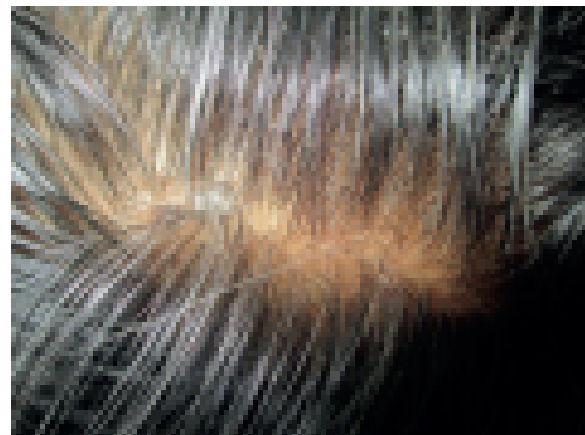


Fig 1 - Hyperpigmented verrucous plaque on the scalp



Fig 2 - Multiple hyperpigmented warty papules

A biopsy was obtained for histological diagnosis. Histopathological examination showed medium sized invagination of epidermis connected with a column of keratinous material. The invaginated area showed acantholytic dyskeratotic cells (Fig. 3). In this particular case the lesions resolved spontaneously.

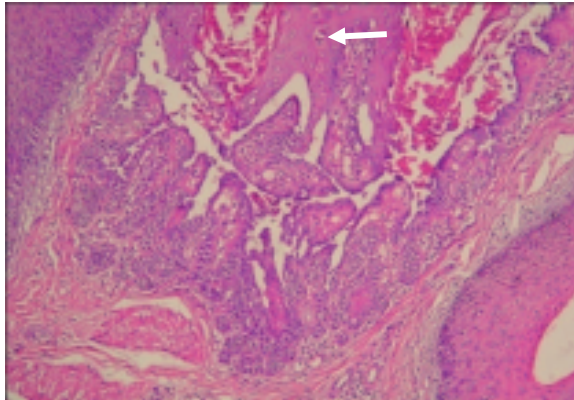


Fig 3 - HPE shows skin with a central lesion occupied by medium sized invagination of epidermis connected with a column of keratinous material. The invaginated area shows acantholytic dyskeratotic cells. (The arrow marked shows a dyskeratotic keratinocyte)

Discussion

Warty dyskeratoma (WD) is a rare and benign epidermal proliferation that was first described in 1954 by Helwig. The term warty dyskeratoma was later coined by Szymansky in 1957². It manifests as a peculiar hyperkeratotic umbilicated persistent nodule usually limited to head and neck regions. Oral involvement³ particularly the hard palate, and genital involvement have been reported¹. A rare subungual warty dyskeratoma has also been reported⁴. Most common in middle aged individuals, males are more commonly affected. In most cases, its size does not exceed 5 mm^{5,6} and the largest tumor reported is 3 cm in diameter⁷. Multiple lesions may occur in the same patient. The etiology of WD is unknown, but ultraviolet light, autoimmunity, viral infections, chemical carcinogens, and smoking have been postulated to play a role. Acquired genetic mutations in ATP2A2 gene has been postulated as supported by the absence of SERCA2 in immunohistochemistry but has not been reported in literature so far.

Differential Diagnosis

- Common warts (*verruca vulgaris*)
- Follicular Keratosis (Darier's disease)
- Familial Benign Pemphigus (Hailey-Hailey Disease)
- Keratoacanthoma
- Actinic keratosis

Treatment

The treatment modalities are surgical removal by excision and topical application of tazarotenic acid gel may provide successful results in the management of this dyskeratotic disorder⁸. But in our patient the lesions underwent spontaneous resolution.

No known risk of malignant transformation of warty dyskeratoma is reported. Recurrence is extremely uncommon¹⁰

Conclusion

- Not all warty lesions on scalp are common warts.
- The characteristic clinical and histopathological features of WD is distinctive.
- Multiple warty dyskeratomas on scalp are rare and reported in association with renal failure but our patient had normal renal function^{9,10}. In summary, multiple WD is an exceptional entity that could be misdiagnosed and its diagnosis should lead us to rule out any possible renal involvement.

Acknowledgement

We acknowledge Dr. Ramesh Rao, Prof. & HOD, Dept. of Pathology, Chettinad Hospital and Research Institute for his valuable contribution.

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