ORIGINAL RESEARCH

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Salivary cortisol response developed in Patients undergoing Dental treatment

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ABSTRACT

Aims and objective: The stress control is essential in patients to elude the loss of motivation for Dental procedures .The present study was conducted to estimate salivary cortisol response to stress developed in patients undergoing Dental treatment

Methodology : 36 patients had their salivary cortisol levels measured; 30 of them were in the study group and had had root canal, apicoectomy, tooth preparation, and impression-making procedures for the fixed prosthesis. Six of the patients were healthy individuals who didn't need any dental treatment.The groups demarcated were as follows.

Group 1: Control group with no treatment and just the saliva sample was taken.

Group 2 ; The patients undergone access opening, Biomechanical preparation and obturation

Group 3 ; The patients undergone apicoectomy procedure

Group 4 ; The patients undergone tooth preparation and impression making for fixed prosthesis . The salivary cortisol levels were evaluated using Salivary Cortisol Enzyme Immunoassay Kit.

Results : The salivary cortisol level was highest in Group 3,followed by Group 2 ,Group 4 and least in Group 1.

Conclusion The stress level was lowest in healthy patient and highest when patient underwent apicoectomy procedure in appointment .

Keywords

Anxiety, Dental Treatment , Salivary Cortisol Enzyme Immunoassay Kit, Salivary Cortisol Level

Imprint

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Introduction

The assessment of patient stress is essential to evenly execute Dental procedures. **Buchanan T W, Preston SD**[1] reported that the stress ripostes are not invariably hostile. The stress control is necessary in patients to escape the loss of motivation for dental treatment. The stress disturbances are the common mental disturbances [2]. **Ohura K, Nozaki T, Shinohara M, Daito K, Sonomoto M, Daito M Kiyo**[3] stated that By lowering stress of Dental procedures, the patients adjustability improves and motivate them to get their Dental treatment done[4]. Cortisol malfunction and severe pain may develop as a result of an extended stress response[5]. Children's behaviour may change as a result, and it may have an impact on dental care. Saliva can be collected with less effort than blood samples because it is not invasive or harmful, making it a suitable specimen for the measurement of substances related to stress. Salivary chromogranin A (CgA), secretory immunoglobulin A (sIgA), salivary amylase, catecholamine, and cortisol are all stress-related substances that are present[6,7]. There is marked contrast in patients reaction to stress in children who are involved not only in a agony procedure but also a painless treatment. Anxiety develops due to restless tense feeling while in dental chair during the treatment procedure. The outcome with administration of anesthesia and with agony procedures are unavoidable. Dental outlook can be intiator of stress for young patients. Exposure treatment strategy should be followed for phobic anxiety. The raised stress levels should be inscribed in clinical training. [8] Panifull situation generally develops due to the stressful situation. [9]Therefore the anxiety strand is more in patients undergoing dental treatment and this pressure differ in the further visits that persue to depend upon to what they are open to, during these visits.

Pain rehabilitation is not dissertated but there is connection between stress and pain . Therefore, the goal of the current study was to determine how much salivary cortisol patients receiving dental treatment produced in reaction to stress.

Aims and Objectives

To estimate salivary cortisol level in healthy patient.

To estimate salivary cortisol level in patient after doing access opening, Biomechanical preparation and obturation

To estimate saliary cortisol level in patient undergoing apicoectomy procedure

To estimate salivary cortisol level in patient after doing tooth preparation and impression making for prosthesis .

To comparatively estimate salivary cortisol level in patients undergoing Dental treatment .

Material and Methodology:

There was 36 participant (6 control and 30 study group patients)who participated in the present study. Greabu M. used the results of prior studies to determine the sample size. Spinu T, Totan C, Totan A, and Purice [10] The sample size was calculated to be 30 for each group, with a 95% confidence interval and at least 80% power. The accurate medical and dental histories of all subjects involved were requested. The age range of the 36 patients involved in this study was 20 to 30. The motive of the study was prior notified to the patients requesting them for collection of saliva sample. These patients underwent Dental procedure.They were divided into 4 groups

Group 1: control group with no treatment and just the saliva sample was taken.

Group 2 ; The patients undergone access opening, Biomechanical preparation and obturation

Group 3 ; The patients undergone apicoectomy procedure

Group 4 ; The patients undergone tooth preparation and impression procedures for fixed prosthesis.

The saliva was taken 5 minutes before patients sat on Dental chair for group 1 subjects,however for group 2, group 3 and group 4 subjects ,saliva was taken 10 minutes after commencement of Dental procedures . Each of the subject was informed to collect saliva samples in polypropylene vials and placed in freezer . Around 1.0 ml of non-revivifying saliva was collected in a sterile tube and frozen latter at 20 degree centigrade for further study. Salivary Cortisol Enzyme Immunoassay Kit was used to measure the salivary cortisol levels (Salimetric™ , LLC State college PA ,USA)[9] SPSS was the programme utilised for the statistical analysis (statistical package for social sciences)

Statistical Analysis:

The statistical analysis were done using **Kruskal-wallis test and Mann-whitney U test**

Level of Significance (p-value)

- P-value < 0.05 - Significant

RESULTS

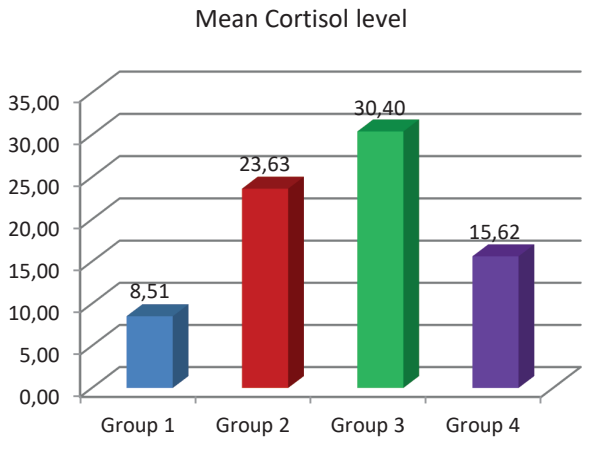
The Kruskal-Wallis test was used to compare the mean cortisol levels in the various groups. The mean cortisol level varied significantly amongst the various groups. Group 3 had a considerably higher mean cortisol level than groups 1, 2, and 4. The mean cortisol level in group 2 was substantially higher than that in group 4, which was significantly higher than that in group 1. In comparison to group 1, the mean cortisol level was considerably higher in groups 2, 3, and 4. Group 3 had the highest mean cortisol levels, followed by Group 2, Group 4, and Group 1, which had the lowest levels. (Table 1 and Graph 1)

Table 1

Comparative mean salivary cortisol level(ng/ml) for group 1, group 2, group 3 and group 4

	Cortisol level			
Groups	Mean	S.D.	F-value	p-value
Group 1	8.51	3.07	50.908	< 0.001*[a]
Group 2	23.63	8.69		
Group 3	30.40	10.05		
Group 4	15.62	7.99		
Group 1 vs Group 2[b]				0.001*
Group 1 vs Group 3[b]				< 0.001*
Group 1 vs Group 4[b]				0.038*
Group 2 vs Group 3[b]				0.045*
Group 2 vs Group 4[b]				0.020*
Group 3 vs Group 4[b]				< 0.001*

a Kruskal-wallis test
b Mann-whitney U test
* Significant difference



Graph 1. Comparative mean salivary cortisol level(ng/ml) for group 1,group 2,group 3 and group 4

DISCUSSION

The cortisone prepares the body for fear or frightening conditions and situations by production of glucose,providing an immediate energy source to large muscles.The cortisol inhibits insulin production in a purpose to halt or terminate glucose from being stored for immediate release [11] .The stress exherbation can develop diminished PNS tone ,which further increases patients attentional reactions to stressors.It can result in alterations in autonomic nervous systems elevating patients vulnerability to stress. [12]

The cortisol nourishes and recalls the frightening participation of Dental treatment. **Drexler SM, Merz CJ ,Tanja C,Hamacher –Dang, Tengentoff M,Oliver T in 2015** [13,] stated that there is persistence of powerfull touching revoke happening in fear and post traumatic pressure therapy .**Lai JCL** in 2014[14] reported that it is not always that aging helps in adjustment of stress hormone cortisol during psychosocial disturbance.There is lesser hopefulness ,anxiety,mental disorder ,depression with severe pressure ,distress multipled with raised cortisol level .The cortisol is produced in response to anxiety, pressure or stress by adrenal gland.The cortisol is also liberated in conditions like getting up early morning,exertion and acute pressure or tension.Dental anxiety ,fear,stress results in negligence of proper Dental treatment care.This is the most commom proplem in Dental office. [15]

The goal of the current study was to determine how salivary cortisol reacts to stress brought on by dental treatment treatments. Cortisol levels in the control group significantly differed from those in the study groups (groups 2, 3, and 4). The salivary cortisol level was highest in Group 3(subjects with apicoectomy procedure procedure [**30.40 ng/ml**]),followed by Group 2(subjects with access opening, Biomechanical preparation and obturation[**23.63ng/ml**]) ,Group 4(subjects with tooth preparation and impression procedure [**15.62ng/ml**]) and least in Group 1(control[**8.51ng/ml**]) .These results are similar to studies done by **Padmanabhan V, Rai K,Hedge AM**[8]The study group (group 2,group 3 and group 4) opened to dental treatment develops in an elevation of salivary cortisol in contrast to control group with no treatment wherein just the saliva sample was taken . Dental treatment raises tension and uneasiness level which further elevates salivary cortisol .Among the study groups {group 2,group 3 and group 4} ,group 3(subjects with apicoectomy procedure[**30.40 ng/ml**]) produced highest cortisol level. The mean cortisol level was more in group 3(subjects with apicoectomy procedure[**30.40 ng/ml**])) compared to group 2(subjects with access opening, Biomechanical preparation and obturation[**23.63ng/ml**]) .The probable reason may be that the patient saw bleeding during the apicoectomy procedure which elevated stress level in these subject resulting with raised cortisol level . Among the study groups {group 2,group 3 and group 4} ,group 4(subjects with tooth preparation and impression procedure [**15.62ng/ml**])) produced lowest cortisol levl. Group 2(subjects with access opening, Biomechanical preparation and obturation[**23.63ng/ml**]) produced higher cortisol level compared to group 4(subjects with tooth preparation and impression procedure[**15.62ng/ml**])

The probable reason may be that the local anesthesia administered for access opening,BMP and obturation elevated the anxiety level more in these patients which further elevated in mean cortisol level more in comparision to subjects with tooth prepation and impression procedures.

Interpratation and Conclusion

1. The mean cortisol level was highest when patient underwent apicoectomy followed by patients who had undergone access opening, Biomechanical preparation , obturation and thereafter in patients with treatment of tooth preparation for fixed prosthesis and lowest in healthy patients(control group)

2. The salivary cortisol is suitable indicator of stress detector.

Strength of the study

Salivary cortisol was used as a diagnostic aid to check stress levels in Dental patients. As collection of Saliva is not invasive and not harmful,therefore it can be used as a specimen for stress-releated substance measurement and is easily collected with minimum efforts than blood sampling.The cortisol saliva does not attach to corticosteroid binding globin as it happens in the blood

Limitations of the study

1.The salivary cortisol level test was not done at particular time so prejudice can be there due to the day- to- day variation.

Future research Direction

1.How to manage patients with stress and anxiety (may be by proper diet,enough sleep or yoga)

2. Effects of laughter therapy on stress responses in patients

Sources of Support

Nill

Conflict of interest

None

References

1. Buchanan T W,Preston SD.Stress leads to prosocial action in immediate need situations Front Behav Neurosci 2014;8;5

2. Enget V,Plessow F,Miller R,Kirschbaum C,Singer T.Cortisol increase in emphathic stress is modulated by emotional closeness and observation modality. Psychoneuroendocrinology Journal; 2014; Volume 45; 195-201

3. Ohura K, Nozaki T, Shinohara M , Daito K ,Sonomoto M, Daito M– Utility of salivary biomarker for stress induced by dental treatment. Japanese Dental Science Review. February 2012, Vol.48(1):14-17, doi:10.1016/j.jdsr.2011.06.001

4. Klingberg G, Berggren U, Carlsson SG, Noren JG. Child dental fear: cause-related factors and clinical effects. Eur J Oral Sci 1995;103:405—12

5. Hannibal KE ,Bishop MD.Chronic stress ,cortisol dysfunction ,and pain a psychoneuroendocrine rationale for stress management in pain rehabilitation. Phys Ther 2014;94(12)1816-25

6. Taani DQ, El-Qaderi SS, Abu Alhaiji ES. Dental anxiety in children and its relationship to dental caries and gingival condition. Int J Dent Hyg 2005;3:83—7

7. Yamaguchi M, Kanemori T, Kanemaru M, Takai N, Mizuno Y, Yoshida H. Performance evaluation of salivary amylase activity monitor. Biosens Bioelectron 2004;20:491—7

8. Schumacher S,Miller R,Strohle A.Therapists and patients stress responses during graduated versus flooding in vivo exposures in the treatment of specific phobia;A preliminary observational study Psychiatric Research 2015;vol 230(2)668-675 .doi;10.10

9. Padmanabhan V, Rai K,Hedge AM;Stress responses in Children during Endodontic Treatment. J Pediatr Dent 2013;1;14-8

10. Greabu M Purice M, Totan A, Spinu T, Totan C .Salivary cortisol marker of stress response to different dental treatment Rom J Intern Med 2006;44(1)49-59

11. Aronson D.Cortisol –its role in stress , inflammation and indication for diet therapy.Todays Dietician 2009,Vol 11,pg 38

12. Novakova B,Harris P,Ponnusamy A,Marques J,Reuber M,Stress and seizures exploring the patterns of cognitive ,stress perceive and physiological stress responses in patients with epilepsy and psychogenic non epileptic seizures .J Neurol ,Neurosurg Psychiatry ,2015 ; 86;e3

13. Drexler SM, Merz CJ ,Tanja C,Hamacher –Dang, Tengentoff M,Oliver T .Wolf.Effects of cortisol on reconsolidation of reactivated fear memories neuropsychophrmacology 2015;10.1038/npp2015.160

14. Lai JCL Psycosocial stress and salivary cortisol in older people ;a brief review Aging Sci 2014 ;2;120,doi 10.172/2329/8847.1000120

15. DP Appukuttam .Strategies to manage patients with dental anxiety and dental phobia ;literature review.Clin Cosmet Investig Dent 2016;8;35-50,doi 10.2147/CCIDE.S63626