

Salivary Cortisol Response to Stress Induced During Periodontic, Endodontic and Prosthetic Procedures: An In Vivo Study

Sumit Singh Phukela^{1*} Ashraf Ullah² Pankaj Kumar Srivastava³ Bharti Raina⁴ Gaurav Setya⁵
Shveta Setia Thareja⁶ Ripul Pawha⁷ Vikram Moond⁸

¹Professor, Department of Prosthodontics, Faculty of Dental Science, SGT University, Gurgaon, India.

²Associate Professor and Head, Department of Dental Surgery, G.S.V.M Medical College, Kanpur, Uttar Pradesh, India.

³Associate Professor, Department of Dental Surgery, G.S.V.M Medical College, Kanpur, Uttar Pradesh, India.

⁴Reader, Dental Material Department of Prosthodontics, Faculty of Dental Science, SGT University, Gurgaon, India.

⁵Reader, Department of Conservative Dentistry and Endodontics, Faculty of Dental Science, SGT University, Gurgaon, India.

⁶Post Graduate Student, Department of Prosthodontics, Faculty of Dental Science, SGT University, Gurgaon, India.

⁷Post Graduate Student, Department of Prosthodontics, Faculty of Dental Science, SGT University, Gurgaon, India.

⁸Post Graduate Student, Department of Prosthodontics, Faculty of Dental Science, SGT University, Gurgaon, India.

ABSTRACT

Aims and objective: The assessment of patient stress is essential to evenly execute dental procedures. The present study was conducted to check salivary cortisol response to stress induced during periodontic, endodontic and prosthetic procedures.

Methodology: The salivary cortisol level were checked in 36 patients, out of which 6 patients were healthy patient who do not require any dental treatment and 30 patients who underwent scaling, root canal procedures and tooth preparation for the fixed prosthesis. The groups divided were as follows.

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

Group 2; The patients underwent scaling

Group 3; The patients underwent access opening, Biomechanical preparation and obturation

Group 4; The patients underwent tooth preparation for fixed prosthesis. The salivary cortisol levels were checked using Salivary Cortisol Enzyme Immunoassay Kit.

Results: The salivary cortisol level was highest in Group 3, followed by Group 4, Group 2 and least in Group 1. There was no significant difference in salivary cortisol level when patient either got scaling or tooth preparation for fixed prosthesis.

Conclusion: The stress level was lowest in healthy patient and highest when patient underwent access opening, Biomechanical preparation and obturation in appointment.

Keywords: Cortisol level, Fear, Stress, Salivary Cortisol Enzyme Immunoassay Kit.

INTRODUCTION

The stress control is essential in patients to elude the loss of motivation for dental procedures. Enget V, Plessow F, Miller R, Kirschbaum C, Singer T¹ stated that the stress disturbances are the

common mental disturbances. Buchanan T W, Preston SD² proved that the stress ripostes are not invariably hostile. Hannibal KE, Bishop MD³ reported extended stress reaction may develop cortisol dysfunction and widerange pain. It may results in change in behavior in children and affects

Received: June. 2, 2016; Accepted: Oct. 23, 2016

*Correspondence Dr. Sumit Singh Phukela.

Department of Prosthodontics, Faculty of Dental Science, SGT University, Gurgaon, India.

Email: phukelasumit@yahoo.com

the dental procedures. By downgrading stress of dental procedures will elevate the adjustability of patients and help them to easily get their dental procedures done.^{4,5} Saliva can be used as a sample for stress-related substance measurement because its collection is not invasive and not harmful, and can be collected with little efforts than blood sampling. Stress-connected substances incorporated in saliva include chromogranin A (CgA), secretory immunoglobulin A (sIgA), and salivary amylase, catecholamine and cortisol^{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. The anxious tense feeling while in the Dental chair and the procedure itself can develop anxiety. The outcome with application of anesthesia and with agony procedures are unavoidable. Dental scenario can be origin of stress for young patients. The stressful state may develop panic and worry in patients.⁸ Therefore the anxiety strand is more in patients undergoing dental treatment and this pressure vary in the consecutive visits that pursue to rely upon to what they are open to, during these visits.

There is connection between stress and pain but the pain rehabilitation is not dissertated. Therefore the present study was conducted to check salivary cortisol response to stress induced during periodontic, endodontic and prosthetic procedures.

AIMS AND OBJECTIVES

To check salivary cortisol level in healthy patient.
To check salivary cortisol level in patient undergoing scaling
To check salivary cortisol level in patient after doing access opening, Biomechanical preparation and obturation
To check salivary cortisol level in patient after doing tooth preparation for fixed prosthesis.
To comparatively evaluate salivary cortisol level in patients undergoing periodontic, endodontic and prosthetic procedures.

MATERIALS AND METHOD

There was 36 participant (6 control and 30 patients) who volunteered in the present study. The

sample size was chosen to be 36 using the previous studies done by **Greabu M, Purice M, Totan A, Spinu T, Totan C**⁹. The sample size was calculated to be 30 per group keeping a confidence interval of 95% and a power of at least 80%. All concerned participant were being asked to give relevant medical and dental history. 36 patients age group ranging 18-30 were included in the study. The investigation motive was prior informed to patients requesting them for accumulation of saliva sample. These patients underwent periodontic, endodontic and prosthetic procedure. They were demarcated into 4 groups

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

Group 2; The patients underwent scaling (periodontal procedure)

Group 3; The patients underwent access opening, Biomechanical preparation and obturation (endodontic procedure)

Group 4; The patients underwent tooth preparation for fixed prosthesis. (prosthetic procedure)

The saliva was collected 5 minutes before patients sat on dental chair for group 1 subjects, however for group 2, group 3 and group 4 subjects saliva was gathered 10 minutes after commencement of dental procedures. All the participants were informed to accumulate saliva samples in polypropylene vials and stocked in freezer. Around 1.0 ml of non-reviving saliva was assembled in a sterile tube and frozen latter at 20 degree centigrade for further investigation. The salivary cortisol levels were checked using Salivary Cortisol Enzyme Immunoassay Kit (Salimetric™, LLC State college PA, USA)⁸. The software used for the statistical analysis were SPSS (statistical package for social sciences).

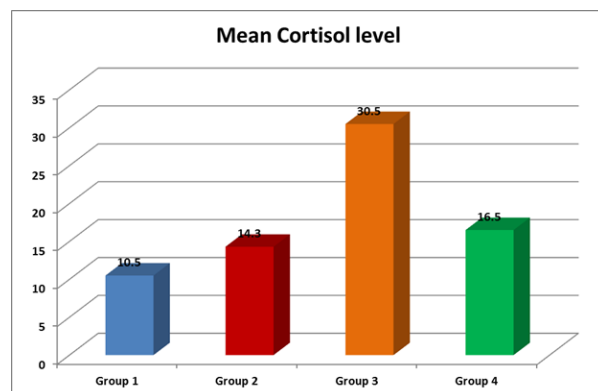
Statistical Analysis:

The statistical analysis were done using One-way ANOVA test and Post-hoc Bonferroni test

Level of Significance (p-value)

❖ P-value < 0.05 - Significant

RESULTS



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

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

Groups	Mean	S.D.	F-value	p-value
Group 1	10.5	1.47	50.908	< 0.001* ^a
Group 2	14.3	2.18		
Group 3	30.5	8.92		
Group 4	16.5	5.76		
Group 1 vs Group 2 ^b				0.047*
Group 1 vs Group 3 ^b				< 0.001*
Group 1 vs Group 4 ^b				0.005*
Group 2 vs Group 3 ^b				< 0.001*
Group 2 vs Group 4 ^b				0.583
Group 3 vs Group 4 ^b				< 0.001*

a One-way ANOVA test

b Post-hoc Bonferroni test

* Significant difference

The mean cortisol level was compared among the different groups using the one way ANOVA test. There was a significant difference in mean cortisol level between the different groups. The mean cortisol level was significantly more among group 3 in comparison to groups 1, 2 and 4. The mean cortisol level was significantly more among groups 2 and 4 in comparison to group 1. There was no significant difference in mean cortisol level between group 2 and group 4 (Table 1 and Graph 1)

DISCUSSION

The cortisol nourishes and recalls the frightening participation of dental treatment. Shira Meir Drexler, Christian J Merz, Tanja C,Hamacher – Dang, Martin Tengtentoff, Oliver T in 2015¹⁰, stated that there is endurance of powerful touching recall

happening in fear and post traumatic pressure disarray. Lai JCL in 2014¹¹ reported that the adaptation in stress hormone ,cortisol to critical psychosocial pressure is not always a result of aging. Severe pressure and raised cortisol level multiplies the possibility for depression, mental disorder ,anxiety, and lesser life hopefulness. The cortisol is delivered in reaction to anxiety, pressure or stress by adrenal gland. The cortisol can also be emancipated in situations like getting up early morning, exertion and acute pressure or tension. The cortisone enables the body for attack or flying reaction by immersing it with glucose, providing an instant energy origin to large muscles. The cortisol hinder insulin release in an aim to stop glucose from being stocked approving instant release ¹².

The present study was conducted to check salivary cortisol response to stress induced during periodontic, endodontic and prosthetic procedures. There was significant difference in cortisol level in control group compared to all study groups {group 2, group 3 and group 4}. The salivary cortisol level was highest in Group 3(subjects with endodontic procedure), followed by Group 4(subjects with prosthetic procedure), Group 2(subjects with periodontic procedure) and least in Group 1(control) .These results are similar to studies done by Padmanabhan V, Rai K,Hedge AM⁸ 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 endodontic procedure) produced highest cortisol level. The probable reason may be that the local anaesthesia used for these patients for carrying out dental procedure raised stress and anxiety level in these subject resulting with raised cortisol level

There was no significant difference in salivary cortisol level when patient either got scaling or tooth preparation for fixed prosthesis Among the study groups {group 2,group 3 and group 4} ,group 2(subjects with periodontic procedure) produced lowest cortisol level.The probable reason may be that the vibrations with scaler donot increases the stress level more in

comparison to subjects administered with local anesthesia during endodontic procedures or sound of airrotor handpiece during the prosthetic procedures

CONCLUSION

1. The salivary cortisol level(stress level) was highest when patient underwent access opening , Biomechanical preparation and obturation in appointment .

2. The lowest cortisol level(stress level) was seen in healthy patients who did not got any treatment done.

3. There was no significant difference in salivary cortisol level (stress level) when patient either got scaling or tooth preparation for fixed prosthesis

4. The salivary cortisol can be one of the reliable indicator of stress detector.

Strength of the study

Salivary cortisol was used as a diagnostic aid to check pressure ,tension and stress levels in dental patients.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 partisanship can be there due to the diurnal variation.

Future research Direction

1. How to reduce the stress and anxiety level(may be by proper diet,enough sleep or yoga)

2. Effects of stress on health

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

REFERENCES

1. 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

2. Buchanan T W,Preston SD.Stress leads to prosocial action in immediate need situations
Front Behav Neurosci 2014;8;5
3. 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
4. Kiyoshi Ohura , Tadashige Nozaki, Mitsuko Shinohara , Kiyoshi Daito ,Mie Sonomoto· Michiharu Daito – 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.
5. 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.
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. Padmanabhan V, Rai K,Hedge AM;Stress responses in Children during Endodontic Treatment. J Pediatr Dent 2013;1;14-8.
9. 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.
10. Shira Meir Drexler,Christian J Merz,Tanja C,Hamacher –Dang,Martin Tengttoff,Oliver T .Wolf.Effects of cortisol on reconsolidation of reactivated fear memories neuropsychopharmacology 2015;10.1038/npp2015.160.

11. Lai JCL Psychosocial stress and salivary cortisol in older people ;a brief review Aging Sci 2014 ;2;120,doi 10.172/2329/8847.1000120.
12. Aronson D.Cortisol –its role in stress , inflammation and indication for diet therapy.Todays Dietician 2009,Vol 11,pg 38.