



Stress and its Link With Periodontal Disease

KEYWORDS

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ABSTRACT Stress is compatible with good health, being necessary to cope with the challenges of everyday life. Problem starts when the stress response is inappropriate to the intensity of the challenge. Stress has long been considered to be a major contributor to the clinical manifestation of many diseases. In this review, the role that stress might play in chronic periodontitis is considered. Sufficient evidence is available to support the notion that stress could be a contributing factor in periodontal destruction in the presence of periodontal pathogens in a susceptible individual.

Introduction:

Stress is part of human condition, which is universally present but to varying degree and with different effects on individuals⁽¹⁾. It is the psycho-physiological response of the organism to perceived challenge or threat. It originates from a Latin word 'stringere' which means 'tight', 'strained' and the concept was first introduced in the life science by Hans Selye in 1936. Selye proposed that the hypothalamus-pituitary-adrenal cortex (HPA) axis response to stress was beneficial in the short term, however, prolonged stress was detrimental to the body by diminishing its ability to respond to a perceived challenge⁽²⁾. This was defined as general adaptation syndrome⁽³⁾.

Stress is defined as a total transaction from demand to resolution in response to an environment encounter that requires appraisal, coping and adaptation by the individual to stress (emotionally and physically).

Types:

Occupational stress: Eg, Athlets, Boxers, Diamond cutters.

Involuntary stress: Eg, Soldiers, Recovery from General Anesthesia.

Voluntary stress: Eg, Dancers, Musicians.

Effect of stress on central nervous system:

Mainly two major pathway systems are involved in stress pathways-

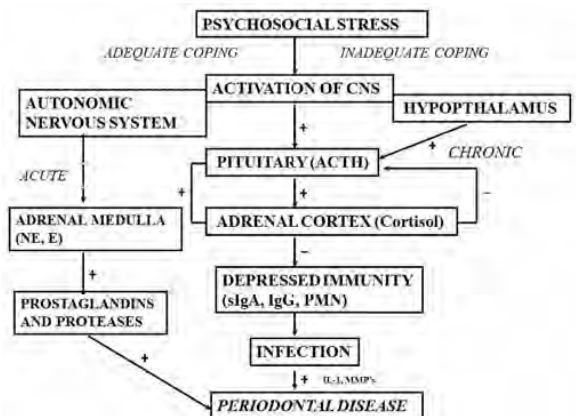
Hypothalamic pituitary-adrenal (HPA) axis

Systemic/adrenomedullary sympathetic nervous system (SNS)

Under the influence of stressful event, hypothalamus-pituitary-adrenal(HPA) axis is stimulated by anterior hypothalamus leading to secretion of corticotropin-releasing hormone(CRH) and arginine vasopressin that act on pituitary gland.

In turn, adrenocorticotrophic hormone is secreted by pituitary gland which acts on adrenal cortex and increases production and release of cortisol, a glucocorticoid hormone that affects immune responses.

Glucocorticoids produced by adrenal cortex have various effects like suppressing the inflammatory response, modifying cytokine profiles, elevating blood glucose levels and altering levels of certain growth factors. At molecular level glucocorticoids profoundly inhibit important functions of inflammatory cells including macrophages, neutrophils, eosinophils and mast cells in function such as chemotaxis secretion and degranulation.



Effect On Humoral Immunity:

IgA and IgG are major antibodies involved in protection against periodontal disease progression. Glucocorticoids downregulate the synthesis of IgA and IgG and also affect functions of neutrophils, which maybe important in protection against infection by periodontal organisms.

IgA- Secretory antibody which is important during initial colonization of bacteria.

IgG- Provides protection by opsonizing periodontal organisms for phagocytosis and killing by neutrophils.

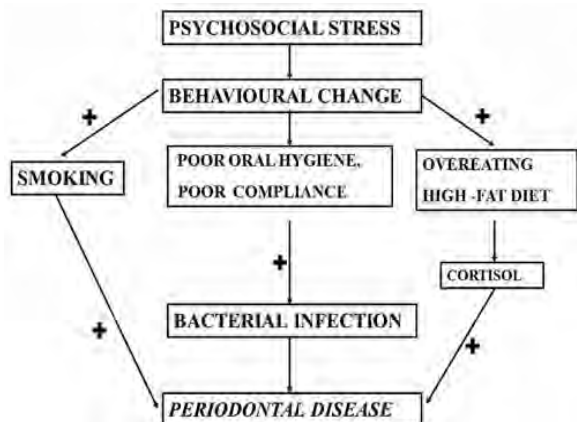
Behavioural changes due to mental stress:

Many changes occurring during stress have been proposed to cause periodontal destruction.

- Smoking
- Poor oral hygiene
- Poor compliance with dental care

Another change is – ‘over eating’

Especially a high fat diet, which can lead to immunosuppression through increased cortisol production.



Effect of stress on wound healing:

During early stages of wound healing immuno inflammatory functions are important, IL-8 and proinflammatory, such as IL-1 and TNF- α are important during initial healing as they bring about important changes in area of injury. They protect against infection by enhancing the recruitment and activation of phagocytes in area of injury.

Along with this, cytokines that are released by recruited cells regulate the ability of fibroblasts and epithelial cells to remodel the damaged tissue.

Matrix metalloproteinase (MMP) activity in healing area which plays an important role in the destruction and remodelling of the wound to a large extent is regulated by IL-1.

Stress And Microbiology Of Periodontal Disease:

Microorganisms possess the ability to recognize hormones within the host and utilize them to adapt to their surroundings. Based on this concept it is also possible that the periodontal microflora may change during stress.

One investigation was done to determine whether noradrenaline (norepinephrine) and adrenaline (epinephrine) which are released during human stress responses, act as environment uses to alter the growth of 43 microorganisms found within subgingival microbial complexes.

In this study it was found that 20 species within the subgingival biofilm significantly grew from inoculation with adrenaline was introduced. It was also found that there was a difference in growth response within bacterial species and between microbial complexes. Soon it was found that chronic psychological stress has a marked impact on localized immune response to *P. gingivalis*.

CONCLUSION:

Presently we have sufficient evidence that stress can act as a significant risk factor in development of periodontal disease.

Furthermore, it is likely that systemic diseases such as diabetes, cardiovascular diseases, preterm delivery and osteoporosis may share psychosocial stress as a common risk factor in progression of periodontal diseases.

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