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Elevation of Some Cytokines, CD4 and CD8 in Odontogenic Infection

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ABSTRACT

An odontogenic infection is an infection that originates within a tooth or in the closely surrounding tissues**.** In vitro quantitative evaluation of IL-6, INF-gamma and CD4 and. CD8 molecules during odontogenic infection and control. group. In vitro quantitative determination of, IL-6,INF-gamma and CD4 and CD8 molecules in serum using Sandwich-ELISA. the Mean±SD of serum IL-6 was 41.1450±19.802 (pg\ml) for patients and 10.367±4.047 pg\ml for healthy with *P*. value 0.0001, while the Mean±SD of serum IFN-ɣ was higher in control group than in test group (61.490±30.662) (pg\ml) and 16.880±7.593 (pg\ml) respectively. and the differences were significant, P< 0.0001. At the same time, The mean of serum CD4 molecules was 5.175±2.335 (ng\ml) and 2.230±1.027 (ng\ml) for controls groups with *P*. value was ≤0.0001. while serum soluble CD8 was the Mean±SD 3.265±1.175 (ng\ml) and 1.014±0.815 (ng\ml) for controls healthy with P. value ≤ 0.0001**.** Mean of the CD4/CD8 ratio was 1.584 in control group while it was 2.199 in odontogenic infection patients

Conclusion: Immunological parameters were included in present study (IL-6, IFN-ɣ, CD4 and CD8,) showed high levels among patients with odontogenic infection compared to a healthy control.

KEYWORDS: odontogenic infection, IL-6, INF-ɣ, CD4,CD8

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INTRODUCTION

"An odontogenic infection is an infection that originates within a tooth or in the closely surrounding tissues. It is estimated that 90-95% of all orofacial infections originate from the teeth or their supporting structures. Furthermore, about 70% of odontogenic infections occur as a periapical abscess and periodontal abscess (Jiménez *et al.*,2004; Hupp, 2008). Most odontogenic are dental origin, dental pulp infection, as a result of caries, is the leading cause of odontogenic infection. The major pathogens identified in dental caries are members of the viridians (alpha-hemolytic) streptococci family including *Streptococcus mutans* and *Streptococcus milleri* (Fragiskos, 2007); Yuvaraj, 2015). Once bacteria invade the dental pulp, an inflammatory reaction results in necrosis and a lower tissue oxidation-reduction potential. At this stage, the bacterial flora change from predominantly aerobic to more anaerobic flora. Anaerobic gram-positive cocci *(Peptostreptococcus)* and anaerobic gram-negative rods (Bacteroides, Prevotella, Porphromonas and Fusobacterium) predominate. Additionally, the anaerobic bacteria inhabiting the periodontal tissues may provide an additional source of odontogenic infection. The most common anaerobes are *.A. actinomycetemcomitans*, *P.intermedi*a, *P. gingivalis*, and *Fusobacterium spps* (Pinkham, 2005; Kuriyama. 2005; Robertson and Smith, 2009). The conquering pathogen encourage immune response comprise antibody and cytokines, such cytokine is IL-6 that can act as proinflammatory and anti-inflammatory cytokine, it secreted by T-cell and macrophage to stimulate immune responses during infections and tissues damage leading to inflammation, studies analyzing periodontal samples resulted in higher counts of IL-6 producing cells in patients with periodontitis in comparison with patients with gingivitis, increased levels of interleukin-6 were shown in the fluid of inflamed periodontal pockets compare with healthy sites Balto *et al.*, 2001). In addition, IFN-ɣ is the principal macrophage-activating cytokine and serve a critical function

in innate immunity and in specific cell-mediated immunity, its stimulate expression of major histocompatibility complex (MHC) class 1 and class 2 molecules and stimulates antigen-presenting cells(APCs), promote the differentiation of naive CD4 T cells to helper T cell type 1 (Th1) subset and inhibits the proliferation of Th2 (Pollard, *et al.,* 2013). Furthermore CD4 is a glycoprotein co-receptors. conveyed on the surface of immune cells. such as T helper cells, , macrophages., and dendritic cells. For T cell 71% are. CD4. CD4 mature T cell spot antigen bind. with MHC class II molecules (Frank *et al.*, 1994; Parslow *et al.,* 2001). While CD8 is a trans membrane glycoprotein conveyed. as co-receptor is mainly expressed on. the surface of cytotoxic T cells, it. also expressed on natural killer cells, and dendritic cells. The CD8 molecule is. a indicator for cytotoxic T cell population. 29%. of T cells are CD8. CD8 mature. T cell recognize antigen bind with MHC . CD4\CD8 molecules. Elisa test can reveal the. percentage of CD4\CD8T cell where flow. cytometric instrumentation is unreachable, and can be. complementary to CD4 T lymphocyte enumeration (Frank et al., 1994).

MATERIALS AND METHODS

Blood collection and storage:

Blood were collected by sterile one-use syringes, from each group, blood samples were permissible to clot for 2 hours at room temperature or overnight at 4°C. before centrifugation for 15 minutes at 1000×g. Supernatant were collected and stored at -20. °C .

***In vitro* quantitative of cytokines and Serological markers of cell-mediated immunity:**

in vitro quantitative determination of IL-6 and INF- ɣ . Serum soluble CD4 and CD8 were rummage-sale as markers for cell mediated immunity in serum of patients and control groups using Sandwich-ELISA as in manufacture . instructions (Elabscience Biotechnology Co., Ltd).

Statistical analysis

comprise t-test for determine . if the differences between the two group means, F test to compare variance**.**

RESULTS

Cytokine profile: IL-6 was higher in test group than in control group (mean=41.1450±19.802 (pg\ml) and 10.367±4.047 respectively), the differences were significant (P< 0.0001; Table-1) . **INF- ɣ** was higher in control group than in test group (61.490±30.662) (pg\ml) and 16.880±7.593 (pg\ml) respectively . and the differences were significant, P< 0.0001; Table-1).

Serum CD4 and CD8

The mean of serum CD4 molecules was 5.175±2.335 (ng\ml) and 2.230±1.027 (ng\ml) for controls groups with *P*. value was ≤0.0001. while serum soluble CD8 was the Mean±SD 3.265±1.175 (ng\ml) and 1.014±0.815 (ng\ml) for controls healthy with P. value ≤ 0.0001. the Mean of the CD4/CD8 ratio was 1.584 in dental infection patients in compared to control group which was about 2.199.

Table (1). Concentration of IL-6 and IFN-ɣ in Patients with Odontogenic Infection and controls

Cytokines	Group	Concentration (ng/ml) Mean ± SD	*P.* Value
IL- 6	Patients	*41.145±19.802	0.0001
	Control	10.367±4.047	
INF-ɣ	Patients	*61.49±30.662	0.0001
	Control	16.88±7.593	

*** Significant differences p < 0.0001**

Table (2). Concentration of CD4 and CD8 in Patients of Odontogenic Infection and controls

Cytokines	Group	Concentration (ng/ml) Mean ± SD	*P.* Value
CD4	Patients	*5.175±2.335	0.0001
	Control	2.23±1.027	
CD8	Patients	*3.265±1.175	0.0001
	Control	1.014±0.815	

*** Significant differences p ≤ 0.0001**

DISCUSSION

Current data were recorded significant elevation in IL-6 among test group, however the anti-inflammatory action of IL-6 is well documented both *in vitro* and *in vivo*. IL-6 attenuates the activation of various immunocompetent cells, including neutrophils, monocytes, and macrophages, by limiting the production of proinflammatory cytokines and control the inflammation processes (Park *et al.,* 2015).

Interleukin 6 (IL-6), promptly and transiently produced in response to infections and tissue injuries, contributes to host defense through the stimulation of acute phase responses, hematopoiesis, and immune reactions (Tanaka *et al.,* 2014). Conversely the recent study done by Nakamura *et al.,* (2018)

also showed elevated IL-6 levels caused by an odontogenic infection triggered the recovery of infection. In cases of repair that improve without any treatments, inflammatory cytokines such as IL-6secreted during an infection may have stimulated erythropoiesis The present study also showed that the high mean serum levels of The IFN-ɣ than control. The promotion in anti-inflammatory cytokine IL-6 in odontogenic infection combined with elevation in INF- ɣ concentration with in the same group comparing with control group (Table-1). The IFN-ɣ is a cytokines produced mainly by TH-1 lymphocytes and has many potential activities its able to induce bactericidal activity of macrophages and stimulates the expression of MHC system and inhibits microbial proliferation (Arango and Descoteaux 2014). Although odontogenic infections are a multifactorial inflammatory condition, it was expected that patients have high production of IL-6 and IFN-γ, It may be assumed that the serum cytokines, as evaluated in this study, can be interesting diagnostic biomarkers, although its significance should be considered with caution since they are general inflammatory marker were significantly augmented (Motta *et al.,* (2010).

All at once serum level of soluble CD4 and CD8 molecule were measured in current study and the results showed both CD4 and CD8 molecules were higher in in dental infection patients than control groups, the Mean of the CD4/CD8 ratio was 1.584 in dental infection patients in compared to control group which was about 2.199. Many studies by Teng *et al.*, (2000) and Hajishengallis, (2014) that supported by an *in vivo* study in CD4 and CD8-deficient mice showed that CD4+ T cells in the periodontium triggered alveolar bone destruction by secreting osteoprotegerin, also showed that CD4+ T cells contribute to the alveolar bone loss in mice. Although the role of CD8+ T cells in chronic periodontitis is less obvious, and more abundant in gingival tissues of periodontitis patients than gingivitis or healthy controls, CD8+ T cells are not involved in gingival tissue pathology. Indeed, the experimental evidence for the existence of CD8+ T cells capable with tissue repair or bone regeneration properties within the gingival tissue (Cardoso and Arosa 2017). Present work can conclude that there were significant differences in IL-6, INF- ɣ and in soluble CD4 & CD8 between odontogenic infection patients and control group also dental infection cause changing in CD4/CD8 ratio

CONCLUSIONS

This study can conclude that there were significant differences in IL-6, INF- ɣ and in soluble CD4 & CD8 between odontogenic infection patients and control group also dental infection cause changing in CD4/CD8 ratio

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REFERENCES

I. Jiménez, Y; Bagán, JV; Murillo, J; Poveda, R (2004). "Odontogenic infections. Complications. Systemic manifestations" Medicina oral, patologia oral y cirugia bucal. 9 (7) 139–43.
II. Fragiskos, Fragiskos D. (2007). Oral surgery. Berlin: Springer. pp. 205–206. ISBN 978-3-540-25184-2.
III. Hupp JR, Ellis E, Tucker MR (2008). Contemporary oral and maxillofacial surgery (5th ed.). St. Louis, Mo.: Mosby Elsevier. pp. 317–333.
IV. Yuvaraj V. (2015). Maxillofacial Infections of Odontogenic Origin: Epidemiological, Microbiological and Therapeutic Factors in an Indian Population. Indian journal of otolaryngology and head and neck surgery: official publication of the Association of Otolaryngologists of India, 68(4), 396-399.
V. Pinkham JR. Pediatric dentistry: infancy through adolescence, 4th ed. St. Louis, Mo. Elsevier Saunders. 2005.
VI. Kuriyama T, Absi G, Williams DW, Lewis MAO. An outcome audit of the treatment of acute dentoalveolar infection: impact of penicillin resistance. Br Dent J. 2005;198:759–763.
VII. Robertson D, Smith AJ. The microbiology of the acute dental abscess. J Med Microbiol. 2009 Feb;58(Pt 2):155-62.
VIII. Balto, K., Sasaki, H., & Stashenko, P. (2001). Interleukin-6 deficiency increases inflammatory bone destruction. *Infection and immunity*, *69*(2), 744-50.
IX. Pollard, K. M., Cauvi, D. M., Toomey, C. B., Morris, K. V., & Kono, D. H. (2013). Interferon-γ and systemic autoimmunity. *Discovery medicine*, *16*(87), 123-31.
X. Parslow, T. G.; Stites, D. P.; Terr, A. I. and Imboden, J. B. (2001). Medical Immunology.,10th ed., New York Lange Medical Books, McGraw-Hill/Medical Publishing Division. pp:133, 157-158.
XI. Frank L, Nugel E, Docke WD and Porstmann T. (1994). Quantitative determination of CD4/CD8 molecules by a cell marker ELISA. CLIN. CHEM. 40/1,38-42. Molecular Pathology.
XII. Frank L, Nugel E, Docke WD and Porstmann T. (1994). Quantitative determination of CD4/CD8 molecules by a cell marker ELISA. CLIN. CHEM. 40/1,38-42. Molecular Pathology
XIII. Nakamura N, Ninomiya S, Matsumoto T, et al. Recovery of Pure Red Cell Aplasia Following Hematopoietic Stem Cell Transplantation Associated with Interleukin (IL)-6 Elevation Caused by Odontogenic Infection. *Intern Med.* 2018;57(21):3175-3177.

XIV. Motta, Ana Carolina F., Furini, Renata Bazan, Simão, João Carlos Lopes, Ferreira, Maria Aparecida Nunes, Komesu, Marilena C., & Foss, Norma T.. (2010). The recurrence of leprosy reactional episodes could be associated with oral chronic infections and expression of serum IL-1, TNF-α, IL-6, IFN-γ and IL-10. *Brazilian Dental Journal*, *21*(2), 158-164.

XV. Hajishengallis G. Periodontitis: from microbial immune subversion to sys-temic inflammation. *Nat Rev Immunol* (2014) 15:30–44.

XVI. Teng YT, Nguyen H, Gao X, Kong YY, Gorczynski RM, Singh B, et al. Functional human T-cell immunity and osteoprotegerin ligand control alveolar bone destruction in periodontal infection. *J Clin Invest* (2000) 106(6):R59–67.

XVII. Cardoso EM and Arosa FA (2017) CD8+ T Cells in Chronic Periodontitis: Roles and Rules. Front. Immunol. 8:145.

XVIII. Park H-J, Shim HS, An K, Starkweather A, Kim KS and Shim I. (2015). IL-4 Inhibits IL-1β-Induced Depressive-Like Behavior and Central Neurotransmitter Alterations. Mediators of Inflammation:1-9.

XIX. Tanaka, T.Narazaki, M.Kishimoto, (2014) IL-6 in Inflammation, Immunity, and Disease Cold Spring Harb Perspect Biol;6:016 -295.

XX. Arango Duque G and Descoteaux A (2014). Macrophage cytokines: involvement in immunity and infectious diseases 190(4):1737–45