

Establishment of a Casual Relationship between Hemoglobin and Chronic Periodontitis

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Abstract

“What is the 1st diagnostic finding that a periodontist looks in his patient’s mouth”? Bleeding on probing and “what are the most important diagnostic tests which he tends to miss? Erythrocyte counts, Hb levels, microhematocrit values. These are the diagnostic tests which are missed by dentist and are of paramount importance in medicine for providing multifactorial measures of systemic response to infections/inflammatory diseases. Epidemiological studies suggest that periodontitis is associated with increased risk of systemic diseases like cerebrovascular disease, cardiovascular ischemia, atherosclerosis. A lot of association of chronic systemic disorders leading to anemia has been totally proven in medicine. In chronic diseases like parasitic infections, bacterial and fungal infections, neoplastic illnesses anemia has been noted and hence it has been given the term anemia of chronic disease. Also periodontitis patients show various acute/ chronic immune activation and may develop anemia called anemia of chronic disease. Despite a lot of association of periodontitis and various systemic conditions very little work has been attempted at association between periodontitis, hemoglobin levels and erythrocyte counts with very few available reports by Scannapieco, Philip et al., JW Hutter. Hence this original research study was undertaken to investigate the possible relation between periodontal disease and Hb levels in systemically healthy subjects compared to chronic severe periodontitis subjects.

Keywords: Periodontitis; Hemoglobin; Anemia of Chronic Disease.

Introduction

Periodontitis is a multifactorial disease. Since time immemorial dentists have known and tried to achieve a healthy mouth as a window to healthy body. In the 1st half of 20th century the evidence of interrelationship between periodontitis and systemic conditions was primarily anecdotal but dentistry has come a long way and a new paradigm in dentistry in general and periodontology in particular has arrived. A lot of association of chronic systemic disorders leading to anemia has been

totally proven in medicine e.g. mild to moderate anemia has been reported as a frequent manifestation of rheumatoid arthritis [6,7,8]. In chronic diseases like parasitic infections, bacterial and fungal infections, neoplastic illnesses anemia has been noted and hence it has been given the term anemia of chronic disease [8,9,10].

Also periodontitis patients show various acute/ chronic immune activation and may develop anemia called Anemia of Chronic Disease.

Despite a lot of association of periodontitis and various systemic conditions very little work has been attempted at association between periodontitis, hemoglobin levels and erythrocyte counts with very few available reports by Scannapieco, Philip et al., JW Hutter et al [11,12]. In a study by J.W. Hutter he suggested that proinflammatory cytokines from chronic disease process like periodontitis down regulate the erythropoiesis in bone marrow. In particular interleukin-1, interleukin-6, tumor necrosis factor- α have been implicated as cytokines responsible for suppressing erythropoiesis.

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Similarly in other studies also, periodontitis patients showed decreased levels of hemoglobin and erythrocyte counts leading to anemia in periodontitis patients. But still there is a paucity of literature to correlate between hemoglobin levels and chronic periodontitis patients.

Hence this original research study was undertaken to investigate the possible relation between periodontal disease and Hb levels in systemically healthy subjects compared to chronic severe periodontitis subjects.

Materials and Methods

The Present study was conducted in the outdoor patient department of Ahmedabad dental college and hospital, GMERS Medical College and Hospital, Sola. A total of 60 subjects were included in the study. The subjects were divided into 2 groups consisting of 30 subjects in each group.

Inclusion Criteria Were

1. Controls: 30 patients with healthy periodontal condition with all teeth present (except 3rd molar).
2. Cases: 30 subjects with severe chronic periodontitis with probing attachment loss of more than 7 mm (Figure 7).
3. Age Group: 35-44 years (W.H.O.).
4. Only Patients with normal microhematocrit values (MCV, MCH, and MCHC) were included in the study.

Exclusion Criteria Were

1. Patient who suffered with any acute / chronic medical condition apart from periodontitis.
2. Any viral, fungal and bacterial infection apart from periodontitis.
3. Pregnant women.
4. Habits like smoking, tobacco etc.

5. Any other systemic disease.

Methodology

Blood from EDTA bulb is aspirated from sample probe into sample rotor value. 4.0 ml of blood measured by sample rotor value is diluted into 1:500 with 1.996 ml of diluent and brought to the mixing chamber as diluted sample (1st step dilution). Out of 1:500 dilution sample, 40 mL is measured by the sample rotor value, diluted into 1:25000 with 1.960 ml of diluent, then transferred to the RBC transducer (2nd step dilution). 250 mL of sample in the RBC transducer chamber is aspirated through aperture. At this time RBC is counted through DC detection method. At the same time hematocrit (HCT) or packed cell volume is calculated by RBC pulse height detection method.

Statistical Analysis

Data The data was coded and entered into Microsoft Excel spreadsheet. Analysis was done using SPSS version 15 (SPSS Inc. Chicago, IL, USA) Windows software program. Descriptive statistics included computation of percentages. For all tests, confidence level and level of significance were set at 95% and 5% respectively. Means of both groups were compared by independent student t-test.

Results

Average mean age of cases is 40.46 ± 2.92 and for controls is 41.93 ± 2.82 (Table 1). Mean values of four parameters in severe chronic periodontitis are as follows. MCV: 82.61 ± 1.7 , MCHC: 31.85 ± 1.7 , MCH: 28.48 ± 2.29 , HB: 14.66 ± 2.1 . Mean values of four parameters in Healthy Subjects are as follows. MCV: 83.11 ± 2.1 , MCHC: 32.16 ± 2.21 , MCH: 26.9 ± 1.7 , HB: 10.8 ± 1.22 (Table 2). In our study, overall data analysis showed that periodontitis patients have lower hematorcit values (Table 3 and Table 4).

Table 1: Mean and standard deviation of age group between the 2 groups (severe chronic periodontitis) cases and controls (healthy subjects)

| | Controls | | Cases | |
|-----|----------|-------|-------|-------|
| | Mean | SD | Mean | SD |
| Age | 40.467 | 2.921 | 41.93 | 2.815 |

SD: Standard Deviation

Table 2: Mean and standard deviation (SD) of 4 parameters in severe chronic periodontitis and healthy subjects

| | Controls | | Cases | |
|------|----------|-------|-------|------|
| | Mean | SD | Mean | SD |
| MCV | 82.613 | 1.767 | 83.11 | 2.01 |
| MCHC | 31.85 | 1.705 | 32.16 | 2.21 |
| MCH | 28.487 | 2.293 | 26.9 | 1.7 |
| Hb | 14.667 | 2.108 | 10.8 | 1.22 |

SD: Standard Deviation

Table 3: Intercomparison of microhematocrit levels using students unpaired 't' test

| | MCV | MCHC | MCH |
|------------------------------|--------|--------|----------------------------|
| Healthy | P=0.31 | P=0.54 | P = 4.0 x 10 ⁻³ |
| Chronic severe periodontitis | NS | NS | S |

Statically significant difference at p=0.05

Test of significance- unpaired 't' test

Table 4: Intercomparison of Hb counts using students unpaired 't' test

| | Hb |
|------------------------------|---------------------------|
| Healthy | P=3.4 x 10 ⁻¹² |
| Chronic severe periodontitis | HS |

Statically significant difference at p=0.05

Test of significance- unpaired 't' test

Discussion

Epidemiological studies suggest that periodontitis is associated with increased risk for systemic diseases like cardiovascular disease, cerebrovascular ischemia, atherosclerosis and preterm low birth weight [1]. In previous studies, it has also been shown that periodontitis has elevated WBC levels, elevated C-reactive protein levels, which indicates that periodontitis has systemic effects. Very few studies have been done considering periodontitis red blood cell interrelationship [2,3,4,5].

Chronic infections and subgingival microbiota have been observed as factors affecting the red blood cell counts in periodontitis patients. The association of anaemia with infection and chronic systemic disorders has been well established. But anaemia has not been identified as a systemic consequence of periodontitis. In our study, overall data analysis showed that periodontitis patients have lower hematorcit values (Table 3 and Table 4). Consequently, in the study lower levels of hemoglobin was noted although Hemoglobin per erythrocyte (MCH and MCHC) is comparable between controls and periodontitis. A few early reports in literature have observed anemia in periodontitis patients [11,12,13]. On the contrary, a study by Siegel have led to believe that anemia was one of the causes of destructive periodontitis rather than to regard this phenomenon as a consequence.

Also in our study, the lower number of lower levels of hemoglobin in chronic severe periodontitis subjects compared to controls are not due to iron or vitamin deficiencies as the MCV levels are nearly the same between periodontitis and control groups. This has been supported by earlier studies done by Ward, Samson who have reported that depressed MCV levels (microcytosis) or elevated levels of MCV (macrocytosis) relate anemia to iron or vitamin deficiencies respectively.

Mild to moderate anemias have been reported as a frequent manifestation of rheumatoid arthritis [7,8,15] and chronic diseases like parasitic diseases hence the name anemia of chronic disease (ACD), is one of the most common syndromes in medicine [8,16].

Recent literature has also considered Periodontitis as a chronic disease and therefore has been grouped under the syndrome of "anemia of chronic disease". The anemia of chronic disease is multifactorial. However, it is currently thought that proinflammatory cytokines from given chronic disease process may downregulate erythropoiesis in bone marrow [13]. In particular IL-1, IL-6 and Tumour necrosis factor -alpha have been implicated as cytokines responsible for suppressing erythropoiesis. The pathogenesis of periodontitis having an effect on red cell counts is most likely similar as reported for rheumatoid arthritis.i.e., depressed erythropoiesis by systemically circulating proinflammatory cytokines resulting from chronic

inflammatory process. In support of this concept is the observed systemic levels of IL-6 in about 1/3rd of patients with localized periodontitis and half of patients with generalized periodontitis [5,14].

The two factors chronic Infection and Subgingival microbiota may be considered as factors that lead to increased levels of proinflammatory cytokines in the plasma of chronic periodontitis patients. These factors acting together lead to suppression of HEMOGLOBIN, erythropoiesis and anemia.

But still there is paucity of literature to see the correlation between erythrocyte count, Hb and periodontal diseases and also the specific processes in the pathogenesis. Additional studies are necessary to better define the relationship between periodontal conditions and red cell parameters.

Conclusion

Chronic infection and sub gingival microbiota have been observed as factors affecting the red blood cell counts in periodontitis patients. The factors acting in conjunction lead to suppression of Hemoglobin, erythropoiesis and thus leading to anemia.

Nonetheless, further longitudinal studies and applied research is required in this area to unveil the exact mechanism underlying the causation of anemia in chronic periodontitis and also to provide a better understanding of the relationship between periodontal conditions and red cell parameters.

Thus chronic periodontitis like other chronic conditions may tend towards anemia therefore improvement in periodontal status may tend towards an improvement in the anemia to some extent.

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