

C-reactive Protein Changes During Perio Protect™ Treatment of Periodontal Disease

C Steele¹; BJ Sindelar, PT, PhD²; DC Keller, DMD¹

¹Perio Protect, St. Louis, MO; ²Ohio University, Athens, OH



PURPOSE

Pilot study to examine blood levels of C-reactive protein in patients being treated for periodontal disease with the Perio Protect Method™

INTRODUCTION

Periodontal disease (PD) is rampant in that it affects about 30% of the world-wide adult population (Greenstein, 2004) and over 53% of the US adult population (Albandar, Brunelle et al, 1999). Estimates indicate that 10-20% of these cases become severe (Petersen and Ogawa, 2005), negatively impacting the patient's quality of life physically, socially, and psychologically. In addition, PD has been linked to diabetes, brain abscesses, low birth weight, cardiovascular, and respiratory diseases (Dietrich and Garcia, 2005; Genco, Gross et al, 2005; Hujuel, Lydon-Rochelle et al, 2006).

C-reactive protein (CRP) is a marker of low grade chronic systemic inflammation that has been shown to be associated with an increased risk of myocardial infarction, stroke, sudden death from cardiac causes, and peripheral arterial disease (Ridker, 2002). CRP can amplify the inflammatory response through complement activation, tissue damage, and motility of endothelial cells (Bhatt and Topol, 2002). Prior studies have demonstrated a positive relationship between serum levels of CRP and patients with periodontal disease. However, a recent review article indicates little current evidence indicating that the current treatments for periodontal disease can control serum levels of CRP (Ioannidou, Malekzadeh et al, 2006).

A new antimicrobial treatment for periodontal disease, Perio Protect Method™, uses customized, prescription trays to deliver medication (tetracycline and hydrogen peroxide) directly to the disease affected structures. This treatment has met FDA approval and has been employed in selected dental clinics for the last 2 years. Routine CRP screenings in the clinic during 2006 suggested a reduction in the serum levels in patients utilizing the Perio Protect Method™. Therefore, this pilot study retrospectively examined the clinical records of a random sample of patients receiving treatment for periodontal disease using the Perio Protect Method™. Expectations were that serum CRP levels 14 days post treatment initiation would be lower than those acquired prior to the start of treatment.

ABSTRACT

Objective: Pilot study to monitor blood levels of C-reactive protein (CRP) while treating periodontal disease in patients with and without co-morbidities. **Methods:** A retrospective analysis of clinical records from January 1-August 1, 2006 from a general dental practice was performed. Records with complete documentation and informed consent were included in the study. The resulting 29 patient sample included 19 females, 6 smokers, 2 patients with diabetes, 8 patients with cardiac disease and an age of 52.9±12.6 years. Three patients exhibited no periodontal disease, 3 had gingivitis, and 23 had periodontitis. All patients with signs of periodontal disease began treatment on day 1 (baseline) with the Perio Protect Method per established guidelines. Blood CRP samples were taken at day 1 and 14 days later through a standard clinical analysis (QuikRead CRP, Orion Diagnostica). All CRP values in the normal range were assigned a "4" for subsequent data analysis. Descriptive statistics were used to describe group differences. **Results:** In the no periodontal disease group, the baseline and 14 day CRP values were 4 mg/L. In the gingivitis group, baseline CRP values were 8.0±5.3mg/L (range=4-16) while 14 day CRP values were 4.0±0.0mg/L. In the periodontitis group, baseline CRP values were 7.7±5.7mg/L (range=4-27) while 14 day CRP values were 4.6±1.4mg/L (range=4-10). All normal values at baseline regardless of group stayed normal at 14 days. The baseline CRP values for smokers were 8.5±4.8mg/L (range=4-16) while 14 day CRP values were 4.3±0.5 mg/L (range=4-5). For the 10 patients with diabetes or cardiac disease, 100% of the baseline CRP readings were greater than normal (9.7±6.9mg/L; range=5-27). At 14 days, 70% were within normal (4.6±1.1mg/L; range=4-7) for an average decrease of 5.1±6.9mg/L (range=0-23). **Conclusion:** The Perio Protect Method produced a decrease in 14 days in the blood CRP levels in all patient population groups examined.

MATERIALS AND METHODS

- Retrospectively obtained dental charts from patients receiving Perio Protect Method™ between January 1 to August 1, 2006 in a general dental practice clinic
- All records were coded by a clinic staff member prior to research usage to preserve patient confidentiality
- Records that were complete and included consent forms were added to the study
- Resulting sample consisted of 29 records composed of 19 females, 6 smokers, and a mean age of 52.9 years (table 1)
- Self-reported co-morbidities included diabetes and cardiovascular disease (table 1). No noted changes in the treatment of these conditions during the 14 day treatment period was noted in the records.
- Subjects were categorized by periodontal severity based on pocket probing depth and the presence of bleeding at baseline, prior to treatment start (table 1)
- CRP serum levels were obtained in the dental clinic using a finger-stick whole blood sample and analyzed immediately with a QuikRead CRP (Orion Diagnostica). CRP samples were taken at baseline and at 14 days post-treatment initiation
- All subjects with any stage of periodontal disease were treated with the Perio Protect Method™ using established procedures (table 2, fig. 1)
- Controls were being treated for other dental conditions and agreed to CRP monitoring
- Descriptive statistics were used to compare CRP levels relative to smoking status, periodontal disease level, and co-morbidities

	Female	Male
Total number of participants	19	10
Mean age (years)	52.5±12.2	53.5±14.2
Age range (years)	29 - 80	28 - 75
Smoker	2	4
Diabetes	1	1
Cardiovascular disease	5	3
Periodontal health		
Control (≤3 mm PPD and no bleeding)	2	1
Age range controls (years)	29-45	28
Gingivitis (<3 mm PPD with bleeding)	3	0
Age range gingivitis (years)	39-64	
Moderate (4-6 mm PPD)	9	5
Age range moderate (years)	43-64	48-67
Severe (>6 mm PPD)	5	4
Age range severe (years)	53-80	35-75

Table 1. Demographics of subject population (n=29). PPD = pocket probing depth.



Figure 1. Samples of tray system used in the application of the Perio Protect Method™. At right, tray is being loaded with prescribed medications.

RESULTS

- Normal levels of CRP at baseline were found in all periodontal disease categories. Subjects with gingivitis and severe PD exhibited the greatest variability in baseline CRP levels (fig 2).
- All subjects without periodontal disease had normal CRP levels. All subjects with initial normal levels of CRP (n=13), regardless of periodontal disease group, stayed at normal levels for the 14 day period.
- Two subjects with CRP levels of 5 mg/L in the moderate periodontal disease category remained unchanged.
- All other subjects with higher levels of CRP (n=14) experienced a positive change in blood levels (table 3).
- The average baseline CRP level for smokers was 8.5±4.8 mg/L and for non-smokers was 7.0±5.5 mg/L. Average 14 day levels for smokers was 4.3±0.5 mg/L and for non-smokers was 4.5±1.4 mg/L (fig. 3). The average CRP change for the smokers in those subjects with non-normal baseline levels (n=5) was 5.0 mg/L.
- Nine out of the 10 subjects with diabetes or cardiovascular disease exhibited moderate PD. All 10 subjects had baseline CRP levels higher than normal. CRP levels at 14 days were within the normal range for 7 out of 10 of these subjects (fig. 4). Only one subject in this group did not experience a CRP level change.

Prescription Tray Formation

- Impressions are taken using a stock tray customized with wax to fit patient's mouth
- Models are poured from trays using dental stone
- Prescription trays are fabricated in an FDA registered laboratory according to the patient's diagnosis and pocket probing depth analysis (fig. 1)
- Prior to tray fitting, patients receive in office training on use and care of the treatment system from the dental staff

Treatment Application

- Hydrogen peroxide gel (Perio Gel 1.7%) in combination with an antioxidant (tetracycline or doxycycline) are added to trays
- A custom-formed seal fabricated in accordance with the patient's scope and magnitude of disease gently directs the medications interproximal and subgingival and the slight positive pressure environment maintains a concentration of the selected medications in the periodontal pocket
- Tray usage frequency and duration are modified as healing occurs until a long-term homecare regimen is established
- Trays are removed and rinsed with cool water
- To remove any remaining materials the mouth may be rinsed with water or mouthwash or the teeth may be brushed.

Table 2. Established procedures for application of the Perio Protect Method™.

Initial PD category	Change in CRP levels (mg/L)
Gingivitis	2
Gingivitis	10
Moderate	4
Moderate	2
Moderate	5
Moderate	2
Moderate	1
Severe	5
Severe	23
Severe	8
Severe	12
Severe	3
Severe	1
Severe	5

Table 3. Changes in blood CRP levels by periodontal disease category.

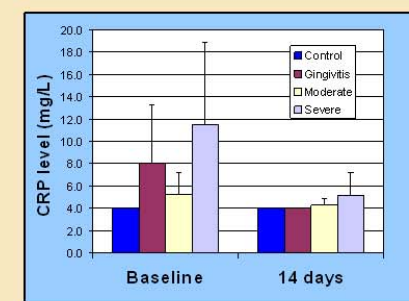


Figure 2. Baseline and 14 day blood CRP levels measured in mg/L. Normal CRP level = 4 mg/L.

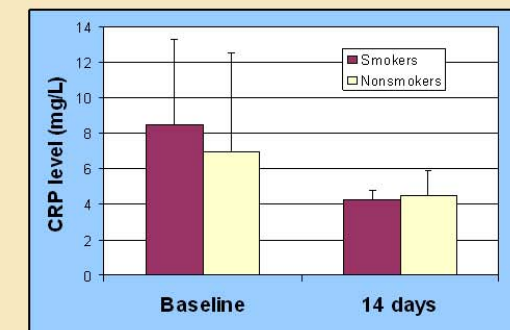


Figure 3. Comparison of blood CRP levels in smokers (n=6) and non-smokers (n=23). Normal CRP level = 4 mg/L.

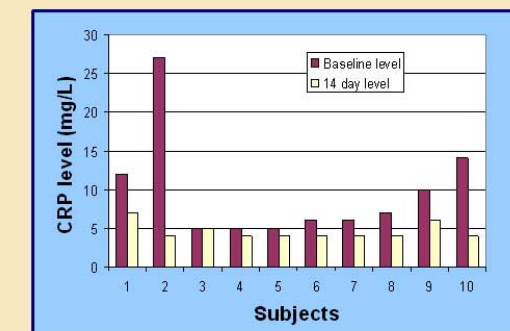


Figure 4. Comparison of baseline and 14 day CRP levels for subjects with self-reported co-morbidities. Subject numbers 1 and 2 reported diabetes. All other subjects reported cardiovascular disease. Normal CRP level = 4 mg/L.

CONCLUSIONS

Results from this pilot study indicate a decrease in the blood CRP levels during the 14 day treatment period with the Perio Protect Method™. A larger prospective study using this system is necessary to correlate treatment usage and CRP levels and to examine long-term implications.

BIBLIOGRAPHY

- Albandar J, Brunelle J and Kingman A. 1999. Destructive periodontal disease in adults 30 years of age and older in the United States, 1988-1994. *J Periodontol* **70**: 13-29.
- Bhatt D and Topol E. 2002. Need to test the arterial inflammation hypothesis. *Circulation* **106**: 136-40.
- Dietrich T and Garcia R. 2005. Associations between periodontal disease and systemic disease: evaluating the strength of the evidence. *J Periodontol* **76**: 2175-84.
- Genco R, Gross S, Ho A, Nishimura F and Murayama Y. 2005. A proposed model linking inflammation to obesity, diabetes, and periodontal infections. *J Periodontol* **76**: 2075-84.
- Greenstein G. 2004. The role of local drug delivery in the treatment of chronic periodontitis. *Dent Today* **23**: 110-5.
- Hujuel P, Lydon-Rochelle M, Robertson P and del-Aguila M. 2006. Cessation of periodontal care during pregnancy: effect on infant birthweight. *Eur J Oral Sci* **114**: 2-7.
- Ioannidou E, Malekzadeh T and Dongari-Bagtzoglou A. 2006. Effect of periodontal treatment on serum C-reactive protein levels: a systematic review and meta-analysis. *J Periodontol* **77**: 1635-42.
- Petersen P and Ogawa H. 2005. Strengthening the prevention of periodontal disease: the WHO approach. *J Periodontol* **76**: 2187-93.
- Ridker P. 2002. C-reactive protein. To screen or not to screen? *N Engl J Med* **347**: 1615-7.