The Systemic Effect of Periodontal Therapy on the Management of Diabetes and Heart Disease: A Review of Recent Studies

A Peer-Reviewed Publication
Written by Thomas W. Nabors, DDS, FACD

Abstract
Dentists are routinely presented with patients that have Type 2 diabetes and cardiovascular disease (CVD). Among these patients, the potential health benefit of diagnosing and treating chronic inflammatory periodontal disease may be uncertain. This course reviews studies over the last decade to help understand the potential effect of periodontal therapy between these two patient groups. While there are many factors involved outside the realm of oral health and our understanding of cause and effect, these studies reveal that the dental professional’s role in systemic health care management is significant. Based on these studies, the management of chronic periodontal disease in specific chronically diseased patients appears to have a significant health benefit: plus an additional benefit in the reduction of over-all medical expenditures.

Educational Objectives:
1. The first objective is to provide evidence from current studies designed to answer specific questions based on periodontal therapy, the potential systemic benefit, and the potential medical savings.
2. The second objective is to give the reader appropriate information that can be used when discussing the health benefits of periodontal therapy with their patients and their physician colleagues.

Author Profile
Thomas W. Nabors, DDS, FACD is a graduate from the University Of Tennessee College Of Dentistry. His clinical and research experience has expanded over 45 years. He is a frequent speaker for both dental and medical groups on the subject of molecular genetics in the field of periodontology and has published numerous peer-reviewed articles. He is a member of many dental and honorary organizations. He can be reached at drtomnabors@gmail.com

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Abstract
Dentists are routinely presented with patients that have Type 2 diabetes and cardiovascular disease (CVD). Among these patients, the potential health benefit of diagnosing and treating chronic inflammatory periodontal disease may be uncertain. This article reviews studies over the last decade to help understand the potential effect of periodontal therapy among these two patient groups. While there are many factors involved outside the realm of oral health and our understanding of cause and effect, these studies reveal that the dental professional’s role in systemic health care management is significant. Based on these studies, the management of chronic periodontal disease in specific chronically diseased patients appears to have a significant health benefit: plus an additional benefit in the reduction of over-all medical expenditures.

Overview
Type 2 diabetes and heart diseases have become diseases of epidemic proportions. Of importance is that both diseases are significantly influenced by lifestyle choices and culture. Both too, in many cases, are preventable with appropriate education within the population and by a more preventive model for the medical fields. The American Diabetes Association and the Centers for Disease Control and Prevention have excellent resources to educate the populous on prevention and disease management.

Also of significance is that the management of patients with type 2 diabetes and heart disease may be improved when inflammatory periodontal infections are properly managed. Several studies in recent years were designed to examine this potential effect of periodontal therapy on disease management and associated costs of these two chronic diseases.

The Burden of Chronic Diseases:
Chronic diseases are the leading causes of death and disability in the United States as well as in the global community. The four diseases most responsible include: cardiovascular diseases, type 2 diabetes, cancer and chronic obstructive pulmonary disease. Along with the individual life-associated burden, the health care costs of these chronic diseases have become a global burden that threatens the entire health care system.

Heart disease and strokes account for 33.6% of all deaths within the U.S. In 2010, the Centers for Disease Control and Prevention (CDC) stated that heart disease and stroke were the first and third leading causes of death for men and women in the U.S. This statistic included an estimated 935,000 heart attacks and 795,000 strokes on an annual basis. Furthermore, approximately 150,000 deaths occurred in Americans younger than age 65. For those that survive a heart attack or stroke, the disabilities associated affect over 4 million Americans. An estimated 1 in 3 American adults (83 million) currently lives with one or more types of cardiovascular disease. Approximately 68 million adults live with high blood pressure and only half are controlled: a significant cause of both heart disease and stroke.

In 2010, the total costs for cardiovascular diseases and events were estimated at $444,000,000,000.00 ($444 billion). Based on 2010 data from the American Heart Association, the estimated direct and indirect costs of cardiovascular diseases are as follows:
- Coronary Heart Disease (CHD): $108.9 Billion
- Hypertensive Disease: $93.5 Billion
- Stroke: $53.9 Billion
- Heart Failure: $34.4 Billion

While other factors such as genetics and other causes of inflammation increase risk, it is well documented that the control of risk factors makes cardiovascular diseases among the most preventable. Controlling risk factors and lifestyle choices can prevent heart disease. The most modifiable risk factors include: not using tobacco, physical activity, maintaining a healthy weight, and making healthy food choices among others. These personal choices greatly reduces a person’s risk of developing heart disease or stroke.

In 2010, an estimated 18.8 million Americans had diagnosed diabetes mellitus (DM): Another 7.0 million had undiagnosed diabetes. Within the past two decades, the prevalence of diabetes within the U.S. has risen sharply among all age groups, both sexes, and all ethnic groups. While some states showed a disproportionate increase in diabetes, a recent analysis of the prevalence of diagnosed diabetes increased in every state during this period of time. Between the years of 1995-2010, the prevalence of diagnosed diabetes throughout the 50 states, DC, and Puerto Rico showed an increase of >50% in most states and by ≥100% in 18 states.

Both research scientists and clinicians agree that strategies to prevent diabetes and its preventable risk factors are needed. Strategies are needed to reverse the trend of increasing diabetes prevalence. With this goal of preventing the onset of type 2 diabetes, the National Diabetes Prevention Program supports a nationwide implementation of evidence-based, community, lifestyle programs that promote modest weight loss, good nutritional practices, and increased physical activity among those at risk.
Periodontal disease and the global burden of health care costs:
Periodontal disease is now considered to be a major contributor to the global burden of chronic diseases and represents a major global public health problem on its own merits of prevalence and disabilities. The World Health Organization (WHO) has recently highlighted this global burden. Within the WHO language, management of periodontal diseases can also play a significant role within the broader goal of reducing health care deaths, disabilities and costs.1

Research continues to validate this long term relationship of periodontal disease to type 2 diabetes and coronary heart diseases thus revealing compelling reasons to include periodontal disease management for both DM and CHD.6,7

Periodontal Disease Management: Improving health and reducing health-care costs
Between 2002 and 2012, a number of studies were designed to evaluate the effect of periodontal therapy on patients with diabetes mellitus and heart disease. These studies are important and have been published to assist both the medical professions and the public, as to the potential benefit of controlling another risk factor; periodontal infections. Two significant questions were asked within the aim of these studies: (1.) Does untreated periodontal disease increase health care costs? (2) Does the treatment of periodontal disease decrease health care costs?

The following studies are reviewed and summarized.

Study one:
In 2006, a joint effort between Columbia College of Dental Medicine and Aetna insurance company published findings from a two year retrospective cohort study of individuals with continuous dental and medical coverage. This study was designed to determine if periodontal treatment does or does not contribute to changes in overall risk and medical expenditures for three chronic conditions: Diabetes Mellitus (DM), Coronary Artery Disease (CAD), and Cerebrovascular Disease (CVD). Within this group of 116,306, those that exhibited one of three chronic conditions (DM, CAD, or CVD) were examined.8 The number of subjects with DM totaled 51,560; with CAD totaled 75,262, and the number with a history of CVD totaled 22,153.

To evaluate the potential relationship between periodontal disease treatment and these three chronic conditions, the individuals were placed into one of three categories: (1) those who had treatment for periodontal disease, (periodontitis or gingivitis); (2) those who had at least one dental maintenance service (examine and preventative treatment); (3) those with other dental services (restorative, prosthetic, and surgical); and (4) those with no dental services. The total medical per member per month (PMPM) medical cost for each category was calculated after a two year time frame.

Based on dental insurance records, periodontal treatment was provided to 14% of subjects with DM, 13.12% with CAD, and 11.5% with a history of CVD. Figure one displays the results of early periodontal therapy for these groups. The reduction in risk scores resulted when those who had periodontal therapy (claims with ADA-CDT “4000” codes) were compared to those having no dental treatment. The medical cost reduction resulted when those who had early periodontal care in the first year of the study were compared to those that had periodontal therapy only in year two of the study.

Figure 1: Aetna-Columbia retrospective claim analysis

<table>
<thead>
<tr>
<th>Episode risk group™ (ERG) scores for diabetes, CAD and CVD participants</th>
<th>Periodontitis codes</th>
<th>No dental services</th>
<th>Reduction in risk score</th>
<th>Associated reduction in overall medical costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes</td>
<td>3.39</td>
<td>4.79</td>
<td>29.2%</td>
<td>9%</td>
</tr>
<tr>
<td>Coronary artery disease (CAD)</td>
<td>4.68</td>
<td>6.49</td>
<td>27.9%</td>
<td>16%</td>
</tr>
<tr>
<td>Cerebrovascular disease (CVD)</td>
<td>6.23</td>
<td>8.26</td>
<td>24.6%</td>
<td>11%</td>
</tr>
</tbody>
</table>

Dramatic decrease in ERG scores for participants with Diabetes, CAD and CVD

ERG™ is a modeling tool to predict current and future health utilization.

Study two:
A 2008 University of Michigan study reported that treating “gum disease” in patients with type 2 diabetes, resulted in a 10-12 percent lower medical costs.9 While not designed to determine a cause and effect relationship between periodontal disease and DM, the study was designed to investigate if routine, non-surgical treatment for gum disease is linked to lower medical care costs for people with diabetes. In this study, Blue Care Network (BCN) provided data to U-M researchers from 2,674 patients with medical, dental, and pharmaceutical coverage. The study showed that medical care costs decreased by an average of 11 percent per month for patients who received one or two periodontal treatment procedures annually compared to those that received none. For patients that received three or four annual treatments, costs decreased nearly 12 percent. The study also showed that combined medical and pharmaceutical monthly costs were 10 percent lower for patients who received one or two periodontal procedures annually.

Study three:
On April 16, 2009, Dr. Clay Hedland, a Cigna dental director, and Dr. Marjorie Jeffcoat, Dean Emeritus and professor, University of Pennsylvania School of Dental Medicine presented findings at the International Association for Dental Research meeting (IADR) on a similar study.10 In this study, the research group reviewed medical and dental claims of over 30,000 patients that
were enrolled in both Cigna medical and Cigna dental plans. The medical costs analysis included 1,136 patients from this group who received treatment for diabetes or cerebrovascular accident (stroke) and received concurrent treatment or maintenance care for gum disease during the three year study period.

Two groups of dental patients with gum disease (based on insurance claims) were then compared. Individuals in the first group received initial treatment for gum disease during the first year of the study. Individuals in the second group received treatment for periodontal disease prior to the baseline year, and received periodontal maintenance care throughout the three years of the study.

As reported by the group, “lower medical costs were observed in the group who had received prior treatment and maintenance care. Conversely, medical costs were higher in the group who first received treatment during the baseline year. These medical cost differences averaged $10,142 per patient in the baseline year among stroke patients and $1,418 per patient in the baseline year among patients with diabetes.”

Study Four:

United Concordia’s landmark study shows immediate medical costs savings as well as longer term savings. In 2012, The University of Pennsylvania in conjunction with Highmark Incorporated published their three year findings on the effect of treating periodontal disease in patients with Type 2 diabetes. This study analyzed data over a three-year period from approximately 1.7 million individuals with both Highmark medical coverage and Untied Concordia dental coverage to determine the effects of periodontal care on type 2 diabetic patients. Among this group, more than 90,000 diabetic patients either elected to receive periodontal treatment, or not, in year 2007. This particular study proved a significant reduction in number of hospitalizations, physician visits and overall cost of medical care among subjects with diabetes who received treatment for periodontal disease. In year one of the study, those patients that received perio therapy had a 61% reduction in hospital admissions, a 41% reduction in physician visits, and a 32% reduction in medical costs over-all compared to patients who did not have periodontal therapy. (Figure two)

Over the three year period, the average savings in medical costs annually per patient was $1,814. The average reduction in hospital admissions was 33% and the annual average of physician visits was reduced by 13%.

“The study is so important when you look at the sheer size of the study and the scope of the study as well as the statistical significance of the results. What it says is the results are no fluke: when diabetics have their periodontal disease treated, it not only helps the patient become healthier, it saves money in the long run,” said Dr. Kim Bramson, chief dental officer for Untied Concordia and former executive director for the ADA. (American Dental Association).

Summary:

This series of studies were intended to determine if the treatment of periodontal disease improves health and reduces costs for systemic disease management. The findings are important for patients with chronic disease, and for the medical & dental communities.

While the “cause and effect” nature of the relationship between periodontal diseases, diabetes and cardiovascular disease is not fully understood, these longitudinal studies clearly show a health benefit when periodontal therapy is rendered. The health care fields should recognize that reducing inflammation and chronic infection from the oral structures (periodontium) has a positive benefit by improving health and reducing health care costs. While one cannot predict the exact benefit or which patient may benefit more or less than another at this moment in time, the studies should form a platform from which future studies may help all understand more clearly.

Both dentists and physicians should be aware of these studies. And, the oral health team should proactively educate their patients and their physician colleagues that the appropriate management of periodontal infections may improve the health of their patients and reduce their health care costs.

Today, dental professionals have a unique and important health care message that demonstrates the dental team to be an indispensable partner in improving general health and reducing health care costs.

References:

1. CDG report Nov 12, 2012; Linda Geiss, MA, Yanféng Li, PhD, Lawrence Barker, PhD, Nilka R. Burrow, MPH, Edward W. Gregg, PhD; Increasing Prevalence of Diagnosed Diabetes: US and Puerto Rico, 1995-2010; Division of Diabetes Translation,
National Center for Chronic Disease Prevention and Health Promotion, CDC; Nov 12, 2012; www.cdc.gov/mmwr/preview/mmwrhtml/mm6145a4.htm


9. George Taylor, DMD, University of Michigan; Treating Gum Disease Linked To Lower Medical Costs For Patients With Diabetes: January 8, 2009; Science Daily, www.sciencedaily.com/releases/2008/12/081223172745.htm

10. Research from Gigna Supports Potential Association between Untreated Gum Disease and Higher Medical Costs; April 16, 2009; Study results presented at recent International Association for Dental Research Meeting; newsroom.cigna.com/article_display.cfm?article_id=1038


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Questions

1. The chronic diseases that cause most death and disability are:
   a. Cardiovascular diseases  
   b. Diabetes  
   c. Cancer and COPD  
   d. All of the above  

2. The number of heart attacks within the U.S. in 2010 was:
   a. 444,000  
   b. 935,000  
   c. 795,000  
   d. 1.8 million  

3. The number of strokes in the U.S. in 2010 was:
   a. 444,000  
   b. 935,000  
   c. 795,000  
   d. 1.8 million  

4. The number of deaths from heart attack and stroke in Americans younger than 65:
   a. 33,600  
   b. 93,500  
   c. 53,900  
   d. 150,000  

5. The first and third leading cause of death for men and women are:
   a. Cancer and heart attack  
   b. Heart attack and stroke  
   c. Heart disease and stroke  
   d. Diabetes and heart attack  

6. Risk factors that can prevent heart disease include:
   a. Tobacco cessation  
   b. Physical activity  
   c. Healthy food choices  
   d. All of the above  

7. In 2010, an estimated number of Americans with diagnosed DM was:
   a. 188 million  
   b. 1.8 million  
   c. .18 million  
   d. 18.8 million  

8. An estimated number of Americans with DM but undiagnosed is approximately:
   a. 7.0 million  
   b. 18.8 million  
   c. 700,000  
   d. 70 million  

9. Between 1995 and 2010, diagnosed diabetes increased in the U.S by:
   a. 25%  
   b. <50% in most states  
   c. >50% in most states and <100% in some states  
   d. >50% in most states and ≥100% in some states  

10. The National Diabetes Prevention program supports preventive measures that include:
    a. Modest weight loss  
    b. Increased physical activity  
    c. Good nutritional practices  
    d. All of the above  

11. The World Health Organization has recently recognized periodontal disease to be:
    a. A global burden among chronic diseases  
    b. A major global public health problem  
    c. Can play a significant role within the broader goal of reducing health care deaths, disabilities and health-care costs  
    d. All of the above  

12. Based on the Columbia and Aetna study, periodontal treatment for patients with DM, CAD, AND CVD:
    a. Early periodontal care in the first year of the study resulted in the over-all risk reduction and actual reduction in medical expenditures  
    b. Associated reduction in medical costs for those with DM was 9%  
    c. Associated reduction in medical costs for CAD was 16% and CVD was 11%  
    d. All of the above  

13. Based on the Michigan study, treating “gum disease” in patients with type 2 diabetes resulted in:
    a. Medical costs decreased by an average of 11%  
    b. Those that received 3 or more annual periodontal treatments had a reduction in medical costs of 12%  
    c. Combined medical and pharmaceutical monthly costs were 10% lower for those who received one or two periodontal procedures annually  
    d. All of the above  

14. The Cigna study included two groups of dental patients. Group one received periodontal treatment and maintenance care prior to the study. Group two received periodontal treatment during the baseline year of the study. Based on this study:
    a. Group one and Group two received no benefit from periodontal therapy  
    b. Group one had a significant improvement in the average medical costs for both stroke patients and diabetic patients  
    c. The average difference based on medical costs was $10,142 per patient among stroke patients and $1,418 for diabetic patients  
    d. Both B and C  

15. The study from the UPenn reviewed the effect of periodontal treatment in patients with Type 2 diabetes. Based on this study, one group of study patients received periodontal treatment and the other group of patients refused periodontal therapy. Based on this study:
    a. In year one, those that received perio therapy, vs. those that did not, had a 16% reduction in hospital admission, a 14% reduction in physician visits, and a 23% reduction in medical costs  
    b. In year one, those that received perio therapy, vs. those that did not, had a 61% reduction in hospital admission, a 41% reduction in physician visits, and a 32% reduction in medical costs  
    c. Over the three year period, the average medical cost per patient was $1,814.00  
    d. Both B & C  

Notes
ANSWER SHEET

The Systemic Effect of Periodontal Therapy on the Management of Diabetes and Heart Disease: A Review of Recent Studies

Name: 
Title: 
Specialty: 

Address: 
E-mail: 

City: 
State: 
ZIP: 
Country: 

Telephone: Home ( ) Office ( )

Lic. Renewal Date: 
AGD Member ID: 

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2. The second objective is to give the reader appropriate information that can be used when discussing the health benefits of periodontal therapy with their patients and their physician colleagues.

Course Evaluation

1. Were the individual course objectives met? 
Objective #1: Yes No
Objective #2: Yes No

2. To what extent were the course objectives accomplished overall? 5 4 3 2 1

3. Please rate your personal mastery of the course objectives. 5 4 3 2 1

4. How would you rate the objectives and educational methods? 5 4 3 2 1

5. How do you rate the author's grasp of the topic? 5 4 3 2 1

6. Please rate the instructor's effectiveness. 5 4 3 2 1

7. Was the overall administration of the course effective? 5 4 3 2 1

8. Please rate the usefulness and clinical applicability of this course. 5 4 3 2 1

9. Please rate the usefulness of the supplemental weblogiography. 5 4 3 2 1

10. Do you feel that the references were adequate? Yes No

11. Would you participate in a similar program on a different topic? Yes No

12. If any of the continuing education questions were unclear or ambiguous, please list them.

13. Was there any subject matter you found confusing? Please describe.

14. How long did it take you to complete this course?

15. What additional continuing dental education topics would you like to see?

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