

A CASE REPORT OF PREPUBERTAL CHILDREN WITH SEVERE PERIODONTITIS

A Thesis
Submitted to
the Temple University Graduate Board

in Partial Fulfillment
of the Requirements for the Degree
MASTER OF SCIENCE

by
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August, 2012

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ABSTRACT

Objectives: To describe clinical features, demographic characteristics, and treatment outcome in four prepubertal children with severe periodontitis. This is a case report of prepubertal children that have been referred to the Temple University Kornberg School of Dentistry (TUKSD) for the treatment of severe periodontitis.

Methods & Materials: Chart review was performed of available paper and electronic records of patients aged ≤ 10 years that have been treated at the Graduate Periodontology Clinic, TUKSD during the past 5 years. Cases were evaluated for periodontal diseases by means of assessing dental plaque, dental calculus, gingivitis, probing depths and clinical attachment level, and radiographic evidence of bone levels. Cases diagnosed with periodontitis were identified and the patients' demographics, clinical findings, type of treatment provided, treatment outcome, and medical history were noted.

Results: Four children with severe periodontitis were identified. All the subjects had deep probing depths around their primary teeth showing significant bone loss on radiographs and were diagnosed with severe periodontitis. These children were treated with scaling and root planing combined with systemic antibiotics and extraction of hopeless primary teeth. The permanent teeth erupted early and there was no radiographic alveolar bone loss. Three subjects had microbiological testing and showed predominance of certain periodontal pathogens such as *Prevotella intermedia* and *Fusobacterium nucleatum*. Following treatment all children were inaccessible for follow-up.

Conclusion: Periodontitis in prepubertal children causes early loss of primary teeth and early eruption of permanent teeth. Relevant systemic diseases were not detected in any of the children. Compliance with periodontal maintenance is poor among prepubertal children attending the TUKSD clinics for the treatment of periodontitis.

ACKNOWLEDGEMENTS

Sincere appreciations to Dr. J.M. Albandar and Dr. J.B. Suzuki for invaluable assistance with this study, and special thanks to Dr. A. Chernyak for help with chart review and data entry.

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CHAPTER 1

INTRODUCTION

Gingival inflammation and other forms of periodontal diseases are common in children and adolescents. The International Workshop for a Classification of Periodontal Diseases and Conditions was held in 1999 to create a new classification system of periodontal diseases.⁽⁴⁾ The new classification revised and modified the previous classification of various forms of periodontitis adopted in the 1989 World Workshop in Clinical Periodontics.⁽³⁾ The new classifications were intended to help clinicians differentiate and identify various forms of gingival and periodontal diseases. A key change in the new classification was the elimination of the category of “early onset periodontitis” and its replacement with “aggressive periodontitis”. In addition, the 1989 classification contained a category termed “Prepubertal Periodontitis” which was subdivided into a localized and generalized forms. This category was eliminated in the new classification.

The disease category prepubertal periodontitis was first defined by Page et al. in 1983⁽¹⁸⁾, and this case definition was based on case reports of children with a unique form of destructive periodontal disease.^(5, 6, 8, 9, 20, 26, 27) This disease category was originally established to accommodate rare situations in which children had severe periodontal destruction around primary teeth leading to the early exfoliation of these teeth. Prepubertal periodontitis may be localized or generalized and can affect both the primary and mixed dentition. Onset occurs between the eruption of the primary dentition and puberty. It is characterized by severe gingival inflammation, rapid bone loss, tooth mobility, and tooth loss. Suzuki⁽²⁸⁾ reported that prepubertal periodontitis patients are usually between ages 5 and 8, they have low caries rates, and there is no sex predilection.

According to Page et al.⁽¹⁸⁾ the localized form of prepubertal periodontitis affects some but not all of the primary teeth, and more often the molars. The associated plaque deposits are moderate and there is minor inflammation of the gingivae, but bleeding upon probing is present at affected sites. There are no associated systemic conditions, and patients do not suffer from frequent upper respiratory tract infections. The destruction is not as rapid as in the generalized form, and the condition usually responds to treatment.

Page et al.⁽¹⁸⁾ also described the clinical features of generalized prepubertal periodontitis. The generalized form affects all the deciduous teeth and sometimes also involves the permanent dentition. There is an acute inflammation of the gingival tissues and rapid destruction of the periodontium, often leading to premature exfoliation of the teeth. Pronounced recession and cleft formation are also sometimes present. The periodontitis may be refractory to therapy, and the affected individuals may suffer from recurrent upper respiratory tract and skin infections.^(8,9)

When prepubertal periodontitis was defined as a unique disease category three decades ago little was known about its etiology. Subsequent studies have shown that in most patients who were previously diagnosed with generalized prepubertal periodontitis may indeed have a systemic defect that may compromise the host response to infections, and thus predisposes the affected individual to severe loss of periodontal tissues. A number of systemic conditions have been disclosed, including leukocyte adherence deficiency, congenital primary immunodeficiency, hypophosphatasia, chronic neutrophil defects, and cyclic neutropenia. Accordingly, in the new classification system, patients who are diagnosed with such a systemic condition and also have periodontitis are classified in the disease category “Periodontitis as a Manifestation of Systemic Diseases”.

Here we report four cases of prepubertal children treated at the Graduate Periodontology Clinic, The Department of Periodontology and Oral Implantology, Temple University Kornberg School of Dentistry (TUKSD), and describe the classification, clinical features, laboratory findings, and periodontal treatment outcomes in these patients.

CHAPTER 2

MATERIALS AND METHODS

The patients used in this report are prepubertal children that have attended, or been referred to the Temple University Kornberg School of Dentistry (TUKSD) for the treatment of severe periodontitis. We describe the clinical features, demographic characteristics, and treatment outcome in four prepubertal children with severe periodontitis. We performed an extensive chart review of paper and electronic records of patients aged ≤ 10 years that have been treated at the Graduate Periodontology Clinic, TUKSD during the past 5 years. Cases diagnosed with periodontitis were identified, and the patients' demographics, medical history, clinical oral findings, type of periodontal treatment provided, and treatment outcome were noted. The cases had a detailed periodontal evaluation consisting of detailed assessments of status of teeth, dental plaque, dental calculus, gingival inflammation, probing depths, clinical attachment level, and radiographic examinations and assessment of the alveolar bone level. Table 1 shows the disease diagnostic characteristics that were used to classify the cases into localized or generalized forms.

Table 1. Diagnostic characteristics of prepubertal children with periodontitis.

Prepubertal children with localized periodontitis (LPP)
Onset: around 4 years of age or older
Affected teeth: either few or many teeth
Microbial plaque: minimal
Alveolar bone destruction: faster than adult periodontitis but much slower than generalized form of PP
Prepubertal children with generalized periodontitis (GPP)
Onset: at the time of tooth eruption
Affected teeth: all primary teeth; the permanent dentition may or may not be affected
Gingival manifestation: fiery red gingiva with acute inflammation around all teeth; gingival proliferation, cleft formation, and recession
Alveolar bone destruction: rapid

CHAPTER 3

RESULTS

We identified four prepubertal children with severe periodontitis that were treated at the Graduate Periodontology Clinic, TUKSD. The age of the children ranged from 7-9 years, and comprised one male and three females. All children were of African American race. The subjects had deep probing depths around the primary teeth, showed significant bone loss on radiographs and were diagnosed with severe periodontitis. These children were treated with scaling and root planing combined with systemic antibiotics, and extraction of hopeless primary teeth. Residual pockets remained after treatment and some of the permanent teeth were also involved. One patient had extractions of seven permanent teeth and another patient had extractions of four permanent teeth during the treatment phase. One child, on presentation, had early exfoliation of the primary teeth. The permanent teeth erupted early, and there was no radiographic alveolar bone loss. Three subjects had microbiological testing, and showed predominance of certain periodontal pathogens such as *P. intermedia* and *F. nucleatum*. Two subjects had a history of asthma and one subject had glucose-6-phosphate dehydrogenase deficiency. Otherwise all children were systemically healthy. Following treatment all children were lost to follow-up.

A detailed description of the individual cases is provided below.

Case 1

A 7 year- old African American male was referred from Episcopal hospital, Philadelphia for the evaluation and treatment of bone loss and mobility around the primary molars. During the first visit a comprehensive periodontal evaluation was performed by means of clinical and radiographic examinations. It was noted that the periodontal attachment loss and the alveolar bone loss were localized to the primary molars, with multiple teeth showing probing depth \geq

5mm, tooth mobility grade 2-3, and gingival recession. Figure 1 shows the clinical presentation at the baseline dental visit.

A review of the medical history showed that the patient had been diagnosed with Glucose-6-phosphate dehydrogenase deficiency G6PD deficiency, otherwise healthy.



Fig 1. The clinical features of Case 1 showing gingival inflammation and recession.



Fig 2. A panoramic radiograph of case 1 showing alveolar bone loss around the primary molars.

At the second visit, subgingival plaque samples were collected for culture analysis and antimicrobial resistance testing from sites B,C,I,J,L. Scaling and root planing of the maxillary and mandibular teeth were performed for all teeth and the patient was prescribed a combination antimicrobial regimen to be started immediately after the mechanical debridement. The antimicrobial regiment prescribed was Amoxicillin 250mg, 21 tablets, and Metronidazole 250mg, 21 tablets, and the combination is used three times daily for 3 weeks.

The results of the microbiologic culture revealed the presence of *Prevotella intermedia*, 2% resistant to amoxicillin and clindamycin, *Fusobacterium nucleatum* 1.6%, *Peptostreptococcus Micros* 4.4%, *Campylobacter rectus* 2%, *Streptococcus constellatus* resistant to metronidazole and clindamycin.

Periodontal re-evaluation was done after six weeks and showed the presence of purulent exudate from all primary pockets. It was recommended to extract all primary teeth with a subsequent fabrication of a space maintainer. The parents approved the treatment plan, and the remaining primary teeth A,C,H,J,K,L,S were extracted during the next visit. The patient was referred to the Department of Pedodontics for the fabrication of a space maintainer appliance. The patient was scheduled to return for a post-operative follow-up visit. However, the patient did not present for the scheduled appointment and he was lost to follow-up despite repeated calls and mail communications to the family.

Case 2

A 7 year- old African American female was referred from Episcopal Hospital to evaluate deep probing depth around primary molars. Medical history showed that the patient was diagnosed

with asthma, otherwise healthy. During the first visit, a comprehensive periodontal evaluation was completed. Bleeding on probing along with deeper probing depths was present. Minimal plaque was clinically evident the gingival tissues were healthy. The clinical presentation is depicted in Figure 3.



Fig 3. Case 2 showing a periodontal abscess at the first primary molar.

At the second dental visit the patient presented with a periodontal abscess at the maxillary right primary first molar. Subgingival plaque samples were collected from sites B,D,19,K,T and were submitted for bacterial culturing. The microbiological test results revealed the presence of *P. intermedia* 25% resistant to amoxicillin, *F.nucleatum* 15%, *P. Micros* 15% resistant to Clindamycin, *C. rectus* 3.5%. The patient was treated with scaling and root planing of all teeth. and was prescribed Azithromycin 200mg/5ml oral suspension for 7 days. During the next visit extractions of the maxillary right primary first molar and incisor were performed. A periodontal re-evaluation was performed after 4 weeks and showed residual pockets around teeth #19,K,T,S. The patient was scheduled to return for a post-operative follow-up visit but did not present for the scheduled appointment and she was lost to follow-up.

Case 3

A 7 year- old African American female was referred from a general dentist for evaluation of deep probing depth around the exfoliating primary molars. Medical history was non-contributory. A comprehensive periodontal evaluation was completed during the first visit which showed bleeding on probing and pocket depths ≥ 5 mm around the primary molars and incisors. Periodontal bone loss and loss of attachment was present at the first and second primary molars.

Scaling and root planing was performed on the next visit. No microbiological testing was performed and no antibiotic medication was prescribed. Re-evaluation after 6 weeks showed significant reduction in the pocket depth and bleeding on probing. The patient was referred back to general dentist and did not present for any follow up appointment.

Case 4

A 9 year- old African American female was attending the predoctoral clinic at TUKSD and was referred the Graduate Periodontology Clinic for the evaluation and treatment of periodontitis. A review of the medical history showed that the patient was diagnosed with asthma, but had no other significant medical findings and was otherwise healthy. The clinical presentation of this case is shown in Figure 4.

During the first visit, a comprehensive periodontal evaluation was completed. The exam showed presence of periodontal attachment loss and alveolar bone loss localized to the primary molars, with bleeding on probing and pocket depth > 5 mm and gingival recession. At the second visit, subgingival plaque samples were collected and submitted for microbiological culture

analysis and antimicrobial resistance testing. Microbiological test results showed presence of *P. intermedia* 9.8 % resistant to amoxicillin and clindamycin, *F. nucleatum* 4.9%, *P. micra* 4.9%, *C. rectus* 3.3%, and *S. constellatus* 1.0%. The patient was treated with scaling and root planing and was prescribed Azithromycin 200mg/5ml oral suspension for 7 days. Re-evaluation after 6 weeks revealed significant reduction in pocket depth and bleeding. The patient was maintained on a 3-month recall maintenance program.



Fig 4. Case 4 showing presence of gingival lesion at the maxillary canine.

CHAPTER 4

DISCUSSION

This report presented four cases of prepubertal children affected with periodontitis. Periodontitis is rare in this age group. It has been reported that the prevalence of prepubertal periodontitis ranges from 0.84% to 26.9%, based on a limited number of case reports (Table 2)⁽³⁰⁾. For example, a high prevalence of 7.7% was reported in 5-9 years old Pima Indians, and 11% reported by Bimastein et al.⁽⁷⁾, and a low prevalence of 0.84% in 6-11 years old children reported by Sweeney et al.⁽²⁹⁾. The variation in the reported prevalence of prepubertal periodontitis may be due to methodological factors and the selection of convenience sample populations.⁽³⁰⁾

Table 2. Reports of the prevalence of prepubertal periodontitis (Modified from Watanabe⁽²⁹⁾)

Investigators	year	# of subjects examined (F/M)	#of periodontitis patients (F/M)	Age Range	Prevalence
Jamison	1963	67 (25/42)	18 (6/12)	5-7	26.9%
Russell	1971	-	-	5-9	0.1%
Shlossman	1986	650	-	5-9	7.7%
Sweeney	1987	2264	19	5-11	0.84%

A significant percentage of patients who visit the dental clinics of the Temple University Kornberg School of Dentistry are from adjacent neighborhoods with a low socioeconomic demographics. This may partly explain the challenge in having patients and their family comply with scheduled maintenance visits. All four cases presented in in this report are of African-American race-ethnicity. This finding is consistent with previously published research showing a higher prevalence of early onset periodontitis in African-American and Hispanic populations. A survey of over 14,000 United States school children, showed the prevalence of localized, generalized and early onset forms periodontitis to be the lowest in whites and highest in African-American and Hispanic adolescents⁽²⁾.

Three out of the four cases presented in this report were females. However, given the small number of cases, the gender distribution may not be representative of the target population.

A possible etiological factor that has been considered in the development of periodontitis in an otherwise healthy prepubertal children is pathogenic bacteria. Bacteria of probable etiologic importance include highly virulent strains of *Aggregatibacter actinomycetemcomitans*, *P. intermedia*, *Capnocytophaga* species, *P. gingivalis*, and *Eikenella corrodens*^(11, 12, 14, 21, 29, 32). Results of several studies suggest that *A. actinomycetemcomitans* is a major etiological factor in the pathogenesis of aggressive periodontitis.⁽²³⁻²⁵⁾ This bacterium has often been identified in young persons showing severe attachment loss and rapid disease progression. Aass et al.⁽¹⁾ detected this bacterium in about 50% of sites showing radiographic bone loss in young persons monitored over 8years. Delaney & Kornman⁽¹¹⁾ found an increased proportion of black-pigmented anaerobic rods, *E. corrodens*, *Capnocytophaga* species. Susceptibility may be related to cementum defects, leukocytes chemotaxis dysfunction, or presence of bacteriophage.

In the present report three cases had microbiological testing, and showed predominance of certain periodontal pathogens such as *P. intermedia* and *F. nucleatum*. Many studies suggest that the primary bacteria of probable etiologic importance include highly virulent strains of *A. actinomycetemcomitans* in combination with *Bacteroides*-like species. However, no single species is found in all cases of prepubertal periodontitis.⁽¹⁷⁾

Although the primary etiology remains bacterial plaque, several other conditions exist that may lead to severe periodontal disease in children. A differential diagnosis would include: insulin dependent diabetes mellitus, Papillon-Lefèvre syndrome, hypophosphatasia, neutropenia, Chediak-Higashi syndrome, leukemia, histiocytosis X, acrodynia, acquired immunodeficiency syndrome (AIDS), Down syndrome, and leukocyte adhesion deficiency. Studies in young children with generalized prepubertal periodontitis have demonstrated that neutrophils from these patients have abnormally low levels of binding by antibodies, which suggests functional abnormalities in these cells.^(13, 15, 19, 22) Page et al.⁽¹⁹⁾ assessed the prevalence of defective neutrophils and monocytes in aggressive periodontitis patients and detected defective neutrophils in 85% and defective monocytes in 74% of these patients. Neutrophils from some children with a clinical diagnosis of periodontitis as a manifestation of systemic disease have abnormalities in a cell surface glycoprotein (LFA-1, leukocyte functional antigen-1, also known as CD11, and Mac-1). The neutrophils in these patients having leukocyte adhesion deficiency are likely to have a decreased ability to move from the circulation to sites of inflammation and infection.^(10, 16)

The patients in this report were treated with scaling and root planing combined with systemic antibiotics, and extraction of hopeless primary teeth. The treatment protocol for prepubertal children with periodontitis should include systemic antimicrobials as an adjunct to mechanical debridement. The combination-regimen of amoxicillin and metronidazole was used

in two of the cases for durations of 7-10 days. The combination-regimen of amoxicillin and metronidazole has been shown to improve clinical attachment level gain in deeper pockets of periodontitis patients.⁽³¹⁾

Patient motivation and compliance is an important factor in successful treatment of periodontitis. Most of the subjects in this patient sample did not follow through with the proposed treatment or return for the scheduled maintenance appointments. Since all the patients were under the age of 10 years, the presence of a parent or guardian at all dental appointments was required. Multiple appointments in the pre-doctoral clinic with subsequent referral to the graduate clinic for a comprehensive evaluation, microbial plaque sampling, individual quadrants of scaling and root planing, re-evaluation and maintenance take multiple appointments and therefore may deter the patients and their guardians from following through with treatment due to scheduling difficulties. This may explain the lack of compliance with periodontal maintenance. It is recommended that the treatment of prepubertal periodontitis be expedited in an academic setting so that these patients be referred to the graduate clinic for all periodontal therapy including initial phase 1 treatment. Periodontal screening should be an integral part of the dental examination of younger individuals. It can be used in conjunction with the history and examination to reach a diagnosis, which then forms the basis for future management.

CHAPTER 5

CONCLUSIONS

Periodontitis in prepubertal children can be localized or generalized and can affect both the primary and mixed dentition, causing early loss of primary teeth and early eruption of permanent teeth. The localized prepubertal periodontitis, unlike the generalized prepubertal periodontitis, affects a limited number of teeth and may be overlooked during dental examination. The gingival tissues may not be red in color and inflamed, as is often the case in periodontitis associated with a systemic condition. Four cases were treated at TUKSD and all were diagnosed with localized prepubertal periodontitis. They comprised African American children, and were mainly females (3:1). Three patients had microbiological testing and showed predominance of certain periodontal pathogens such as *P. intermedia* and *F. nucleatum*. Current modalities for managing periodontitis in young children include antibiotic therapy in combination with non-surgical periodontal therapy. The management of periodontitis in these children is very challenging. Compliance with periodontal maintenance is poor among prepubertal children with periodontitis attending the TUKSD clinics for periodontal treatment.

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