Atraumatic Restorative Treatment for Prevention and Treatment of Caries in an Underserved Community

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We evaluated the acceptability and effectiveness of atraumatic restorative treatment to prevent and treat caries in an underserved community in Mexico. We placed 370 restorations and 193 sealants in 118 children aged 5 to 18; 85% reported no pain, and 93% were comfortable with their restorations. We then evaluated the children 1 and 2 years later. At 2-year evaluation, 66% of restorations and 35% of sealants were retained. Atraumatic restorative treatment is acceptable and effective to control and prevent decay in a socioeconomically deprived community. (*Am J Public Health.* 2005;95:1338–1339. doi:10.2105/AJPH.2004.056945)

Dental caries is the most widely spread oral disease in the world, yet it tends to go untreated in underserved communities in both developing and industrialized countries. These underserved populations mainly receive extractions when they seek dental care; they do not receive fillings for cavities when they are able to see a dentist.[1,2] The World Health Organization actively promotes atraumatic restorative treatment as a viable approach to meet the need for treatment of dental caries.

Atraumatic restorative treatment uses manual excavation of dental caries, which eliminates the need for anesthesia and use of expensive equipment, and restores the cavity with glass ionomer, an adhesive material that bonds to the tooth structure and releases fluoride as it stimulates remineralization. Atraumatic restorative treatment is noninvasive, making it highly acceptable to patients.

Studies conducted in several countries showed high survival rates of atraumatic restorative treatment one-surface restorations,[3–6] even in comparison with amalgam restorations.[7] Median survival time of atraumatic restorative treatment is 5 years compared with 7 years for conventional amalgam restorations.[8] The cost-effectiveness of atraumatic restorative treatment also has been established,[8–10] considering costs of equipment, materials, and wages. Atraumatic restorative treatment is currently used in 25 countries and is part of regular training programs for oral personnel in at least 3 countries.[11]

MATERIALS AND METHODS

The study was conducted in Santiago-Toxie, a small community 50 miles northwest of Mexico City, Mexico, that has limited access to medical and dental care. A team of dentists and dental students from 2 dental schools and the Ministry of Health visited the community after obtaining permission from the village elders through the help of a religious order. Parents of 118 children aged 5 to 18 (mean = 10.6 years) gave their consent. Treatment followed the World Health Organization protocol and was approved by the University of Pennsylvania Institutional Review Board. Universal infection control measures were used throughout the treatment.

Selected teeth for atraumatic restorative treatment technique were prepared by removing decay with hand instruments; conditioned following the manufacturer's instructions; and restored with FUJI IX, GC glass ionomer (GC, Chicago, Ill), with the press finger technique that automatically places sealants on the occlusal tooth surface. Children who underwent treatment were asked to evaluate their experience by completing the World Health Organization Patient Satisfaction Form. Follow-up evaluations of atraumatic restorative treatment restorations were conducted at 1- and 2-year intervals (2001–2002); the criteria established by Frencken and Holmgren[4] were used to determine whether the atraumatic restorative treatment restorations were lost, had marginal defects, or had deep wear. Descriptive statistics were analyzed from the data.

RESULTS AND DISCUSSION

A total of 370 restorations were performed, and 193 sealants were placed. Treatment time ranged from 10 to 80 minutes, with no significant time difference between professional dentists and dental students. We were unable to follow-up on some cases because the families migrated.

Results showed a restoration retention rate of 81% in the first year and 66% in the second year; the highest rate was in the central and distal surfaces in posterior permanent teeth (Table 1). These results were comparable to those of other studies—78% to 90% retention rate in the first year and 63% to 86% in the second year.[4,8] The probability for failure is less in restoration of occlusal surfaces (P=.004). Retention rate in the sealants was quite low (51%); the highest rate was in the buccal and lingual surfaces. This may be attributed to poor moisture control and the lack of comprehensive strength of glass ionomers in high-wear areas.[4] A significant result is the absence of recurring decay related to the atraumatic restorative treatment

TABLE 1—Retention of Atraumatic Restorative Treatment Restorations at 1 and 2 Years

Surface Restored	Treated at Baseline, No.	Evaluated at 1 y, No.	Retained at 1 y No. (%)	Evaluated at 2 y, No.	Retained at 2 y, No. (%)
Mesio-occlusal	56	37	28 (75.7)	24	15 (62.5)
Central occlusal	57	39	31 (79.5)	29	21 (72.4)
Disto-occlusal	56	39	32 (82.1)	29	19 (65.5)
Buccodistal	55	22	18 (81.8)	14	9 (64.3)
Buccomesial	52	13	10 (76.9)	7	4 (57.1)
Linguomesial	42	17	15 (88.2)	11	7 (63.6)
Linguodistal	52	10	10 (100.0)	5	4 (80.0)
Total	370	177	144 (81.4)	119	79 (66.4)

TABLE 2—Patient Experience of Pain (N = 72) During Scraping and Filling: Satisfaction With Atraumatic Restorative Treatment

Patient Responses	Did You Feel Pain When the Hole in the Tooth Was Being Scraped?	Did You Feel Pain When the Hole in the Tooth Was Being Filled?
Yes, it was painful, and I did not like it.	0 (0%)	0 (0%)
Yes, it was a bit painful, and I did not like it.	3 (4.2%)	0 (0%)
Yes, it was a bit painful, but I did not mind it.	18 (25.0%)	4 (5.6%)
No, it was not painful, but I did not like it.	1 (1.4%)	5 (6.9%)
No, it was not painful, and I did not mind it.	49 (68.1%)	61 (84.7%)
Not applicable; sent to dental clinic	1 (1.4%)	1 (1.4%)

restorations and the absence of caries in children where sealants were placed, but later lost.

Patient satisfaction with atraumatic restorative treatment was high (Table 2). Most did not experience pain during excavation (68%) and during filling (85%). Of the patients treated, 93% were comfortable with their restorations. One child was sent to the dental clinic in the town of Aculco because of pulp exposure.

Retention rates for the restorations were higher in the first than in the second year, which suggests a wear and tear in the restorations. Glass ionomers are reported to have a medium-term wear of 1 year,[4] and resistance to wear of glass ionomers is lower than that of composite resins or amalgam.[7] The retention rate was higher in 1 surface restoration, which may reflect high compressive strength but low resistance to flexural forces of glass ionomers.[12]

The absence of caries in teeth with atraumatic restorative treatment restorations or sealants indicates that atraumatic restorative treatment is an effective preventive measure for caries even in the presence of other factors that may contribute to the development of caries. It has been noted that fluoride from glass ionomers produces an environment that controls the development of caries, and surfaces that were not sealed had a 4 times greater chance of developing caries.[4] It is possible that some of the children would have needed teeth extractions were it not for the atraumatic restorative treatment restorations and sealants.

The lower rate of retention as compared with other field studies may be attributed to the inexperience of the students and dentists, especially in the mixing of glass ionomers, which affects its compressive strength. The absence of a significant difference between the performance of dentists and dental students may indicate that less experienced personnel or nondentists can be trained to do atraumatic restorative treatment. Dental nurses and therapists can successfully place atraumatic restorative treatment restorations.[13,14]

CONCLUSIONS

Atraumatic restorative treatment needs to be considered as a preventive and treatment modality for caries in communities with no dentists. More studies of atraumatic restorative treatment in both developing and industrialized countries are needed to validate its effectiveness and acceptability. ■

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Contributors

N. Lopez wrote the project proposal, implemented and administered the project, and was the main author of the brief. S. Simpser-Rafalin conducted the field study and supervised dentists and dental students in the study. P. Berthold led the evaluation of the atraumatic restorative treatment. All authors analyzed the data, interpreted findings, and reviewed drafts of the article.

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Human Participant Protection

The study was approved by the institutional review board of the University of Pennsylvania.

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