

Authors : Sheila Fils-Aime, D.D.S., Jeannine Weiss, D.D.S., Kelly Cervellione, MA, MPHIL  
 Jamaica Hospital Medical Center, Jamaica, NY , 11418 - USA

## Introduction :

Dental caries is considered a chronic disease. The management of dental caries is grounded in an understanding of caries as a chronic biobehavioral disease (6). Early childhood caries (ECC) has been a major international oral health problem in both industrialized and developing countries (7). It is defined by the presence of 1 or more decayed (cavitated or non-cavitated lesions), missing tooth/teeth (due to caries), or restored tooth surfaces in any primary tooth in a child 7 months of age or younger. In the initial phase, it presents as a white demineralized enamel termed white spot lesions on smooth surfaces that quickly advances to dull, chalky decay along the gingival margin.

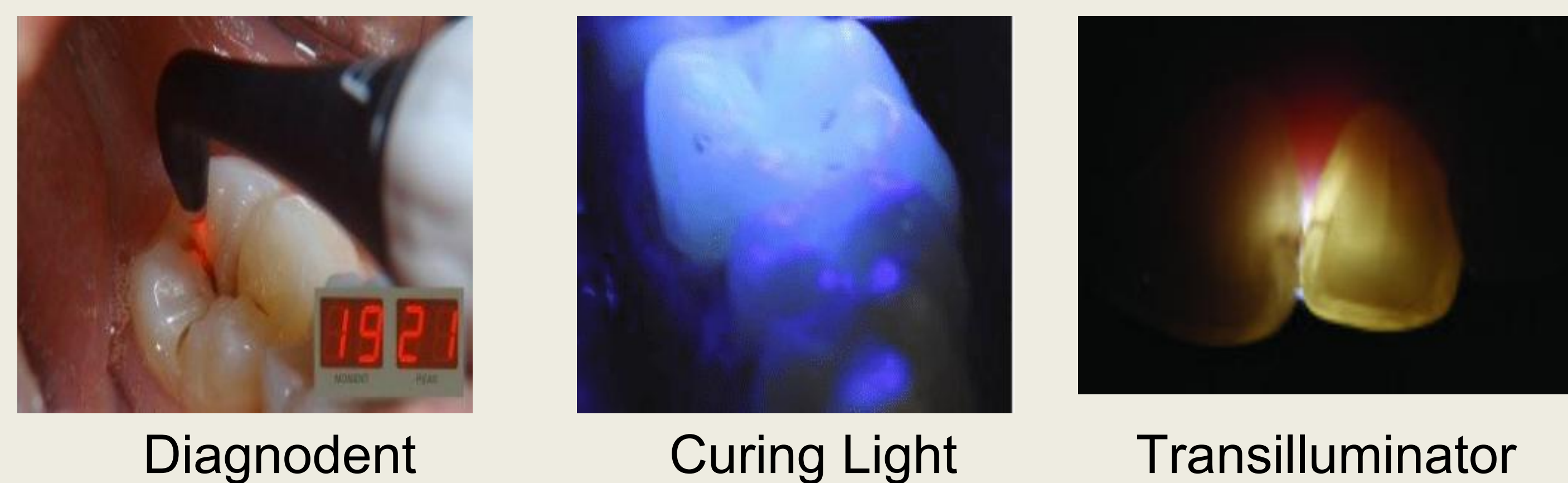
Trends in treatment from detecting caries to early minimally intervention dentistry has become a focal point for pediatric dentists, since it gives the provider a chance to reverse the process, eliminate, or postpone treatment. Several diagnostic devices have been developed with the aim of detecting the earliest signs of enamel demineralization. Traditional methods for detecting caries include but are not limited to radiographs and the Diagnodent. These methods of detection in school age children require some degree of cooperation from them, thus ineffective for those under the age of three.

To prevent the progression of lesions, it is necessary to identify them in the initial stages of development and to start preventative therapies. The transilluminator, a curing light, Iscanner and or a DIAGNOdent are devices that can be used in a short time frame (few seconds) to identify and quantify the condition of caries for children of any age or needs (4).

The objective of this pilot study is to compare the effectiveness of the (Transilluminator) fluorescence vs (Curing light) prism vs (Diagnodent) near infrared light beam for accuracy in early caries diagnosis. The understanding of early detections would provide interceptive care opportunities of non-cavitated lesions and enhance the dental home education of families, as it would be utilized as an adjective diagnostic modality on pre-cooperative children.

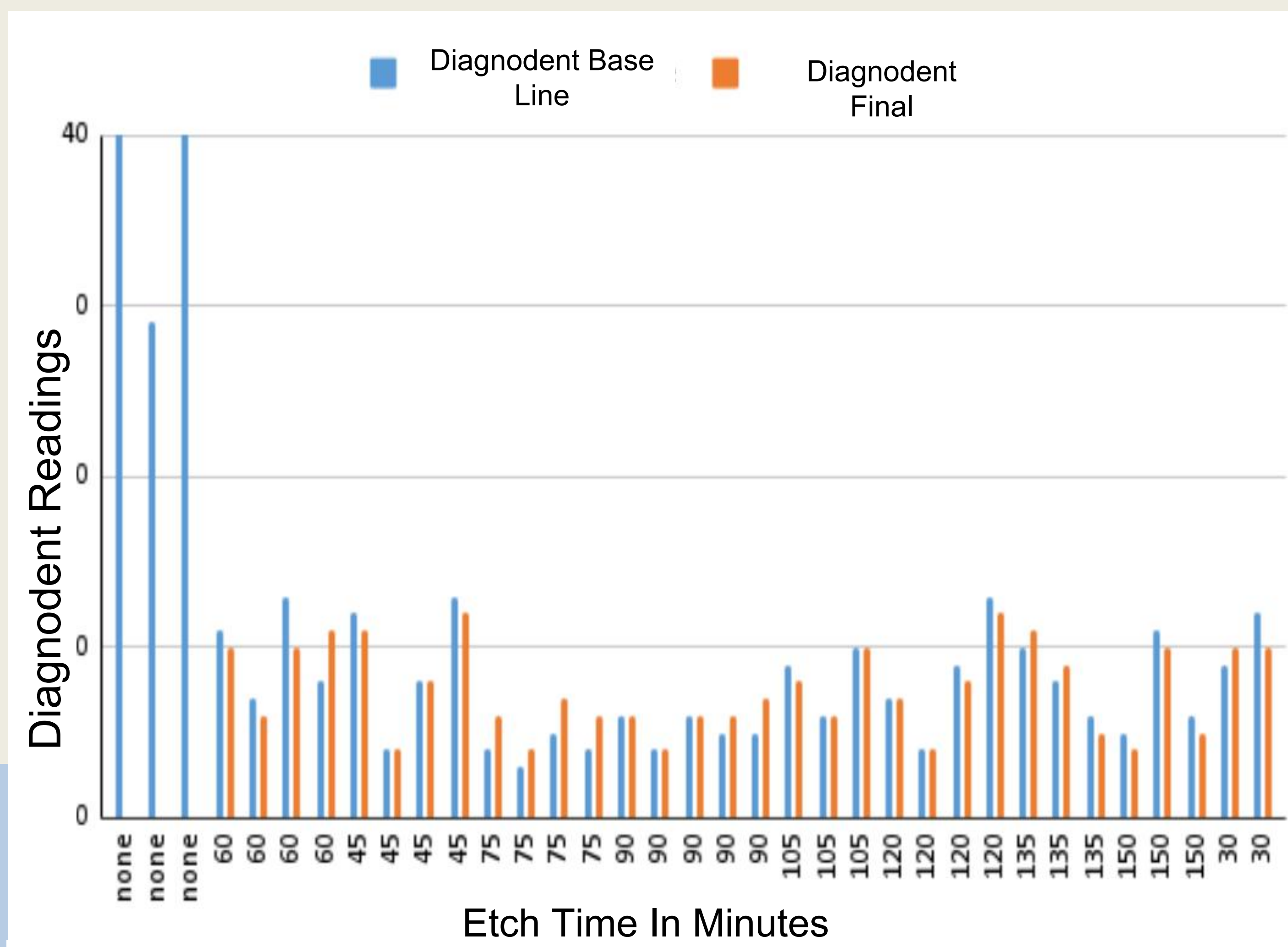
## Methods

In this study 32 previously extracted primary and permanent caries free teeth were used. Demineralization method using Phosphoric Acid 37% at different time intervals. Demineralization detection by DIAGNOdent was recorded ranging from 0-78. Demineralization detection with Curing Light and Transilluminator was recorded as positive or negative. Radiographs before and after were obtained for mounted samples.



## Results

32 caries-free teeth were evaluated by radiographs, transilluminator, curing light, and Diagnodent. Both curing light and transillumination identified 20/32 (62%) demineralized teeth. The DIAGNOdent and radiograph failed to identify any teeth demineralization (0/32 for both methods) (Graph 1). Significant differences were found in the mean etch time of successful classifications by curing light (table 2) or transillumination (Table 3) compared to unsuccessful classifications (H (1,30)=31.50, P < .001). Correctly classified teeth had a mean etch time of 107.25 (SD=30.11) compared to the mean etch time for incorrectly classified teeth of 61.25 (SD=26.72) (Table 1).



Graph 1: Etch Time and Diagnodent Reading

Table 1: Descriptive Statistics & Success Rates of Procedure

	Overall (n=32)
n	32 ( 32 )
Etch_Time_min	90 ( 36.35 )
<b>Success Rates</b>	
Curing_Light	0.62 ( 20 )
Transilluminator	0.62 ( 20 )
Diagnodent_Base_Line	0 ( 0 )
Diagnodent_Final	0 ( 0 )
Radiographs_Base_Line	0 ( 0 )
Radiographs_After	0 ( 0 )

Table 2: Curing Light Mean Etch Times

Curing_Light01	Etch_time
0	61.25
1	107.25

Table 3: Transilluminator Mean Etch Times

Transilluminator01	Etch_time
0	61.25
1	107.25

## Conclusion

Transillumination and curing light were able to detect demineralization whereas the DIAGNOdent and Radiographs did not. These findings suggest that transillumination and curing light may be reliable alternative diagnostic methods to digital bitewing radiography and DIAGNOdent for in vitro detection of early proximal demineralization. Differences in etch time should also be considered, as more etch time was related to better detection. Findings suggest that the DIAGNOdent identifies lesions at the DEJ and therefore are not as sensitive for the diagnosis of white spot lesions. The transillumination and curing light were significantly more accurate and effective in detecting lesions in primary enamel prisms. Overall the concept of using some form of transillumination or light should be used in pre-cooperative or children with special needs.

## References

- Schwendicke, F., Dörfer, C. E., Schlattmann, P., Page, L. F., Thomson, W. M., & Paris, S. (2015). Socioeconomic inequality and caries: a systematic review and meta-analysis. *Journal of dental research*, 94(1), 10-18.
- Kirthiga, M., Murugan, M., Saikia, A., & Kirubakaran, R. (2019). Risk factors for early childhood caries: a systematic review and meta-analysis of case control and cohort studies. *Pediatric dentistry*, 41(2), 95-112.
- Alranyes, S., Horn, A., Kratunova, E., & Koerber, A. (2021). Evaluation of a near-infrared light transillumination device for caries detection in interproximal primary molar surfaces. *Journal of Dentistry for Children*, 88(3), 180-186.
- Ortiz, M. I. G., de Melo Alencar, C., De Paula, B. L. F., Magno, M. B., Maia, L. C., & Silva, C. M. (2020). Accuracy of near-infrared light transillumination (NILT) compared to bitewing radiograph for detection of interproximal caries in the permanent dentition: A systematic review and meta-analysis. *Journal of Dentistry*, 98, 103351.
- Edelstein, B. L., & Ng, M. W. (2015). Chronic disease management strategies of early childhood caries: support from the medical and dental literature. *Pediatric dentistry*, 37(3), 281-287.
- Karpiński, T. M., & Szkaradkiewicz, A. K. (2013). Microbiology of dental caries. *J Biol Earth Sci*, 3(1), M21-4.
- Rai, N. K., & Tiwari, T. (2018). Parental factors influencing the development of early childhood caries in developing nations: a systematic review. *Frontiers in public health*, 6, 64.