

# Assessment of Diagnostic Quality and Acceptance of Bitewing Radiography Using Film Holder and Loop in 6-8 Year Old Children

## Original Article

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## **Abstract**

**Introduction:** Bite wing radiographs are indicated in children with closed posterior contacts. Given the fact that nowadays bitewing radiographs are taken using both paper loop and film holder, the aim of this study is the evaluation of acceptance and diagnostic quality of two methods.

**Materials and Methods:** This study is a sort of diagnostic accuracy test that was performed on 20 6-8 year old children referring to Babol Dental School. Forty posterior bitewing radiographs were taken including 20 radiographs using film holder and 20 radiographs using paper loop. Diagnostic quality of radiographs was assessed according to the film coverage, proximal overlap and observation of alveolar bone crest. Acceptance was evaluated according to the feeling expressed by children about the radiographic experience. Data was processed by SPSS statistical software and McNemar test.

**Results:** Film coverage, proximal overlap and observation of alveolar bone crest were acceptable in all radiographs taken by film holder. Film coverage and observation of alveolar bone crest in upper second primary molar were acceptable in 70% and 65% of the radiographs taken by paper loop respectively; that were significantly different with film holder group ( $P < 0.05$ ). There was no significant difference in the acceptance of the methods.

**Conclusion:** Bitewing radiograph with film holder produced adequate radiographs for almost all parameters and was well tolerated by children.

**Key words:** •Child •Diagnosis •Radiography  
**Bitewing**

## Introduction

Early detection of dental caries can prevent pain, dental extraction and emotional stress in pediatric patients.<sup>(1)</sup> Radiography is a valuable supplement in caries detection. Also it can be used in diagnosis of developmental and eruption problems. Early management of these problems can decrease the need for long-term orthodontic procedures. Performing some restorative treatments needs an exact registration of pulpal borders which is possible just by taking exact radiographs.<sup>(1,2)</sup>

Bitewing radiography is indicated for posterior teeth with closed contacts that cannot be examined visually or by using probes.<sup>(2)</sup> These radiographs are valuable tools in detecting proximal caries with or without clinical performance.<sup>(1,3)</sup> Furcation radiolucencies, the common feature of pulpal involvement in primary teeth, are best seen in bitewing radiographs.<sup>(4)</sup>

Using a film holder can facilitate the procedure of taking a proper radiography by minimizing improper positioning or bending of the film and maintaining the relationship of film to the considered structures.<sup>(5,6,7)</sup>

Nowadays, most of the bitewing radiographs are taken using paper loops due to lack of equipments and problems in sterilization, the aim of this study is to evaluate the acceptance and diagnostic quality of bitewing radiographs using XCP specific pediatric film holder (Dentsply, Rinn Co, USA) and paper loop in 6 to 8 years old children who referred to Babol dental school, University of Medical Sciences.

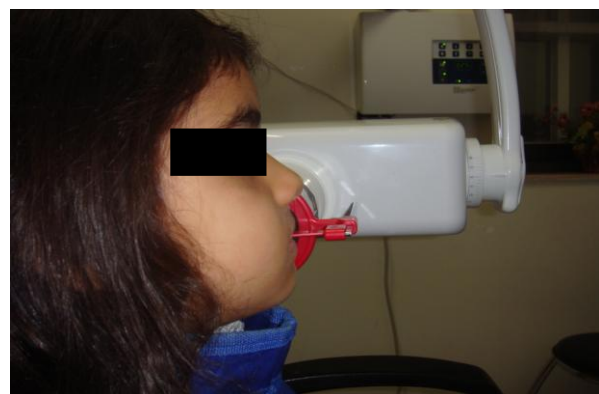
## Materials and Methods

The project was approved by the Ethic Committee of Babol University of Medical Sciences (No 1391). Children were divided to two groups randomly. Forty bitewing radiographs were taken consisting of 10 radiographs of right primary molars of the first group and left primary molars of the second group using pediatric size XCP film holder (Dentsply, Rinn Co USA; Figure 1); and then 10 radiographs of left primary molars of the first group and right primary molars of the second group using paper loop. The order of taking radiographs in the first group was us-

ing XCP and then paper loop, and in the second group, the order was reversed (cross over). The intraoral radiography device used in this study was Minary (Soredek, Helsinki, Finland) which operates at 60 KVP and 7 mAs and exposure time regulated due to patient's age. The film used for bitewing radiographs was size 0, E-speed Kodak film (Kodak, New York, USA). All of the radiographs were taken by the same oral and maxillofacial radiologist (OMFR) and processed by Hope automatic processor (Hope product Inc, Pennsylvania, USA) using Tetenal developer and fixer. Patients were protected against radiation employing lead collar. Image interpretation was carried out under optimal conditions in a darkroom with dim backlighting. Quality of radiographs was evaluated by the same OMFR considering three items as follows:



(a)



(b)

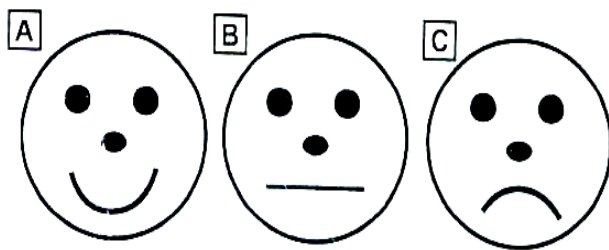
**Figure 1:** Bitewing radiography taken by XCP film holder, (a): frontal view, (b): lateral view

1. Adequate film coverage: observation of the whole crown and coronal third of the roots of posterior primary teeth.
2. No proximal overlap of adjacent teeth: proximal overlap of adjacent teeth was

considered as an error if more than half of the distance between the proximal surface and DEJ was superimposed in at least two distinct points.

3. Observing alveolar bone crest in maxilla and mandible.

Patient's acceptance according to child's feeling and perception of this experience was evaluated using visual scales consisting of three smileys of satisfaction, indifference and dissatisfaction (Figure 2). They were explained regarding the meaning of each smiley prior to the procedure. After taking each radiograph, children were asked to express their feeling of the procedure by choosing one smiley and then explain their opinion about the preferred technique verbally.



**Figure 2:** Visual scales showing satisfaction, indifference and dissatisfaction

Data were collected using SPSS software and statistical comparison of two groups was performed using McNemar test.

## Results

Twenty patients including 13 girls (65%) and 7 boys (35%), six to eight years old (mean:  $7 \pm 0.8$  years) participated in this study. All of the radiographs were evaluated by an oral and maxillofacial radiologist and the results were obtained as follows:

Table 1 shows the rate of the acceptable film coverage using film holder and paper loop. Significant difference was seen just for maxillary second primary molar ( $P < 0.05$ ).

As seen in table 2, there was no significant difference between the two groups in regarding the acceptable proximal overlap ( $P > 0.05$ ).

Table 3 shows that except for the maxillary second primary molar, there was no significant difference between two groups in observing alveolar bone crest ( $P > 0.05$ ).

Evaluating the patients' acceptance, 19 patients were satisfied by using XCP and one was dissatisfied. On the other hand, after using paper loop, 13 patients were satisfied, 5 patients expressed indifference and two were dissatisfied. No significant difference was seen between the two groups ( $P > 0.05$ ).

Satisfaction after using paper loop and XCP was 69.2% and 92.3% among the girls and 57.1% and 100% among the boys. Mean age of satisfied, dissatisfied and indifferent patients after using paper loop was 7.5, 6.6 and 7.8 years, respectively. For XCP group, the mean age of the satisfied and dissatisfied patients were 7.5 and 6 years.

**Table 1.** Acceptable film coverage by using paper loop and XCP

Tooth	Acceptable film coverage by paper loop	Acceptable film coverage by XCP	P.value*
Maxillary first primary molar	85%	100%	0.250
Mandibular first primary molar	100%	100%	-----
Maxillary second primary molar	70%	100%	0.008
Mandibular second primary molar	100%	100%	-----

\*P value < 0.05 was considered significant

**Table 2:** Acceptable proximal overlap by using paper loop and XCP

Tooth	Acceptable proximal overlap using paper loop	Acceptable proximal overlap using XCP	P. value*
Maxillary first primary molar	85%	100%	0.250
Mandibular first primary molar	95%	100%	0.500
Maxillary second primary molar	85%	100%	0.250
Mandibular second primary molar	95%	100%	0.500

\*P value < 0.05 was considered significant

**Table 3:** Acceptable proximal overlap by using paper loop and XCP

Tooth	Observing alveolar bone crest using paper loop	Observing alveolar bone crest using XCP	P-value*
Maxillary first primary molar	90%	100%	0.301
Mandibular first primary molar	100%	100%	-----
Maxillary second primary molar	65%	100%	0.016
Mandibular second primary molar	100%	100%	-----

\*P value <0.05 was considered significant

## Discussion

According to the results of the present study, film coverage was 100% accepted in radiographs taken by XCP while it was 70% accepted in maxillary second primary molars radiographs taken by paper loop. There was a significant difference between the two groups possibly because film holder was stiffer than the paper loop and the potential of displacement caused by forces of cheek and tongue was less; and the patients' involvement in keeping film holder in its correct position was less than paper loop. In a study performed by Pierrovs et al, bitewing film holders were used in preschool children and its diagnostic quality and children's acceptance were evaluated. It was concluded that corrected bitewing film holder was acceptable in approximately all parameters such as proximal overlap, appropriate film position and observing alveolar bone crest, and was well tolerated by children.<sup>(5)</sup>

Several studies have been performed by using XCP film holder and its corrected models and all documented that it has less technical errors than the other film holders.<sup>(8-10)</sup>

Regarding the patients' better acceptance and comfort, extraoral bitewing radiographs are available and can be used in children who cannot tolerate the intraoral film and receptor; although it has been shown that its diagnostic quality is less than intraoral bitewings.<sup>(11)</sup>

In the present study, absence of proximal overlap was more acceptable in XCP group although the difference between the two groups was not statistically significant. This is in agreement with the study of Kositbowornchai and colleagues who have shown that there was no significant difference in the proximal overlap in radiographs taken by paper loop and film holders.<sup>(12)</sup> An explanation For less proximal overlap by using XCP

would be that because of using a guiding rod and focusing ring in film holders, minimal movements of patients' head would be noticeable and these semirigid connectors would keep the film and the tube in the same direction.

In our study, we found an acceptable observation of the alveolar bone crest in all radiographs taken by XCP. This is in agreement by the other studies that introduced the film holders as useful tools for observation and measurement of alveolar bone crest.<sup>(13-15)</sup> There was a significant difference in observation of the alveolar crest of maxillary second primary molars while using XCP and paper loop which is concordant with the results of the study run by Piero et al in 2008.<sup>(5)</sup>

In the present study, the patient's acceptance of XCP was more than paper loop. Keeping in mind that taking a radiograph in this age may be the first unpleasant treatment for a child, XCP can help to make this experience more pleasing for children. In a study performed by Pitts et al. in 1991, acceptance of bitewing radiographs was compared using freehand technique, film holder and HPL bitewing device. Range of acceptance was 87 to 97 percent and the three methods showed a significant difference.<sup>(16)</sup> Hayashi et al., in their study about technical quality and convenience of four film holders, Hanshin, Indusbelo, Imagem and Rinn, found that Rinn film holder caused the greatest discomfort and was at the third grade regarding the radiograph's quality. Their results are in conflict with the results of our study. May be because we used only one type of film holder (Rinn) that led to a better diagnostic quality in comparison to paper loop. On the other hand, we used pediatric specified type of film holder that has less height than the adult size used by Hayashi et al.<sup>(17)</sup>

As bitewing radiographs are used for caries diagnosis and despite the large amount of studies about caries diagnosis, just a few studies compared film holder and paper loop in children; so further studies with larger sample size and new film holders are recommended.

## Conclusion

Based on the results of our study, using film holder led to better diagnostic quality

and it was well accepted by children. It seems that using film holders is preferred in children older than six years.

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