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The comparison of the densitometric stability between E+ and Insight intra oral films, which were processed by Champion and Teifsaz solutions*

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ABSTRACT

Background and objective: Proper patient treatment planning depends on correct diagnosis of its disease which could be achieved by taking high quality radiographs. Densitometric stability and film processing have important effect on the radiographs quality. The aim of the present study was to compare the densitometric stability of intra oral E+ and Insight film, which were processed by Champion and Teifsaz solutions. Materials and methods: A lab trial study was conducted. Radiographic images were taken of 56 E and Insight through lead step-wedge. Films were processed by new and in aging Champion and Teifsaz solutions every four days. After 56 days, the radiographic density of each film was calculated by Photoshop software. The contrast of each image was calculated by distracting maximum and minimum density. The resultant data were coded in SPSS software and analyzed by two-way variance analysis. Results: There is significant difference between the mean of density of processed films with the two different chemicals (Champion & Teifsaz) (P-value < 0.0001) that Champion was better than Teifsaz. However, there is no significant difference between the density of E+ and Insight films (P-value = 0.717). Conclusion: Densitometric stability of new Insight film is as the same as currently used E+ film and is better preserved with Champion chemicals than Teifsaz solutions.

Keywords: Radiographic Density; Processing Solutions; Dental Film; E and Insight

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1. INTRODUCTION

Image acquisition with optimal quality and radiation dosage as low as reasonably achievable (ALARA) were the major objectives of dental diagnostic radiology [1]. As result of dental radiology development, we had a progressive increase in X-ray film speed and a consequent reduction in radiation hazards. Image quality is also influenced by the processing method and it has been observed that depletion of processing chemicals can have a deleterious effect on film densitometric properties. [2].

X-ray films in medical dentistry had arranged alphabetically (A-F type) by their speed and Insight films belonged to F group and with suitable processing solution lead to high quality radiological images. After film exposing by X-ray radiation silver halide transformed into the metal silver ingredients and made radiographic densitometry due to blocking light transfer from light box. [3].

Processing solution with additive substance were important factors in image densitometry and quality. Different film quality is related to differences in processing solution and films which were used by dentists [4].

Most of film producing companies prepared suitable processing solution and time or temperature for achieving to the best quality. In some cases due to decline of processing solution or its expensive prices and use of processing solution which made in the country, other solution were used for processing films of specific companies.

Present study was designed for comparing the density stability of Insight and Ekta speed plus radiographic films manually processed using fresh and depleted Champion and Teifsaz solutions.

2. MATERIAL AND METHODS

This lab trial study was performed for comparison

impacts of Champion (X-ray Tehran-Iran) and Teifsaz (Teifsaz, Tehran-Iran) processing solutions on densitometric stability of two types of intra oral films including Insight and Ekta speed plus films. Study was approved in ethical research committee of Shahid Sadoughi University of medical sciences and health services.

An eight step Lead step-wedge was prepared .Images of step wedge was made by intraoral tube (Planmeca ProLin Helsinki-Finland-Prostyle) with 15 centimeters distance between tube and film. Radiographic study was performed according standard radiation which were got from pilot study with radiation factor KVP = 60 and mA = 8. Time factor was considered 0.25 Second for insight and 0.4 S for Ekta speed plus.

All of 56 radiographs, processed. Developing, fixing and washing times were measured with chronometer and their temperature was recorded in consecutive 56 days (14 series) with regular thermometer. Entire of films were scanned with 8x Scanner (Genus, Thailand) with 300 pixels and transferred to CRT monitor (LG, Korea). Densitometry of films was measured in Photoshop program using info option according to Bashizadeh *et al.* method [5]. Eight densitometric measurements were obtained from each of eight film layer and mean of them was considered as film density.

Study variables were entered into the SPSS11.5 software and Analysis of Variance test (ANOVA) was used for comparing two different film densities. All P-values less than 0.05 were assumed as significant.

3. RESULTS

Within the present study, mean of film densitometries which were processed in Champion and Teifsaz solution were measured and compared. Mean of density in Ekta speed plus films which was processed in Champion solution was significantly higher than Teifsaz solution (55.6 ± 11.1 Vs 27.05 ± 30.4; $P < 0.00$). Mean of densitometry for Insight films in Champion solution was significantly higher than Teifsaz solution (56.5 ± 6.8 Vs 30.4 ± 25.8; $P < 0.00$).

For covering role of film type as confounding variables, we compared densitometry of both films with each of processing solution. In our comparison densitometry of Insight and Ekta speed plus films in Champion solution had no significant differences ($P = 0.90$). As the same as Champion, Insight and Ekta speed plus films in Teifsaz solution had no significant differences ($P = 0.70$). In the other hand film types did not consider as cofounding variables in above significant differences. (**Table 1**)

In assessment of densitometric changes during study period (56 days) in one of two type of solutions, there was one sudden decline in Teifsaz densitometry (**Graph 1** and **2**) and lead to decrease in film visual quality and noted decline was not observe in about Champion solution and its density was remained in acceptable ranges. (**Figures 1** and **2**).

4. DISCUSSION

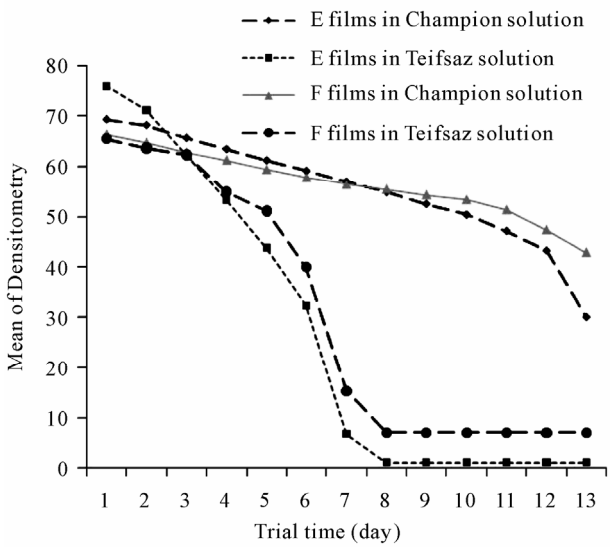
Processing of one film in different solutions can lead to different contrast and density [6,7]. Syrtoponlos *et al.* and Framan *et al.* in their study concluded that processing solution had main role in quality of dental radiographies [8-10]. Zamani *et al.* in their study reported that AGFA and *Primex Films* with Champion solution had suitable density and contrast [11]. As we see in our study density of both films which were processed with Champion solutions was higher than Teifsaz solution.

Results of our study showed that image density was

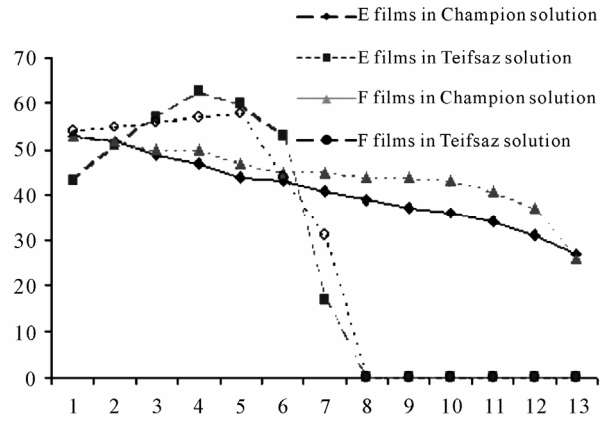
Table 1. Comparing film densitometry of E and F film in both of processing solutions.

Film	Solution	P-value
E-C	E-T	0.07
	F-T	0.67
	F-C	0.09
E-T	F-C	0.03
	F-T	0.92
F-C	F-T	0.04

E-C: E film in Champion processing solution; E-T: E film in Teifsaz processing solution; F-C: F film in Champion processing solution; F-T: film in Champion Teifsaz processing solution.



Graph 1. Densitometry changes during study period in both films and processing solutions.



Graph 2. Film contrast changes during study period in both films and processing solutions.

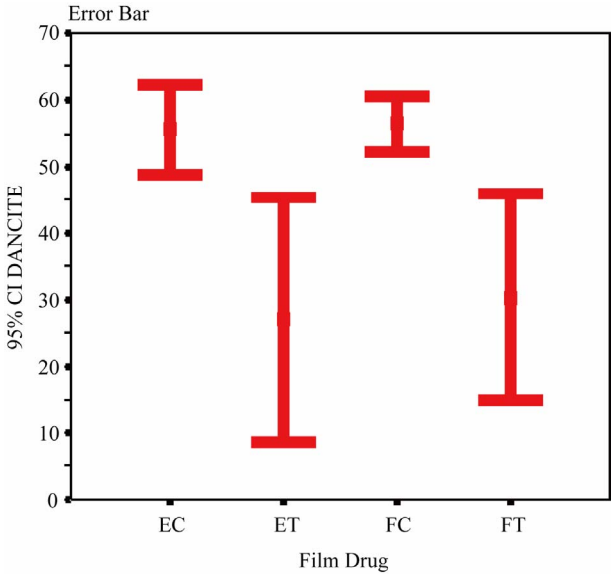


Figure 1. Error bar of densitometry changes during study period in both films and processing solutions.

not significantly influenced by speed of dental films, as reported by Farman T.T. *et al.* [11]. As we know density of dental films is more related to their optimal exposure factors rather than image processing time [12]. However Haiter study in comparing Insight and Ekta speed plus films for image quality found that Insight films were more sensitive to processing solutions depletion than Ekta speed plus [12]. On the other hand Insight films which were introduced at 2000 and several studies were performed for assessing its quality in compare with traditional Ekta speed plus films and reported that insight film that need to 30% lower radiation than Ekta speed plus films could replace its clinical usage [10].

Findings of our study confirmed that Champion solution usage for studies films. Similar with our findings, Zamani *et al.* compared Agpha panoramic and *Primex*

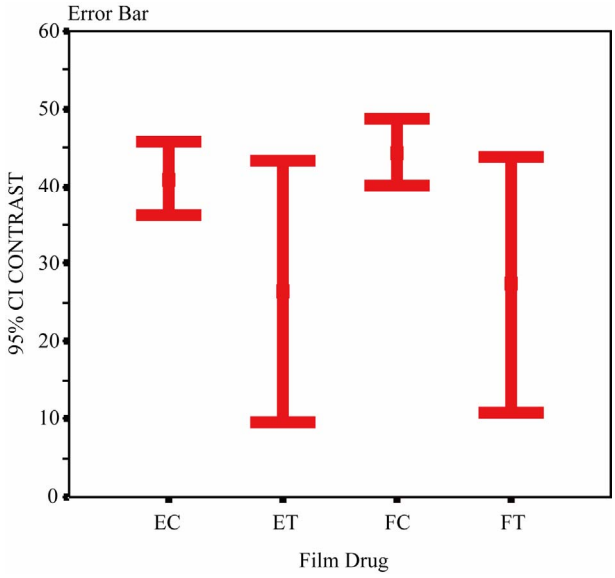


Figure 2. Error bar of film contrast changes during study period in both films and processing solutions

films with three processing solutions including Champion, Teifsaz and Darutasvir and found that Champion solution was best solution for dental film processing [11]. We did not recommended Teifsaz solution due to low densitometric stability.

5. CONCLUSIONS

Densitometric stability of new Insight film is as the same as currently used E^+ film and is better preserved with Champion chemicals than Teifsaz solutions.

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