Densitometric evaluation of E-speed film with three different developing solutions.

Mona Al Safi B.D.S., M.Sc. (1)
Ruqayya S. AL Qizweeny B.D.S., M.Sc. (2)
Jamal A. Abid Al–Rhida B.D.S., M.Sc. (3)

ABSTRACT

Background: In order to determine the influence of different solutions on the quality of the radiograph, the purpose of this study is to have a comparison between solutions to see the best one produce radiographs of highly diagnostic ability.

Material and method: An aluminum step wedge was radiograph with E-Speed periapical films of the films were developed in three different processing solutions at standardized conditions according to manufacture's instructions data concerning film density, contrast, fog and speed film. Each film solution combination was compiled in attempted to evaluate optimal film–solution combination.

Results: In present study better contrast and less film fog obtained with technique C solution, for film speed, higher speed values indicate lower exposure time to patient.

Conclusion: The rapid processing solution deteriorated faster and need less processing time than conventional solutions.

Keywords: Film-Speed, Contrast, Density.

INTRODUCTION

Rapid processing techniques for dental radio graphics have been an important adjunct in helping to resolve urgent diagnostic problems encountered in endodontic therapy and surgical energies (1,2,5). These techniques have reduced the time interval for developing and fixing of films from 13 minutes to 60 seconds. However some of question remains regarding the diagnostic quality of such films compared with that of conventionally processed films.

MATERIALS AND METHODS

Thirty periapical X-Ray films type E-Speed intra oral dental film and examined by the same operator in order to eliminate the possibility of existence of any variation in technique between different operators. Exposure was made using an Aluminum step wedge used for determination the quality of dental films with the three different processing solutions. The step-wedge with 1mm. X-ray machine type general electric 1000, the step-wedge with 1 mm difference in each step made of commercially pure Aluminum.

Exposure Factors were fixed at following: 65Kvp.10 mA, 1.5 second exposure time, 8 inches tube film distance 2.7 millimeters aluminium half value layer, and 2.5 millimeters aluminium filtration.

Manual processor was made with the following solution:

Processing solution A: Type read MSDA data distributed by DT&T. the 10 films were developed at 22°C for 15 sec., rinsed, and fixed at room temperature for four minutes.

Processing solution B: rapid Schell, replenished type AGFA, the 10 films were developed at 22°C for 15 seconds, rinsed, and fixed at room temperature for four minutes.

Processing solutions C: Rapid Kodak replenished. The 10 films were developed at 22°C for 15 sec., rinsed and fixed at room temperature for four minutes.

The films were mounted separately for each solution and examined by five dental radiologists in radiology department in college of dentistry at university of Baghdad, using viewer with magnifying lens X10. The reading was kept for each examiner and repeated after 2 weeks for calibration; only one examiner was excluded from the study because of wide range between the two readings.

RESULTS

The radiographs were ranked on a scale of one to three in ascending order of quality. Radiographies with the best diagnostic quality had an assigned weight of three and those with the least diagnostic quality had assigned weight of one.
The remaining position was assigned two between groups. The frequency of each rank was multiplied by assigned weight of that rank to produce a composite score. (Table 1).

So that statistically significant differences among the groups could be determined, a frequency distribution of each method was constructed and an analysis of variance performed. The magnitude of F value confirmed the existence of significant group differences (Table 2).

Although no significant differences was found between films processed by techniques A and B, there was significant differences between A and C, that final rank of diagnostic quality of the films processed by the C technique much better than B and A technique. (Table 3)

**DISCUSSION**

Processing of the same type of films in different processing solutions materials will produce radiographs of different quality (1) with regard to density, contrast, fog and speed, the higher contrast value and lower the fog the better quality of the radio graph. In present study better contrast obtained with technique C solution higher than those obtained with other solutions. Fog (2,11,14) maybe due to the base density or to the various chemical reaction that the solution undergoes during the developing process.

Contrast was defined as the difference in density between step-wedges of 5 and 10 mm aluminum. Greatest contrast obtained with technique C solutions, then with technique B and lower values obtained with technique A solutions. (4,6,11)

Film speed was defined by standards as reciprocal of the exposure to direct X- Ray or Gamma radiation that required to produce a net image density of 1.0 ( that is, a density greater by 1.0 than that of the unexposed film). Higher speed values indicate that the X-Ray examination can be carried out with a lower exposure to the patient, without determined to the quality of the image.

According to this study, speed values obtained with the technique C solutions were significantly higher than those obtained with other solutions evaluated (4,7,9,13,15).

<table>
<thead>
<tr>
<th>Technique</th>
<th>First (list)</th>
<th>Second</th>
<th>Third</th>
<th>Composite rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0</td>
<td>9</td>
<td>22</td>
<td>156</td>
</tr>
<tr>
<td>B</td>
<td>0</td>
<td>21</td>
<td>9</td>
<td>80</td>
</tr>
<tr>
<td>C</td>
<td>35</td>
<td>20</td>
<td>3</td>
<td>35</td>
</tr>
</tbody>
</table>

Table 2: Analysis of Variance

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Degrees of Freedom</th>
<th>Sum of Squares</th>
<th>Mean Squares</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between groups</td>
<td>4</td>
<td>276.34</td>
<td>69.09</td>
<td>159.45</td>
</tr>
<tr>
<td>Within groups</td>
<td>170</td>
<td>73.66</td>
<td>0.43</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>174</td>
<td>350.00</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Significant at 0.01 level of significance.

Table 3: Comparison of groups of radiographic films 30 films per groups processed with five techniques.

<table>
<thead>
<tr>
<th>Techniques</th>
<th>Mean speed</th>
<th>Standard deviation</th>
<th>T value</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4.11</td>
<td>1.00</td>
<td>29.19</td>
</tr>
<tr>
<td>B</td>
<td>4.46</td>
<td>1.00</td>
<td>24.00</td>
</tr>
<tr>
<td>C</td>
<td>4.46</td>
<td>0.84</td>
<td>1.91</td>
</tr>
</tbody>
</table>

**REFERENCES**