Evaluation of the accuracy of subtraction digital radiography for detecting vertical root fractures

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Abstract
The radiograph is the auxiliary method most common used for diagnosis of vertical root fractures (VRF). However, the diagnosis is still a challenge and other technologies must be tested. The present study was proposed with the aim to evaluate the accuracy of diagnosis of subtraction digital radiography (SDR) for detection of VRF. Four periapical digital radiographs of unirradicular teeth roots were made: (1) healthy root, (2) healthy root with gutta percha cone, (3) fracture root and (4) fracture root with gutta percha cone. The radiograph images were subtracted in three situations, using the program Regemy (v.0.2.43, São José dos Campos, Brazil). The images subtracted were analyzed by three evaluators that classified them as the presence and absence of fracture using a five points scale. The area under the ROC curve was 0.66 to 0.86. The SDR is a technique that must be used whenever is possible when there is VRF suspicion.

Key words: Subtraction technique, Diagnostic Imaging, teeth fracture

Introduction
The clinical and radiographic diagnosis of vertical root fracture (VRF) presents as a challenge for the dental surgeon. The subtraction digital radiography (SDR) is a technique that consists on the subtraction of structures that don’t change in two radiographic exams, with emphasis on those that suffered a change. The present study was proposed with the aim of evaluate the accuracy of the SDR technique for the VRF diagnosis.

Results and Discussion
The obtained images were gathered in three groups for the realization of the subtractions: Group 1: without filling /with and without VRF; Group 2: with filling /with and without VFR; Group 3: with and without filling / with and without VRF. The SDR images were evaluated by three examiners that classified them in relation to presence or absence of VRF.

Table 1: área under the ROC curve of the groups.

<table>
<thead>
<tr>
<th>Group</th>
<th>Area under the ROC curve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>0.86</td>
</tr>
<tr>
<td>Group 2</td>
<td>0.73</td>
</tr>
<tr>
<td>Group 3</td>
<td>0.66</td>
</tr>
</tbody>
</table>

The kappa indice intra and interexaminers was of 0.2 to 1 and 0 to 0.73, respectively.

Conclusions
The subtraction digital radiographic is a technique that shows good accuracy for diagnostic of vertical root fractures and must be used whenever is possible for investigation of those lesions.

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