Radiographic Signs associated with Damage to Inferior Alveolar Nerve: A Diagnostic Tool to Perform Coronectomy

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ABSTRACT

Radiographic signs in the OPG, that indicate a relationship between the lower third molar and the inferior alveolar canal, are considered a risk factor for nerve damage. These signs are darkening of root, deflection of root, narrowing of root, bifid root apex, diversion of canal, narrowing of canal, interruption of white line of canal.

The present study assesses the radiographic signs that indicate a relationship between the lower third molar and the inferior alveolar canal and application of these diagnostic tools for efficacy of coronectomy (intentional root retention) over the conventional technique of third molar removal in avoiding injury to the IAN.

Eighty patients with radiographic features suggestive of close proximity of IAN to the roots were selected and were randomly divided into two equal groups. Group I patients underwent coronectomies and group II patients underwent removal of the lower third molars by conventional technique. Postoperative neurological assessment was carried out at regular intervals on day 1, 10th day, 1 and 3 months.

In group I, none of the patients had evidence of inferior alveolar nerve injury, whereas, there was altered labial sensation in eight patients in group II.

Keywords: Panoramic radiograph, IOPA, Coronectomy, Inferior alveolar nerve.

INTRODUCTION

Proximity of the root apices of the third molars to the inferior alveolar nerve (IAN) can lead to complication when radiographic signs are present. This proximity can assess using panoramic radiographs.

The reported incidence of inferior alveolar nerve injury, in the postoperative period, is between 1 and 5%. Although the incidence of permanent damage postoperatively is below 1% between 0.36 and 0.9%.

Various radiographic techniques and markers are available to predict the intimacy of the IAN with the root apices of the third molar, but these markers have variable accuracy as well as the incidence of nerve involvement, which rises from 1% to 1.7 that can go up to 12%, when increased risk factors are shown on a radiograph. So coronectomy is proposed as a technique of choice in cases, where there is possibility of nerve damage with removal of third molars.

MATERIALS AND METHODS

The present study was carried out in the Department of Oral and Maxillofacial Surgery of DMIMS from May 2004 to May 2006.

<table>
<thead>
<tr>
<th>Teeth</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Darkening of the root</td>
<td>28</td>
</tr>
<tr>
<td>Deflected root</td>
<td>16</td>
</tr>
<tr>
<td>Interruption of the white line</td>
<td>14</td>
</tr>
<tr>
<td>Narrowing of IAN</td>
<td>14</td>
</tr>
<tr>
<td>Diversion of the IAN</td>
<td>08</td>
</tr>
<tr>
<td>Dark and bifid root</td>
<td>00</td>
</tr>
<tr>
<td>Narrowing of the root</td>
<td>00</td>
</tr>
<tr>
<td>Total sign appearance</td>
<td>80</td>
</tr>
</tbody>
</table>

Eighth patients having one of the seven radiographic signs, given by JP Rood, which suggest close approximation between the root apices of the third molar tooth, were included in the present study (Table 1).

The cases showing active infection were excluded. Patients divided into two groups: Group I (40) coronectomy, group II (40) conventional technique. Procedures were conducted under local anesthesia. Panoramic radiographs were taken...
and the tip of the root apex as seen in earlier studies.\textsuperscript{9,10,13} There
migration of root fragment is very unpredictable and is seen as
patients, hence, a CT scan/dentascan seems to be a better tool.

- The altered labial sensation was noted postoperatively in eight
patients with the neurovascular bundle intraoperatively, but
that of the root apices of the tooth.\textsuperscript{15} In group II, in seven patients
were found with the neurovascular bundle intraoperatively, but
the presence of any of the three signs can be a potential threat to damaging the
IAN. Hence, panoramic radiograph is a handy tool for planning
intentional root retention.

DISCUSSION
Coronectomy proved to be a superior technique over the
conventional technique in preventing the damage to the inferior
alveolar nerve in almost all of the studies.\textsuperscript{9,10,13,14} This technique
has been studied intermittently in the past but only been
highlighted and detailed recently in the literature.\textsuperscript{9,10,15,14} We
have tried to compare this technique with the conventional
method of third molar removal especially in cases, where
radiographic signs are present. Though, use of panoramic
radiograph has been a debate, but it is the most convenient tool
available for preoperative assessment.\textsuperscript{2,14} Various studies have
shown inconsistent intraoperative and postoperative results
when treatment is planned by assessing relationship of the root
apices, with the inferior alveolar nerve, using panoramic
radiograph.\textsuperscript{1,3}

Computed tomography has been shown to have more
predictive value in assessing the proximity of the nerve with
that of the root apices of the tooth.\textsuperscript{15} In group II, in seven patients
were found with the neurovascular bundle intraoperatively, but
the altered labial sensation was noted postoperatively in eight
patients, hence, a CT scan/dentascan seems to be a better tool.
Migration of root fragment is very unpredictable and is seen as
a radiopaque band between the upper cortex of the IAN canal
and the tip of the root apex as seen in earlier studies.\textsuperscript{9,10,13} There
is also a report of an unusual complication of migration of
inferior alveolar canal along with the retained root fragment
17, which was not seen postoperatively even at the end of
3 years.

RESULTS
Eighty patients, having mean age of 33 years were included in
the present study. In group I, there was no altered sensation
noted postoperatively.

At the end of 1 year, radiograph showed evidence of bone
formation over the retained root fragment. Migration of the
retained root fragments by 1.5 to 3 mm superior to the inferior
alveolar canal was seen in 12 cases on the panoramic radiograph,
taken 1 to 3 years postoperatively.

In group II, eight patients had altered labial sensation four
patients had paresthesia, postoperatively and only one patient
had it at the end of 1 year (Table 2). Interruption of the white
line was found to be associated with postoperative altered labial
sensation in four cases whereas, darkness of the roots and
deflection of the canal was found to be associated in two cases
each.

With the use of conventional technique, the incidence of
neurological deficit ranges from 0.6 to 5.3\%. Though this is
usually a transient deficit but, about 1% cases can have this
permanently. In the present series, eight such patients from group
II had transient altered labial sensation of which, only one had
it at the end of 1 year.\textsuperscript{4,5}

The radiographic sign, most consistently found associated
with nerve involvement, was interruption of the white line, four
cases and the other two signs associated with nerve involvement
were darkening of the root and deflection of the canal in two
cases each, according to Blaeser et al,\textsuperscript{16} darkening of the root,
interruption in the white line of the canal and the diversion of
the canal were all statistically related with nerve damage. So,
in our study, all these signs are positive that is, interruption in
the white line of the canal is 10\% and darkening of the root and
diversion of the canal is 5\%, while according to Sedaghatfar
et al,\textsuperscript{17} observed four radiographic signs (darkening and
narrowing of the root, and interruption in the white line and
diversion of the canal) are statistically associated with nerve
exposure during LTM extraction and, therefore, carrying an
increased risk of nerve damage, but in our study, narrowing of
the root was not seen, whereas, the other four radiographic signs
were not at all found to be associated with the nerve damage.\textsuperscript{2}

CONCLUSION
It is always safe to plan the treatment of third molar removal
using a preoperative panoramic radiograph, as the presence of
any of the three signs can be a potential threat to damaging the
IAN. Hence, panoramic radiograph is a handy tool for planning
intentional root retention.

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and lingual nerve disturbances after dentoalveolar surgery, and
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Table 2: Nerve deficit associated with the radiographic sign after removal of third molar

<table>
<thead>
<tr>
<th></th>
<th>1st day N = 8</th>
<th>1 month N = 8</th>
<th>3 months N = 5</th>
<th>6 months N = 2</th>
<th>1 year N = 1</th>
<th>χ²-value = 8.06, significant, p &lt; 0.05</th>
</tr>
</thead>
<tbody>
<tr>
<td>Darkening of root</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Interruption of white line</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diversion of the IAN</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>