

# A revision of the adult intraoral radiograph protocol for ABO clinical examinations

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**A**s the American Board of Orthodontics (ABO) strives to increase objectivity in certification and recertification examinations, it has developed new testing instruments and established a standard protocol of examiner calibration. Although the board has historically required the highest quality of diagnostic records, its intent to effectively evaluate the pretreatment and posttreatment periodontal status of adults (21 years or older) has necessitated revision of the intraoral radiographic requirements for case displays.

It was documented that at least 1 region of 2 mm or more of attachment loss is noted in 50% of untreated 18- and 19-year-old subjects. This frequency increases to 87% in patients between the ages of 45 and 49 years.<sup>1</sup> At least 3 independent studies showed radiographic bone losses in 79.95%, 64.0%, and 68.77% of adult subjects.<sup>2-4</sup> It is therefore incumbent on the orthodontist to provide accurate assessment of the adult patient's pretreatment periodontal susceptibility and possible attachment loss during active therapy. Although clinical indicators such as mobility and bleeding indexes can be used to assess periodontal susceptibility, radiographic evaluation is an integral component of pretreatment status as well as changes in crestal bone levels coincident with treatment.

## Literature review

A review of the radiology literature shows that there is no gold standard for the type of radiographic survey used for patient assessment.<sup>5</sup> Studies using experienced clinicians' comparative reviews of panoramic, periapical, and

bitewing radiographs of large numbers of randomized patients are often used to compare the reliability and validity of intraoral radiograph film diagnoses.

In a 300-subject assessment conducted by 2 independent reviewers, 30% of the patients required only a panoramic radiograph for accurate radiographic diagnosis. The remaining 70% required 2 periapical radiographs to show all pathology.<sup>6</sup> Accurate diagnosis from a panoramic radiograph alone decreases in the premolar region due to orthogonality.<sup>7</sup> Anatomic details of crestal bone, small carious lesions, and widened periodontal ligament space are not discernable on routine panoramic radiographs. Disproportionate distortion and magnification are also common in panoramic radiographs, as well as overlap of adjacent teeth, vertebrae, and distant structures of the skull that can obscure details necessary to document pretreatment and posttreatment dentoalveolar changes.<sup>8</sup> Hence, diagnosis of dental disease requires periapical and bitewing radiographs to supplement the panoramic radiograph.<sup>9-11</sup>

Combinations of the panoramic film and bitewing radiographs were most accurate in showing horizontal crestal bone losses. Additionally, bitewing radiographs were more effective at these determinations than panoramic film or periapical radiograph alone. The panoramic and bitewing series was found to best show vertical crestal bone defects. Periapical and bitewing radiographs were also most effective in showing furcation involvement. Periapical radiographs were twice as effective at discerning periodontal ligament changes, and these differences were statistically significant.<sup>5</sup>

A comparison of conventional intraoral films and digital intraoral radiographs demonstrated that alveolar bone measurements are reproducible in either imaging modality. Hence, either system or both systems can be used to accurately evaluate crestal bone levels.<sup>12</sup>

Cone-beam computed tomography (CBCT) is also rapidly emerging as an appropriate imaging modality for assessment of crestal bone levels and might ultimately replace conventional periapical and bitewing radiographs in routine diagnosis of orthodontic pa-

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tients. In a recent investigation comparing artificially created crestal defects on mandibles of dry skulls, CBCT and conventional periapical films were equally accurate in showing the size and presence of interproximal osseous craters.<sup>13</sup> However, CBCT was found to be superior to conventional periapical films in documenting buccal and lingual defects because of its unique 3-dimensional capability. This study also emphasized the value of regional intraoral radiography in the diagnosis of attachment loss.<sup>13</sup>

The current consensus of dental radiologists is that although there is no 1 radiographic prescription that provides adequate intraoral assessment of adult patients, radiographic evaluation is most effectively conducted by a combination of panoramic and bitewing radiographs, or bitewing and periapical radiographs.<sup>14</sup> The paralleling extension cone technique is considered the most accurate.<sup>15,16</sup> In assessments of crestal bone levels on panoramic and intraoral radiographs, it is clear that panoramic radiographs should be supplemented by intraoral radiographs.<sup>17</sup> The panoramic film alone is inadequate for diagnosis or assessment of posttreatment attachment changes.

#### Revised radiographic requirements

On the basis of an evidence-based approach to policy development, the ABO's revised options for required intraoral radiographs for comparison of pretreatment and posttreatment results in adult patients are as follows.

1. Panoramic and intraoral radiographs including maxillary and mandibular periapical radiographs disclosing the root apices and the surrounding crestal bone of the central and lateral incisors, and bitewing radiographs of the posterior teeth showing crestal bone levels. Vertical bitewings are optimal.<sup>18</sup>

OR

2. Full-mouth periapical radiographs including bitewing films. The board encourages periapical films when panoramic radiography suggests root proximity before and after active therapy.

The revised requirement will be in effect for all records presented for the Clinical Examination beginning in February 2009. If diagnostic records produced for case displays before this announcement do not include bitewing and periapical films, suspected changes in crestal bone height and root proximity must be noted in the written case report. Documentation of the examinee's clinical findings that might be correlated to the radiographic changes (bleeding indexes, pocket depth, definition of crestal bone, furcation involvement) or a periodontal specialty report is then recommended.

The revised radiographic protocol is another effort of the ABO to enhance the orthodontist's level of treatment quality. As future advances in dental radiography evolve, the board's requirements for thorough and first-quality records will also change to continually elevate the level of care for the public we serve.

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