An Aiming Device for an Extraoral Radiographic Technique

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Abstract

To assist certain patient populations who are unable to tolerate intraoral films and/or sensors during endodontic therapy, an alternative technique (extraoral film placement) has been innovated by Newman and Friedman (2003). In this study, we devise and test a film/sensor-beam alignment aiming device for taking a periapical radiograph using this extraoral radiographic technique. An instrument is assembled from the following components: (1) two locator rings for bite-wing radiography, (2) two metal supporting indicator rods for bite-wing radiography, (3) a bite block for horizontal bite-wing radiography, and (4) a rubber tube of about 2 cm in length. Using our newly-devised aiming device to take periapical radiographs using the extraoral technique, appropriate images of the left upper and right lower molar areas for a series of 12 adult volunteers were successfully obtained. Angulation of the x-ray cone, with reference to the horizontal plane, was −20° to −30° and −10° to −15° for the upper and lower teeth, respectively. This study therefore shows that appropriate images can be easily obtained using this aiming device. *(J Endod 2007;33:758–760)*

Key Words

Aiming device, extraoral radiographic technique, periapical radiograph

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Newman and Friedman (1), in this journal, have recently proposed an effective approach for obtaining periapical radiographs, an extraoral radiographic technique, which can be used in the treatment of a wide spectrum of patients, such as those with a developmentally disabled, exaggerated gag reflex, those of a young age, and patients with dental phobia. Although this technique is not intended to be a substitute for conventional intraoral radiography, it is a helpful supplement to our clinical practice (1). Newman and Friedman have reported that patients tolerate the procedure well, preferring this extraoral technique to conventional intraoral radiography.

In this article, we describe the design and testing of a simple and efficient film/sensor-beam alignment aiming device to facilitate the implementation of this extraoral radiographic technique for taking a periapical radiograph.

Materials

Components of the Aiming Device

The aiming device consists of the following components (Fig 1)*:

1. Two locator rings for bite-wing radiography (Dentsply, York, PA)
2. Two straight metal supporting indicator rods for bite-wing radiography
3. A bite block for horizontal bite-wing radiography
4. A rubber tube of approximately 2 cm in length

*Components 1 to 3 are available in most dental clinics as the Rinn film packet holder for bite-wing radiography (Dentsply, York, PA); the rubber tube is available in orthodontic clinics.

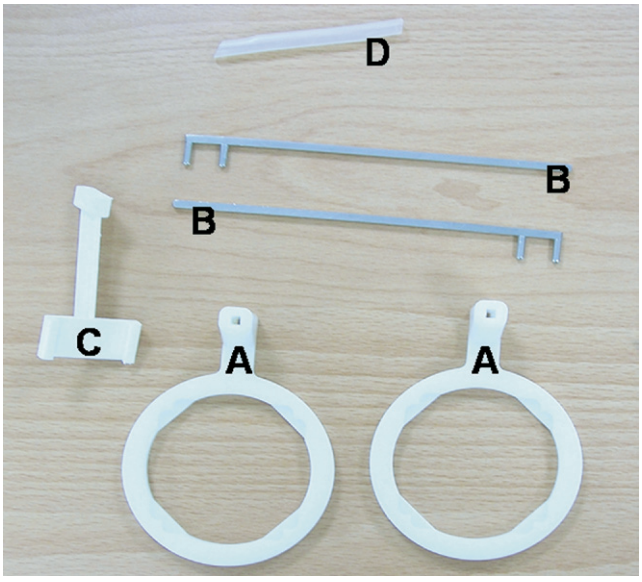

Figure 1. The four components (A, locator rings for bite-wing radiography; B, straight metal supporting indicator rods for bite-wing radiography; C, bite block for horizontal bite-wing radiography; and D, rubber tube) of the aiming device.

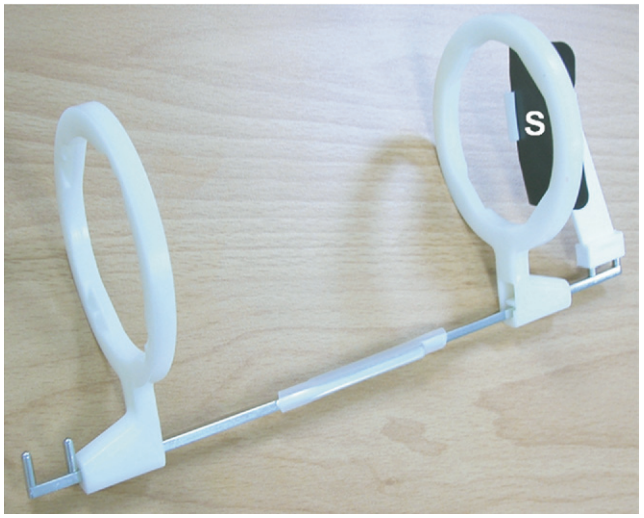

Figure 2. The finished aiming device with placement of the sensor. Note that the exposing surface (S) of the sensor should be oriented in the direction of the X-ray cone.

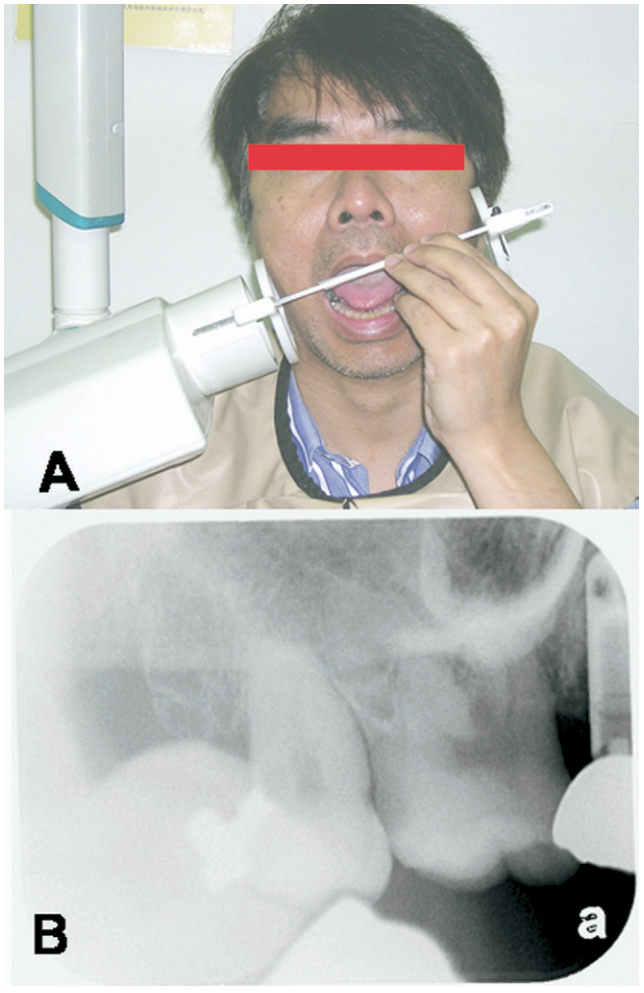

Figure 3. A representative demonstration of taking a radiograph of the left upper third molar area using the extraoral radiographic technique and employing the aiming device (A). The image acquired is shown in B; the left upper second and third molars are indicated. Note that an implant is placed at the original left upper first molar position. (The radiopaque small letter "a" is equivalent to the dot mark on conventional film).

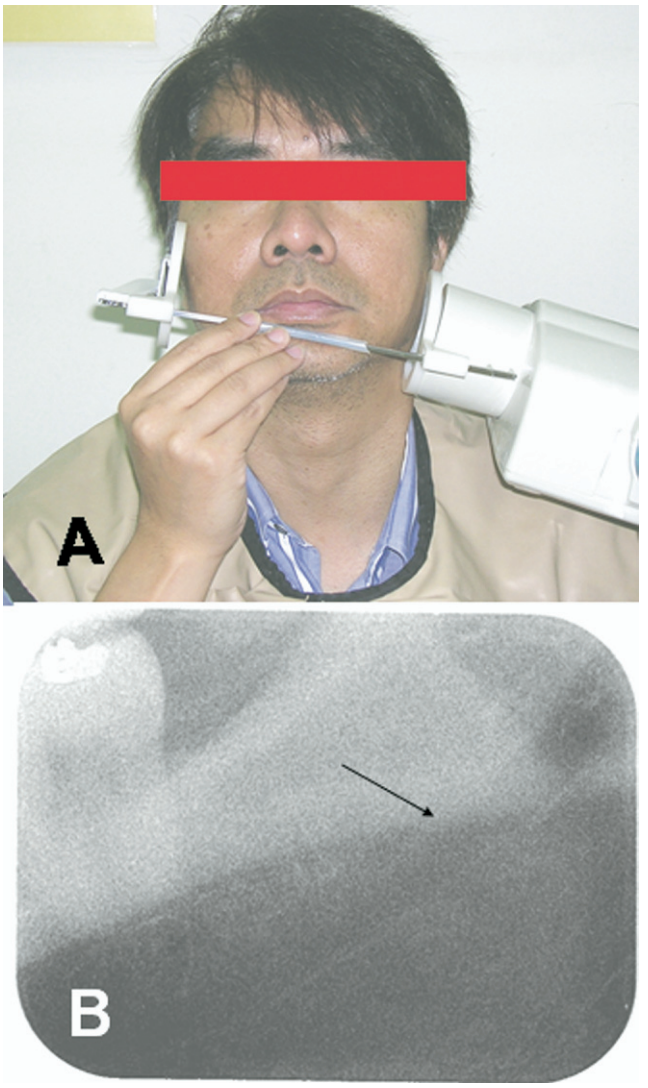

Figure 4. (A) Taking an image of the right lower third molar area using the extraoral radiographic technique under the guidance of the aiming device; (B) the resultant image shows the right lower second molar. No third molar is noted, but the alveolar canal can be seen (arrow).

Procedure for Assembling the Aiming Device

The two straight supporting metal indicator rods are inserted into two locator rings (one at each end). At one end of the indicator rods, the bite block is attached and the film/PSP sensor is placed firmly into the slot of the bite block. Note that the exposing surface of the sensor must be oriented in the direction of the x-ray cone. Finally, the two indicator rods (with one locator ring each) are connected together using the rubber tube. The finished instrument assembly for use in the extraoral radiographic technique is shown in Figure 2. The distance between the two locator rings can be adjusted using the linking tube to take into account the facial width of the patient.

Methods and Results

Using our newly devised aiming device to take radiographs using the extraoral technique suggested by Newman and Friedman (1), images of the left upper and right lower molar areas for a series of 12 adult volunteers (6 men and 6 women, aged between 26 and 65 years) were acquired. All subjects gave informed consent after the nature of the

procedure, and possible discomforts and risks had been fully explained. This work received human-subjects approval.

The volunteers were instructed to hold the device firmly with their hand when the proper angulation (−20° to −30°) for upper teeth; −10° to −15° for lower teeth) with reference to the horizontal plane had been determined by the radiographic technicians/dentists. The x-ray cone was then placed in a position adjacent to that locator ring without insertion of the sensor (Fig. 3A and Fig. 4A).

All images were obtained by using the A/T Scan X digital system (Air Technique Inc., Hicksville, NY) and standard intraoral sensors (30 × 40 mm). A Siemens 7 mA 60 KV DC X-ray source (Munich, Germany) was used at 60 kVP, 7 mA, 0.5 seconds (lower teeth), and 1.0 second (upper teeth) exposure. Representative images are shown in Figures 3B and 4B.

Discussion

The extraoral radiographic technique suggested by Newman and Friedman (1) is not intended as a substitute for conventional intraoral radiography. Nonetheless, it is a useful alternative technique and has proved to be an effective approach for those patients who are unable to tolerate the conventional technique, appropriate images having been successfully acquired. Nevertheless, during our clinical practice, we had encountered difficulty in avoiding the cone cut artifact of the resultant images, attributed to incorrect positioning of the x-ray cone. This may be because of the fact that there is a rather long distance between the film/sensor and the x-ray cone, which may cause a problem in aiming the x-ray cone correctly toward the film/sensor.

Because of the necessity of facilitating the positioning of the x-ray cone during the implementation of the extraoral radiographic technique, a film/PSP sensor-beam alignment aiming device has consequently been designed for use in our department. Using our aiming device, the possible drawback of cone cut can be avoided because the x-ray beam can be aimed directly at the sensor under the guidance of the locator ring. The instrument assembly presented in this article has the further advantages of being inexpensive and easily assembled because all of the components are available in most dental clinics.

The angulation of the x-ray cone used in our volunteer series is less than that indicated in the article by Newman and Friedman (1); this may be because of racial differences because the facial height of the Taiwanese is usually less than that of whites.

As early as 1974, an extraoral radiographic technique for obtaining images of third molars using occlusal film was proposed by Fisher (2), but the drawback of the requisite high kVP (as high as 90 kVP) had limited its daily clinical application. In this study, it has been found that, using a digital imaging system (60 kVP is appropriate) together with the newly developed aiming device, an image of third molar teeth can be obtained relatively easily compared with the conventional intraoral procedure.

In conclusion, there is a possible deficiency with this technique in that patients are instructed to "hold the device firmly." Nevertheless, a simple and inexpensive film/PSP sensor-beam alignment aiming device has been successfully developed for taking periapical radiographs using the extraoral radiographic technique, and, using this instrument assembly, appropriate images have been easily acquired for a series of volunteers.

Acknowledgments

Chia-Hui Chen, Shui-Hui Lin, and Hui-Lin Chiu contributed equally to this article. †Drs. Yuk-Kwan Chen and Li-Min Lin are both corresponding authors.

References

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