Maxillary molar distalization with the Indirect Palatal Miniscrew for Anchorage and Distalization Appliance (iPANDA)

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Aim: Distalization of the maxillary molars is an important treatment option for the correction of Class II malocclusions. The purposes of this study were to introduce the clinical application of the indirect Palatal miniscrew Anchorage and Distalization Appliance (iPanda) and to describe the dental and skeletal effects obtained with this innovative appliance. Methods: Pretreatment (TO), post-distalization (T1), and posttreatment (T2) lateral cephalometric radiographs and dental casts of 20 consecutively treated adult patients (mean age 23.2 ± 4.7 years) with Class II molar relationship were analyzed. All patients were treated with the iPanda for maxillary molar distalization. The iPanda was anchored on a pair of midpalatal miniscrew implants to deliver the distalizing force to the maxillary first molars. The iPanda was the only appliance used during the distalization phase of treatment. A paired t test analysis was used to statistically assess the effects of treatment. Results: A Class I molar relationship was obtained in a mean period of 3.2 ± 0.6 months. Cephalometric analysis demonstrated that the maxillary first molars were significantly distalized by an average 4.5 ± 1.5 mm (P < .001) and were intruded by a mean of 1.0 mm ± 0.8 mm (P < .05). No significant change in the inclination of the first molars was observed. No significant change in the mandibular plane was observed. Dental model analysis demonstrated an asymmetric pattern of distalization between right (4.5 ± 2.2 mm) and left (3.1 ± 2.1 mm) first molars. The transverse width of the dental arch was maintained. No significant rotation of the first molars was observed. Conclusions: This study demonstrated that the innovative iPanda is effective to bodily distalize the maxillary molars into a Class I molar relationship and to provide maximum anchorage.

Key words: Miniscrew implants, Molar distalization, appliances

Distalization of the maxillary molars is an important treatment option for the correction of Class II malocclusions. Conventional approaches to distalize the maxillary molars include the use of extra- or intraoral devices. However, the esthetic and social concerns of headgear wear for molar distalization and the control of anchorage loss with the use of intraoral molar mechanics has stimulated several investigators to evaluate the possibility of using miniscrew implants as anchorage devices.
Miniscrew implants with reduced sizes allow their insertion in the interradicular bone between the roots of adjacent teeth, thus allowing the application of relatively simple orthodontic force systems. However, the midpalatal suture site should be considered as a safe and viable alternative for miniscrew placement if the availability of interradicular bone between the roots is insufficient to allow safe miniscrew placement. Moreover, miniscrews inserted into the interradicular bone present disadvantages in performing distalization as they may interfere with the dental movement.

The midpalatal suture site is composed of dense cortical bone and has been recommended as the best anchorage site in the maxilla. Moreover, because additional height is provided by the nasal crest, the midsagittal area of the palate is regarded as a safe location for miniscrew implants. However, miniscrew implants placed in the midpalate require additional accessories, such as transpalatal bars or extension arms to allow their use. In addition, there is a paucity of devices designed to allow the application of midpalatal miniscrews in the distalization of the maxillary molars.

Several authors have described the use of conventional non-compliance intraoral distalizing devices, such as the Distal Jet or Pendulum appliances, anchored to miniscrews inserted at locations paramedian to the palatal suture, to distalize the maxillary molars. Although these appliances can produce significant amounts of distal movement, they are difficult to fabricate and the use of the palatal acrylic button generates problems with maintaining proper oral hygiene. Moreover, it has been demonstrated that these paramedian miniscrews do not offer stationary anchorage during molar distalization.

To overcome such difficulties, the authors have developed a simplified and innovative distalization appliance that allows the effective use of midpalatal miniscrew implants, the indirect Palatal miniscrew Anchorage and Distalization Appliance (iPanda). The iPanda is easily connected to and removed from the midpalatal miniscrews and allows either maximum anchorage or distalization of the maxillary molars, or both in succession.

Therefore, the purposes of this study are to introduce the clinical application of the iPanda and to describe the dental and skeletal effects obtained with this innovative appliance.

MATERIALS AND METHODS

Twenty consecutively admitted adult patients diagnosed with dental Class II malocclusions who had undergone previous orthodontic treatment with four-premolar extractions were selected for this study. There were 12 female and 8 male patients. The mean age at the start of treatment was 23.2 years (range from 16.6 to 35.3 years) (Table 1). Initial records showed molar Class II relationship and large overjet. Extraction of the maxillary second molars combined with the distalization of the first molars with the iPanda was the main treatment option to restore a Class I molar relationship and reduce the large overjet.

iPanda fabrication

A custom-made iPanda was fabricated on the dental cast for each patient (Fig 1a). A 0.9 mm round stainless steel archwire (Dentaurum, Ispringen, Germany) was bent with a Young pliers instrument to produce a 2 mm wide and 10 mm long teardrop loop (Fig 1d). The bent teardrop loop, in this appliance, was used to produce a custom-made self-locking system between the heads of two midpalatal miniscrews and the iPanda appliance (Fig 2). This self-locking system allows easy and quick connection to and removal from the midpalatal miniscrews, without the need of any additional accessories, such as
Maxillary molar distalization with the iPANDA appliance

**Table 1  Patient characteristics and distal tooth movement**

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<tr>
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*Measurements performed on the dental cast (T0-T1)

Fig 1  Details of an iPanda. (a) The iPanda is fabricated for each patient on the dental cast. (b and c) Extension arms connect the first molars with single round molar tubes. (d) Palatal bar with a long tear drop loop to allow connection to the miniscrew heads.
ligatures or composite materials to stabilize the appliance. This innovative self-locking system also eliminates the need for acrylic buttons in the palate, thus facilitating the patient’s oral hygiene. Another advantage of this self-locking system is the possibility of maintaining a minimum clearance space between the palatal archwire and the palatal mucosa, thus avoiding risks of palatal bar impingement on the palate.

Additional loops were incorporated bilaterally at the extended arms to allow connection to the light wire single round tubes with hooks (Tomy International Inc, Tokyo, Japan) that were bonded on the lingual side of the maxillary first molars (Figs 1b and 1c). The distalizing force was delivered through the 100-cN nickel titanium Sentalloy closed coil springs (GAC International, Bohemia, NY), which were inserted bilaterally. The high springiness effect obtained from the long arms of the iPanda appliance, combined with the nickel titanium closed coil springs, allows light and continuous distalizing forces to be delivered bilaterally to the maxillary molars (Fig 3). Since the iPanda is firmly stabilized on the pair of midpalatal miniscrew implants, it allows the use of asymmetric molar distalizing forces without compromising the anchorage (Fig 4).

If simultaneous distalization of both first and second molars is planned, distalizing forces of 200- to 300-cN nickel titanium closed coil springs can be inserted bilaterally.
Maxillary molar distalization with the iPANDA appliance

Treatment progress
A pair of self-drilling, conical-type, titanium miniscrew implants (Dual Top Anchor system, Jeil Medical Co, Seoul, Korea) of 1.6 mm diameter and 6 mm length was inserted in the midpalatal suture of each of the patients following the protocol described by Suzuki and Suzuki.\textsuperscript{26} An average distance of 10 mm between miniscrew implants was maintained in order to provide a stable skeletal anchorage to the iPanda. The custom-made iPanda was connected to the midpalatal miniscrews with the teardrop loop. Then, the single round tubes were bonded bilaterally on the lingual surface of the maxillary first molars with 4-META/MMA-TBB resin cement (Superbond C&B, Sun Medical, Kyoto, Japan). Distalizing force was applied bilaterally on the first maxillary molars. The appliances’ coil spring systems were activated to a distalization force of 100 cN. Regular follow-up visits were conducted to re-activate the iPanda.

After the maxillary molar distalization had been completed, the iPanda was maintained in position to serve as an indirect anchorage device to maintain the molars in position while performing the distalization of the remaining teeth (premolars, canines and the anterior incisors).

Cephalometric analysis
Lateral cephalometric radiographs, made before treatment (T0), post-distalization (T1) and at the end of the treatment (T2), were used to evaluate the effects of treatment with the iPanda, and to assess whether the palatal miniscrews remained stationary during the treatment. Fifteen anatomic landmarks were recorded to allow the measurement (Fig 5). All tracings were performed by a single experienced investigator (BS). A custom-made computerized cephalometric digitizer (Smart’n Ceph v 8.1 digitizer software, Y&B Products, Chiang Mai, Thailand) was used to perform the measurements.

Error of the method
The errors associated with the method were computed using all lateral radiographs in order to examine measurement reliability. Each film was measured and digitized twice, with a three-week interval between the two repetitions. Analysis of the mean differences between duplicate measurements were analyzed using a paired t test to show the systematic errors ($P < 0.05$).\textsuperscript{31} Differences between the measurements were 0.8 mm $\pm$ 0.4 mm (mean $\pm$ SD) for the linear, and 1.8$^\circ$ $\pm$ 0.5$^\circ$ for the angular measurements, and were not statistically significant.
Dental cast analysis

The dental cast analysis was performed using the midpalatal miniscrew implants as a stationary reference. Dental casts made at T0, T1 and T2 were photographed as digital images at fixed magnification with a resolution of 600 DPI and then transferred to a computer. Each measurement was made on the computer display monitor with custom-made software, Smart’n Align V 1.0 software (Y&B Products, Chiang Mai, Thailand). A coordinate system (x, y) was constructed using the midpalatal miniscrews as reference landmarks, with the y-axis running through the centers of the miniscrews, and the x-axis running through the anterior miniscrew. Angular and linear measurements were as follows (Fig 6).
Angular and Linear Measurements

- $\alpha$ and $\beta$: The angle formed between the constructed line passing through the mesial and distal contact points of the first molars and the reference y-axis ($\alpha$ and $\beta$) was calculated in order to identify any rotational changes that may occur in the maxillary first molars during the distalization.
- AL: The arch length (AL) was defined as the distance between a tangent to the incisal edges of the maxillary incisors and the x-axis. The AL measurement allows the quantification of the retraction of the anterior incisors.
- U6Rw: The distance between the mesiolingual cusp tip of the right first maxillary molar and the y-axis.
- U6Lw: The distance between the mesiolingual cusp tip of the left first maxillary molar and the y-axis.
- Assessment of pre- and posttreatment U6Rw and U6Lw measurement allows the identification of possible changes in the arch width on the right and left maxillary arches, respectively.
- MU6R: The distance between the mesial contact point of the right first maxillary molar and the x-axis.
- MU6L: The distance between the mesial contact point of the left first maxillary molar and the x-axis.

Assessment of pre- and posttreatment MU6R and MU6L values allows the calculation of the amount of distalization of the right and left molars, respectively.

Statistical analysis

The statistical analyses were performed using the SPSS program (SPSS Inc, Chicago, Ill., USA) on a personal computer. The mean and the standard deviation of the measurements were calculated. A paired t-test analysis was used to assess the significance of the amount of two-dimensional displacement demonstrated by the T0-T1 and T1-T2 values. Significance level was established at .05.

RESULTS

Molar distalization (T1-T0)

No problems or complications, such as appliance dislodgement or breakage, were observed with the iPanda during the bilateral maxillary molars distalization. No patient discomfort was observed during the distalization period. All miniscrew implants were stable at the end of the maxillary molar distalization. Cephalometric measurements indicated that the midpalatal miniscrews remained stationary during distalization (Table 2).

Cephalometric analysis of the movement during the distalization period (T1-T0) demonstrated that the maxillary first molars were distalized by a mean of $4.5 \pm 1.5$ mm ($P < .001$) into a Class I molar relationship. An average of $3.2 \pm 0.6$ months was necessary to distalize the maxillary molars to a Class I relationship (Table 1). Therefore, the approximate distalization rate was $1.4$ mm/month. No significant change in the inclination of the first molars (U6-FH) was observed. In the distalization process, the first molars were intruded by a mean of $1.0$ mm $\pm 0.8$ mm ($P < .01$). No significant change in the position of the upper incisors (U1-FH) was observed. No significant change in the mandibular plane was observed (Table 2).

Dental cast analysis (T1-T0) demonstrated an asymmetric pattern of distalization between right and left first molars. The right maxillary first molars were distalized an average of $3.7 \pm 2.4$ mm ($P < .001$), while the left maxillary first molars were distalized an average $5.2 \pm 4.9$ mm ($P < .01$) into a Class I molar relationship.
relationship. The transverse width of the dental arch was increased by an average of $0.5 \pm 2.3 \text{mm}$ and $1.6 \pm 2.7 \text{mm}$ ($P < .01$), for the right and left segments, respectively. There was no significant distal rotation of the first molars during the distalization process (Table 2).

### Treatment effects following molar distalization (T2-T1)
Following the maxillary molar distalization, the iPanda was maintained in position throughout the orthodontic treatment period (T2-T1) to serve as an indirect anchorage device to maintain the molars in position while performing the distalization of the remaining teeth. Cephalometric measurements indicated that the midpalatal miniscrews remained stationary throughout the orthodontic treatment (Table 3).

Cephalometric analysis of the treatment effects with the iPanda following the molar distalization (T2-T1) are shown in Table 3. No significant difference in the position of the maxillary first molar between T1 and T2 was observed. In the contraction of the anterior segment, the incisors were retracted by a mean of $6.1 \pm 6.5 \text{mm}$ ($P < .05$). The maxillary incisors significantly inclined palatally by a mean of $12.9 \pm 11.1^\circ$ ($P < .05$). An average period of 8.7 ± 3.6 months was necessary to perform the contraction of the anterior segment. The overall treatment (T0-T1) effects of the iPanda are summarized in Fig 7.
Maxillary molar distalization with the iPANDA appliance

Dental cast analysis (T2-T1) demonstrated that the transverse width of the dental arch was reduced by an average of $2.3 \pm 1.9$ mm and $2.5 \pm 2.1$ mm ($P < .05$) during the contraction phase. The maxillary incisors were retracted by an average of $6.8 \pm 7.0$ mm ($P < .05$) (Table 3).

![Diagram of the dental changes following the use of the iPanda.](image)

**Table 3** Changes in cephalometric measurements from post-distalization (T1) and posttreatment (T2)

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<th>Posttreatment (T2)</th>
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<th>Significance</th>
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NS, Non-significant; *$P < .05$; **$P < .01$; ***$P < .001$
DISCUSSION

In this study, the authors introduce an innovative non-compliance iPanda to perform the maxillary molar distalization in Class II malocclusions and describe the dental and skeletal effects obtained with this appliance.

Molar distalization (T1-T0)

Cephalometric analysis of the distalization process (T0-T1) demonstrated that a significant amount of maxillary molar distalization (4.5 mm) with no significant distal tipping was obtained with the iPanda. The results demonstrated an increased amount of molar distalization compared to the results of similar studies using conventional non-compliance intraoral appliances and miniscrew supported distalizers.\textsuperscript{3-14,17-25} Bolla et al have evaluated the dental and skeletal effects of the Distal Jet appliance in growing patients.\textsuperscript{8} The authors have reported a significant amount of maxillary molar distalization of 3.2 mm with a distal tipping of 3.1°. Papadopoulos et al reported 4.0 mm of maxillary distal movement with the non-compliance FCA.\textsuperscript{14} Chiu et al compared the effect of the Distal Jet and Pendulum appliances to distalize molars and observed that both appliances were able to achieve 3.0 mm of distal movement.\textsuperscript{4} However, in these studies only growing patients with maxillary second molars not emerged into the oral cavity were included. Moreover, some amount of anchorage loss measured at the premolar area has often been reported.\textsuperscript{8-12}

The increased amount of molar distalization obtained in the present study was also higher than in similar studies using miniplates and miniscrews as anchorage.\textsuperscript{17-25} Sugawara et al\textsuperscript{24} reported that the maxillary molars were moved distally by approximately 4.0 mm at the crown level with miniplate anchorage. Yamada et al\textsuperscript{25} reported an average molar distalization of 2.8 mm and distal tipping of 4.8 degrees with miniscrews inserted in the interradicular space. The increased amount of distalization obtained in the present study can be explained by three main factors: (1) the miniscrew implant inserted in the midpalatal suture did not interfere with the path of distal movement of the maxillary molars, allowing a large amount of movement (compared to the interradicular miniscrews); (2) the second maxillary molars were extracted, producing an edentulous area with new bone formation for the distalization of the first molars; and (3) the nickel titanium Sentalloy closed coil springs used light and continuous forces, applied directly to the maxillary first molars.

In the present study, no significant distal tipping was obtained with the iPanda. The explanation for the controlled body movement is the design of the iPanda. The use of the round buccal tubes (0.9 mm diameter) sliding through the large diameter palatal bar (0.9 mm diameter) prevents the molars from tipping distally. It also avoids the distal rotation of the maxillary first molar during distalization. The bodily movement observed in the present study contrasts with the studies using non-compliance devices that often generate a significant amount of distal tipping during the distalization process.\textsuperscript{3-14} Moreover, distalizing devices using miniplates and miniscrews often generate a significant amount of distal tipping during the distalization process.\textsuperscript{24,25}

In the present study, although the treatment was performed in a group of adult patients, the rate of molar distalization was 1.4 mm per month. This rate is higher than that achieved in similar studies involving either non-compliance intraoral appliances in growing patients, distalizing devices using miniplates, or miniscrews.\textsuperscript{2,24,25}

Conventional, non-compliance intraoral appliances designed to produce molar distalization often result in some amount of molar extrusion and subsequent clockwise mandibular rotation.\textsuperscript{3-8} In the present study, however, the first molars were intruded by an average of 1.0 mm during the distalization
Maxillary molar distalization with the iPANDA appliance

process. This result is similar to that of Yamada et al.\textsuperscript{25} (0.6 mm), who used miniscrews inserted into the interradicular spaces to distalize the molars. This result suggests that clockwise rotation of the mandible could be prevented by intrusive force produced by the miniscrew-supported distalizing appliances.\textsuperscript{25}

In the present study, cephalometric analysis demonstrated that the midpalatal miniscrews were stable and remained stationary throughout the orthodontic treatment. Therefore, the pair of miniscrews in the palate was used as a reliable stationary reference landmark to allow the superimposition of pre-distalization, post-distalization, and posttreatment dental casts. Moreover, it allowed for the construction of a coordinate system that permitted accurate comparison between the amounts of distalization in the right and left segments. This measurement method facilitates the identification of sagittal and transverse dental changes using the dental casts.

Dental cast analysis (T1-T0) identified an asymmetric pattern of distalization between right and left first molars. Differences in the amount of molar distalization can be explained by the different amounts of distalization required to achieve a Class I molar relationship. The results indicated that the iPanda has the potential to provide different amounts of molar distalization between right and left segments without compromising the anchorage. Only a few studies describe the asymmetric effects of distalizing devices. Yamada et al.\textsuperscript{25}, using buccal miniscrews to distalize molars, described different amounts of distalization between right and left segments. However, their measurements were performed on lateral cephalometric films, which may not reliably distinguish between right and left sides.

Dental cast analysis also demonstrated that the transverse intermolar width was increased, since both right and left molars moved buccally (0.5 mm and 1.6 mm, respectively) as the result of the distalization. This effect was attributed to the large amount of distalization obtained and to the design of the palatal bar of the iPanda that guided the molars parallel to the posterior part of the maxillary arch. The results are in agreement with those of several previous studies reporting the use of noncompliance distalization devices.\textsuperscript{8,14}

Treatment effects following molar distalization (T2-T1)

Cephalometric analysis of the treatment effects with the iPanda (T1-T2) demonstrated that following the maxillary first molar distalization, the iPanda was still effective in maintaining the amount of distalization obtained in the distalization period (T0-T1) and in providing additional maximum anchorage to the molars during the retraction of the anterior teeth. A significant amount of incisor retraction was possible without compromising the anchorage on the posterior teeth.

In the present study, the overcorrection of molar distalization was performed during the retraction of the anterior segment in order to achieve a full Class I molar relationship. The iPanda was actively maintained in position, aided by an elastomeric chain in order to provide additional anchorage to the maxillary first molars during the anterior retraction (Fig 8). In this system, the small amount of continuous distalizing force was used to reinforce the maxillary first molar anchorage while avoiding any undesirable mesial movement of the molars, therefore providing a “dynamic anchorage” of the molars. This dynamic anchorage of the molars has been shown to be effective in eliminating the risks of mesial movement of the molars that is often observed during the retraction phase. Wehrbein et al.\textsuperscript{32} evaluated the anchorage capacity of palatally inserted Orthosystem implants for anchorage reinforcement of posterior teeth. The authors observed that even more rigid palatal bars (1.2 × 1.2 mm) allowed some mesial movement of molars during the retraction of the anterior segments.\textsuperscript{32}
Interestingly, with the dynamic anchorage of the molars, a small but not significant amount of distalization, as observed in the MU6L, was obtained during the retraction phase (T2-T1).

The results indicate that the iPanda is effective in anchoring the maxillary molars throughout the orthodontic treatment.

Dental model analysis (T2-T1) confirmed the cephalometric findings that the maxillary first molar remained stationary (in the sagittal dimension) throughout the retraction of the anterior teeth. A large amount of maxillary incisor retraction was possible with the iPanda without compromising the anchorage of the molars. The results indicated that the iPanda was not only efficient in maintaining the amount of molar distalization, but also efficient in providing maximum anchorage to the molars during anterior retraction. This is an advantage, since most non-compliance distalizers must be replaced by a Nance button, after distalization has been completed until the second phase of treatment with fixed appliances, to prevent, or at least minimize, the possible anchorage loss (mesialization of the maxillary molars).

Model analysis also demonstrated that the intermolar width (transverse dimension) was decreased to values similar to the initial values following the removal of the palatal bar. The results indicated that although the iPanda had a tendency to produce the buccoversion of the molars during the distalization process, the intermolar width returned to the initial values after the distalizing force was removed during the contraction phase of the treatment. Therefore, a transient-pattern maxillary expansion is caused by the iPanda.

Most of the intraoral distalization devices involving miniscrew implants are mere adaptations of the pre-existing, conventional non-compliance intraoral devices, such as Distal Jet and Pendulum appliances, in order to avoid the undesirable anchor loss. These appliances are often adapted to allow connection to the paramedian miniscrew implants through the acrylic Nance button in order to obtain skeletal anchorage. However, as in the conventional intraoral distalizers, the palatal acrylic Nance button generates problems with maintaining proper oral hygiene.

Recently, a modification in the appliance design has been developed to eliminate the acrylic palatal button, thus avoiding oral hygiene concerns. Kinzinger et al. designed a modified distal jet appliance that is anchored to short paramedian miniscrew implants without the acrylic Nance button. However, the authors observed that paramedian miniscrew implants with short lengths could not remain stationary during the maxillary molar distalization.

Practical clinical approaches have been described to indirectly connect these palatal bars to the miniscrew head through the use of light-cured composites or bonding materials, thereby obtaining a rigid fixation palatal bar-screw. However, these methods do not allow the easy replacement of the palatal bar during regular activation visits, nor do they allow adequate oral hygiene. Moreover, by the end of treatment, the removal of the miniscrew may be made difficult by the presence of composite material.
In this study, the iPanda could be easily connected to and removed from the heads of midpalatal miniscrew implants using a self-locking system. This simple and effective mechanism avoids the accidental dislodgement of the palatal bar, while allowing the orthodontist to simply remove or replace the palatal bar at regular visits. Because the self-locking system does not require any additional accessories, such as acrylic buttons in the palate, ligatures, or composite materials to remain stationary inside the patient's mouth, it facilitates the maintenance of oral hygiene. Another advantage of this self-locking system is the possibility of maintaining a minimum clearance space between the palatal bar and the palatal mucosa, thus avoiding risks of palatal bar impingement on the palate.

The clinical application of the iPanda is not limited to maxillary molar distalization; it can also be used as an effective appliance to anchor the maxillary molars when maximum anchorage is required. Because midpalatal miniscrew implants, used to anchor the iPanda, are located far from the dental roots and consequently do not interfere with the dental movement, they do not need to be replaced following the molar distalization. In the present study, after the maxillary molar distalization had been completed, the iPanda was maintained in position to serve as an indirect anchorage device to maintain the molars in position while performing the distalization of the remaining teeth (premolars, canines and the anterior incisors).

Because the maxillary molars are efficiently anchored to the midpalatal miniscrews through the iPanda, no adaptations in the conventional biomechanics or force systems, such as adjustable long hooks or lever arms, are necessary to perform the closure of the extraction spaces. As a result, the iPanda allows flexibility to the orthodontist to apply either sliding or contraction loop mechanics for the orthodontic treatment.

In this study, extractions of the maxillary second molars combined with the distalization of the first molars with the iPanda were the main treatment option to restore a Class I molar relationship and reduce the large overjet for this group of patients. However, the iPanda can also be used in non-extraction cases to distalize both the first and second molars simultaneously with the application of heavier distalizing forces (200 to 300 cN).

CONCLUSIONS

A midpalatal, miniscrew-supported appliance, the iPanda, has been described as an alternative that allows non-compliance maxillary molar distalization while providing improved palatal mucosal hygiene capacity by dispensing with the acrylic button. The iPanda has shown to be effective, not only to distalize the maxillary molars, but also to provide skeletal anchorage to the maxillary molars throughout the orthodontic treatment.

Further studies are necessary to evaluate the total treatment changes following the use of the iPanda.

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